



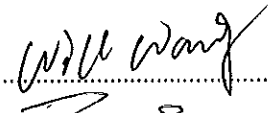
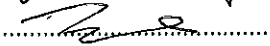
<b>TEST REPORT</b> <b>IEC 61558-2-16</b> <b>Safety of power transformers, power supplies, reactors and similar products for supply voltages up to 1100 V</b> <b>Part 2: Particular requirements and tests for switch mode power supply units and transformers for switch mode power supply units</b>	
Report Reference No. ....	: 130401494SHA-001
Date of issue .....	: 2013-08-13
Total number of pages.....	: 121
<b>Testing Laboratory</b> .....	: Intertek Testing Services Shanghai.
Address .....	: Building No.86, 1198 Qinzhou Road (North), Shanghai 200233, China
<b>Applicant' s name</b> .....	: GlobTek, Inc.
Address .....	: 186 Veterans Dr. Northvale, NJ 07647 USA
<b>Test specification:</b>	
Standard.....	: IEC 61558-2-16: 2009 (First Edition) used in conjunction with IEC 61558-1: 2005 (Second Edition) + A1:2009 Including group differences for CENELEC and national difference for Sweden (EN 61558-2-16: 2009 used in conjunction with EN 61558-1: 2005 + A1:2009)
Test procedure .....	: CB Scheme
Non-standard test method .....	: N/A
<b>Test Report Form No.</b> .....	: IEC61558_2_16A
Test Report Form(s) Originator.....	: VDE Testing and Certification Institute
Master TRF .....	: Dated 2009-10
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<b>This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.</b>	

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<b>Test item description</b> .....	: Building-in power supply (switching power supply) for general purpose
Trade Mark.....	: GlobTek
Manufacturer.....	: GlobTek, Inc.
Address .....	: 186 Veterans Dr. Northvale, NJ 07647 USA
Model/Type reference .....	: GT*93021-*** -*2 The 1st “*” can be “M” or “-“or “H” for market identification and not related to safety. The 2nd “*” denote the rated output wattage designation, which can be “01” to “20”, with interval of 1. The 3rd “*” denote the standard rated output voltage designation, which can be “07”, “09”, “15”, “24”, “36” or “48”. The 4th “*” is optional deviation, subtracted from standard output voltage, which can be “-0,1” to “-11,9” with interval of 0,1, or blank to indicate no voltage different. The 3rd and 4th “**” together denote the output voltage, with a range of 5- 48 volts. The last “*” can be P or T or D, the model name with P denotes connected by wires, with T denotes connected by terminal block, with D denotes connected by metal pin. (See below table for detailed models)
Rating(s) .....	: Class II, t <sub>a</sub> : 50°C Input: 100-240V~, 50-60Hz, 0,6A max.; Output: 5-48VDC, 20W max. (See below table for detailed ratings)

Model	Voltage	Max. current	Max. power
GT*93021-*07-*2	5-7V	3A	18W
GT*93021-*09-*2	7,1-9V	2,8A	20W
GT*93021-*15-*2	9,1-15V	2,2A	20W
GT*93021-*24-*2	15,1-24V	1,32A	20W
GT*93021-*36-*2	24,1-36V	0,83A	20W
GT*93021-*48-*2	36,1-48V	0,55A	20W

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Testing procedure and testing location:	
<input checked="" type="checkbox"/> <b>CB Testing Laboratory:</b>	Intertek Testing Services Shanghai.
Testing location/ address .....	Building No.86, 1198 Qinzhou Road (North), Shanghai 200233, China
<input type="checkbox"/> <b>Associated CB Laboratory:</b>	
Testing location/ address .....	
Tested by (name + signature).....	Will Wang 
Approved by (+ signature) .....	Susanna Xu 
<input type="checkbox"/> Testing procedure: TMP	
Tested by (name + signature).....	
Approved by (+ signature) .....	
Testing location/ address.....	
<input type="checkbox"/> Testing procedure: WMT	
Tested by (name + signature).....	
Witnessed by (+ signature).....	
Approved by (+ signature) .....	
Testing location/ address .....	
<input type="checkbox"/> Testing procedure: SMT	
Tested by (name + signature).....	
Approved by (+ signature) .....	
Supervised by (+ signature).....	
Testing location/ address .....	
<input type="checkbox"/> Testing procedure: RMT	
Tested by (name + signature).....	
Approved by (+ signature) .....	
Supervised by (+ signature).....	
Testing location/ address .....	

**Summary of testing:****Tests performed (name of test and test clause):****Testing location:**

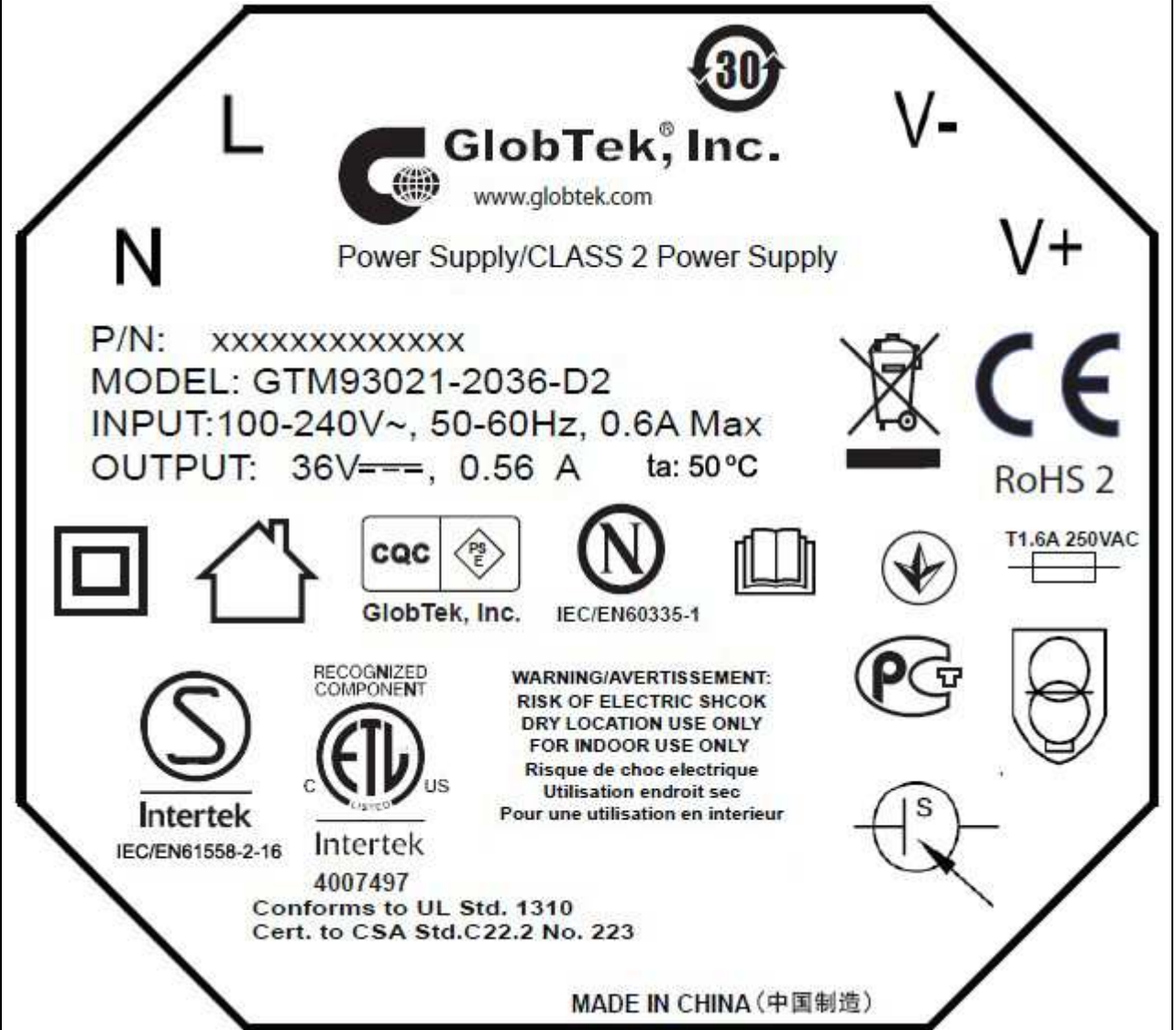
Marking test	8.15
Protection against accessibility to hazardous live parts	9
Full-load output voltage test	11
No-load output voltage test	12
Heating test	14.2
Short-circuit & overload protection (Non-inherently short-circuit proof transformer)	15.3
Mechanical strength test - Impact test	16.2
IP test	17.1
Humidity	17.2
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Dielectric strength test	18.3
Touch current and protective earth conductor current	18.5
Impulse test	18.101
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Creepage distances, clearances and distances through insulation measurement	26.1
Mandrel test	26.3.3
Ball pressure test	27.1
Glow wire test	27.3
Electronic circuits fault test	H.2.3

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

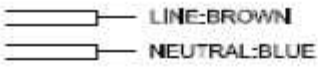
**Summary of compliance with National Differences:**


Group differences for CENELEC and national difference for Sweden were considered.

Copy of marking plate




Note: Other models of GT\*93021-\*\*\*-D2 and all models of GT\*93021-\*\*\*-T2 are with similar label as GTM93021-2036-D2 except different model name and output ratings.





**GlobTek, Inc.**  
 www.globtek.com

Power Supply/CLASS 2 Power Supply


P/N: xxxxxxxxxxxxxx  
 MODEL: GTM93021-2036-P2  
 INPUT: 100-240V~, 50-60Hz, 0.6A Max  
 OUTPUT: 36V==, 0.56 A    ta: 50°C



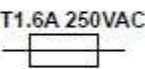




RoHS 2




RoHS 2







GlobTek, Inc.    IEC/EN60335-1



**Intertek**  
IEC/EN61558-2-16

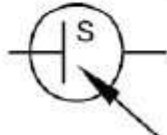
RECOGNIZED COMPONENT



**Intertek**  
4007497  
Conforms to UL Std. 1310  
Cert. to CSA Std. C22.2 No. 223

**WARNING/AVERTISSEMENT:**  
 RISK OF ELECTRIC SHOCK  
 DRY LOCATION USE ONLY  
 FOR INDOOR USE ONLY  
 Risque de choc électrique  
 Utilisation endroit sec  
 Pour une utilisation en intérieur





MADE IN CHINA (中国制造)

Note: Other models of GT\*93021-\*\*\*-P2 are with similar label as GTM93021-2036-P2 except different model name and output ratings.

<b>Test item particulars.....:</b>	
Type of transformers .....	Safety isolating transformer
Application .....	<del>stationary</del> / portable / <del>hand-held</del>
Protection against electric shock .....	Class II
Short-circuit protection.....	Yes/ <del>No</del>
inherently short-circuit proof .....	<del>Yes</del> / No
non-inherently short-circuit proof .....	Yes/ <del>No</del>
non short-circuit proof .....	<del>Yes</del> / No
fail safe .....	<del>Yes</del> / No
Protection index .....	Built-in power supply, shall be considered in end product
Other characteristics.....	Weight: 136g max with potting material Weight: 75g max without potting material
Rated ambient temperature ta (°C) .....	50°C
Short-circuit voltage (V) .....	-
<b>Possible test case verdicts:</b>	
- test case does not apply to the test object .....	N/A (not applicable)
- test object does meet the requirement .....	P (Pass)
- test object does not meet the requirement.....	F (Fail)
<b>Testing .....</b>	
Date of receipt of test item.....	2013-05-24
Date (s) of performance of tests.....	2013-05-24 to 2013-06-28
<b>General remarks:</b>	
<p>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.            "(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 is used as the decimal separator.</p> <p>Model GTM93021-1507-2.0-P2, GTM93021-2009-P2, GTM93021-2024-P2, GTM93021-2036-P2 and GTM93021-2048-P2 were tested as typical models. Heating tests for terminal blocks were also performed on model GTM93021-1507-2.0-T2, GTM93021-2009-T2, GTM93021-2024-T2, GTM93021-2036-T2 and GTM93021-2048-T2 for evaluation.</p> <p>Appendix no. 1: Photos, from page 102 to page 120, total 19 pages.</p> <p>Appendix no. 2: Group differences for CENELEC and national difference for Sweden (EN 61558-2-16: 2009 used in conjunction with EN 61558-1: 2005 + A1:2009), page 121, total 1 page.</p> <p>Determination of the test result includes consideration of measurement uncertainty from the test equipment and methods.</p> <p>The tests evaluated in this report were only based on component condition and some parts of products were not considered in this test report. Protection against Access to Live Parts, Heating Test, Leakage Current and touch current Tests, Overload Test, Stability Test, Mechanical Strength and PROTECTION AGAINST HARMFUL INGRESS OF WATER AND MOISTURE shall be evaluated in end appliance again. Further tests may be under consideration if influences exist in end product, such as Ball Pressure Test if the heating tests get more severe results.</p>	



**General product information:**

The products covered by this report are Building-in power supply (switching power supply) for general purpose.

Transformers used in all models are with same construction. The turns of secondary winding may be added or reduced according different output voltage.

All models have same PCB, but some non-critical components may be adjusted according different output voltage. The parameters of these components depend on output voltage.

The difference for GT\*93021-\*\*\* -T2, GT\*93021-\*\*\* -P2 and GT\*93021-\*\*\* -D2 three series:

GT\*93021-\*\*\* -T2 have two terminal blocks for input and output wiring. Relevant symbols for input and output such as "L", "N", "V+" and "V-" are marked on label near corresponding terminals;

GT\*93021-\*\*\* -P2 have four lead wires for input and output wiring; Relevant symbols for input and output such as "LINE", "NEUTRAL", "V+" and "COM" are marked on label near corresponding wires;

GT\*93021-\*\*\* -D2 have solid metal pins for input and output wiring, relevant indication marks near pins.

Relevant symbols for input and output such as "L", "N", "V+" and "V-" are marked on label near corresponding terminals.




The products are intended to use in environment which ambient temperature is 50°C.





The products are fully impregnated by epoxy resin. All internal components are enclosed except these wiring components.

Factory:

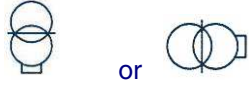











1. GlobTek ( Suzhou) Co., Ltd  
Building 4, No. 76 JinLing East Road, Suzhou Industrial Park, Suzhou, JiangSu, 215021, China
2. GlobTek, Inc.  
186 Veterans Dr. Northvale, NJ 07647 USA



IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
<b>8</b>	<b>MARKING AND OTHER INFORMATION</b>		<b>P</b>
8.1	Transformer marked with:		<b>P</b>
	a) rated supply voltage or voltage range (V) .....	100-240V~	<b>P</b>
	b) rated output voltage (V) .....	See page 5 and 6	<b>P</b>
	c) rated output (VA, kVA or W) .....		<b>N/A</b>
	d) rated output current (A) .....	See page 5 and 6	<b>P</b>
	e) rated frequency (Hz) .....	50-60Hz	<b>P</b>
	f) rated power factor (if not 1) .....		<b>N/A</b>
	g) symbol AC for alternating current, or DC for direct current-output	See page 5 and 6	<b>P</b>
	h) symbol for electrical function (according to one or more part's 2) in addition with the symbol for SMPS (IEC 61558-2-16:09)	For example: 	<b>P</b>
	i) manufacturer's name or trademark or name of the responsible vendor	See page 5 and 6	<b>P</b>
	j) model or type reference	See page 5 and 6	<b>P</b>
	k) vector group according to IEC 60076 for three-phase transformer		<b>N/A</b>
	l) symbol for Class II		<b>P</b>
	m) symbol for Class III		<b>N/A</b>
	n) index IPXX if other than IP00	Built-in product, considered as IP00	<b>N/A</b>
	o) rated max. ambient temperature ta (if not 25 °C) .....	Ta: 50°C	<b>P</b>
	p) rated minimum ambient temperature ta min, if <10° C and if a temperature sensitive device is used		<b>N/A</b>
	q) short-time duty cycle: operating time Intermittent duty cycle: operating and resting time (e.g. 5min/30min)		<b>N/A</b>
	r) for tw-marked transformers marked with the rated max. operating temperature, increased by multiples of 5 (e.g. tw 120; tw 125 )		<b>N/A</b>
	s) transformers used with forced air cooling shall be marked with "AF" in m/s		<b>N/A</b>
	t) Information from the manufacturer to the purchaser (data sheet) :		<b>N/A</b>
	– short-circuit voltage (% rated supply voltage) for stationary transformers > 1000 VA		<b>N/A</b>
	– electrical function of the transformer		<b>N/A</b>

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
8.2	Marking for transformers IP00 or for associated transformers: type and trademark, instruction sheets		P
8.3	Adjusted voltage easily and clearly discernible		N/A
8.4	For each tapping or winding: rated output voltage and rated output		N/A
	necessary connections clearly indicated		N/A
8.5	For short-circuit proof transformers or non-inherently short-circuit proof transformers:		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 .....	T1,6A	P
	Manufacturer's model or type reference and rating of the device for non-inherently short-circuit proof transformers with incorporated replaceable protective device (other than fuses)	Non-replaceable	N/A
	Construction sheet for transformers with replaceable protective device (other than fuses) information with information about the replacement.		N/A
8.6	Terminals for neutral: "N"		N/A
	Terminal for protective earth marked with earthing symbol		N/A
	Identification of input terminals: "PRI"		N/A
	Identification of output terminals: "SEC"		N/A
	Symbol for any point/terminal in connection with frame or core		N/A
8.7	Indication for correct connection		N/A
8.8	Instruction sheet for type X, Y, Z attachments	Built-in product	N/A
8.9	Transformer for indoor use shall be marked with the relevant symbol.		P
8.10	Symbol for Class II construction not confused with maker's name or trademark.		P
	Class II transformer with parts to be mounted – delivered with all parts for class II after mounting.		N/A
	Symbol for class II transformer placed on the part which provides class II.		N/A
8.11	Correct symbols:		P
	Volts	V	P
	Amperes	A (mA)	P
	Volt amperes (or volt-amperes reactive for reactors)	VA or (VAR)	N/A
	Watts	W	N/A

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	Hertz	Hz	P
	Input	PRI	N/A
	Output	SEC	N/A
	Direct current	d.c. (DC) or	P
	Neutral	N	N/A
	Single-phase a.c.		P
	Three-phase a.c.	3	N/A
	Three-phase and neutral a.c.	3/N	N/A
	Power factor	$\cos \varphi$	N/A
	Class II construction		P
	Class III construction		N/A
	Fuse-link	F	N/A
	Rated max. ambient temperature	$t_a$	P
	Frame or core terminal		N/A
	Protective earth		N/A
	IP number	IP00	N/A
	Earth (ground for functional earth)		N/A
	For indoor use only		P
	tw5 YYY		N/A
	tw10 YYY		N/A
	twx YYY		N/A
	Additional Symbols (IEC 61558-2-16:09)		P
	<b>SMPS</b> incorporating a <b>Fail-safe separating transformer</b>		N/A
	<b>SMPS</b> incorporating a <b>Non-short-circuit-proof separating transformer</b>		N/A
	<b>SMPS</b> incorporating a <b>Short-circuit-proof separating transformer</b> (inherently or non-inherently)		N/A
	<b>SMPS</b> incorporating a <b>Fail-safe isolating transformer</b>		N/A
	<b>SMPS</b> incorporating a <b>Non-short-circuit-proof isolating transformer</b>		N/A

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	<b>SMPS</b> incorporating a <b>Short-circuit-proof isolating transformer</b> (inherently or non-inherently)	 or 	N/A
	<b>SMPS</b> incorporating a <b>Fail-safe safety isolating transformer</b>		N/A
	<b>SMPS</b> incorporating a <b>Non-short-circuit-proof safety isolating transformer</b>		N/A
	<b>SMPS</b> incorporating a <b>Short-circuit-proof safety isolating transformer</b> (inherently or non-inherently)		P
	<b>SMPS</b> incorporating a Fail-safe <b>auto-transformer</b>	 or 	N/A
	<b>SMPS</b> incorporating a <b>Non-short-circuit proof auto-transformer</b>	 or 	N/A
	<b>SMPS</b> incorporating a <b>Short-circuit proof auto-transformer</b> (inherently or non-inherently)	 or 	N/A
	<b>SMPS</b> (Switch mode power supply unit)		P
8.12	Figures, letters or other visual means for different positions of regulating devices and switches	No switch	N/A
	OFF position indicated by figure 0		N/A
	Greater output, input etc. indicated by higher figure		N/A
8.13	Marking not on screws or other easily removable parts		P
	Marking clearly discernible (transformer ready for use)		P
	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	Special information for installation (in the catalogue, data sheet, or instruction sheet) if necessary:		P
	For non-inherently short-circuit proof transformers with non-self-resetting or non replaceable devices (weak-point, thermal link): The device can not be reseted or replaced		N/A

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	For transformers generating a protective earth conductor current of 10 mA (see also cl. 18.5.2): The installation shall be made according to the wiring rules.		N/A
	For associated- and IP00-transformers: At 10% over or under voltage in the supply voltage, the rated output of the transformer shall be selected accordingly.		N/A
	For stationary transformers exceeding 1000 VA: The short circuit voltage in % of the rated voltage		N/A
	For all transformers the electrical function: An information about the electrical function of the transformer (e.g. inherently short circuit proof safety isolating transformer)		P
	For associated- and IP00-transformers: The max. abnormal winding temperature		N/A
	For tw-transformers: The specific constant S is (e.g. S6 says S = 6000)		N/A
	For transformers with more than one output winding, not for series or parallel connection		N/A
	– an information in the in the instruction sheet: the transformer is not intended for series/parallel connection		N/A
	For IP00-transformers the test of 27.2 is not performed. The result may be affected by the enclosure in the final application.		N/A
8.15	Marking durable and easily legible		P

<b>9</b>	<b>PROTECTION AGAINST electric shock</b>		<b>P</b>
9.1	Protection against contact with hazardous live parts		P
9.1.1	A live part is not a hazardous live part if:		P
	– it is separated from the supply by double or reinforced insulation		P
	– the requirements of 9.1.1.1 and 9.1.1.2 are fulfilled		P
9.1.1.1	The touch voltage is $\leq 35$ V(peak) a.c. or $\leq 60$ Vd.c.	Output: 47,89VDC max (GTM93021-2048-P2)	P
9.1.1.2	If the touch voltage is $> 35$ V (peak)a.c. or $> 60$ V d.c., the following requirements shall be fulfilled:	Between input circuit and output circuit	P
	The touch current shall not exceed:		P
	– for a.c. 0,7 mA (peak)	0,134 mA (peak) max (GTM93021-2036-P2)	P

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	– for d.c. 2,0 mA (see Annex J)		N/A
	In addition, when a capacitor is connected to live parts:		—
9.1.1.2.1	discharge: < 45 $\mu$ C (between 60 V and 15 kV)	0,264 $\mu$ C	P
9.1.1.2.2	energy: $\leq$ 350 mJ (voltage >15 kV)		N/A
9.1.2	Transformers shall have an adequate protection against accessibility to hazardous live parts:	Built-in product, only consider the parts excluding terminals	P
	The enclosure of class I and class II transformers gives an adequate protection against accidental contact with hazardous live parts.		P
	Class I transformers: accessible parts are separated from hazardous live parts by at least basic insulation.		N/A
	Class II transformers: no accessibility to basic insulation, or conductive parts separated from hazardous live parts by basic insulation.		P
	Hazardous live parts are not accessible after removal of detachable parts.	No such part	N/A
	Hazardous live parts are not accessible after removal of detachable parts except for:	No lamp or fuse holder	N/A
	– lamps having caps larger B9 and E10		N/A
	– type D fuse holder		N/A
	Lacquers, enamel, paper, cotton, oxide film on metal parts not used for protection against accidental contact with hazardous live parts:	Such substance not used	N/A
	Shafts, handles, operating levers, knobs are not hazardous life parts.	No such part	N/A
	Compliance is checked by inspection and by relevant tests according to IEC 60 529	Only the parts excluding terminals were tested	P
	Class II transformers and Class II parts of Class I construction are tested with the test pin (fig. 3)		P
	Hazardous live parts shall not be touchable by test finger (fig. 2)		P
	for Class II transformers: metal parts separated by basic insulation from hazardous live parts not touchable by test finger		P
	hazardous live parts shall not be touchable with the test pin		P
9.1.3	Accessibility of non hazardous live parts		P
	Non hazardous live parts of the output circuit may be accessible if they are isolated from the input circuit by double or reinforced insulation and if the following conditions are fulfilled:		P

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	– The no load output voltage is $\leq 35$ V peak a.c. or $\leq 60$ V ripple free d.c., both poles are accessible	No-load output voltage: 47,89VDC max (GTM93021-2048-P2)	P
	– The no load output voltage is $> 35$ V peak a.c. or $> 60$ V ripple free d.c. and $\leq 250$ V a.c., only one pole may be accessible		N/A
9.2	Transformers with primary supply plug: 1 s after the interruption of the supply the voltage between the pins do not exceed 35 V (peak) a.c. or 60 V ripple free d.c.	Built-in product, only for end product reference. 20,2VDC max (GTM93021-2048-P2)	P
	Transformers without a primary supply plug: 5 s after the interruption of the supply the voltage between the input terminals do not exceed 35 V (peak) a.c. or 60 V ripple free d.c.	Built-in product, only for end product reference. No voltage measured	P
	The following tests are required :		P
	If the nominal capacitance is $\leq 0,1 \mu\text{F}$ – no test is conducted.	0,22 $\mu\text{F}$ X capacitor across line and neutral	P
	– 10 times switch the supply source on and off, or use a special equipment for to switch off at the most unfavourable electrical angle		P
	If the measured voltage is $> 60$ V ripple free d.c., the discharge must be $\leq 45 \mu\text{C}$ .	20,2VDC max (GTM93021-2048-P2)	N/A

<b>10</b>	<b>CHANGE OF INPUT VOLTAGE SETTING</b>		N/A
	Voltage setting not possible to change without a tool	Cannot be changed	N/A
	Different rated supply voltages:		N/A
	– indication of voltage for which the transformer is set, is discernible on the transformer.		N/A
10.101	A wide range of the input (120 V a. c, to 240 V a.c voltage is allowed (IEC 61558-2-16:09):		N/A
	– if the output voltages does not exceed the rated output voltage		N/A
	– if the no-load voltage does not exceed the limits of output voltage deviation		N/A

<b>11</b>	<b>OUTPUT VOLTAGE AND OUTPUT CURRENT UNDER LOAD</b>		P
11.1	Difference from rated value (without rectifier; with rectifier):	(see appended table) Rectifier is not accessible	P
	a) inherently short-circuit proof transformers with one rated output voltage for output voltage: a.c. $\leq 10\%$ ; d.c. $\leq 15\%$		N/A



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Clause	Requirement + Test	Result - Remark	Verdict
	b) inherently short-circuit proof transformers with one more than 1 rated output voltage for highest output voltage: a.c. ≤ 10%; d.c. ≤ 15%		N/A
	c) idem for other output voltages: a.c. ≤ 15%; d.c. ≤ 20%		N/A
	d) other transformers for output voltages: a.c. ≤ 5%; d.c. ≤ 10%	Non-inherently short-circuit proof transformers	P

<b>12</b>	<b>NO-LOAD OUTPUT VOLTAGE (see supplementary requirements in Part 2)</b>		P
	Remark: with rectifier measuring on both sides of the rectifier	The rectifier is not accessible to the user	N/A
12.101	The no load output voltage shall not exceed (IEC 61558-2-16:09):		P
	– For SMPS incorporating separating or auto-transformers: 1000V a.c. or 1415 V ripple free d.c.		N/A
	– For SMPS including isolating transformers: 500 V a.c. or 708 V ripple-free d.c.		N/A
	– For SMPS including safety isolating transformers: 50 V a.c. or 120 V ripple-free d.c.	47,89VDC max (GTM93021-2048-P2)	P
	For <b>independent transformers</b> , this output voltage limitation applies even when output windings, not for interconnection, are connected in series		N/A
12.202	The difference between output voltage at no load and the output voltage measured in clause 11 does not exceed the values of table 101 (IEC 61558-2-16:2009), Rated output (VA) Rated value %	(see appended table)	P

<b>13</b>	<b>SHORT-CIRCUIT VOLTAGE</b>		N/A
	Difference from marking for short-circuit voltage ≤ 20%		N/A

<b>14</b>	<b>HEATING</b>		P
14.1	General requirements		P
	No excessive temperature in normal use		P
	Room temperature: rated ambient temperature $t_{a\pm 5} \text{ }^\circ\text{C}$		—
	Type X, Y, Z attachments: 1 pull (5 N) to the connection windings	Built-in product	N/A
	Upri (V): 1,1 times rated supply voltage loaded with rated impedance – for independent transformers		—

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Clause	Requirement + Test	Result - Remark	Verdict
	Upri (V): 1,1 times rated supply voltage: with I sec (A), measured with rated impedance and 1,0 times of the rated supply voltage for others than independent transformers		—
	Type X, Y, Z attachments: 1 pull (5 N) to the connection windings	Built-in product	N/A
	Max. temperature windings .....	(see appended table)	P
	– Class A: $\leq 100\text{ }^{\circ}\text{C}$		N/A
	- Class E: $\leq 115\text{ }^{\circ}\text{C}$		N/A
	– Class B: $\leq 120\text{ }^{\circ}\text{C}$		P
	– Class F: $\leq 140\text{ }^{\circ}\text{C}$		N/A
	– Class H: $\leq 165\text{ }^{\circ}\text{C}$		N/A
	– other classes		N/A
	Temperature of external enclosures of stationary transformers:	Built-in product, no enclosure can be touched directly	N/A
	– metal: $\leq 70\text{ }^{\circ}\text{C}$		N/A
	– other material: $\leq 80\text{ }^{\circ}\text{C}$		N/A
	Temperature of external enclosure of stationary transformer $\leq 85\text{ }^{\circ}\text{C}$ (not touchable with the IEC test finger)		N/A
	Temperature of external enclosures, handles, etc. of portable transformers:		N/A
	– continuously held parts of metal: $\leq 55\text{ }^{\circ}\text{C}$		N/A
	– continuously held parts of other material: $\leq 75\text{ }^{\circ}\text{C}$		N/A
	– not continuously held parts of metal: $\leq 60\text{ }^{\circ}\text{C}$		N/A
	– not continuously held parts of other material: $\leq 80\text{ }^{\circ}\text{C}$		N/A
	Temperature of terminals for external conductors $\leq 70\text{ }^{\circ}\text{C}$	According T mark $100^{\circ}\text{C}$	P
	Temperature of terminals of switches $\leq 70\text{ }^{\circ}\text{C}$		N/A
	Temperature of internal and external wiring:		P
	– rubber: $\leq 65\text{ }^{\circ}\text{C}$		N/A
	– PVC: $\leq 70\text{ }^{\circ}\text{C}$	According T mark	P
	Temperature of parts where safety can be affected:		N/A
	u) rubber: $\leq 75\text{ }^{\circ}\text{C}$		N/A
	– phenol-formaldehyde: $\leq 105\text{ }^{\circ}\text{C}$		N/A
	– urea-formaldehyde: $\leq 85\text{ }^{\circ}\text{C}$		N/A
	– impregnated paper and fabric: $\leq 85\text{ }^{\circ}\text{C}$		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– impregnated wood: ≤ 85 °C		N/A
	– PVC, polystyrene and similar thermoplastic material: ≤ 65 °C		N/A
	– varnished cambric: ≤ 75 °C		N/A
	Temperature rise of supports ≤ 85 °C		P
	Temperature of printed boards:	T=130°C	P
	– bonded with phenol-formaldehyde: ≤ 105 °C		N/A
	– melamine-formaldehyde: ≤ 105 °C		N/A
	– phenol-furfural: ≤ 105 °C		N/A
	– polyester: ≤ 105 °C		N/A
	– bonded with epoxy: ≤ 140 °C		N/A
	Electric strength between input and output windings (18.3, 1 min); test voltage (V) .....	3640V 1min	P
14.101	Winding temperature measured by thermocouples at the surface of the winding(IEC 61558-2-16:09)		P
	– if the internal frequencies is > 1kHz		P
	– the values of Table 1 for windings temperatures are reduced by 10° C		P
14.2	Application of 14.1 or 14.3 according to the insulation system		P
14.2.1	Class of isolating system (classified materials according to IEC 60 085 and IEC 60 216)	Class B	P
14.2.2	No classified material, or system but the measured temperature does not exceed the value of Class A		N/A
14.2.3	No classified material or system but the measured temperature exceeds the value for Class A, the live parts of the transformers are submitted to the test of 14.3		N/A
14.3	Accelerated ageing test for undeclared class of isolating system		N/A
	Cycling test (10 cycles):		N/A
	– measuring of the no-load input current (mA)		N/A
14.3.1	– heat run (temperature in table 2)		N/A
14.3.2	– vibration test: 30 min; amplitude 0,35 mm; frequency range: 10 Hz, 55 Hz, 10 Hz		N/A
14.3.3	– moisture treatment (48 h, 17.2)		N/A
14.3.4	Measurements and tests at the beginning and after each test:		N/A
	– deviation of the no-load input current, measured at the beginning of the test is ≤ 30%		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– insulation resistance acc. cl.18.1 and 18.2		N/A
	– electric strength, no breakdown (18.3); 2 min; test voltage 35% of specified value (table VI)		N/A
	– Transformers (50 or 60 Hz version) are tested after the dielectric strength test as follows: under no load; duration: 5 min; Upri(V):1,2 times rated supply voltage; frequency (Hz): 2 times rated frequency		N/A

<b>15</b>	<b>SHORT-CIRCUIT AND OVERLOAD PROTECTION</b>		<b>P</b>
15.1	General		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		—
	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
	– Max. temperature of winding protected inherently (insulation class): ≤ 150 °C (A); ≤ 165 °C (E); ≤ 175 °C (B); ≤ 190 °C (F); ≤ 210 °C (H)		N/A
	Winding protected by protective device:		P
	– Test according 15.3.2 - 15.3.3 – 15.3.4: max. temperature of winding during the time required or the time T given in table 4 (a) (insulation class): ≤ 200 °C (A); ≤ 215 °C ;(E); ≤ 225 °C (B); ≤ 240 °C (F); ≤ 260 °C (H)		N/A
	– Test according 15.3.1: max. temperature of winding <b>during the first hour, peak value</b> (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 <b>after first hour, peak value</b> (insulation class): ≤ 175 °C (A); ≤ 190 °C (E); ≤ 200 °C (B); ≤ 215 °C (F); ≤ 235 °C (H)		N/A
	– Test according 15.3.1: max. temperature of winding <b>after first hour, arithmetic mean value</b> (insulation class): ≤ 150 °C (A); ≤ 165 °C (E); ≤ 175 °C (B); ≤ 190 °C (F); ≤ 210 °C (H)		N/A
	Max. temperature of external enclosures (accessible by test finger) ≤ 105 °C		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Max. temperature of insulation of wiring (rubber and PVC) $\leq 85$ °C		P
	Temperature rise of supports $\leq 105$ °C		P
15.2	For inherently short-circuit proof transformers and for transformers with rectifiers test by short circuit of the output winding at rated supply voltage x 1,1: temperature rises $\leq$ values in table 3		N/A
15.3	For non-inherently short-circuit proof transformers and for transformers with rectifiers: temperature rises $\leq$ values in table 3		P
15.3.1	Output terminals short-circuited: protection device operates, test at 0,9 ... 1,1 of the rated supply voltage		P
15.3.2	If protected by a fuse accordance with either IEC 60 269-2 or IEC 60 269-3, or a technical equivalent fuse, the transformer is loaded as in table 4.		N/A
15.3.3	If protected by a fuse accordance with either IEC 60 127 or ISO 8820, or a technical equivalent fuse, the transformer is loaded with the current as specified for the longest pre arcing time. <i>If protected by a miniature fuses in accordance to IEC 60127, 1,5 times of the rated fuse, until steady state condition (in addition)</i>	1,6A time-lag fuse	P
15.3.4	If protected by a circuit-breaker according to IEC 60 898 the transformer is loaded with a current equal to 1,45 times the value of the circuit-breaker rated current		N/A
15.3.5	If other overload protection than a fuse (IEC 60 127) or a circuit-breaker (IEC 60 898) test with 0,95 times of operating current		N/A
	If an internal weak point is used, the test must be repeated with two new samples. The two additional samples works similar to the first sample. Temperatures in the limit of table 3		N/A
15.4	For non-short-circuit proof transformers: temperature rises $\leq$ values in table 3, tests as indicated in 15.3		N/A
15.5	For fail-safe transformers:		N/A
15.5.1	Three additional new specimens are used		—
	– U <sub>pri</sub> (V): 1,1 times rated supply voltage .....		—
	– I <sub>sec</sub> (A): 1,5 times rated output current .....		—
	– time until steady-state conditions t <sub>1</sub> (h) .....		—
	– time until failure t <sub>2</sub> (h): $\leq t_1$ ; $\leq 5$ h .....		N/A
15.5.2	During the test:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– no flames, molten material, etc.		N/A
	– temperature of enclosure $\leq 175$ °C		N/A
	– temperature of plywood support $\leq 125$ °C		N/A
	After the test:		N/A
	– electric strength (Cl. 18, 1 min, test voltage: 35% of specified value); no flashover or break-down for primary-to-secondary only for safety isolating, isolating and separating transformer and for primary-to-body for all kinds of transformer		N/A
	– bare hazardous live parts not accessible by test finger through holes of enclosure		N/A
15.101	Electronic circuits of the SMPS fulfils the requirements of <b>Annex H of part 1</b> . After a fault: no electric shock, no fire hazard and no unintentional operation.	(Details see Annex H)	P

<b>16</b>	<b>MECHANICAL STRENGTH</b>		P
16.1	General	Built-in product, only consider the parts excluding terminals	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	Built-in product, only consider the parts excluding terminals	P
	– no damage for insulating barriers		P
	– handles, levers, etc. have not moved on shafts	No such part	N/A
16.2	Transformers (stationary and portable s. 16.1)		P
	For stationary and portable transformers: 3 blows, impact energy 0,5 Nm		P
16.3	Portable transformers (except of plug in transformers)	For reference	P
	For portable transformers: 100 falls, 25 mm		P
16.4	Transformers with integrated pins (plug in transformers), the following tests are carried out:	Built-in product	N/A
	a) plug-in transformers: tumbling barrel test: $50 \times \leq 250$ g; $25 \times \leq 250$ g		N/A
	b) torque test of the plug pins with 0,4 Nm		N/A
	c) pull force according to table 5 for each pin		N/A

<b>17</b>	<b>PROTECTION AGAINST HARMFUL INGRESS OF WATER AND MOISTURE</b>	P
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IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
17.1	Degree of protection (IP code marked on the transformer)	Built-in product, considered as IP00	N/A
	Test according to 17.1.1 and for other IP ratings test according to IEC 60 529:		P
	– stable operating temperature before starting the test for < IPX8		N/A
	– transformer mounted and wired as in normal use		N/A
	– fixed transformer mounted as in normal use by the tests according to 17.1.1 A to L	The parts excluding terminals were tested according IP20 for reference.	P
	– portable transformers placed in the most unfavourable position and wired as in normal use		N/A
	– glands tightened with a torque equal to two-thirds of 25.6		N/A
	After the tests:		P
	– dielectric strength test according to 18.3		P
	Inspection:		P
	a) in dust-proof transformers no deposit of talcum powder		N/A
	b) no deposit of talcum powder inside dust-tight transformers		N/A
	c) no trace of water on live parts except SELV parts below 15 V ac or 25 V dc or insulation if hazard for the user or surroundings no reduction of creepage distances		N/A
	d) no accumulation of water in transformers $\geq$ IPX1 so as to impair safety		N/A
	e) no trace of water entered in any part of water-tight transformer		N/A
	f) no entry into the transformer by the relevant test probe		P
17.1.1	Tests on transformers with enclosure:		P
	A) Solid-object-proof transformers:		P
	- 2 IP2X test finger (IEC 60 529) and test pin (fig. 3)		P
	B) Solid-object-proof transformers:		N/A
	- wire 2,5 mm; force 3 N		N/A
	- IP4X, wire 1 mm; force 1 N		N/A
	C) Dust-proof transformers, IP5X; dust chamber according to IEC 60 529, fig. 2:		N/A
	a) transformer has operating temperature		N/A



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Clause	Requirement + Test	Result - Remark	Verdict
	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
	A) Dust-tight transformers (IP6X) test according to C)		N/A
	B) Drip-proof transformers (IPX1) test according to fig. 3 of IEC 60 529 for 10 min		N/A
	C) Rain-proof transformers (IPX2) test according to fig. 3 of IEC 60 529 for 10 min in operation, any angle up to 15°		N/A
	D) Spray proofed transformers (IPX3) test according to fig. 4 of IEC 60 529 for 10 min in operation and 10 min switched off , time for complete oscillation (2 x 120°) is 4 sec.		N/A
	E) Splash-proof transformers (IPX4) test according to fig. 4 of IEC 60 529 (see F) for 10 min in operation and 10 min switched off (the tube shall oscillate ≈360 °)		N/A
	F) Jet-proof transformer (IPX5) test according to fig. 6 of IEC 60 529 (nozzle 6,3mm)		N/A
	G) Powerful Jet-proof transformer (IPX6) test according to fig. 6 of IEC 60 529 (nozzle 12 mm)		N/A
	H) Watertight transformers (IPX7)		N/A
	I) Pressure watertight transformers (IPX8)		N/A
17.2	After moisture test (48 h for ≤ IP20, 168 h for other transformers):	IP00, 48h	P
	– insulation resistance and electric strength (Cl. 18)		P

<b>18</b>	<b>INSULATION RESISTANCE AND ELECTRIC STRENGTH</b>		<b>P</b>
18.2	Insulation resistance between:		P
	v) live parts and body for basic insulation $\geq 2 \text{ M}\Omega$		N/A
	w) live parts and body for reinforced insulation $\geq 7 \text{ M}\Omega$	Input circuit and outer enclosure excluding terminals (rounded with metal foil): 199MΩ	P
	x) input circuits and output circuits for basic insulation $\geq 2 \text{ M}\Omega$		N/A
	y) input circuits and output circuits for double or reinforced insulation $\geq 5 \text{ M}\Omega$	Input circuit and output circuit: 199MΩ	P

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Clause	Requirement + Test	Result - Remark	Verdict
	– each input circuit and all other input circuits connected together $\geq 2 \text{ M}\Omega$		N/A
	– each output circuit and all other output circuits connected together $\geq 2 \text{ M}\Omega$		N/A
	– hazardous live parts and metal parts with basic insulation (Class II transformers) $\geq 2 \text{ M}\Omega$		N/A
	– body and metal parts with basic insulation (Class II transformers) $\geq 5 \text{ M}\Omega$		N/A
	– metal foil in contact with inner and outer surfaces of enclosures $\geq 2 \text{ M}\Omega$	199M $\Omega$	P
18.3	Electric strength test (1 min): no flashover or breakdown:		P
	1) basic insulation between input circuits and output circuits; working voltage (V); test voltage (V) :		N/A
	double or reinforced insulation between input circuits and output circuits; working voltage (V); test voltage (V) .....	Working voltage: 240V Test voltage: 3640V	P
	2) basic or supplementary insulation between:		N/A
	a) live parts of different polarity; working voltage (V); test voltage (V) .....		N/A
	b) live parts and the body if intended to be connected to protective earth .....		N/A
	c) inlet bushings and cord guards and anchorages .....		N/A
	d) live parts and an intermediate conductive part .....		N/A
	e) intermediate conductive parts and body .....		N/A
	Reinforced insulation between the body and live parts; working voltage (V); test voltage (V) .....	Working voltage: 240V Test voltage: 3640V	P
	1) Functional insulation for windings intended to be connected in series or parallel (test voltage = working voltage + 500 V) (IEC 61558-2-16:09)		N/A
18.4	Does not apply (IEC 61558-2-16:09)		N/A
18.101	Impulse test according Table F5 of IEC 60664-1 with 1,2/50 $\mu\text{s}$ (IEC 61558-2-16)		P
	– After the test of 18.3, 10 impulses of each polarity between input and output terminals	4923V at sea level	P
	– During the tests no breakdown of the insulation between turns of a winding, between input and output circuits, or between windings and any conductive core		P
18.5	Touch current and protective earth current		P

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
18.5.1	Touch current		P
	Touch current measured after the clause 14 test (hot) for class I and class II transformers (class II transformers with metal foil at the plastic surface). The test circuit according figure 8. Measuring network according Figure J1 (Annex J). If the frequency is >30kHz, measuring across the 500 Ohm resistor of J1 (burn effects).	Max. 0,008mA	P
	Measurement of the touch current with switch p of picture 8 in both positions and in combination with switches e and n. The measured values are less than the required values of table 8b.		P
	– switches n and e in on position	Class II, switch e does not exist	P
	– switch n: off and switch e: on		P
	– switch n: on and switch e: off		N/A
18.5.2	Protective earth conductor current		N/A
	The transformer is connected as in clause 14 Impedance of the ammeter < 0,5 Ohm, connected between earth terminal of the transformer and protective earth conductor		N/A
	The measured values are less than the required values of table 8b.		N/A

<b>19</b>	<b>CONSTRUCTION</b>		P
19.1	Separation of input and output circuits		P
19.1.1	SMPS incorporating auto-transformers (IEC 61558-2-16:2009)		N/A
19.1.1.1	For plug connected auto-transformers with rated input voltage > rated output voltage the potential to earth shall not exceed the rated output voltage. (IEC 61558-2-16:2009)		N/A
19.1.1.2	SMPS with polarised input and output plug and socket-outlet system: an instruction is given with the information, that the transformer shall not be used with non-polarised plug and socket outlet system. (IEC 61558-2-16:2009)		N/A
19.1.1.3	A polarity detecting device only energise the output in the case: output potential to earth $\leq$ rated output voltage, also with reversed input plug. (IEC 61558-2-16:2009)		N/A
	– The contact separation of the device is $\geq$ 3mm		N/A
	– A current to earth does not exceed 0,75 mA.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– All tests are repeated under fault conditions of H.2.3 of annex H of part 1. The potential to earth does not exceed the max output voltage for more than 5 s.		N/A
19.1.2	SMPS incorporating separating transformers (IEC 61558-2-16:09)		N/A
19.1.2.1	Input and output circuits electrically separated. (IEC 61558-2-16:09)		N/A
19.1.2.2	The insulation between input and output winding(s) consist of basic insulation (IEC 61558-2-16:09)		N/A
	Class I SMPS		N/A
	– Insulation between input windings and body consist of basic insulation		N/A
	– Insulation between output windings and body consist of basic insulation		N/A
	Class II SMPS (IEC 61558-2-16:2009)		N/A
	– Insulation between input windings and body consist of double or reinforced insulation		N/A
	– Insulation between output windings and body consist of double or reinforced insulation		N/A
19.1.2.3	The insulation between input windings and intermediate conductive parts and the output windings and intermediate part consist of basic insulation (IEC 61558-2-16:09)		N/A
	For class I SMPS the insulation between input and output windings via the intermediate conductive parts consist of basic insulation (IEC 61558-2-16:2009)		N/A
	For class II SMPS the insulation between input winding and the body and between the output windings and the body via the intermediate conductive parts consist of double or reinforced insulation. (IEC 61558-2-16:2009)		N/A
19.1.2.4	Parts of output circuits may be connected to protective earth (IEC 61558-2-16:09)		N/A
19.1.2.5	No direct contact between output circuits and the body, unless: (IEC 61558-2-16:2009)		N/A
	– Allowed for associated transformers by the equipment standard		N/A
	– Clause 19.8 of part 1 is fulfilled		N/A
19.1.3	SMPS incorporating isolating transformers and safety isolating transformers (IEC 61558-2-16:09)		P
19.1.3.1	Input and output circuits electrically separated (IEC 61558-2-16:09)		P

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Clause	Requirement + Test	Result - Remark	Verdict
	No possibility of any connection between these circuits		P
19.1.3.2	The insulation between input and output winding(s) consist of double or reinforced insulation (exception see 19.1.3.4) (IEC 61558-2-16:09)		P
	Class I SMPS <b>not</b> intended for connection to the mains by a plug:		—
	– Insulation between input windings and body connected to earth consist of basic insulation rated to the input voltage		N/A
	– Insulation between output windings and body, connected to earth consist of basic insulation rated for the output voltage		N/A
	Class I SMPS intended for connection to the mains by a plug (EN 61558-2-16:09):		N/A
	– Insulation between input windings and body connected to earth consist of basic insulation rated to the working voltage		N/A
	– Insulation between output windings and body, connected to earth consist of supplementary insulation rated for the working voltage		N/A
	Class II SMPS (IEC 61558-2-16:2009)		P
	– Insulation between input windings and body consist of double or reinforced insulation rated to the input voltage		P
	– Insulation between output windings and body consist of double or reinforced insulation, rated to the output voltage		P
19.1.3.3	SMPS with intermediate conductive parts not connected to the body (between input/output) (EN 61558-2-16:09):		N/A
19.1.3.3.1	For class I and class II SMPS the insulation between input and output windings, via intermediate conductive parts, consist of double or reinforced insulation, rated to the working voltage (EN 61558-2-16:09).		N/A
	– For class II SMPS the insulation between input winding and the body and between the output windings and the body via the intermediate conductive parts consist of double or reinforced insulation. (rated to the input voltage, for SELV circuits only basic insulation to the body)		N/A
	– For transformers, different from independent, the insulation between input and output windings, via intermediate conductive parts, consist of double or reinforced insulation, rated to the working voltage.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
19.1.3.3.2	Class I transformers with earthed core, and not allowed for class II equipment (EN 61558-2-16:09)		N/A
	– Insulation from the input to the earthed core: basic insulation rated for the input voltage		N/A
	– Insulation from the output voltage to the earthed core: basic insulation rated for the output voltage		N/A
19.1.3.3.3	Insulation between : input to intermediate conductive parts and output and intermediate parts consist of at least basic insulation (EN 61558-2-16:09)		N/A
	– If the insulation from input or output to the intermediate metal part is less than basic insulation, the part is considered to be connected to input or output.		N/A
19.1.3.4	For class I SMPS, with protective screen, not connected to the mains by a plug the following conditions comply (EN 61558-2-16:09):		N/A
	– The insulation between input winding and protective screen consist of basic insulation (rated input voltage)		N/A
	– The insulation between output winding and protective screen consist of basic insulation (rated output voltage)		N/A
	– The protective screen consist of metal foil or a wire wound screen extending the full width of the windings and has no gaps or holes		N/A
	– Where the protective screen does not cover the entire width of the input winding, additional insulation to ensure double insulation in this area, is used.		N/A
	– If the screen is made by a foil, the turns are isolated, overlap at least 3 mm		N/A
	– The cross-section of the screen and the lead out wire is at least corresponding to the rated current of the overload device		N/A
	– The lead out wire is soldered or fixed to the protective screen.		N/A
	Protective screening is not allowed for SMPS with plug connection to the mains (EN 61558-2-16:09)		N/A
19.1.3.5	No connection between output circuit and protective earth, except of associated transformers (allowed by equipment standard) or 19.8 is fulfilled (EN 61558-2-16:09).	No protective earth	P
19.1.3.6	No connection between output circuit and body, except of associated transformers (allowed by equipment standard) (EN 61558-2-16:09)	No such connection	P

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Clause	Requirement + Test	Result - Remark	Verdict
19.1.3.7	The distance between input and output terminals for the connection of external wiring is $\geq 25$ mm	For model GT*93021-*** -T2 and GT*93021-*** -D2	P
19.1.3.8	Portable SMPS having an rated output $\leq 630$ VA (EN 61558-2-16:09)	Built-in product	N/A
19.1.3.9	No connection between input and output circuit, except of associated transformers (allowed by equipment standard) (EN 61558-2-16:09)	No connection	P
19.1.3.10	Protective screening is not allowed for SMPS with plug connection to the mains (EN 61558-2-16:09)		N/A
19.2	Fiercely burning material not used	Such substance not used	P
	Unimpregnated cotton, silk, paper and fibrous material not used as insulation		P
	Wax-impregnated, etc. not used		P
19.3	Portable transformer: short-circuit proof or fail-safe	Short-circuit proof	P
19.4	Class II transformers: contact between accessible metal parts and conduits or metal sheaths of supply wiring impossible	No conduit or metal sheath of supply wiring	N/A
19.5	Class II transformers: part of supplementary or reinforced insulation, during reassembly after routine servicing not omitted		P
19.6	Class I and II transformers: creepage distances and clearances over supplementary or reinforced insulation if wire, screw, nut, etc. become loose or fall out of position not $\leq 50\%$ specified values (Cl. 26)		P
19.7	Conductive parts connected to accessible metal parts by resistors or capacitors shall be separated from hazardous live parts by double or reinforced insulation	No such part	N/A
19.8	Resistors or capacitors connected between hazardous live parts and the body (accessible metal parts) consist of:	Two Y capacitors used	P
	– components according to IEC 60 065, 14.1 or capacitor Y1 according to IEC 60 384-14		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 $\leq 250$ V, one Y1 capacitor according 60384-14 is allowed	Two Y capacitors	N/A
19.9	Insulation material input/output and supplementary insulation of rubber resistant to ageing		N/A
	Creepage distances (if cracks) $\geq$ specified values (Cl. 26)		P
19.10	Protection against accidental contact by insulating coating:		N/A



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Clause	Requirement + Test	Result - Remark	Verdict
	a) ageing test (section I, IEC 60 068-2-2), test Ba: 168 h; 70 °C		N/A
	b) impact test (spring-operated impact hammer according to IEC 60 068-2-63; 0,5 ± 0,05 J)		N/A
	c) scratch test (hardened steel pin) electric strength test according to Cl. 18		N/A
19.11	Handles, levers, knobs, etc.:	No such part	N/A
	– insulating material		N/A
	– supplementary insulation covering		N/A
	– separated from shafts or fixing by supplementary insulation		N/A
19.12	Windings construction		P
19.12.1	Undue displacement in all types of transformers not allowed:		P
	– of input or output windings or turns thereof		P
	– of internal wiring or wires for external connection		P
	– of parts of windings or of internal wiring in case of rupture or loosening		P
19.12.2	Serrated tape:		N/A
	– distance through insulation according to table 13		N/A
	– one additional layer of serrated tape, and		N/A
	– one additional layer without serration		N/A
	– in case of cheekless bobbins the end turns of each layer shall be prevented from being displaced		N/A
19.12.3	Insulated windings wires:		P
	– to all types of transformers for basic or supplementary insulation taken separately		N/A
	a) Winding wire with basic or supplementary insulation:		N/A
	– comply with Annex K		N/A
	– the insulation of the conductor: two layers		N/A
	b) Winding wire with double or reinforced insulation:		P
	– comply with Annex K	Certified triple insulated winding wire	P
	– the insulation of the insulated winding wire: three layers		P

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Clause	Requirement + Test	Result - Remark	Verdict
	– dielectric strength test with the values according 18.3 multiplied by 1,25		P
	Where the wire is wound:		P
	– upon metal or ferrite cores		P
	– upon enamelled wire		P
	– under enamelled wire		P
	An additional insulation with a dti of supplementary insulation provided between insulated an enamelled wires	3-layer insulating tape	P
	100 % Routine test according to Annex K.3 for windings giving double or reinforced insulation	Certified triple insulated winding wires	N/A
	For windings providing reinforced insulation the values in table 13, table C.1 and table D1, box 2) c), are not required		P
19.13	Handles, operating levers and the like shall be fixed	No such part	N/A
19.14	Protection against electric shock: covers securely fixed, 2 independent fixing means, one with tool	Built-in products filled with epoxy resin	N/A
19.15	Transformer with pins for fixed socket-outlets: no strain on socket-outlet	Built-in products	N/A
	Additional torque $\leq 0,25$ Nm		N/A
19.16	Protection index for portable transformers:	Built-in products, only considered as IP00	N/A
	$\leq 200$ VA $\geq$ IP20 and instructions for use		N/A
	$> 200$ VA $\leq 2,5$ kVA $\geq$ IPX4 (single-phase)		N/A
	$> 200$ VA $\leq 6,3$ kVA $\geq$ IPX4 (polyphase)		N/A
	$> 2,5$ VA (single-phase) $\geq$ IP21		N/A
	$> 6,3$ VA (polyphase) $\geq$ IP21		N/A
19.17	Transformers IPX1 - IPX6 totally enclosed, except for drain hole (diameter $\geq 5$ mm or $20$ mm <sup>2</sup> with width $\geq 3$ mm); drain hole not required for transformer completely filled with insulating materials		N/A
19.18	Transformers $\geq$ IPX1 with a moulded, if any		N/A
19.19	Class I transformers with a non-detachable flexible cable or cord with earth conductor and a plug with earth contact		N/A
19.20	Live parts of SELV and PELV-circuits: separation not less than PRI/SEC of a safety isolating transformer		P
	– SELV output circuits separated by double or reinforced insulation from all other than SELV or PELV circuits		P

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Clause	Requirement + Test	Result - Remark	Verdict
	– SELV output circuits separated by basic insulation from other SELV or PELV circuits		N/A
19.20.1	SELV circuits and parts not connected to protective earth, to live parts, or protective conductors forming part of other circuits		P
	Nominal voltage (V) > 25 V a.c. or 60 V d.c., the required insulation fulfils the high voltage test according to table 8 a		N/A
19.20.2	PELV-circuits double or reinforced insulation is necessary		N/A
19.21	FELV-circuits: protection against contact fulfils the min. test voltage required for the primary circuit		N/A
19.22	Class II transformers shall not be provided with means for protective earth		P
	For fixed transformers an earth conductor with double or reinforced insulation to accessible metal parts is allowed		N/A
19.23	Class III transformers shall not be provided with means for protective earth		N/A

<b>20</b>	<b>COMPONENTS</b>		<b>P</b>
	Components such as switches, plugs, fuses, lamp holders, flexible cables and cords, comply with relevant IEC standard		P
	Components inside the transformer pass all tests of this standard together with the transformer tests		P
	Testing of components separately to the transformer according the relevant standard:		P
	z) 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
	aa) Components without markings tested under transformer conditions including inrush current.		P
	bb) If no IEC standard exist, the component is tested under transformer conditions.		P
20.1	Appliance couplers for main supply shall comply with:	No appliance coupler	N/A
	– IEC 60 320 for IPX0		N/A
	– IEC 60 309 for other		N/A
20.2	Automatic controls shall comply with IEC 60 730-1	No control	N/A
20.3	Thermal-links comply with IEC 60691	No thermal-link	N/A
20.4	Switches shall comply with annex F	No switch	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Disconnection from the supply:	Built-in products, shall be installed in end appliance	N/A
	– by a switch, disconnecting all poles of the supply (full disconnection under the relevant over-voltage category		N/A
	– or a flexible supply cable and cord with plug		N/A
	– or an instruction sheet: disconnection by all-poles switches incorporated in fixed wiring		N/A
20.5	Socket-outlets of the output circuit shall be such that there is no unsafe compatibility to plugs complying with input circuit.	Built-in products, shall be installed in end appliance	N/A
	Plugs and socket-outlets for SELV systems with both a rated current = 3A and a rated voltage =24 V shall comply with following:		N/A
	SELV plug and socket-outlets shall comply with IEC 60 884-2-4 and IEC 60 906-3		N/A
	– It is not possible for plugs to enter socket-outlets of other standardised voltage system		N/A
	– Socket outlets do not accommodate plugs of other standardised voltage systems		N/A
	– Socket outlets do not have a protective earth contact		N/A
	PELV plug and socket-outlets shall comply with following:		N/A
	– It is not possible for plugs to enter socket-outlets of other standardised voltage system		N/A
	– Socket outlets do not accommodate plugs of other standardised voltage systems		N/A
	– Socket outlets do not have a protective earth contact		N/A
	FELV plug and socket-outlets shall comply with following:		N/A
	– It is not possible for plugs to enter socket-outlets of other standardised voltage system		N/A
	– Socket outlets do not accommodate plugs of other standardised voltage systems		N/A
20.6	Thermal cut-outs, overload releases etc. have adequate breaking capacity	Current fuse	P
	– Thermal cut outs fulfil the relevant requirements of 20.7 and 20.8		N/A
	– Thermal links fulfil the relevant requirements of 20.8		N/A
	– The breaking capacity is in accordance with the relevant fuse standard		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
20.6.1	For Fuses According IEC 60127 and IEC 60269, the fuse current does not exceed 1,1 times of the rated value		P
20.7	Thermal cut outs shall meet the requirements of 20.7.1.1 and 20.7.2, or 20.7.1.2 and 20.7.2.		N/A
20.7.1	Requirements according to IEC 60730-1		N/A
20.7.1.1	Thermal cut-out tested as component shall comply with IEC 60 730-1		N/A
20.7.1.2	Thermal cut-out tested as a part of the transformer		N/A
	a) Thermal cut outs type 1 or type 2 (IEC 60730-1)		N/A
	b) Thermal cut outs fulfil the requirements of micro-interruption (type 1C or 2 C) or micro-disconnection, (type 1B or 2B) (see IEC 60730-1)		N/A
	c) Thermal cut outs with manual reset have a trip free mechanism (type 1E and 2E) (see IEC 60730-1)		N/A
	d) The number of cycles of automatic action shall be:		N/A
	– 3000 cycles for self resetting thermal cut-outs		N/A
	– 300 cycles for non self resetting thermal cut-outs resetting by hand		N/A
	– 300 cycles for non self resetting thermal cut-outs resetting disconnecting		N/A
	– 30 cycles for non self resetting thermal cut-outs which are only resettable by a tool		N/A
	e) Thermal cut outs fulfil the electrical stress according IEC 60730-1, 6.14.2		N/A
	f) Characteristic of thermal cut-outs:		N/A
	– ratings according IEC 60730-1, cl. 5		N/A
	– classification according to:		N/A
	1) nature of supply to IEC 60730-1, cl. 6.1		N/A
	2) type of load controlled to IEC 60730-1, cl. 6.2		N/A
	3) degree of protection IPX0 to IEC 60730-1, cl. 6.5.1		N/A
	4) degree of protection IP0X to IEC 60730-1, cl. 6.5.2		N/A
	5) pollution degree to IEC 60730-1, cl. 6.5.3		N/A
	6) comparative tracking index to IEC 60730-1, cl. 6.13		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	7) max. ambient temperature to IEC 60730-1, cl. 6.7		N/A
20.7.1.2	Thermal cut-out tested as a part of the transformer, test with 3 samples:		N/A
	– at least micro-interruption or micro-disconnection (IEC 60730-1)		N/A
	– 300 h aged at $t_a$ (transformer) + 10°C		N/A
	– subjected to a number of cycles for automatic operating according 20.7.1.1		N/A
	During the test no sustaining arcing shall occur, during and after the test no damage at the thermal cut out and the transformer in the sense of this standard		N/A
20.7.2	Thermal cut-outs shall have adequate breaking capacity		N/A
20.7.2.1	The output of the transformer with a non self resetting thermal cut out is short circuited at a supply voltage 1, 1 of rated supply voltage. After opening of the cut off, the supply voltage is switched of, until the transformer is cooling down.		N/A
	– 3 cycles at 25° C for transformers without $t_a$ min		N/A
	– 3 cycles at $t_a$ min for transformers with $t_a$ min		N/A
	– after the 3 cycles short circuit of the output at 1,1 of rated supply voltage for 48 h.		N/A
	During the tests no sustaining arcing shall occur After the test: withstand the test of clause 18, show no damage in sense of this standard, and be operational.		N/A
20.7.2.2	The output of the transformer with a self resetting thermal cut out is short circuited at a supply voltage 1, 1 of rated supply voltage.		N/A
	– 48 h at 25° C for transformers without $t_a$ min		N/A
	– 24 h at $t_a$ and 24 h at $t_a$ min for transformers with $t_a$ min		N/A
	During the tests no sustaining arcing shall occur After the test: withstand the test of clause 18, show no damage in sense of this standard, and be operational.		N/A
20.7.3	Test of a PTC resistor:		N/A
	5 cycles: transformer short-circuited for 48 h by 1,1 times of the input voltage and max. $t_a$		N/A
	5 cycles: transformer short-circuited for 48 h by 0,9 times of the input voltage and min. $t_a$ (if declared)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	After the test: withstand the test of clause 18, show no damage in sense of this standard, and be operational.		N/A
20.8	Thermal links shall be tested in one of the following two ways.		N/A
20.8.1	Thermal-links shall comply with IEC 60 691 as a separate component.		N/A
	– electrical conditions to IEC 60691, cl. 6.1		N/A
	– thermal conditions to IEC 60691, cl. 6.2		N/A
	– ratings to IEC 60691, cl. 8 b		N/A
	– suitability of sealing components, impregnating fluids or cleaning solvents IEC 60691, cl. 8 c		N/A
20.8.2	Thermal-links tested as a part of the transformer:		N/A
	– ageing test 300 h by 35 °C or ta + 10 °C		N/A
	– After transformer fault condition the thermal link operate without sustaining arcing		N/A
	– after opening the thermal-link shall have an insulation resistance of at least 0,2 MΩ		N/A
	– 3 cycles for replaceable thermal-links		N/A
	– 3 new specimens for not replaceable thermal-links		N/A
20.9	Self-resetting devices not used if mechanical, electrical, etc. hazards		N/A
20.10	Thermal cut-outs which can be reset by soldering operation are not allowed		N/A
20.11	Overload protection devices do not operate during test (20 times switched on and off, at no load); Upri (V): 1,1 times rated supply voltage.	264V	P

<b>21</b>	<b>INTERNAL WIRING</b>		<b>P</b>
21.1	Internal wiring and electrical connections protected or enclosed		P
	Wire-ways smooth and free from sharp edges		P
21.2	Openings in sheet metal: edges rounded (radius ≥ 1,5 mm) or bushings of insulating material		N/A
21.3	Bare conductors: distances adequately maintained		N/A
21.4	When external wires are connected to terminal, internal wiring shall not work loose		N/A
21.5	Insulation of heat-resistant and non-hygroscopic material for insulated conductors subject to temperature rise > limiting values given in 14.1		N/A



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Clause	Requirement + Test	Result - Remark	Verdict
<b>22</b>	<b>SUPPLY CONNECTION AND EXTERNAL FLEXIBLE CABLES AND CORDS</b>		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	Built-in products, shall be considered in end appliance	N/A
	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
	cc) possible to connect after fixing		N/A
	dd) inside space for wires allow easy introduction and connection of conductors		N/A
	ee) fitting of cover without damage to conductors		N/A
	– contact between insulation of external supply wires and live parts of different polarity not allowed		N/A
22.4	Length of power supply cord for portable transformers between 2 m and 4 m; without 0,5 mm <sup>2</sup>		N/A
22.5	Power supply cords for transformers IPX0 and transformers "for indoor use only" ≥ IPX0:		N/A
	– for transformers with a mass ≤ 3 kg: 60227 IEC52 ( H03VV-..) (60245 IEC 53)		N/A
	– for transformers with a mass > 3 kg: 60227 IEC53 (H05VV-..) or 60245 IEC 53		N/A
	Power supply cords for transformers for outdoor use: ≥ IPX0: 60245 IEC57 (H05RN-..)		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		N/A
22.7	Nominal cross-sectional area (mm <sup>2</sup> ); input current (A) at rated output not less than shown in table 9		P
22.8	Class I transformer with power supply flexible cable: green/yellow core connected to earth terminal		N/A
	Plug for single-phase transformer with input current at rated output ≤ 16 A according to IEC 60 083, IEC 60 906-1 or IEC 60 309		N/A
22.9	Type X, Y or Z attachments: see relevant part 2	Built-in products	N/A
22.9.1	For type Z attachment: moulding enclosure and power supply cable do not affect insulation of cable		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
22.9.2	Inlet openings or inlet bushing: without risk of damage to protective covering of power supply cord	Built-in products	N/A
	Insulation between conductor and enclosure:		N/A
	– for Class I transformer: insulation of conductor plus separate basic insulation		N/A
	– for Class II transformer: insulation of conductor plus double or reinforced insulation		N/A
22.9.3	Inlet bushings:		N/A
	– no damage to power supply cord		N/A
	– reliably fixed		N/A
	– not removable without tool		N/A
	– not integral with power supply cord (for type X attachment)		N/A
	– not of natural rubber except for Class I transformer with type X, Y and Z attachments		N/A
22.9.4	For portable transformers which are moved while operating:		N/A
	– cord guards, if any, of insulating material and fixed		N/A
	Compliance is tested by the oscillating test according to fig. 7:		N/A
	– loaded force during the test according to fig. 7		N/A
	– 10 N for a cross-sectional area > 0,75		N/A
	– 5 N for a cross-sectional area ≤ 0,75		N/A
	After the test according to fig. 7:		N/A
	– no short-circuit between the conductors		N/A
	– no breakage of more than 10% of stands of any conductor		N/A
	– no separation of the conductor from the terminal		N/A
	– no loosening of any cord guards		N/A
	– no damage of the cord or cord guard		N/A
	– no broken strands piercing the insulation and not becoming accessible		N/A
22.9.5	Cord anchorages for type X attachment:		N/A
	– glands in portable transformers not used unless possibility for clamping all types and sizes of cable		N/A
	– moulded-on designs, tying the cable into a knot and tying the end with string not allowed		N/A
	– labyrinths, if clearly how, permitted		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– 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:	Built-in products	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		N/A
	Test for type X attachments one test with a cord with smallest and one test with a cord with the largest cross-sectional area:		N/A
	– for the test with clamping screws or tightened with torque 2/3 of that specified in table 11		N/A
	– not possible to push cable into transformer		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- 25 pulls of 1 s		N/A
	- 1 min torque according to table 10		N/A
	- mass (kg); pull (N); torque (Nm) .....		—
	- 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:	Built-in products, shall be considered in end appliance	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

<b>23</b>	<b>TERMINALS FOR EXTERNAL CONDUCTORS</b>		<b>P</b>
23.1	Transformer for connection to fixed wiring and transformer without power supply cords with type Y and Z attachments: only connections by screws, nuts, terminals	For models GT*93021-*** -T2 series	P
	Terminals are integral part of the transformer:		N/A
	ff) comply with IEC 60 999-1 under transformer conditions		N/A
	Other terminals:		P
	- separately checked according to IEC 60 998-2-1, IEC 60 998-2-2 or IEC 60 947-7-1	IEC60998-2-1 approved terminal blocks	P
	- used in accordance with their marking		P
	- checked according to IEC 60 999-1 under transformer conditions		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Transformer with type X attachments: soldered connection permitted if reliance not placed upon soldering, crimping or welding alone unless by barriers, creepage distances and clearances between hazardous live parts and metal parts should conductor break away $\geq 50\%$ of specified value (Cl. 26)		N/A
	Transformer with type Y and Z attachments for external conductors: soldered, welded, crimped, etc. connections allowed	Built-in products, shall be considered in end appliance	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 metal parts should conductor break away $\geq 50\%$ of specified value (Cl. 26)		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:		P
	– terminal does not work loose		P
	– internal wiring is not subjected to stress		P
	– creepage distances and clearance are not reduced below the values specified in Cl. 26		P
23.4	Other terminals than Y and Z attachments shall be so designed that:		P
	– they clamp the conductor between metallic surfaces with sufficient contact pressure		P
	– without damage to the conductor		P
	– test by inspection according to 23.3 and 23.4		P
	– 10 times fastening and loosening a conductor with the largest cross-sectional area with 2/3 of the torque specified in Cl. 25		P
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	Built-in products, shall be considered in end appliance	N/A
23.7	Transformer with type X attachments: stranded conductor test (8 mm removed):		N/A
	– Class I transformers: no connection between live parts and accessible metal parts		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– 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:	Built-in products, shall be considered in end appliance	N/A
	– between terminal screws and accessible metal parts		N/A
	– between terminal screws and inaccessible metal parts for Class II transformers		N/A

<b>24</b>	<b>PROVISION FOR PROTECTIVE EARTHING</b>		<b>P</b>
24.1	Class I transformers: accessible conductive parts connected to earth terminal	Class II	N/A
	Class II transformers: no provision for earth		P
24.2	Protective earth terminal for connection to fixed wiring and for type X attachment transformers: comply with Cl. 23, adequately locked, not possible to loosen without a tool		N/A
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 $\leq 0,1 \Omega$ with a min. 25 A or 1,5 rated input current at 1 min		N/A
24.5	Class I transformers with external flexible cables or cords:		N/A
	– current-carrying conductors becoming touch before the earth conductor		N/A

<b>25</b>	<b>SCREWS AND CONNECTIONS</b>		<b>N/A</b>
25.1	Screwed connections withstand mechanical stresses	No screw	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Screws transmitting contact pressure or likely to be tightened by the user or having a diameter < 2,8 mm, shall screw into metal		N/A
	Screws not of metal which is soft or liable to creep (Zn, Al)		N/A
	Screws of insulating material: not used for electrical connection		N/A
	Screws not of insulating material if their replacement by metal screws can impair supplementary or reinforced insulation		N/A
	Screws to be removed (replacement etc. of power supply cord) not of insulating material if their replacement by metal screws can impair basic insulation		N/A
	No damage after torque test: diameter (mm); torque (Nm); ten times		N/A
	No damage after torque test: diameter (mm); torque (Nm); five times		N/A
25.2	Screws in engagement with thread of insulating material:		N/A
	– length of engagement $\geq 3 \text{ mm} + 1/2 \text{ screw diameter}$ or 8 mm		N/A
	– correct introduction into screw hole		N/A
25.3	Electrical connections: contact pressure not transmitted through insulating material		N/A
25.4	In case of use of thread-forming (sheet metal) screws for connection of current-carrying parts: clamping and locking means provided		N/A
	Thread-cutting (self-tapping) screws used for the connection of current-carrying parts allowed if they generate a full form machine screw thread and if not operated by the user		N/A
	Thread-cutting screws and thread-forming screws used for earth continuity allowed if at least 2 screws for each connection are used and it is not necessary to disturb the connection in normal use		N/A
25.5	Screws for current-carrying mechanical connections locked against loosening		N/A
	Rivets for current-carrying connections subject to torsion locked against loosening		N/A
25.6	Test of screwed glands with a torque according table 12. After the test no damage at the transformer and the gland.		N/A
<b>26</b>	<b>CREEPAGE DISTANCES AND CLEARANCES</b>		<b>P</b>

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Clause	Requirement + Test	Result - Remark	Verdict
26.1	See 26.101		P
26.2	Creepage distances (cr) and clearances (cr)		P
26.2.1	Windings covered with adhesive tape		N/A
	– the values of pollution degree 1 are fulfilled		N/A
	– all isolating material are classified acc. to IEC 60085 and IEC 60216		N/A
	– test A of 26.2.3 is fulfilled		N/A
26.2.2	Uncemented insulating parts pollution degree P2 or P3	Pollution degree 2	P
	– all isolating material are classified acc. to IEC 60085 and IEC 60216		P
	– values of pollution degree 1 are not applicable		P
26.2.3	Cemented insulating parts		N/A
	– all isolating materials are classified acc. to IEC 60085 and IEC 60216		N/A
	– values of distance through insulation (dti) are fulfilled		N/A
	– creepage distances and clearances are not required		N/A
	– test A of this sub clause is fulfilled		N/A
	Test A		N/A
	– thermal class		N/A
	– working voltage		N/A
	– Test with three specially specimens, with un-insulated wires, without impregnation or potting		N/A
	Two of the three specimens are subjected to:		N/A
	– the relevant humidity treatment according to 17.2 (48 h)		N/A
	– the relevant dielectric strength test of 18.3 multiplied with factor 1,35		N/A
	– One of the three specimens is subjected to the relevant dielectric strength test of 18.3 multiplied by the factor 1,35 immediately at the end of the last cycle with high temperature		N/A
	Impulse dielectric test according to 4.1.1.2.1 of IEC 60 664-1 (1,2 / 50 $\mu$ s waveform) – see Annex R of IEC 61558-1		N/A
26.2.4	Enclosed parts, by impregnation or potting		N/A
26.2.4.1	– The requirements of reduced values as stated for pollution degree 1 (P1) are fulfilled		N/A



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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
	– working voltage		N/A
	– Test with three specially specimens, potted or impregnated. The dielectric strength test is applied directly to the joint.		N/A
	Two of the three specimens are subjected to:		N/A
	– the relevant humidity treatment according to 17.2 (48 h)		N/A
	– the relevant dielectric strength test of 18.3 multiplied with factor 1,25		N/A
	– One of the three specimens is subjected to the relevant dielectric strength test of 18.3 multiplied by the factor 1,25 immediately at the end of the last cycle with high temperature		N/A
	The three spacemen pass the Impulse dielectric test according to 4.1.1.2.1 of IEC 60 664-1 (1,2 / 50 $\mu$ s waveform) – see Annex R of IEC 61558-1		N/A
26.2.4.2	– The requirements of distance through insulation (dti) are fulfilled. (P1 values are not required)		N/A
	– all isolating materials are classified acc. to IEC 60085 and IEC 60216		N/A
	Test C		N/A
	– thermal class		N/A
	– working voltage		N/A
	– Test with three specimens, potted or impregnated. (finished components)		N/A
	– Neither cracks, nor voids in the insulating compounds		N/A
	Two of the three specimens are subjected to:		N/A
	– the relevant humidity treatment according to 17.2 (48 h)		N/A
	– the relevant dielectric strength test of 18.3 multiplied with factor 1,35		N/A
	– One of the three specimens is subjected to the relevant dielectric strength test of 18.3 multiplied by the factor 1,35 immediately at the end of the last cycle with high temperature		N/A

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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 $\mu$ s waveform) – see Annex R of IEC 61558-1		N/A
26.3	Distance through insulation		P
	For double or reinforced insulation, the required values of Tables 13, C1, and D1 – boxes 2b, 2c and 7 are fulfilled	Comply with 19.12.3	N/A
	The insulation fulfil the material classification according IEC 60085 or 60216 or the test of 14.3	Class B according to IEC 60085 and IEC 60216	P
26.3.1	Reduced values of the thickness of insulation for supplementary or reinforced insulation are allowed if the following conditions are fulfilled:		N/A
	– the isolating materials are classified acc. to IEC 60085 and IEC 60216		N/A
	– the test of 14.3 is fulfilled		N/A
	– If both requirements are fulfilled, the required values for solid insulation can be multiplied by 0,4		N/A
	– Minimum thickness of reinforced insulation $\geq 0,2$ mm		N/A
	– Minimum thickness of supplementary insulation $\geq 0,1$ mm		N/A
26.3.2	Insulation in thin sheet form		P
	– If the layers are non separable (glued together):		N/A
	– The requirement of 3 layers is fulfilled		N/A
	– The mandrel test according 26.3.3 is fulfilled with 150 N		N/A
	– The required values for d.t.i. of Tables 13, C.1 and D.1 – marked by index "e" are fulfilled.		N/A
	– If the layers are separated:		N/A
	– The requirement of 2 layers is fulfilled		N/A
	– If serrated tape is used, 1 additional layer (serrated) and one additional layer without serration is required		N/A
	– The mandrel test according 26.3.3 is fulfilled on each layer with 50 N		N/A
	– The required values for d.t.i. of Tables 13, C.1 and D.1 – marked by index "e" are fulfilled.		N/A
	– If the layers are separated (alternative:		P
	– The requirement of 3 layers is fulfilled		P

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Clause	Requirement + Test	Result - Remark	Verdict
	– If serrated tape is used, 1 additional layer (serrated) and one additional layer without serration is required		N/A
	– The mandrel test according 26.3.3 is fulfilled on 2/3 of the layers with 100 N		P
	– The required values for d.t.i. of Tables 13, C.1 and D.1 – marked by index "e" are fulfilled.		P
	Test according to 14.3 and if the isolating materials are classified acc. to IEC 60085 and IEC 60216 no distances through insulation are required for insulation in thin sheet form		N/A
	The figures within square brackets in box 2 and 7 of table 13 (C.1/D.1) are used for insulation in thin sheet form as follows:		P
	– rated output > 100 VA values in square brackets apply		N/A
	– rated output $\geq 25 \text{ VA} \leq 100 \text{ VA}$ 2/3 of the value in square brackets apply		N/A
	– rated output $\leq 25 \text{ VA}$ 1/3 of the value in square brackets apply		P
26.3.3	Mandrel test of insulation in thin sheet form (specimen Of 70 mm width are necessary):		P
	– 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.		P
	– pull force of 100 N		P
	– high voltage test of 5,0 kV or the test voltage of 18.3 multiplied by 1,25 whatever is the greater. No flashover, no breakdowns.	5000V	P
	– If the layers are separable 1 of at least 2 layers fulfil the test:		N/A
	– pull force of 50 N		N/A
	– high voltage test of 5,0 kV or the test voltage of 18.3 multiplied by 1,25 whatever is the greater. No flashover, no breakdown.		N/A
26.101	Creepage distances, clearances and distances through insulation, specified values according to (EN 61558-2-16:09):		P
	– table 13, material group IIIa (part 1)		P

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Clause	Requirement + Test	Result - Remark	Verdict
	- table C, material group II (part 1)		N/A
	- table D, material group I (part 1)		N/A
	- working voltage	240Vrms	P
	- rated supply frequency 50/60 Hz	50Hz	P
	- rated internal frequency		N/A
	1. Insulation between input and output circuits (basic insulation):		N/A
	a) measured values $\geq$ specified values (mm) .....		N/A
	2. Insulation between input and output circuits (double or reinforced insulation):		P
	a) measured values $\geq$ specified values (mm) .....	Input to output: CI: Min.7,10 mm > 4,50 mm Cr: Min. 7,80 mm > 4,80 mm	P
	b) measured values $\geq$ specified values (mm) .....		N/A
	c) measured values $\geq$ specified values (mm) .....	TIW used as secondary winding and 3 layers of insulation tape between Pri. and Sec. winding Complying with 19.12.3	P
	3. Insulation between adjacent input circuits: measured values $\geq$ specified values (mm) :		N/A
	Insulation between adjacent output circuits: measured values $\geq$ specified values (mm) ..:		N/A
	4. Insulation between terminals for external connection:		N/A
	a) measured values $\geq$ specified values (mm) .....		N/A
	b) measured values $\geq$ specified values (mm) .....		N/A
	c) measured values $\geq$ specified values (mm) .....		N/A
	5. Basic or supplementary insulation:		P
	a) measured values $\geq$ specified values (mm) .....	L/N before fuse / different poles of fuse: CI: 2,58 / 2,60mm > 2,4mm Cr: 2,58 / 2,60mm > 2,44mm	P
	b) measured values $\geq$ specified values (mm) .....		N/A
	c) measured values $\geq$ specified values (mm) .....		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	d) measured values $\geq$ specified values (mm) .....		N/A
	e) measured values $\geq$ specified values (mm) .....		N/A
	6. Reinforced or double insulation: measured values $\geq$ specified values (mm) .....	Input to outer enclosure (excluding terminals): Cl: 5,46 mm min. > 4,50 mm Cr: 7,42 mm min. > 4,80 mm	P
	7. Distance through insulation:		P
	a) measured values $\geq$ specified values (mm) .....		N/A
	b) measured values $\geq$ specified values (mm) .....	3-layer insulating tape with total thickness: 0,15mm > 0,041mm; according to 19.12.3 and 26.3.2	P
	c) measured values $\geq$ specified values (mm) .....	Input to outer enclosure (excluding terminals): 2,0mm > 0,80mm	P
26.102	Values of IEC 61558-2-16 applicable for frequency up to 3 MHz (EN 61558-2-16:09)	Measured frequency: 46,3kHz (GTM93021-2048-P2)	P
	For frequency above 3 MHz clause 7 of IEC 60664-4 is applicable (high frequency testing)		N/A
26.103	Clearance (EN 61558-2-16:09)		P
	a) Clearance for frequency $\geq$ 30 kHz according figure 101 two determinations are necessary:		P
	– determination based on peak working voltage according Table 104 :		N/A
	Peak working voltage		N/A
	Basic insulation: required / measured		N/A
	Double or reinforced insulation: required / measured value		N/A
	– and alternative if applicable for approximately homogeneous field according to Table 102		P
	Peak working voltage	396V peak max.	P
	Basic insulation: required / measured		N/A
	Double or reinforced insulation: required / measured value	Input to output: 0,06mm / 7,10mm min. Input to outer enclosure: 0,06mm / 5,46mm min.	P
	– determination based on measured r.m.s. working voltage according Tables 13, C1 and D1 (see clause 26.101)	Required (DI/RI): 4,50mm	P

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Clause	Requirement + Test	Result - Remark	Verdict
	The minimum clearance is the greater of the two values.	4,50mm is the greater	P
	b) Clearance for frequency $\leq 30$ kHz according figure 101 two determinations are necessary:		N/A
	– determination based on peak working voltage with recurring peak voltages according Table 103 :		N/A
	– determination based on measured r.m.s. working voltage according Tables 13, C1 and D1 (see clause 26.101)		N/A
	The minimum clearance is the greater of the two values.		N/A
26.104	The working voltages of Table 102, 103 and 104 are peak voltages including $\mu$ sec peaks (EN 61558-2-16:09)		P
	The working voltage according to Table 13 of part 1 are r.m.s. voltages		P
26.105	Creepage distances		P
	Two determinations of creepage distances are necessary (see Figure 102)		P
	– determination based on measured peak working voltage according Tables 105 to 110		P
	Peak working voltage	396V peak max.	P
	Pollution degree	2	P
	Basic or supplementary insulation: required / measured		N/A
	Double or reinforced insulation: required / measured value	Input to output: 0,30mm / 7,80mm min. Input to outer enclosure (excluding terminals): 0,30mm / 7,42mm min.	P
	– determination based on measured r.m.s. working voltage according Tables 13, C1 and D1 (see clause 26.101)	Required (DI/RI): 4,80mm	P
	If the values based on table 105 to 110 are lower than the relevant values in Tables 13, C.1 or D.1, the higher values shall be applicable	4,80mm is the greater	P
26.106	Distance through insulation (EN 61558-2-16:09)		N/A
	Instead of partial discharge with high frequency voltage the test of the distance and the calculation of the electric field is applicable under the following conditions:		N/A
	– the max. frequency is $< 10$ MHz		N/A
	– the field strength approximately comply with Figure 103		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	– no voids or gaps are present in between the solid insulation		N/A
	For thick layers $d1 \geq 0,75$ the peak value of the field strength is $\leq 2$ kV/mm		N/A
	For thin layers $d2 \leq 30 \mu\text{m}$ the peak value of the field strength is $\leq 10$ kV/mm		N/A
	For $d1 > d > d2$ equation (1) is used for calculation the field strength		N/A

<b>27</b>	<b>RESISTANCE TO HEAT, FIRE AND TRACKING</b>		<b>P</b>
27.1	Resistance to heat		P
	All insulating parts are resistant to heat		P
	For parts of rubber, which passed the test of 19.9, no additional test is required.		N/A
	The tests are not required for cables and small connectors with a rated current $\leq 3$ A, a rated voltage $\leq 24$ V a.c. or 60 V d.c. and a power $\leq 72$ W		P
27.1.1	External accessible parts	Enclosure and epoxy resin are considered as external part, 50°C ambient temperature is considered.	P
	The Ball-pressure test -: diameter of impression $\leq 2$ mm; heating cabinet temperature (°C) at 70 °C or the temperature T of 14.1 (T + 15) - is fulfilled.	Enclosure (SE1X / C2950 / CX7211 / EXCY0098 / LN-1250P / LN-1250G / PA-765A / PC-540): 105°C, 1,2mm / 1,4mm / 1,3mm / 1,2mm / 1,1mm / 1,3mm / 1,4mm / 1,5mm. Epoxy resin: 105°C, 1,8mm	P
27.1.2	Internal parts		P

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Clause	Requirement + Test	Result - Remark	Verdict
	For insulating material retaining current carrying parts in position , the ball-pressure test -: diameter of impression $\leq 2$ mm; heating cabinet temperature ( $^{\circ}\text{C}$ ) at $125^{\circ}\text{C}$ or the temperature T of 14.1 (T + 15) - is fulfilled	<p><math>50^{\circ}\text{C}</math> ambient temperature is considered.</p> <p>Bobbin (T375J / T375HF / PM-9820 / CP-J-8800): <math>150^{\circ}\text{C}</math>, 1,6mm / 1,6mm / 1,8mm / 1,7mm.</p> <p>Terminal blocks (EK381A-02P / KF10H): <math>150^{\circ}\text{C}</math>, 1,6mm / 1,6mm</p> <p>PCB (T2A / T2B / T4 / CEM1 / 2V0 / 02 / 03 / 03A / DS2 / YLH-1 / YLH-2 / 02V0 / 04V0 / DKV0-3A / TCX) : <math>150^{\circ}\text{C}</math>, 0,8mm / 0,8mm / 0,8mm / 0,8mm / 0,9mm / 0,8mm / 0,8mm / 0,9mm / 0,8mm / 0,8mm / 0,9mm / 0,8mm / 0,8mm</p>	P
27.2	Resistance to abnormal heat under fault conditions		N/A
27.3	Resistance to fire		P
	All isolating parts of the transformer shall be resistant to ignition and spread of fire. The test according to IEC 60696-2-10 is required		P
27.3.1	External accessible parts (glow wire tests)		P
	– $650^{\circ}\text{C}$ for enclosures	Enclosure (SE1X / C2950 / CX7211 / EXCY0098 / LN-1250P / LN-1250G / PA-765A / PC-540): no ignition	P
	– $650^{\circ}\text{C}$ for parts retaining current carrying parts in position and terminals for external conductors Current $< 0,2\text{ A}$		N/A
	– $750^{\circ}\text{C}$ for parts retaining current carrying parts in position and terminals for external conductors with fixed wiring. Current $> 0,2\text{ A}$		N/A
	– $850^{\circ}\text{C}$ for parts retaining current carrying parts in position and terminals for external conductors with non fixed wiring. Current $> 0,2\text{ A}$	Terminal blocks (EK381A-02P / KF10H): no ignition	P
27.3.2	Internal parts		P
	– $550^{\circ}\text{C}$ for internal insulating material – not retaining current carrying parts in position	Epoxy resin: no ignition	P
	– $650^{\circ}\text{C}$ for coil formers (bobbins)	Bobbin (T375J / T375HF / PM-9820 / CP-J-8800): no ignition	P
	– $650^{\circ}\text{C}$ for parts retaining current carrying parts in position and terminals for external conductors. Current $\leq 0,2\text{ A}$		N/A



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Clause	Requirement + Test	Result - Remark	Verdict
	– 750° C for parts retaining current carrying parts in position and terminals for external conductors with fixed wiring. Current > 0,2 A		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		N/A
27.4	For IP other than IPX0:If insulating parts retaining current carrying parts in position and under P3 conditions, the material resistance to tracking is at least material of group IIIa		N/A
	Test (175 V): no flashover or breakdown before 50 drops		N/A
<b>28</b>	<b>RESISTANCE TO RUSTING</b>		<b>P</b>
	Ferrous parts protected against rusting	Solid pins	P

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Clause	Requirement + Test	Result - Remark	Verdict

E	ANNEX E , GLOW WIRE TEST		P
	The test is required according to IEC 60695-2-10 and IEC 60695-2-11 with the following additions:		P
E.1	Clause 6, "Severities" of IEC 6095-2-11, apply with the temperature stated in 27.3 of IEC 61558-1		P
E2	Clause 8, "Conditioning", of IEC 60695-2-11 apply, preconditioning is required		P
E3	Clause 10, "Test Procedure", of IEC 60695-2-11 apply, The tip of the glow wire is applied to the flat side of the surface.		P

F	ANNEX F, REQUIREMENTS FOR MANUALLY OPERATED SWITCHES WHICH ARE PARTS OF THE TRANSFORMER		N/A
F.2	Manually operated mechanical switches, tested as separate component, shall comply with IEC 61058 under the conditions of F2.		N/A
F.§	Manually operated mechanical switches tested as part of the transformer shall comply with the conditions specified under F.3		N/A

H	ANNEX H, ELECTRONIC CIRCUITS (IEC 61558-1)		P
H1	General notes on tests (addition to clause 5)		P
H.2	SHORT-CIRCUIT AND OVERLOAD PROTECTION (ADDITION TO CLAUSE 15)		P
H.2.1	Circuits designed and applied so that fault conditions do not render the appliance unsafe		P
	During and after each test:		P
	gg) temperatures do not exceed values specified in table 3 of Cl. 15.1		P
	– transformer complies with conditions specified in sub-clause 15.1		P
	If a conductor of a pcb becomes open circuited, the transformer is considered to have withstood the particular test, provided that all six conditions as specified are met		N/A
H.2.2	Fault conditions a) to f) of sub-clause H.2.3 are not tested if the following conditions are met:		P
	– electronic circuit is a low-power circuit as specified		N/A
	– safety of the appliance as specified does not rely on correct functioning of the electronic circuit		P
H.2.3	Fault conditions tested as specified when relevant:		P

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Clause	Requirement + Test	Result - Remark	Verdict


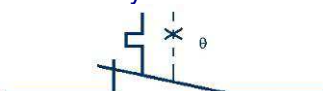


	a) short-circuit of creepage distances and clearances, if less than specified in Cl. 26		N/A
	b) open circuit at the terminals of any component	Evaluated	P
	c) short-circuit of capacitors, unless they comply with IEC 60 384-14	Short-circuit C1, C3	P
	d) short-circuit of any two terminals of an electronic component as specified	Short-circuit D8, Q1, pin 1-2 of U1, pin 3-4 of U1	P
	e) any failure of an integrated circuit as specified		N/A
	f) low-power circuit: low-power points are connected to the supply source		N/A
	Cl. 15 is repeated with a simulated fault as indicated in a) to e), if the transformer incorporates an electronic circuit to ensure compliance with Cl. 15		P
	Fault condition e) is applied for encapsulated and similar components		N/A
	PTC's and NTC's are not short-circuited if they are used as specified		N/A
H.2.4	If for a fuse-link complying with IEC 60 127-3 rated fuse current I1 is used, current I2 is measured as specified:		N/A
	– if $I2 < 2,1 \times I1$ test of 15.8 is repeated with fuse-link short-circuited		N/A
	– if $I2 > 2,75 \times I1$ , no other tests are necessary		N/A
	If $I2 > 2,1 \times I1$ and $I2 < 2,75 \times I1$ test of 15.8 is repeated as specified		N/A
	For fuses other than those complying with IEC 60 127-3, the test is carried out as specified 15.3.2 to 15.3.5		N/A

H.3	CREEPAGE DISTANCES, CLEARANCES AND DISTANCES THROUGH INSULATION		N/A
H.3.1	For live parts separated by basic insulation smaller cr and cl as in 26 are allowed, if H2 is fulfilled.		N/A
	In optocouplers no requirements of cr and cl		N/A
	For coatings annex W applies. Smaller distances as required in IEC 60664-3, clause 4 are applicable,		N/A
	For potted transformers cycling tests acc, 26.2. are applicable		N/A
H.3.2	The ma. surface temperature of optocouplers is 50 K		N/A

<b>IEC 61558-1</b>			
Clause	Requirement + Test	Result - Remark	Verdict
<b>K</b>	<b>ANNEX K, INSULATED WINDING WIRES FOR USE AS MULTIPLE LAYER INSULATION</b>		N/A
K.1	Wire construction:		N/A
	– insulated winding wire with min. two layers for basic or supplementary insulation		N/A
	– insulated winding wire with min. three layers for reinforced insulation		N/A
	– winding insulation material .....		N/A
K.2	Conformance test		N/A
K.2.1	Test 13 of IEC 60 851-5 nominal conductor diameter $\geq 0,018 \text{ mm} \leq 0,1 \text{ mm}$ , test as specified in 4.2.1 and 4.2.2 of IEC 60 851-5		N/A
	Nominal conductor diameter $> 0,1 \text{ mm}, \leq 2,5 \text{ mm}$ , test as specified in 4.3.1 and 4.3.2 of IEC 60 851-5		N/A
	Nominal conductor diameter $< 2,5 \text{ mm}$ , test as specified in 4.4.1 and 4.4.2 of IEC 60 851-5		N/A
	High voltage test immediately after the above specified tests:		N/A
	– test voltage for two layers 3 kV		N/A
	– test voltage for three layers 5,5 kV		N/A
K.2.2	Adherence and flexibility, test as specified under 5.1.4 of IEC 60 851-3		N/A
	– high voltage test immediately after this test		N/A
	– test voltage for two layers 3 kV		N/A
	– test voltage for three layers 5,5 kV		N/A
K.2.3	Heat shock, test as specified under 3.1 or 3.2 of IEC 60 851-6:		N/A
	– high voltage test immediately after this test		N/A
	– test voltage for two layers 3 kV		N/A
	– test voltage for three layers 5,5 kV		N/A
K.2.4	Retention of dielectric strength after bending, test as specified under test 13 of 4.6.1 c) of IEC 60 851-5		N/A
	1. high voltage test immediately after this test		N/A
	2. test voltage for two layers 3 kV		N/A
	3. test voltage for three layers 5,5 kV		N/A
K.2.5	Resistance to abrasion, test 11 of IEC 60851-3		N/A
<b>U</b>	<b>ANNEX U – INFORMATIVE – OPTIONAL TW – MARKING FOR TRANSFORMERS</b>		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The tests of Annex U are based on constant $S = 4500$ . Other constants are possible, if the test of U.5.2 is done with positive result.		N/A
U1	General notes and tests		N/A
	8 transformers of one type are necessary for the test. Tests according U5.		N/A
U.2	Heating (addition to clause 14)		N/A
14.4	Thermal endurance test		N/A
	Test according U5 and measurements according 11.1		N/A
	Transformers tested as a integral part of the equipment (option), assigned with tw		N/A
	The thermal conditions are so adjusted, that the duration of test is as indicated by the manufacturer.		N/A
	If no indications are given, the test period is 30 days		N/A
	After the test, when the transformers have returned to room temperature, they fulfil the following requirements:		N/A
	a) The output voltage has not changed from the measured value at the beginning by more than allowed value of clause 11.1		N/A
	b) The insulation resistance between input and output winding and between windings and body is, measured with 500 V d.c. , not less than 1 MOhm		N/A
	c) The transformer fulfil the dielectric strength test with 35% of the values in Clause 18, Table 8.a.		N/A
	The test result is positive, is min. 6 of the 7 samples have passed the test.		N/A
	The test result is negative, if 2 or more samples fail the test		N/A
	If the result is negative, the test can be repeated with 7 new samples		N/A
U.3	Short circuit and overload protection (addition to clause 15)		N/A
	At short circuit and overload tests the winding temperature if less than the required value of table U.1		N/A
U.5	General requirements and information about thermal endurance test on windings		N/A
U.5.1	Thermal endurance test		N/A
	Transformers tested at rated output		N/A
	Loads outside of the oven		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	7 transformers are placed in the oven		N/A
	The temperature of the hottest winding of each of the 7 transformers is-together with the oven temperature, at the applicable temperature of table U.2		N/A
	After 4 hours measuring of the actual winding temperatures. Regulation of the oven temperature if necessary		N/A
	After 24 hours again measuring of the winding temperature. The temperatures of the 7 samples are very near to the required temperature of the values of table U.2. The test time of the coldest winding is not longer than twice the theoretical test time based on table U.2		N/A
U.5.2	The use of constant S other than 4500 in tw tests		N/A
U.5.2.1	Procedure a)		N/A
	The manufacturer prepares test results with a minimum of samples of 30.		N/A
	T and log L are calculated from the dates		N/A
	The diagram according to Figure U.2 will be founded.		N/A
U.5.2.3	Procedure b)		N/A
	The testing authority shall test 14 new transformers		N/A
	Test 1, based on clause U.5.1 but at the calculated test room temperature for 10 days. The test is continued until all transformer fail.		N/A
	Calculation of the mean life L <sub>2</sub> at temperature T <sub>2</sub> according to U4		N/A
	Test 2, based on clause U.5.1 but at a calculated room temperature T <sub>2</sub> (for 120 days).The test time with T <sub>2</sub> exceeds L <sub>2</sub> .		N/A
	If all transformers fail before L <sub>2</sub> , the result is negative.		N/A

<b>IEC 61558-2-16</b>			
Clause	Requirement + Test	Result - Remark	Verdict
<b>V</b>	<b>ANNEX V, SYMBOLS TO BE USED FOR THERMAL CUT-OUTS</b>		N/A
V.2.1.1	Restored by manual operation  IEC 489/98		N/A
V.2.1.2	Restored by disconnection of the supply  IEC 490/98		N/A
V.2.1.3	Thermal link  IEC 491/98		N/A
V.2.2	Self-resetting thermal cut-out  IEC 492/98		N/A

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

11	TABLE: OUTPUT VOLTAGE AND OUTPUT CURRENT UNDER LOAD			P
	Ambient temperature(°C).....:	23		—
	Model.....:	See below		—
Model	Load output voltage (V)	Rated output voltage (V)	Different (%)	Required (%)
GTM93021-1507-2.0-P2	4,92 / 4,92	5	-1,60 / -1,60	10
GTM93021-2009-P2	8,97 / 8,97	9	-0,33 / -0,33	10
GTM93021-2024-P2	24,16 / 24,15	24	+0,67 / +0,63	10
GTM93021-2036-P2	36,31 / 36,29	36	+0,86 / +0,81	10
GTM93021-2048-P2	47,86 / 47,87	48	-0,29 / -0,27	10
Supplementary information: Figures shown above are corresponding to rated supply voltage of 100 Va.c and 240 Va.c respectively.				

12	TABLE: NO-LOAD OUTPUT VOLTAGE			P
	Ambient temperature(°C).....:	23		—
	Model.....:	See below		—
Model	No-load output voltage (V)	Load output voltage (V)	Different (%)	Required (%)
GTM93021-1507-2.0-P2	4,99 / 4,99	4,92 / 4,92	+1,42 / +1,42	20
GTM93021-2009-P2	9,01 / 9,01	8,97 / 8,97	+0,45 / +0,45	20
GTM93021-2024-P2	24,17 / 24,17	24,16 / 24,15	+0,04 / +0,08	20
GTM93021-2036-P2	36,31 / 36,31	36,31 / 36,29	+0,00 / +0,06	20
GTM93021-2048-P2	47,88 / 47,89	47,86 / 47,87	+0,04 / +0,04	20
Supplementary information: Figures shown above are corresponding to rated supply voltage of 100 Va.c and 240 Va.c respectively.				



14		TABLE: HEATING						P
type/rated output	r-cold Ω	r-warm Ω	temp. °C	ext. encl. °C	support °C	int. + ext. wire	further information	
See table below								
	Ambient (°C).....:		50			—		
	Test voltage (V).....:		110 / 264			—		
	Test frequency (Hz).....:		50			—		
Model	Temperature rise of part/at:		dT (K)		Required dT (K)			
GTM93021-1507-2.0-P2	External enclosure		35 / 35		For reference			
	Inside enclosure		40 / 39		For ball pressure			
	Table support		31 / 31		35			
	Input cord		25 / 24		30 (T80)			
	Output cord		42 / 42		55 (T105)			
	Winding		52 / 52		60			
	Core		50 / 51		For ball pressure			
	X capacitor CX1		40 / 35		50 (T100)			
	Y capacitor CY1		47 / 47		75 (T125)			
	Y capacitor CY2		42 / 40		75 (T125)			
	Optocoupler U1		46 / 45		50 (T100)			
	Varistor MOV1		32 / 25		35 (T85)			
	PCB		54 / 54		80 (T130)			
Terminal block (For GTM93021-1507-2.0-T2 only)		34 / 34		50 (T100)				
Supplementary information:								
The ambient temperature is 50°C and all corresponding limits are reduced respectively.								
The product is built-in type and no such enclosure can be touched directly. The temperature for enclosure was measured for reference only.								

14		TABLE: HEATING (CONTINUED)						P
type/rated output	r-cold Ω	r-warm Ω	temp. °C	ext. encl. °C	support °C	int. + ext. wire	further information	
See table below								
	Ambient (°C).....:			50		—		
	Test voltage (V).....:			110 / 264		—		
	Test frequency (Hz).....:			50		—		
Model	Temperature rise of part/at:			dT (K)		Required dT (K)		
GTM93021-2009-P2	External enclosure			28 / 25		For reference		
	Inside enclosure			30 / 26		For ball pressure		
	Table support			16 / 12		35		
	Input cord			14 / 17		30 (T80)		
	Output cord			26 / 26		55 (T105)		
	Winding			56 / 57		60		
	Core			52 / 52		For ball pressure		
	X capacitor CX1			38 / 26		50 (T100)		
	Y capacitor CY1			35 / 36		75 (T125)		
	Y capacitor CY2			30 / 29		75 (T125)		
	Optocoupler U1			46 / 44		50 (T100)		
	Varistor MOV1			32 / 24		35 (T85)		
	PCB			55 / 53		80 (T130)		
Terminal block (For GTM93021-2009-T2 only)			18 / 17		50 (T100)			
Supplementary information:								
The ambient temperature is 50°C and all corresponding limits are reduced respectively.								
The product is built-in type and no such enclosure can be touched directly. The temperature for enclosure was measured for reference only.								

14	TABLE: HEATING (CONTINUED)							P
type/rated output	r-cold Ω	r-warm Ω	temp. °C	ext. encl. °C	support °C	int. + ext. wire	further information	
See table below								
	Ambient (°C).....:			50		—		
	Test voltage (V).....:			110 / 264		—		
	Test frequency (Hz).....:			50		—		
Model	Temperature rise of part/at:			dT (K)		Required dT (K)		
GTM93021-2024-P2	External enclosure			22 / 23		For reference		
	Inside enclosure			25 / 26		For ball pressure		
	Table support			15 / 13		35		
	Input cord			19 / 15		30 (T80)		
	Output cord			18 / 22		55 (T105)		
	Winding			53 / 55		60		
	Core			48 / 50		For ball pressure		
	X capacitor CX1			39 / 30		50 (T100)		
	Y capacitor CY1			35 / 47		75 (T125)		
	Y capacitor CY2			30 / 36		75 (T125)		
	Optocoupler U1			43 / 46		50 (T100)		
	Varistor MOV1			32 / 25		35 (T85)		
	PCB			47 / 58		80 (T130)		
Terminal block (For GTM93021-2024-T2 only)			10 / 10		50 (T100)			
Supplementary information:								
The ambient temperature is 50°C and all corresponding limits are reduced respectively.								
The product is built-in type and no such enclosure can be touched directly. The temperature for enclosure was measured for reference only.								

14	TABLE: HEATING (CONTINUED)							P
type/rated output	r-cold Ω	r-warm Ω	temp. °C	ext. encl. °C	support °C	int. + ext. wire	further information	
See table below								
	Ambient (°C).....:			50		—		
	Test voltage (V).....:			110 / 264		—		
	Test frequency (Hz).....:			50		—		
Model	Temperature rise of part/at:			dT (K)		Required dT (K)		
GTM93021-2036-P2	External enclosure			23 / 23		For reference		
	Inside enclosure			26 / 25		For ball pressure		
	Table support			12 / 12		35		
	Input cord			19 / 16		30 (T80)		
	Output cord			21 / 23		55 (T105)		
	Winding			55 / 55		60		
	Core			51 / 51		For ball pressure		
	X capacitor CX1			42 / 30		50 (T100)		
	Y capacitor CY1			40 / 47		75 (T125)		
	Y capacitor CY2			36 / 43		75 (T125)		
	Optocoupler U1			46 / 46		50 (T100)		
	Varistor MOV1			32 / 25		35 (T85)		
	PCB			51 / 58		80 (T130)		
Terminal block (For GTM93021-2036-T2 only)			8 / 8		50 (T100)			
Supplementary information:								
The ambient temperature is 50°C and all corresponding limits are reduced respectively.								
The product is built-in type and no such enclosure can be touched directly. The temperature for enclosure was measured for reference only.								

14		TABLE: HEATING (CONTINUED)						P
type/rated output	r-cold Ω	r-warm Ω	temp. °C	ext. encl. °C	support °C	int. + ext. wire	further information	
See table below								
	Ambient (°C).....:			50		—		
	Test voltage (V).....:			110 / 264		—		
	Test frequency (Hz).....:			50		—		
Model	Temperature rise of part/at:			dT (K)		Required dT (K)		
GTM93021-2048-P2	External enclosure			29 / 23		For reference		
	Inside enclosure			31 / 26		For ball pressure		
	Table support			22 / 20		35		
	Input cord			18 / 11		30 (T80)		
	Output cord			22 / 24		55 (T105)		
	Winding			56 / 50		60		
	Core			53 / 49		For ball pressure		
	X capacitor CX1			39 / 23		50 (T100)		
	Y capacitor CY1			36 / 34		75 (T125)		
	Y capacitor CY2			32 / 33		75 (T125)		
	Optocoupler U1			47 / 41		50 (T100)		
	Varistor MOV1			32 / 20		35 (T85)		
	PCB			54 / 51		80 (T130)		
	Terminal block (For GTM93021-2048-T2 only)			7 / 7		50 (T100)		
Supplementary information:								
The ambient temperature is 50°C and all corresponding limits are reduced respectively.								
The product is built-in type and no such enclosure can be touched directly. The temperature for enclosure was measured for reference only.								

<b>15</b>	<b>TABLE: SHORT-CIRCUIT AND OVERLOAD PROTECTION</b>							<b>P</b>
	ambient temperature (°C) .....							
type/rated output	r-cold Ω	r-warm Ω	temp. °C	ext. encl. °C	support °C	int. + ext. wire	further information	
See table below								
	ambient temperature (°C) .....					50		
	Test voltage (V).....					110 / 264		—
Model	Temperature rise of part/at:		dT (K)	Required dT (K)		further information		
GTM93021-1507-2.0-P2	Transformer winding		76 / 79	125		-		
	External surface		39 / 37	55		-		
	Input cord		23 / 20	30		-		
	Output cord		46 / 44	55		-		
	Support		38 / 37	55		-		
GTM93021-2009-P2	Transformer winding		56 / 55	125		-		
	External surface		30 / 29	55		-		
	Input cord		23 / 17	30		-		
	Output cord		28 / 28	55		-		
	Support		29 / 26	55		-		
GTM93021-2024-P2	Transformer winding		54 / 55	125		-		
	External surface		28 / 28	55		-		
	Input cord		21 / 18	30		-		
	Output cord		21 / 23	55		-		
	Support		25 / 24	55		-		
GTM93021-2036-P2	Transformer winding		57 / 58	125		-		
	External surface		30 / 29	55		-		
	Input cord		23 / 20	30		-		
	Output cord		24 / 25	55		-		
	Support		26 / 25	55		-		
GTM93021-2048-P2	Transformer winding		58 / 57	125		-		
	External surface		31 / 31	55		-		
	Input cord		19 / 13	30		-		
	Output cord		30 / 29	55		-		
	Support		28 / 26	55		-		
Supplementary information:								
The ambient temperature is 50°C and all corresponding limits are reduced respectively.								
The product is built-in type and no such enclosure can be touched directly. The temperature for enclosure was measured for reference only.								

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Clause	Requirement + Test	Result - Remark	Verdict

20.1	Table: Component					P
Object / part No.	Manufacturer/ trademark <sup>2)</sup>	Type / model <sup>2)</sup>	Technical data	Standard	Mark(s) of conformity <sup>1)</sup>	
Enclosure	SABIC INNOVATIVE PLASTICS B V	SE1X (UL E45329)	PPE+PS, V-1, 105°C, min thickness: 2,0mm	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	SABIC INNOVATIVE PLASTICS B V	C2950 (UL E45329)	PC/ABS, V-0, 75°C, min thickness: 2,0mm	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	SABIC INNOVATIVE PLASTICS B V	CX7211, EXCY0098 (UL E45329)	PC/ABS, V-0, 5VB, 90°C, min thickness: 2,0mm	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	TEIJIN CHEMICALS LTD	LN-1250P, LN-1250G (UL E50075)	PC, V-0, 115°C, min thickness: 2,0mm	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	CHI MEI CORPORATION	PA-765A (UL E56070)	ABS, V-1, 80°C, min thickness: 2,0mm	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	CHI MEI CORPORATION	PC-540 (UL E56070)	ABS, V-1, 80°C, min thickness: 2,0mm	IEC/EN 61558-2-16	Tested with appliance	
Input cord ( for GT*93021-***-P2)	DONGGUAN YUE YANG WIRE & CABLE CO LTD	1007 / 1015 / 1185	Min. 18AWG, min. 300V, min. 80°C (UL E230810)	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	YONG HAO ELECTRICAL INDUSTRY CO LTD	1007 / 1015 / 1185	Min. 18AWG, min. 300V, min. 80°C (UL E240426)	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	HIP TAI ELECTRIC WIRE CO	1007 / 1015 / 1185	Min. 18AWG, min. 300V, min. 80°C (UL E225804)	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	KUNSHAN NEW ZHICHENG ELECTRONICS TECHNOLOGIES CO LTD	1007 / 1015 / 1185	Min. 18AWG, min. 300V, min. 80°C (UL E237831)	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	SHENG YU ENTERPRISE CO LTD	1007 / 1015	Min. 18AWG, min. 300V, min. 80°C (UL E219726)	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	SUZHOU HONGMENG ELECTRONIC CO LTD	1007 / 1015 / 1185	Min. 18AWG, min. 300V, min. 80°C (UL E315421)	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	ZHUANG SHAN CHUAN ELECTRICAL PRODUCTS (KUNSHAN) CO LTD	1007 / 1015 / 1185	Min. 18AWG, min. 300V, min. 80°C (UL E333601)	IEC/EN 61558-2-16	Tested with appliance	

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Clause	Requirement + Test	Result - Remark	Verdict

20.1	Table: Component					P
Object / part No.	Manufacturer/ trademark <sup>2)</sup>	Type / model <sup>2)</sup>	Technical data	Standard	Mark(s) of conformity <sup>1)</sup>	
Alt. use	SUZHOU YEMAO ELECTRONIC CO LTD	1007 / 1015 / 1185	Min. 18AWG, min. 300V, min. 80°C (UL E353532)	IEC/EN 61558-2-16	Tested with appliance	
<sup>2)</sup> Output cord ( for GT*93021- ***-P2)	DONGGUAN YUE YANG WIRE & CABLE CO LTD	1015	Min. 24AWG, min. 600V, min. 105°C (UL E230810)	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	YONG HAO ELECTRICAL INDUSTRY CO LTD	1015	Min. 24AWG, min. 600V, min. 105°C (UL E240426)	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	HIP TAI ELECTRIC WIRE CO	1015	Min. 24AWG, min. 600V, min. 105°C (UL E225804)	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	KUNSHAN NEW ZHICHENG ELECTRONICS TECHNOLOGIES CO LTD	1015, 1569	Min. 24AWG, min. 300V, min. 105°C (UL E237831)	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	SHENG YU ENTERPRISE CO LTD	1015	Min. 24AWG, min. 600V, min. 105°C (UL E219726)	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	SUZHOU HONGMENG ELECTRONIC CO LTD	1015	Min. 24AWG, min. 600V, min. 105°C (UL E315421)	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	ZHUANG SHAN CHUAN ELECTRICAL PRODUCTS (KUNSHAN) CO LTD	1015, 1569	Min. 24AWG, min. 300V, min. 105°C (UL E333601)	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	SUZHOU YEMAO ELECTRONIC CO LTD	1015	Min. 24AWG, min. 600V, min. 105°C (UL E353532)	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	YONG HAO ELECTRICAL INDUSTRY CO LTD	SPT-1 / SPT-2	Min. 24AWG, min. 300V, min. 105°C (UL E310072)	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	JHI WEI ELECTRIC WIRE & CABLE CO LTD	SPT-1 / SPT-2	Min. 24AWG, min. 300V, min. 105°C (UL E157718)	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	ZHUANG SHAN CHUAN ELECTRICAL PRODUCTS (KUNSHAN) CO LTD	SPT-1 / SPT-2	Min. 24AWG, min. 300V, min. 105°C (UL E333536)	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	SUZHOU DIOUDE ELECTRONICS CO LTD	SPT-1 / SPT-2	Min. 24AWG, min. 300V, min. 105°C (UL E336192)	IEC/EN 61558-2-16	Tested with appliance	



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

20.1	Table: Component					P
Object / part No.	Manufacturer/ trademark <sup>2)</sup>	Type / model <sup>2)</sup>	Technical data	Standard	Mark(s) of conformity <sup>1)</sup>	
PCB	TECHNI TECHNOLOGY LTD	T2A / T2B / T4 (UL E154355)	V-0, 130°C, min thickness: 1,6mm	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	DONGGUAN HE TONG ELECTRONICS CO LTD	CEM1 / 2V0 (UL E243157)	V-0, 130°C, min thickness: 1,6mm	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	CHEERFUL ELECTRONIC (HK) LTD	02 / 03 / 03A (UL E199724)	V-0, 130°C, min thickness: 1,6mm	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	DONGGUAN DAYSUN ELECTRONIC CO LTD	DS2 (UL E251754)	V-0, 130°C, min thickness: 1,6mm	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	SUZHOU CITY YILIHUA ELECTRONICS CO LTD	YLH-1 / YLH-2 (UL E251781)	V-0, 130°C, min thickness: 1,6mm	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	SHANGHAI AREX PRECISION ELECTRONIC CO LTD	02V0 / 04V0 (UL E186016)	V-0, 130°C, min thickness: 1,6mm	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	BRITE PLUS ELECTRONICS (SUZHOU) CO LTD	DKV0-3A (UL E177671)	V-0, 130°C, min thickness: 1,6mm	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	SHENZHEN TONGCHUANGXIN ELECTRONICS CO LTD	TCX (UL E250336)	V-0, 130°C, min thickness: 1,6mm	IEC/EN 61558-2-16	Tested with appliance	
Epoxy resin	SUZHOU POCHELY ELECTRONIC MATERIAL CO LTD	HB-5225A/B (UL E304947)	V-0	IEC/EN 61558-2-16	Tested with appliance	
Terminal block (only for GT*93021-***- T2 construc- tion)	Dinkle Enterprise Co. Ltd.	EK381A-02P	250VAC, 12A, 105°C, 2 poles.	EN 60998-1 EN60998-2- 1	VDE/ 40014444	
Alt. use	Cixi Kaifeng Electronic Co., Ltd.	KF10H	400VAC, 41A, 100°C, 2 poles.	EN 60998-1 EN60998-2- 1	VDE/ 40025775	
Current fuse (F1)	Conquer Electronics Co., Ltd.	MST series	T1,6AL250VAC	IEC/EN 60127-1 IEC/EN 60127-3	VDE/ 40017118	

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

20.1	Table: Component					P
Object / part No.	Manufacturer/ trademark <sup>2)</sup>	Type / model <sup>2)</sup>	Technical data	Standard	Mark(s) of conformity <sup>1)</sup>	
Alt. use	Ever Island Electric Co., Ltd. And Walter Electric	2010	T1,6AL250VAC	IEC/EN 60127-1 IEC/EN 60127-3	VDE/ 40018781	
Alt. use	Bel Fuse Ltd.	RST-Serie(s)	T1,6AL250VAC	IEC/EN 60127-1 IEC/EN 60127-3	VDE/ 40011144	
Alt. use	Cooper Bussmann LLC	SS-5	T1,6AL250VAC	IEC/EN 60127-1 IEC/EN 60127-3	VDE/ 40015513	
Alt. use	Walter Electronic Co. Ltd.	ICP-Series	T1,6AL250VAC	IEC/EN 60127-1 IEC/EN 60127-3	VDE/ 40012824	
Alt. use	Das & Sons International Ltd.	385 T Serie(s)	T1,6AL250VAC	IEC/EN 60127-1 IEC/EN 60127-3	VDE/ 40008524	
Alt. use	Shenzhen Lanson Electronics	SMT T1,6A250V	T1,6AL250VAC	IEC/EN 60127-1 IEC/EN 60127-3	VDE/ 40012592	
X capacitor (CX1, optional)	Cheng Tung Industrial Co., Ltd.	CTX	X2, AC310V, Max 0,22µF, 40/110/21/C	IEC/EN 60384-14	Semko ENEC SE/12010-1 VDE/ 40022642 UL CB / US- 17992-UL	
Alt. use	Ultra Tech Xiphi Enterprise Co. Ltd.	HQX	X2, AC275V, Max 0,22µF, 40/100/21/C	IEC/EN 60384-14	VDE/ 40015608	
Alt. use	Tenta Electric Industrial Co. Ltd.	MEX	X2, AC275V, Max 0,22µF, 40/100/21/C	IEC/EN 60384-14	VDE/ 119119	
Alt. use	Okaya Electric Industries Co. LTD	RE-Series	X2, AC275V, Max 0,22µF, 55/100/56/C	IEC/EN 60384-14	VDE/ 40028657	
Alt. use	VISHAY Capacitors Belgium NV	F 1772-xxx- 2xxx(R)	X2, AC310V, Max 0,22µF, 40/100/56/C	IEC/EN 60384-14	VDE/ 40005079	
Alt. use	Dain Electronics Co., Ltd.	MEX, MPX, NPX	X2, AC275V, Max 0,22µF, 40/100/21/C	IEC/EN 60384-14	VDE/ 40018798	
Alt. use	Sinhua Electronics (Huzhou) Co., Ltd	MPX	X2, AC300V, Max 0,22µF, 40/100/21/C	IEC/EN 60384-14	VDE/ 40014686	

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

20.1	Table: Component					P
Object / part No.	Manufacturer/ trademark <sup>2)</sup>	Type / model <sup>2)</sup>	Technical data	Standard	Mark(s) of conformity <sup>1)</sup>	
Alt. use	Shunde Da Hua Electric Co., Ltd.	HD-MKP-series	X2, AC275V, Max 0,22μF, 40/105/21/C	IEC/EN 60384-14	VDE/ 40001126	
Alt. use	Foshan Shunde Chuang Ge Electronic Industrial Co., Ltd.	MKP-X2	X2, AC275V, Max 0,22μF, 40/105/21/C	IEC/EN 60384-14	VDE/ 40008922	
Alt. use	Hongzhi Enterprises Ltd.	MPX	X2, AC275V, Max 0,22μF, 40/100/56/C	IEC/EN 60384-14	VDE/ 40023936	
Alt. use	Jiangsu Xinghua Huayu Electronics Co., Ltd.	MPX - Series	X2, AC275V, Max 0,22μF, 40/100/21/C	IEC/EN 60384-14	VDE/ 40022417	
Alt. use	Winday Electronic Industrial Co., Ltd.	MPX series	X2, AC275V, Max 0,22μF, 40/100/21/C	IEC/EN 60384-14	VDE/ 40018071	
Alt. use	Welson Industrial Co., Ltd.	WD	X2, AC250V, Max 0,22μF, 25/125/21/B	IEC/EN 60384-14	VDE/ 115455	
Y capacitor (CY1, CY2, optional)	TDK-EPC Corporation, Capacitors Group Circuit Devices Business Group	CD	Y1, 250V, max 2200pF, 25/125/56/B	IEC/EN 60384-14	VDE/ 138526	
Alt. use	Success Electronics Co., Ltd.	SE, SB	Y1, 250V, max 2200pF, 30/125/56/C	IEC/EN 60384-14	VDE/ 40008996	
Alt. use	Murata Mfg. Co., Ltd.	KX	Y1, 250V, max 2200pF, 25/125/21/B	IEC/EN 60384-14	VDE/ 40002831	
Alt. use	Walsin Technology Corp.	AH	Y1, 250V, max 2200pF, 25/125/21/C	IEC/EN 60384-14	VDE/ 40001804	
Alt. use	JYA-NAY Co., Ltd.	JN	Y1, 250V, max 2200pF, 25/125/21/C	IEC/EN 60384-14	VDE/ 40001831	
Alt. use	Haohua Electronic Co.	CT 7	Y1, 250V, max 2200pF, 30/125/56/C	IEC/EN 60384-14	VDE/ 40003902	
Alt. use	Jerro Electronics Corp.	JX-series	Y1, 250V, max 2200pF, 20/125/21	IEC/EN 60384-14	VDE/ 40032158	
Varistor (MOV1, optional)	Joyin Co., Ltd.	7N471K / 10N471K / 14N471K	Max continuous voltage: 300VAC, max peak current: 1200A / 2500A / 4500A, 40/85/56	IEC 61051-1; IEC 61051-2; IEC 61051-2-2	VDE/ 005937	
Alt. use	Centra Science Corp.	CNR-07D471K / CNR-10D471K / CNR-14D471K	Max continuous voltage: 300VAC, max peak current: 1200A / 2500A / 4500A, 40/085/56	IEC 61051-1; IEC 61051-2; IEC 61051-2-2	VDE/ 40008220	

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

20.1	Table: Component					P
Object / part No.	Manufacturer/ trademark <sup>2)</sup>	Type / model <sup>2)</sup>	Technical data	Standard	Mark(s) of conformity <sup>1)</sup>	
Alt. use	Thinking Electronic Industrial Co., Ltd.	TVR07471 / TVR10471 / TVR14471	Max continuous voltage: 300VAC, max peak current: 1200A / 2500A / 4500A, 40/85/56	IEC 61051-1; IEC 61051-2; IEC 61051-2-2	VDE/ 005944	
Alt. use	Success Electronics Co., Ltd.	SVR07D471K / SVR10D471K / SVR14D471K	Max continuous voltage: 300VAC, max peak current: 1200A / 2500A / 4500A, 40/085/56	IEC 61051-1; IEC 61051-2; IEC 61051-2-2	VDE/ 123677	
Alt. use	Ceramate Techn. Co., Ltd.	GNR07D471K / GNR10D471K / GND14D471K	Max continuous voltage: 300VAC, max peak current: 1200A / 2500A / 4500A, 40/085/56	IEC 61051-1; IEC 61051-2; IEC 61051-2-2	VDE/ 40021606	
Alt. use	Brightking (Shenzhen) Co., Ltd.	07D471K / 10D471K / 14D471K	Max continuous voltage: 300VAC, max peak current: 500A / 1000A / 2000A, 40/85/56	IEC 61051-1; IEC 61051-2; IEC 61051-2-2	VDE/ 40027827	
Alt. use	Lien Shun Electronics Co., Ltd.	07D471K / 10D471K / 14D471K	Max continuous voltage: 300VAC, max peak current: 500A / 1000A / 2000A, 40/85/56	IEC 61051-1; IEC 61051-2; IEC 61051-2-2	VDE/ 40005858	
Alt. use	Hongzhi	HEL-07D471K HEL-10D471K HEL-14D471K	Max continuous voltage: 300VAC, max peak current: 500A / 1000A / 2000A, 40/85/56	IEC 61051-1; IEC 61051-2; IEC 61051-2-2	VDE/ 40008621	
Alt. use	New Future	07D471K 10D471K, 14D471K	Max continuous voltage: 300VAC, max peak current: 500A / 1750A / 2000A, 40/85/56	IEC 61051-1; IEC 61051-2; IEC 61051-2-2	VDE/ 40030322	
Optocoupler (U1)	Everlight Electronics Co., Ltd.	EL817	Insulation voltage: 850Vp Transient overvoltage: 6000Vp Cr/Cl>=7,6mm 55/110/21	EN 60747-5-5	VDE/ 132249	

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

20.1	Table: Component					P
Object / part No.	Manufacturer/ trademark <sup>2)</sup>	Type / model <sup>2)</sup>	Technical data	Standard	Mark(s) of conformity <sup>1)</sup>	
Alt. use	Bright Led Electronics Corp.	BPC-817 B / BPC-817 M / BPC-817 S	Insulation voltage: 850Vp Transient overvoltage: 5000Vp Cr>Cl>=7,6mm 30/100/21	EN 60747-5- 2	VDE/ 40007240	
Alt. use	Lite-On Technology Corp.	LTV-817	Insulation voltage: 850V; Transient overvoltage: 6000V Cr>Cl>=7,6mm; 30/110/21	EN60747-5- 2	VDE/ 40015248	
Alt. use	Sharp	PC-817	Insulation voltage: 890V; Transient overvoltage: 9000V Cr>Cl>=7,6mm 30/100/21	IEC/EN6074 7-5-2	VDE/ 40008087	
Alt. use	Cosmo Electronics Corp.	K1010, KP1010	Insulation voltage: 890V; Transient overvoltage: 6000V; CTI175; Cr>Cl>=7,6mm 55/100/21	EN60747-5- 2	VDE/ 101347	
Transformer (T1)	GlobTek/ BOAM/ ZhongTong	TF005	Class B, for model with 5-7V output	IEC/EN 61558-2-16	Tested with appliance	
Transformer (T1)	GlobTek/ BOAM/ ZhongTong	TF006	Class B, for model with 7,1-9V output	IEC/EN 61558-2-16	Tested with appliance	
Transformer (T1)	GlobTek/ BOAM/ ZhongTong	TF007	Class B, for model with 9,1-15V output	IEC/EN 61558-2-16	Tested with appliance	
Transformer (T1)	GlobTek/ BOAM/ ZhongTong	TF008	Class B, for model with 15,1-24V output	IEC/EN 61558-2-16	Tested with appliance	
Transformer (T1)	GlobTek/ BOAM/ ZhongTong	TF009	Class B, for model with 24,1-36V output	IEC/EN 61558-2-16	Tested with appliance	
Transformer (T1)	GlobTek/ BOAM/ ZhongTong	TF010	Class B, for model with 36,1-48V output	IEC/EN 61558-2-16	Tested with appliance	
Triple insulated wire	Great Leoflon Industrial Co., Ltd.	TRW (B) Serie(s)	Class B, reinforced insulation	IEC/EN 60950-1	VDE/ 136581	
Alt. use	COSMOLINK CO. Ltd.	TIW-M Serie(s)	Class B, reinforced insulation	IEC/EN 60950-1	VDE/ 138053	
Alt. use	Furukawa Electric Co., Ltd. Electronics & Automotive Systems Company Global Business Development Division	TEX-E	Class B, reinforced insulation	IEC/EN 60950-1	VDE/ 006735	

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

20.1	Table: Component					P
Object / part No.	Manufacturer/ trademark <sup>2)</sup>	Type / model <sup>2)</sup>	Technical data	Standard	Mark(s) of conformity <sup>1)</sup>	
Alt. use	Totoku Electric Co. Ltd.	TIW-2	Class B, reinforced insulation	IEC/EN 60950-1	VDE/40005152	
Magnet wire	PACIFIC ELECTRIC WIRE & CABLE (SHENZHEN) CO LTD	UEWN/U (UL E201757)	MW28-C, 130°C	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	PACIFIC ELECTRIC WIRE & CABLE (SHENZHEN) CO LTD	UEWS/U (UL E201757)	MW75-C, 130°C	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	CHENG DU SOUTH-WEST ELECTRIC CO.,LTD	2UEW (UL E178366)	MW75#, 130°C	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	JUNG SHING WIRE CO LTD	UEW-4 (UL E174837)	MW75C, 130°C	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	JUNG SHING WIRE CO LTD	UEY-2 (UL E174837)	MW28-C, 130°C	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	JIANGSU HONGLIU MAGNET WIRE TECHNOLOGY CO LTD	2UEW/130 (UL E335065)	MW75-C, 130°C	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	CHANGZHOU DAYANG WIRE & CABLE CO LTD	2UEW/130 (UL E158909)	MW75-C, 130°C	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	WUXI JUFENG COMPOUND LINE CO LTD	2UEWB (UL E206882)	MW75#, 130°C	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	JIANGSU DARTONG M & E CO LTD	UEW (UL E237377)	MW 75-C, 130°C	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	SHANDONG SAINT ELECTRIC CO LTD	UEW/130 (UL E194410)	MW75#, 130°C	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	ZHEJIANG LANGLI ELECTRIC EQUIPMENTS CO LTD	UEW (UL E222214)	MW 79#, 130°C	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	NINGBO JINTIAN NEW MATERIAL CO LTD	2UEW/130 (UL E227047)	MW75#, 130°C	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	ZHEJIANG HONGLEI COPPER CO LTD	2UEW (UL E307975)	MW75#, 130°C	IEC/EN 61558-2-16	Tested with appliance	
Bobbin	CHANG CHUN PLASTICS CO LTD	T375J T375HF (UL E59481)	V-0, 150°C, min thickness: 0,45mm	IEC/EN 61558-2-16	Tested with appliance	

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

20.1	Table: Component					P
Object / part No.	Manufacturer/ trademark <sup>2)</sup>	Type / model <sup>2)</sup>	Technical data	Standard	Mark(s) of conformity <sup>1)</sup>	
Alt. use	SUMITOMO BAKELITE CO LTD	PM-9820 (UL E41429)	V-0, 150°C, min thickness: 0,45mm	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	HITACHI CHEMICAL CO LTD	CP-J-8800 (UL E42956)	V-0, 150°C, min thickness: 0,45mm	IEC/EN 61558-2-16	Tested with appliance	
Insulating tape	3M COMPANY ELECTRICAL MARKETS DIV (EMD)	1350F-1 / 1350T-1 (UL E17385)	130°C	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	BONDTEC PACIFIC CO LTD	370S (UL E175868)	130°C	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	PZ, CT (UL E165111)	130°C	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	JINGJIANG JINGYI ADHESIVE PRODUCT CO LTD	JY25-A (UL E246950)	130°C	IEC/EN 61558-2-16	Tested with appliance	
Alt. use	CHANG SHU LIANG YI TAPE INDUSTRY CO LTD	LY-XX (UL E24680)	130°C	IEC/EN 61558-2-16	Tested with appliance	

<sup>1)</sup> An asterisk indicates a mark which assures the agreed level of surveillance.

<sup>2)</sup> Detailed dimension of output cord for different models

For model output current 3A, Min. 18AWG;

For model output current 1,5-2,99A, Min. 20AWG;

For model output current 0-1,49A, Min. 24AWG

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Clause	Requirement + Test	Result - Remark	Verdict

<b>26.2 TEST A</b>	<b>TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION</b>			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

<b>26.2 TEST B</b>	<b>TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION</b>			N/A
	Test with three specially prepared specimens with potting or impregnation (P1)			
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

<b>26.2 TEST C</b>	<b>TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION</b>			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



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










Annex U	U.5.1 THERMAL ENDURANCE TEST													
Type ref.														
Rated PRI-Voltage														
Rated SEC-Voltage														
Material of Winding														
Material of bobbin														
Material of resin														
Material of potting														
Material of foil														
Components re- moved for test														
tw														
S														
Objective test dura- tion (days)														
Theoretical test temperature														
Sample	1		2		3		4		5		6		7	
Winding	PRI	SEC	PRI	SEC	PRI	SEC	PRI	SEC	PRI	SEC	PRI	SEC	PRI	SEC
Start – Rk														
After 4 h – Rw														
After 4 h – winding temperature														
After 4 h - oven temperature														
After 24 h – Rw														
After 24 h – wind- ing temperature														
After 24 h - oven temperature														
Final test period (days)														
Output voltage (11.1) under load														
Insulating resis- tance														
High voltage test (35% of the values in Table 8.a														

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

Annex U	U.5.2 The use of an other constant S other than 4500 in tw tests Test1:10 days													
Type ref.														
Rated PRI-Voltage														
Rated SEC-Voltage														
Material of Winding														
Material of bobbin														
Material of resin														
Material of potting														
Material of foil														
Components re- moved for test														
tw														
S														
Objective test dura- tion (days)														
Theoretical test temperature														
Sample	1		2		3		4		5		6		7	
Winding	PRI	SEC	PRI	SEC	PRI	SEC	PRI	SEC	PRI	SEC	PRI	SEC	PRI	SEC
Start – Rk														
After 4 h – Rw														
After 4 h – winding temperature														
After 4 h - oven temperature														
After 24 h – Rw														
After 24 h – wind- ing temperature														
After 24 h - oven temperature														
Final test period (days)														
Output voltage (11.1) under load														
Insulating resis- tance														
High voltage test (35% of the values in Table 8.a														












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

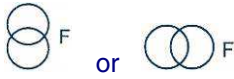

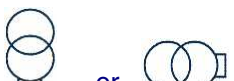
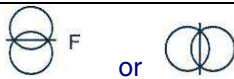
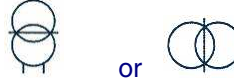





Annex U	U.5.2 The use of an other constant S other than 4500 in tw tests Test2:120 days													
Type ref.														
Rated PRI-Voltage														
Rated SEC-Voltage														
Material of Winding														
Material of bobbin														
Material of resin														
Material of potting														
Material of foil														
Components re- moved for test														
tw														
S														
Objective test dura- tion (days)														
Theoretical test temperature														
Sample	1		2		3		4		5		6		7	
Winding	PRI	SEC	PRI	SEC	PRI	SEC	PRI	SEC	PRI	SEC	PRI	SEC	PRI	SEC
Start – Rk														
After 4 h – Rw														
After 4 h – winding temperature														
After 4 h - oven temperature														
After 24 h – Rw														
After 24 h – wind- ing temperature														
After 24 h - oven temperature														
Final test period (days)														
Output voltage (11.1) under load														
Insulating resis- tance														
High voltage test (35% of the values in Table 8.a														

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
<b>AA</b>	<b>Annex AA</b>		N/A
	Partial discharge (PD) test		N/A
<b>BB</b>	<b>Annex BB</b>		N/A
	<b>Particular requirements for associated transformers for switch mode power supplies with internal frequencies &gt; 500 Hz</b>		N/A
	See separate test report-form for these Annex.		N/A
<b>BB.8</b>	<b>MARKING AND OTHER INFORMATION</b>		N/A
BB.8.2	Marking for transformers IP00 or for associated transformers: type and trademark, instruction sheets		N/A
BB.8.11	Correct symbols:		N/A
	Volts	V	N/A
	Amperes	A (mA)	N/A
	Volt amperes (or volt-amperes reactive for reactors)	VA or (VAR)	N/A
	Watts	W	N/A
	Hertz	Hz	N/A
	Input	PRI	N/A
	Output	SEC	N/A
	Direct current	d.c. (DC) or 	N/A
	Neutral	N	N/A
	Single-phase a.c.		N/A
	Three-phase a.c.	3 	N/A
	Three-phase and neutral a.c.	3N 	N/A
	Power factor	cosφ	N/A
	Class II construction		N/A
	Class III construction		N/A
	Fuse-link	F	N/A
	Rated max. ambient temperature	$t_a$	N/A
	Frame or core terminal		N/A
	Protective earth		N/A
	IP number	IPXX	N/A
	Earth (ground for functional earth)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	For indoor use only		N/A
	tw5 YYY		N/A
	tw10 YYY		N/A
	twx YYY		N/A
	Additional Symbols (IEC 61558-2-16:09)		N/A
	<b>SMPS</b> incorporating a <b>Fail-safe separating transformer</b>		N/A
BB.8.2	Marking for transformers IP00 or for associated transformers: type and trademark, instruction sheets		N/A
BB.8.11	Correct symbols:		N/A
	Volts	V	N/A
	Amperes	A (mA)	N/A
	Volt amperes (or volt-amperes reactive for reactors)	VA or (VAR)	N/A
	Watts	W	N/A
	Hertz	Hz	N/A
	Input	PRI	N/A
	Output	SEC	N/A
	Direct current	d.c. (DC) or	N/A
	Neutral	N	N/A
	Single-phase a.c.		N/A
	Three-phase a.c.	3	N/A
	Three-phase and neutral a.c.	3N	N/A
	Power factor	cosφ	N/A
	Class II construction		N/A
	Class III construction		N/A
	Fuse-link	F	N/A
	Rated max. ambient temperature	$t_a$	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

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	tw5 YYY		N/A
	tw10 YYY		N/A
	twx YYY		N/A
	Additional Symbols (IEC 61558-2-16:09)		N/A
	<b>SMPS</b> incorporating a <b>Fail-safe separating transformer</b>		N/A
BB.8.2	Marking for transformers IP00 or for associated transformers: type and trademark, instruction sheets		N/A
BB.8.11	Correct symbols:		N/A
	Volts	V	N/A
	Amperes	A (mA)	N/A
	Volt amperes (or volt-amperes reactive for reactors)	VA or (VAR)	N/A
	Watts	W	N/A
	Hertz	Hz	N/A
	Input	PRI	N/A
	Output	SEC	N/A
	Direct current	d.c. (DC) or	N/A
	Neutral	N	N/A
	Single-phase a.c.		N/A
	Three-phase a.c.	3	N/A
	Three-phase and neutral a.c.	3N	N/A
	Power factor	cosφ	N/A
	Class II construction		N/A
	Class III construction		N/A
	Fuse-link	F	N/A
	Rated max. ambient temperature	$t_a$	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
	tw5 YYY		N/A

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	tw10 YYY		N/A
	twx YYY		N/A
	Additional Symbols (IEC 61558-2-16:09)		N/A
	<b>SMPS</b> incorporating a <b>Fail-safe separating transformer</b>		N/A
BB.8.2	Marking for transformers IP00 or for associated transformers: type and trademark, instruction sheets		N/A
BB.8.11	Correct symbols:		N/A
	Volts	V	N/A
	Amperes	A (mA)	N/A
	Volt amperes (or volt-amperes reactive for reactors)	VA or (VAR)	N/A
	Watts	W	N/A
	Hertz	Hz	N/A
	Input	PRI	N/A
	Output	SEC	N/A
	Direct current	d.c. (DC) or 	N/A
	Neutral	N	N/A
	Single-phase a.c.		N/A
	Three-phase a.c.	3 	N/A
	Three-phase and neutral a.c.	3N 	N/A
	Power factor	cosφ	N/A
	Class II construction		N/A
	Class III construction		N/A
	Fuse-link	F	N/A
	Rated max. ambient temperature	t <sub>a</sub>	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
	tw5 YYY		N/A
	tw10 YYY		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	twx YYY		N/A
	Additional Symbols (IEC 61558-2-16:09)		N/A
	<b>SMPS</b> incorporating a <b>Fail-safe separating transformer</b>		N/A
	<b>SMPS</b> incorporating a <b>Non-short-circuit-proof separating transformer</b>		N/A
	<b>SMPS</b> incorporating a <b>Short-circuit-proof separating transformer</b> (inherently or non-inherently)		N/A
	<b>SMPS</b> incorporating a <b>Fail-safe isolating transformer</b>		N/A
	<b>SMPS</b> incorporating a <b>Non-short-circuit-proof isolating transformer</b>		N/A
	<b>SMPS</b> incorporating a <b>Short-circuit-proof isolating transformer</b> (inherently or non-inherently)		N/A
	<b>SMPS</b> incorporating a <b>Fail-safe safety isolating transformer</b>		N/A
	<b>SMPS</b> incorporating a <b>Non-short-circuit-proof safety isolating transformer</b>		N/A
	<b>SMPS</b> incorporating a <b>Short-circuit-proof safety isolating transformer</b> (inherently or non-inherently)		N/A
	<b>SMPS</b> (Switch mode power supply unit)		N/A
<b>BB.9</b>	<b>PROTECTION AGAINST ELECTRIC SHOCK</b>		N/A
<b>BB.10</b>	<b>CHANGE OF INPUT VOLTAGE SETTING</b>		N/A
<b>BB.11</b>	<b>OUTPUT VOLTAGE AND OUTPUT CURRENT UNDER LOAD</b>		N/A
<b>BB.12</b>	<b>NO-LOAD OUTPUT VOLTAGE (see supplementary requirements in Part 2)</b>		N/A
<b>BB.13</b>	<b>SHORT-CIRCUIT VOLTAGE</b>		N/A
<b>BB.14</b>	<b>HEATING</b>		N/A
BB.14.2	Application of 14.1 or 14.3 according to the insulation system		N/A



<b>IEC 61558-2-16</b>			
Clause	Requirement + Test	Result - Remark	Verdict
BB.14.2.1	Class of isolating system (classified materials according to IEC 60 085 and IEC 60 216)		N/A
BB.14.2.2	No classified material, or system but the measured temperature does not exceed the value of Class A		N/A
BB.14.2.3	No classified material or system but the measured temperature exceeds the value for Class A, the live parts of the transformers are submitted to the test of 14.3		N/A
BB.14.3	Accelerated ageing test for undeclared class of isolating system		N/A
	Cycling test (10 cycles):		N/A
	– measuring of the no-load input current (mA)		N/A
BB.14.3.1	– heat run (temperature in table 2)		N/A
BB.14.3.2	– vibration test: 30 min; amplitude 0,35 mm; frequency range: 10 Hz, 55 Hz, 10 Hz		N/A
BB.14.3.3	– moisture treatment (48 h, 17.2)		N/A
BB.14.3.4	Measurements and tests at the beginning and after each test:		N/A
	– deviation of the no-load input current, measured at the beginning of the test is $\leq 30\%$		N/A
	– insulation resistance acc. cl.18.1 and 18.2		N/A
	– electric strength, no breakdown (18.3); 2 min; test voltage 35% of specified value (table VI)		N/A
	– Transformers (50 or 60 Hz version) are tested after the dielectric strength test as follows: under no load; duration: 5 min; Upri(V):1,2 times rated supply voltage; frequency (Hz): 2 times rated frequency		N/A
<b>BB.15</b>	<b>SHORT-CIRCUIT AND OVERLOAD PROTECTION</b>		N/A
<b>BB.16</b>	<b>MECHANICAL STRENGTH</b>		N/A
<b>BB.17</b>	<b>PROTECTION AGAINST HARMFUL INGRESS OF WATER AND MOISTURE</b>		N/A
<b>BB.18</b>	<b>INSULATION RESISTANCE AND ELECTRIC STRENGTH</b>		N/A
BB.18.2	Insulation resistance between:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– live parts and body for basic insulation $\geq 2 \text{ M}\Omega$		N/A
	– live parts and body for reinforced insulation $\geq 7 \text{ M}\Omega$		N/A
	– input circuits and output circuits for basic insulation $\geq 2 \text{ M}\Omega$		N/A
	– input circuits and output circuits for double or reinforced insulation $\geq 5 \text{ M}\Omega$		N/A
	– each input circuit and all other input circuits connected together $\geq 2 \text{ M}\Omega$		N/A
	– each output circuit and all other output circuits connected together $\geq 2 \text{ M}\Omega$		N/A
	– hazardous live parts and metal parts with basic insulation (Class II transformers) $\geq 2 \text{ M}\Omega$		N/A
	– body and metal parts with basic insulation (Class II transformers) $\geq 5 \text{ M}\Omega$		N/A
	– metal foil in contact with inner and outer surfaces of enclosures $\geq 2 \text{ M}\Omega$		N/A
BB.18.3	Electric strength test (1 min): no flashover or breakdown:		N/A
	1) basic insulation between input circuits and output circuits; working voltage (V); test voltage (V) .....		N/A
	2) double or reinforced insulation between input circuits and output circuits; working voltage (V); test voltage (V) .....		N/A
	3) basic or supplementary insulation between:		N/A
	a) live parts of different polarity; working voltage (V); test voltage (V) .....		N/A
	b) live parts and the body if intended to be connected to protective earth .....		N/A
	c) inlet bushings and cord guards and anchorages .....		N/A
	d) live parts and an intermediate conductive part .....		N/A
	e) intermediate conductive parts and body ...		N/A
	1) Reinforced insulation between the body and live parts; working voltage (V); test voltage (V) .....		N/A
	2) Functional insulation for windings intended to be connected in series or parallel (test voltage = working voltage + 500 V) (IEC 61558-2-16:2009)		N/A

<b>BB.19</b>	<b>CONSTRUCTION</b>		N/A
BB.19.1	Separation of input and output circuits		N/A
BB.19.1.1	SMPS incorporating auto-transformers (IEC 61558-2-16:2009)		N/A
BB.19.1.2	SMPS incorporating separating transformers (IEC 61558-2-16:2009)		N/A
BB.19.1.2.1	Input and output circuits electrically separated. (IEC 61558-2-16:09)		N/A
BB.19.1.2.2	The insulation between input and output winding(s) consist of basic insulation (IEC 61558-2-16:09)		N/A
	Class I SMPS		N/A
	– Insulation between input windings and body consist of basic insulation		N/A
	– Insulation between output windings and body consist of basic insulation		N/A
	Class II SMPS (IEC 61558-2-16:09)		N/A
	– Insulation between input windings and body consist of double or reinforced insulation		N/A
	– Insulation between output windings and body consist of double or reinforced insulation		N/A
BB.19.1.2.3	The insulation between input windings and intermediate conductive parts and the output windings and intermediate part consist of basic insulation (IEC 61558-2-16:09)		N/A
	For class I SMPS the insulation between input and output windings via the intermediate conductive parts consist of basic insulation (IEC 61558-2-16:09)		N/A
	For class II SMPS the insulation between input winding and the body and between the output windings and the body via the intermediate conductive parts consist of double or reinforced insulation (IEC 61558-2-16:09)		N/A
BB.19.1.2.4	Parts of output circuits may be connected to protective earth (IEC 61558-2-16:09)		N/A
BB.19.1.2.5	No direct contact between output circuits and the body, unless: (IEC 61558-2-16:2009)		N/A
	– Allowed for associated transformers by the equipment standard		N/A
	– Clause 19.8 of part 1 is fulfilled		N/A
BB.19.1.3	SMPS incorporating isolating transformers and safety isolating transformers (IEC 61558-2-16:09)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
BB.19.1.3.1	Input and output circuits electrically separated (IEC 61558-2-16:09)		N/A
	No possibility of any connection between these circuits		N/A
BB.19.1.3.2	The insulation between input and output winding(s) consist of double or reinforced insulation (exception see 19.1.3.4) (IEC 61558-2-16:09)		N/A
	Class I SMPS <b>not</b> intended for connection to the mains by a plug:		—
	– Insulation between input windings and body connected to earth consist of basic insulation rated to the input voltage		N/A
	– Insulation between output windings and body, connected to earth consist of basic insulation rated for the output voltage		N/A
	Class I SMPS intended for connection to the mains by a plug (EN 61558-2-16:09):		N/A
	– Insulation between input windings and body connected to earth consist of basic insulation rated to the working voltage		N/A
	– Insulation between output windings and body, connected to earth consist of supplementary insulation rated for the working voltage		N/A
	Class II SMPS (IEC 61558-2-16:09)		N/A
	– Insulation between input windings and body consist of double or reinforced insulation rated to the input voltage		N/A
	– Insulation between output windings and body consist of double or reinforced insulation, rated to the output voltage		N/A
BB.19.1.3.3	SMPS with intermediate conductive parts not connected to the body (between input/output) (EN 61558-2-16:09):		N/A
19.1.3.3.1	For class I and class II SMPS the insulation between input and output windings, via intermediate conductive parts, consist of double or reinforced insulation, rated to the working voltage (EN 61558-2-16:09)		N/A
	– For class II SMPS the insulation between input winding and the body and between the output windings and the body via the intermediate conductive parts consist of double or reinforced insulation. (rated to the input voltage, for SELV circuits only basic insulation to the body))		N/A

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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.19.1.3.3.2	Class I transformers with earthed core, and not allowed for class II equipment (EN 61558-2-16:09)		N/A
	– Insulation from the input to the earthed core: basic insulation rated for the input voltage		N/A
	– Insulation from the output voltage to the earthed core: basic insulation rated for the output voltage		N/A
BB.19.1.3.3.3	Insulation between : input to intermediate conductive parts and output and intermediate parts consist of at least basic insulation (EN 61558-2-16:09)		N/A
	– If the insulation from input or output to the intermediate metal part is less than basic insulation, the part is considered to be connected to input or output.		N/A
BB.19.1.3.4	For class I SMPS, with protective screen, <b>not</b> connected to the mains by a plug the following conditions comply (EN 61558-2-16:09):		N/A
	– The insulation between input winding and protective screen consist of basic insulation (rated input voltage)		N/A
	– The insulation between output winding and protective screen consist of basic insulation (rated output voltage)		N/A
	– The protective screen consist of metal foil or a wire wound screen extending the full width of the windings and has no gaps or holes		N/A
	– Where the protective screen does not cover the entire width of the input winding, additional insulation to ensure double insulation in this area, is used.		N/A
	– If the screen is made by a foil, the turns are isolated, overlap at least 3 mm		N/A
	– The cross-section of the screen and the lead out wire is at least corresponding to the rated current of the overload device		N/A
	– The lead our wire is soldered or fixed to the protective screen.		N/A
	Protective screening is not allowed for SMPS with plug connection to the mains (EN 61558-2-16:09)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
BB.19.1.3.5	No connection between output circuit and protective earth, except of associated transformers (allowed by equipment standard) or 19.8 is fulfilled (EN 61558-2-16:09)		N/A
BB.19.1.3.6	No connection between output circuit and body, except of associated transformers (allowed by equipment standard) (EN 61558-2-16:09)		N/A
BB.19.1.3.7	The distance between input and output terminals for the connection of external wiring is $\geq 25$ mm		N/A
BB.19.1.3.8	Portable SMPS having an rated output $\leq 630$ VA (EN 61558-2-16:09)		N/A
BB.19.1.3.9	No connection between input and output circuit, except of associated transformers (allowed by equipment standard) (EN 61558-2-16:09)		N/A
BB.19.1.3.10	Protective screening is not allowed for SMPS with plug connection to the mains (EN 61558-2-16:09)		N/A
BB.19.11	Handles, levers, knobs, etc.:		N/A
	– insulating material		N/A
	– supplementary insulation covering		N/A
	– separated from shafts or fixing by supplementary insulation		N/A
BB.19.12	Windings construction		N/A
BB.19.12.1	Undue displacement in all types of transformers not allowed:		N/A
	– of input or output windings or turns thereof		N/A
	– of internal wiring or wires for external connection		N/A
	– of parts of windings or of internal wiring in case of rupture or loosening		N/A
BB.19.12.2	Serrated tape:		N/A
	– distance through insulation according to table 13		N/A
	– one additional layer of serrated tape, and		N/A
	– one additional layer without serration		N/A
	– in case of cheek less bobbins the end turns of each layer shall be prevented from being displaced		N/A
BB.19.12.3	Insulated windings wires:		N/A
	– to all types of transformers for basic or supplementary insulation taken separately		N/A
	a) Winding wire with basic or supplementary insulation:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- comply with Annex K		N/A
	- the insulation of the conductor: two layers		N/A
	b) Winding wire with double or reinforced insulation:		N/A
	- comply with Annex K		N/A
	- the insulation of the insulated winding wire: three layers		N/A
	- dielectric strength test with the values according 18.3 multiplied by 1,25		N/A
	Where the wire is wound:		N/A
	- upon metal or ferrite cores		N/A
	- upon enamelled wire		N/A
	- under enamelled wire		N/A
	An additional insulation with a dti of supplementary insulation provided between insulated an enamelled wires		N/A
	100 % Routine test according to Annex K.3 for windings giving double or reinforced insulation		N/A
	For windings providing reinforced insulation the values in table 13, table C.1 and table D1, box 2) c), are not required		N/A
<b>BB.20</b>	<b>COMPONENTS</b>		N/A
<b>BB.21</b>	<b>INTERNAL WIRING</b>		N/A
<b>BB.22</b>	<b>SUPPLY CONNECTION AND EXTERNAL FLEXIBLE CABLES AND CORDS</b>		N/A
<b>BB.23</b>	<b>TERMINALS FOR EXTERNAL CONDUCTORS</b>		N/A
<b>BB.24</b>	<b>PROVISION FOR PROTECTIVE EARTHING</b>		N/A
<b>BB.25</b>	<b>SCREWS AND CONNECTIONS</b>		N/A
<b>BB.26</b>	<b>CREEPAGE DISTANCES AND CLEARANCES</b>		N/A
BB.26.1	See 26.101		N/A
BB.26.2	Creepage distances (cr) and clearances (cr)		N/A
BB.26.2.1	Windings covered with adhesive tape		N/A
	- the values of pollution degree 1 are fulfilled		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– all isolating material are classified acc. to IEC 60085 and IEC 60216		N/A
	– test A of 26.2.3 is fulfilled		N/A
BB.26.2.2	Uncemented insulating parts pollution degree P2 or P3		N/A
	– all isolating material are classified acc. to IEC 60085 and IEC 60216		N/A
	– values of pollution degree 1 are not applicable		N/A
BB.26.2.3	Cemented insulating parts		N/A
	– all isolating materials are classified acc. to IEC 60085 and IEC 60216		N/A
	– values of distance through insulation (dti) are fulfilled		N/A
	– creepage distances and clearances are not required		N/A
	– test A of this sub clause is fulfilled		N/A
	Test A		N/A
	– thermal class		N/A
	– working voltage		N/A
	– Test with three specially specimens, with un-insulated wires, without impregnation or potting	(see appended table)	N/A
	Two of the three specimens are subjected to:		N/A
	– the relevant humidity treatment according to 17.2 (48 h)		N/A
	– the relevant dielectric strength test of 18.3 multiplied with factor 1,35		N/A
	– One of the three specimens is subjected to the relevant dielectric strength test of 18.3 multiplied by the factor 1,35 immediately at the end of the last cycle with high temperature		N/A
	Impulse dielectric test according to 4.1.1.2.1 of IEC 60 664-1 (1,2 / 50 µs waveform) – see Annex R of IEC 61558-1		N/A
BB.26.2.4	Enclosed parts, by impregnation or potting		N/A
BB.26.2.4.1	– The requirements of reduced values as stated for pollution degree 1 (P1) are fulfilled		N/A
	– all isolating materials are classified acc. to IEC 60085 and IEC 60216		N/A
	Test B		N/A



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Clause	Requirement + Test	Result - Remark	Verdict
	– thermal class		N/A
	– working voltage		N/A
	– Test with three specially specimens, potted or impregnated. The dielectric strength test is applied directly to the joint.	(see appended table)	N/A
	Two of the three specimens are subjected to:		N/A
	– the relevant humidity treatment according to 17.2 (48 h)		N/A
	– the relevant dielectric strength test of 18.3 multiplied with factor 1,25		N/A
	– One of the three specimens is subjected to the relevant dielectric strength test of 18.3 multiplied by the factor 1,25 immediately at the end of the last cycle with high temperature		N/A
	The three spacemen pass the Impulse dielectric test according to 4.1.1.2.1 of IEC 60 664-1 (1,2 / 50 µs waveform) – see Annex R of IEC 61558-1		N/A
BB.26.2.4.2	– The requirements of distance through insulation (dti) are fulfilled. (P1 values are not required)		N/A
	– all isolating materials are classified acc. to IEC 60085 and IEC 60216		N/A
	Test C		N/A
	– thermal class		N/A
	– working voltage		N/A
	– Test with three specimens, potted or impregnated. (finished components)	(see appended table)	N/A
	– Neither cracks, nor voids in the insulating compounds		N/A
	Two of the three specimens are subjected to:		N/A
	– the relevant humidity treatment according to 17.2 (48 h)		N/A
	– the relevant dielectric strength test of 18.3 multiplied with factor 1,35		N/A
	– One of the three specimens is subjected to the relevant dielectric strength test of 18.3 multiplied by the factor 1,35 immediately at the end of the last cycle with high temperature		N/A
	The three spacemen pass the Impulse dielectric test according to 4.1.1.2.1 of IEC 60 664-1 (1,2 / 50 µs waveform) – see Annex R of IEC 61558-1		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
BB.26.3	Distance through insulation		N/A
	For double or reinforced insulation, the required values of Tables 13, C1, and D1 – boxes 2b, 2c and 7 are fulfilled		N/A
	The insulation fulfil the material classification according IEC 60085 or 60216 or the test of 14.3		N/A
BB.26.3.1	Reduced values of the thickness of insulation for supplementary or reinforced insulation are allowed if the following conditions are fulfilled:		N/A
	– the isolating materials are classified acc. to IEC 60085 and IEC 60216		N/A
	– the test of 14.3 is fulfilled		N/A
	– If both requirements are fulfilled, the required values for solid insulation can be multiplied by 0,4		N/A
	– Minimum thickness of reinforced insulation $\geq 0,2$ mm		N/A
	– Minimum thickness of supplementary insulation $\geq 0,1$ mm		N/A
BB.26.3.2	Insulation in thin sheet form		N/A
	– If the layers are non separable (glued together):		N/A
	– The requirement of 3 layers is fulfilled		N/A
	– The mandrel test according 26.3.3 is fulfilled with 150 N		N/A
	– The required values for d.t.i. of Tables 13, C.1 and D.1 – marked by index "e" are fulfilled.		N/A
	– If the layers are separated:		N/A
	– The requirement of 2 layers is fulfilled		N/A
	– If serrated tape is used, 1 additional layer (serrated) and one additional layer without serration is required		N/A
	– The mandrel test according 26.3.3 is fulfilled on each layer with 50 N		N/A
	– The required values for d.t.i. of Tables 13, C.1 and D.1 – marked by index "e" are 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

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Clause	Requirement + Test	Result - Remark	Verdict
	– The mandrel test according 26.3.3 is fulfilled on 2/3 of the layers with 100 N		N/A
	– The required values for d.t.i. of Tables 13, C.1 and D.1 – marked by index "e" are fulfilled.		N/A
	Test according to 14.3 and if the isolating materials are classified acc. to IEC 60085 and IEC 60216 no distances through insulation are required for insulation in thin sheet form		N/A
	The figures within square brackets in box 2 and 7 of table 13 (C.1/D.1) are used for insulation in thin sheet form as follows:		N/A
	– rated output > 100 VA values in square brackets apply		N/A
	– rated output $\geq 25 \text{ VA} \leq 100 \text{ VA}$ 2/3 of the value in square brackets apply		N/A
	– rated output $\leq 25 \text{ VA}$ 1/3 of the value in square brackets apply		N/A
BB.26.3.3	Mandrel test of insulation in thin sheet form (specimen Of 70 mm width are necessary):		N/A
	– If the layers are non separable – at least 3 layers glued together fulfil the test:		N/A
	– pull force of 150 N		N/A
	– high voltage test of 5,0 kV or the test voltage of 18.3 multiplied by 1,25 whatever is the greater. No flashover, no breakdown.		N/A
	– If the layers are separable and 2/3 of at least 3 layers fulfil the test.		N/A
	– pull force of 100 N		N/A
	– high voltage test of 5,0 kV or the test voltage of 18.3 multiplied by 1,25 whatever is the greater. No flashover, no breakdowns.		N/A
	– If the layers are separable 1 of at least 2 layers fulfil the test:		N/A
	– pull force of 50 N		N/A
	– high voltage test of 5,0 kV or the test voltage of 18.3 multiplied by 1,25 whatever is the greater. No flashover, no breakdown.		N/A
BB.26.101	Creepage distances, clearances and distances through insulation, specified values according to (EN 61558-2-16:09):		N/A
	– table 13, material group IIIa (part 1)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– table C, material group II (part 1)		N/A
	– table D, material group I (part 1)		N/A
	– working voltage		N/A
	– rated supply frequency 50/60 Hz		N/A
	– rated internal frequency		N/A
	1. Insulation between input and output circuits (basic insulation):		N/A
	a) measured values $\geq$ specified values (mm) .....		N/A
	2. Insulation between input and output circuits (double or reinforced insulation):		N/A
	a) measured values $\geq$ specified values (mm) .....		N/A
	b) measured values $\geq$ specified values (mm) .....		N/A
	c) measured values $\geq$ specified values (mm) .....		N/A
	3. Insulation between adjacent input circuits: measured values $\geq$ specified values (mm) .....		N/A
	Insulation between adjacent output circuits: measured values $\geq$ specified values (mm) .....		N/A
	4. Insulation between terminals for external connection:		N/A
	a) measured values $\geq$ specified values (mm) .....		N/A
	b) measured values $\geq$ specified values (mm) .....		N/A
	c) measured values $\geq$ specified values (mm) .....		N/A
	5. Basic or supplementary insulation:		N/A
	a) measured values $\geq$ specified values (mm) .....		N/A
	b) measured values $\geq$ specified values (mm) .....		N/A
	c) measured values $\geq$ specified values (mm) .....		N/A
	d) measured values $\geq$ specified values (mm) .....		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	e) measured values $\geq$ specified values (mm) .....		N/A
	6. Reinforced or double insulation: measured values $\geq$ specified values (mm) .....		N/A
	7. Distance through insulation:		N/A
	a) measured values $\geq$ specified values (mm) .....		N/A
	b) measured values $\geq$ specified values (mm) .....		N/A
	c) measured values $\geq$ specified values (mm) .....		N/A
BB.26.102	Values of IEC 61558-2-16 applicable for frequency up to 3 MHz (EN 61558-2-16:09)		N/A
	For frequency above 3 MHz clause 7 of IEC 60664-4 is applicable (high frequency testing)		N/A
BB.26.103	Clearance (EN 61558-2-16:09)		N/A
	a.) Clearance for frequency $\geq$ 30 kHz according figure 101 two determinations are necessary:		N/A
	– determination based on peak working voltage according Table 104 :		N/A
	Peak working voltage		N/A
	Basic insulation: required / measured		N/A
	Double or reinforced insulation: required / measured value		N/A
	– and alternative if applicable for approximately homogeneous field according to Table 102		N/A
	Peak working voltage		N/A
	Basic insulation: required / measured		N/A
	Double or reinforced insulation: required / measured value		N/A
	– determination based on measured r.m.s. working voltage according Tables 13, C1 and D1 (see clause 26.101)		N/A
	The minimum clearance is the greater of the two values.		N/A
	b.) Clearance for frequency $\leq$ 30 kHz according figure 101 two determinations are necessary:		N/A
	– determination based on peak working voltage with recurring peak voltages according Table 103 :		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– determination based on measured r.m.s. working voltage according Tables 13, C1 and D1 (see clause 26.101)		N/A
	The minimum clearance is the greater of the two values.		N/A
BB.26.104	The working voltages of Table 102, 103 and 104 are peak voltages including $\mu$ sec peaks (EN 61558-2-16:09)		N/A
	The working voltage according to Table 13 of part 1 are r.m.s. voltages		N/A
BB.26.105	Creepage distances		N/A
	Two determinations of creepage distances are necessary (see Figure 102)		N/A
	– determination based on measured peak working voltage according Tables 105 to 110		N/A
	Peak working voltage		N/A
	Pollution degree		N/A
	Basic or supplementary insulation: required / measured		N/A
	Double or reinforced insulation: required / measured value		N/A
	– determination based on measured r.m.s. working voltage according Tables 13, C1 and D1 (see clause 26.101)		N/A
	If the values based on table 105 to 110 are lower than the relevant values in Tables 13, C.1 or D.1, the higher values shall be applicable		N/A
BB.26.106	Distance through insulation (EN 61558-2-16:09)		N/A
	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 $d1 \geq 0,75$ the peak value of the field strength is $\leq 2$ kV/mm		N/A
	For thin layers $d2 \leq 30 \mu\text{m}$ the peak value of the field strength is $\leq 10$ kV/mm		N/A



<b>IEC 61558-2-16</b>			
<b>Clause</b>	<b>Requirement + Test</b>	<b>Result - Remark</b>	<b>Verdict</b>
	For $d_1 > d > d_2$ equation (1) is used for calculation the field strength		N/A
<b>BB.27</b>	<b>RESISTANCE TO HEAT, FIRE AND TRACKING</b>		N/A

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

<b>BB.E</b>	<b>ANNEX E , GLOW WIRE TEST</b>		N/A
	The test is required according to IEC 60695-2-10 and IEC 60695-2-11 with the following additions:		N/A
BB.E.1	Clause 6, "Severities" of IEC 6095-2-11, apply with the temperature stated in 27.3 of IEC 61558-1		N/A
BB.E2	Clause 8, "Conditioning", of IEC 60695-2-11 apply, preconditioning is required		N/A
BB.E3	Clause 10, "Test Procedure", of IEC 60695-2-11 apply, The tip of the glow wire is applied to the flat side of the surface.		N/A

<b>BB.F</b>	<b>ANNEX F, REQUIREMENTS FOR MANUALLY OPERATED SWITCHES WHICH ARE PARTS OF THE TRANSFORMER</b>		N/A
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<b>BB.H</b>	<b>ANNEX H, ELECTRONIC CIRCUITS (IEC 61558-1)</b>		N/A
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<b>BB.K</b>	<b>ANNEX K, INSULATED WINDING WIRES FOR USE AS MULTIPLE LAYER INSULATION</b>		N/A
BB.K.1	Wire construction:		N/A
	– insulated winding wire with min. two layers for basic or supplementary insulation		N/A
	– insulated winding wire with min. three layers for reinforced insulation		N/A
	– winding insulation material .....		N/A
BB.K.2	Conformance test		N/A
BB.K.2.1	Test 13 of IEC 60 851-5 nominal conductor diameter $\geq 0,018 \text{ mm} \leq 0,1 \text{ mm}$ , test as specified in 4.2.1 and 4.2.2 of IEC 60 851-5		N/A
	Nominal conductor diameter $> 0,1 \text{ mm}, \leq 2,5 \text{ mm}$ , test as specified in 4.3.1 and 4.3.2 of IEC 60 851-5		N/A
	Nominal conductor diameter $< 2,5 \text{ mm}$ , test as specified in 4.4.1 and 4.4.2 of IEC 60 851-5		N/A
	High voltage test immediately after the above specified tests:		N/A
	– test voltage for two layers 3 kV		N/A
	– test voltage for three layers 5,5 kV		N/A
BB.K.2.2	Adherence and flexibility, test as specified under 5.1.4 of IEC 60 851-3		N/A
	– high voltage test immediately after this test		N/A
	– test voltage for two layers 3 kV		N/A



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

	– test voltage for three layers 5,5 kV		N/A
BB.K.2.3	Heat shock, test as specified under 3.1 or 3.2 of IEC 60 851-6:		N/A
	– high voltage test immediately after this test		N/A
	– test voltage for two layers 3 kV		N/A
	– test voltage for three layers 5,5 kV		N/A
BB.K.2.4	Retention of dielectric strength after bending, test as specified under test 13 of 4.6.1 c) of IEC 60 851-5		N/A
	1. high voltage test immediately after this test		N/A
	2. test voltage for two layers 3 kV		N/A
	3. test voltage for three layers 5,5 kV		N/A
BB.K.2.5	Resistance to abrasion, test 11 of IEC 60851-3		N/A

<b>BB.U</b>	<b>ANNEX U – INFORMATIVE – OPTIONAL TW – MARKING FOR TRANSFORMERS</b>	N/A
<b>V</b>	<b>ANNEX V, SYMBOLS TO BE USED FOR THERMAL CUT-OUTS</b>	N/A

<b>BB.26.2 TEST A</b>	<b>TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION</b>					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	

<b>BB.26.2 TEST B</b>	<b>TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION</b>					N/A
	Test with three specially prepared specimens with potting or impregnation (P1)					
	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	

<b>BB.26.2 TEST C</b>	<b>TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION</b>					
	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	

**Appendix No.2: Group and National Difference**

<b>IEC/EN 61558-2-16</b>			
Clause	Requirement + Test	Result - Remark	Verdict
	EN 61558-1: 2005 + A1:2009, GROUP DIFFERENCES (CENELEC common modifications (EN))		
		No differences exist.	-
	EN 61558-2-16: 2009, GROUP DIFFERENCES (CENELEC common modifications (EN))		
		No differences exist.	-
	EN 61558-1: 2005 + A1:2009, National Difference for Sweden		
		No differences exist.	-
	EN 61558-2-16: 2009, National Difference for Sweden		
		No differences exist.	-