

APPLICATION FOR LOW VOLTAGE DIRECTIVE
On Behalf of
Zhongshan Dianxing Electrical Appliance Industry Co., Ltd.
AC. AUTOMATIC VOLTAGE REGULATOR
Model: SDC-500VA, SDC-1000VA, SDC-1500VA,
SDC-2000VA, SDC-3000VA, SDC-5000VA

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Date of Test: Apr. 02, 2013 to Apr. 10, 2013
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Report Number: 201304676S

TEST REPORT

EN 61558-2-12

**Safety of power transformers, power supply units and similar devices
Part 2-12: Particular requirements for constant voltage transformers**

Report

Report reference No. : 201304676S
 Tested by : Phevos Hu / Project Engineer *phevos hu*
 Approved by : Terry Tian / Deputy Manager *Terry Tian*
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Testing laboratory

Name : Anbotek Compliance Laboratory Limited
 Address : 1/F, 1 /Building, SEC Industrial Park, No.4 Qianhai Road, Nanshan District, Shenzhen, 518054, China
 Testing location : As above

Client

Name : Zhongshan Dianxing Electrical Appliance Industry Co., Ltd.
 Address : Anle Industrial Zone, DongFeng Town, Zhongshan, GuangDong, China

Test specification

Standard : EN 61558-1:2005+A1:2009
 EN 61558-2-12:2011
 Test procedure : CCA-scheme
 Procedure deviation : N.A.
 Non-standard test method : N.A.

Test item

Description : AC. AUTOMATIC VOLTAGE REGULATOR
 Trademark : 

Model and/or type reference : SDC-500VA, SDC-1000VA, SDC-1500VA, SDC-2000VA, SDC-3000VA, SDC-5000VA
 Manufacturer : Zhongshan Dianxing Electrical Appliance Industry Co., Ltd.
 Address : Anle Industrial Zone, DongFeng Town, Zhongshan, GuangDong, China
 Rating(s) : AC Input: 140-260V~, 50/60Hz
 AC Output: 220-230V~, 50/60Hz

Particulars: test item vs. test requirements

Type of transformers : Separating transformer
 Application : N.A
 Protection against electric shock..... : Class I
 Short-circuit protection..... : ---
 - inherently short-circuit proof..... : N.A
 - non-inherently short-circuit proof..... : Yes
 - non short-circuit proof..... : N.A
 - fail-safe : N.A
 Protection index..... : IPX0
 Other characteristics..... : N.A
 Rated ambient temperature t_a (°C)..... : -10°C~+40°C

Test case verdicts

Test case does not apply to the test object..... : N.A
 Test item does meet the requirement..... : P(Pass)
 Test item does not meet the requirement..... : F(Fail)

Testing

Date of receipt of test item : Apr. 02, 2013
 Date(s) of performance of test..... : Apr. 02, 2013 to Apr. 10, 2013

General remarks

This test report shall not be reproduced except in full without the written approval of the testing laboratory.

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

"(see remark #)" refers to a remark 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.

Remark:

1. Clearance was evaluated for altitude up to 2000m above sea level.
2. If no otherwise specified, all tests were performed on model SDC-1000VA.

Copy of marking plate

formed as following:

AC. AUTOMATIC VOLTAGE REGULATOR
Model: SDC-1000VA
AC Input: 140-260V~, 50/60Hz
AC Output: 220-230V~, 50/60Hz, 1000VA, IPX0
Operation temperature: -10~40°C



Zhongshan Dianxing Electrical Appliance Industry Co., Ltd.

Summary of testing


Automatic Voltage Regulator/Stabilizer was tested and found to compliance with requirement of EN 61558-1: 2005+A1:2009; EN 61558-2-12: 2011

EN 61558-2-12			
Clause	Requirement – Test	Result - Remark	Verdict

6	Ratings		P
6.101	The rated output voltage shall not exceed		--
	1 000 V a.c. or 1 415 V ripple-free d.c. for constant voltage auto-transformers and constant voltage separating transformers;	Output 220-230V~	P
	500 V a.c. or 708 V ripple-free d.c. for constant voltage isolating transformers;	Auto-transformers	N
	50 V a.c. and/or 120 V ripple-free d.c. for constant voltage safety isolating transformers;	Auto-transformers	N
	The rated output voltage shall exceed		--
	50 V a.c. or 120 V ripple-free d.c. for constant voltage independent auto-transformers and separating transformers;	Output 220-230V~	P
	50 V a.c. or 120 V ripple-free d.c. for constant voltage isolating transformers.		N
6.102	The rated output is not limited.		N
6.103	The rated frequency shall not exceed 500 Hz.	50/60Hz	P
6.104	The rated value of output regulation tolerance shall be given at rated supply voltage range, rated output and power factor = 1.	220-230V~	P
6.105	For constant voltage independent transformers the input voltage variation shall not be less than 10 %.		P
6.106	The internal operational frequency shall not exceed 30 kHz.	Not exceed 30 kHz.	P

7	Classification	Class I	P
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8	MARKING AND OTHER INFORMATION		---
8.1	Transformer marked with:		---
	a) rated supply voltage(s) and input voltage variation in %	140-260V~±10%	P
	b) rated output voltage(s) and the regulation tolerance of this voltage(s) in %	220-230V~±10%	P
	c) rated output (VA, kVA or W)	1000VA	P
	d) rated output current (A).....		P
	e) rated frequency (Hz)	50/60Hz	P
	f) rated power factor (if not 1).....	0,85	P

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Clause	Requirement – Test	Result - Remark	Verdict
	g) symbol for nature of output current for transformers with rectifier		N
	h) symbol for electrical function		N
	Constant voltage transformers shall be marked with one of the graphical symbols shown in 8.11:		P
	i) manufacturer's name or trademark	See marking plate	P
	j) model or type reference	See marking plate	P
	k) vector group according to IEC 76 for three-phase transformer	Single-phase transformer	N
	l) symbol for Class II		N
	m) symbol for Class III		N
	n) index IP (if not IP00 or ordinary transformer)	IPX0	P
	o) rated max. ambient temperature t_a (if not 25 °C)	-10°C~+40°C	P
	p) short-time operation or intermittent operation: rated operating and resting time	Continuous operation	N
	q) duty cycle		N
	r) declared values of the rated maximum operating temperature of the winding		N
	s) "AF" followed by the air speed		N
	t) additional information		N
8.2	Marking for transformers IP00 or for associated transformers: type and trademark, instruction sheets	IPX0	P
8.3	Adjusted voltage easily and clearly discernible	No voltage adjustor	N
8.4	For each tapping or winding: rated output voltage and rated output	The output: 220-230V~±10%	P
8.5	Symbol for short-circuit proof transformers or non-inherently short-circuit proof transformers	See below	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	No fuse	N
	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)		P

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Clause	Requirement – Test	Result - Remark	Verdict
	Characteristic symbol for fail-safe transformers		N
8.6	Terminals for neutral: "N"	Neutral mark "N"	P
	Terminal for earthing	Class I	P
	Identification of input terminals: "PRI"	Clearly identified	P
	Identification of output terminals: "SEC"	Clearly identified	P
	Symbol for any point/terminal in connection with frame or core		N
8.7	Indication for correct connection	Evident from the design	P
8.8	Instruction sheet for type X, Y, Z attachments	Type Y	P
8.9	Transformer for indoor use shall be marked on the label or in the instruction sheet with the words: "for indoor use only"		P
8.10	Symbol for Class II construction not confused with maker's name or trademark		N
8.11	Correct symbols:		---
	Volts	V	P
	Amperes	A	P
	Volt amperes (or volt-amperes reactive for reactors)	VA	P
	Watts		N
	Hertz	Hz	P
	Input	INPUT	P
	Output	OUTPUT	P
	Direct current	For AC only	N
	Neutral	N	P
	Single-phase a.c.	~	P
	Three-phase a.c.		N
	Three-phase and neutral a.c.		N
	Power factor	Load power factor 0,8	N
	Class II construction	Class I	N
	Class III construction	Class I	N
	Fuse-link		N
	Rated max. ambient temperature	40°C	P
	Frame or core terminal		N
	Protective earth		P

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Clause	Requirement – Test	Result - Remark	Verdict

	IP number	IPX0	P
	For indoor use only (text)		P
	tw marked transformer only with 5 years life expectancy		N
	tw marked transformer only with 10 years life expectancy		N
	tw marked transformer only where x=life expectancy		N
8.12	Figures, letters or other visual means for different positions of regulating devices and switches		P
	OFF position indicated by figure 0	Marking "OFF" and "ON"	P
	Greater output, input etc. indicated by higher figure		P
8.13	Marking not on screws or other easily removable parts	Comply whit requirement	P
	Marking clearly discernible (transformer ready for use)		P
	Marking for terminals clearly discernible if necessary after removal of the cover		N
	Marking for terminals: no confusion between input and output		N
	Marking for interchangeable protective devices positioned adjacent to the base		N
	Marking for interchangeable protective devices clearly discernible after removal of cover and protective device		N
8.14	Special information for installation if necessary	To prevent electric shock do not open the cabinet refer servicing to qualified personnel only	P
8.15	Marking durable and easily legible	Compliance is checked by inspection and by hand for 15s with a piece of cotton cloth soaked with water and again for 15s with a piece of cotton cloth soaked with petroleum spirit, after these test, marking be legible and show no curling	P

9	PROTECTION AGAINST ELECTRIC SHOCK		---
9.1	Protection against contact with hazardous live parts		---
9.1.1	Determination of hazardous live parts		N

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Clause	Requirement – Test	Result - Remark	Verdict
	A live part is not a hazardous live part if it is separated from the supply by double or reinforced insulation and the requirements of 19.1.1.1 or 9.1.1.2 are met when the transformer is supplied at rated supply voltage		---
9.1.1.1	The voltage shall not exceed 35 Va.c. peak or 60 V ripple free d.c.		N
9.1.1.2	Where the voltage exceeds 35 V (peak)a.c. or 60 V ripple free d.c., the touch-current shall not exceed:		---
	- for a.c.: 0,7 mA (peak)		N
	- for d.c.: 2,0 mA		N
	When a capacitor is connected to the live parts:		---
9.1.1.2.1	The discharge shall not exceed 45 μ C for stored voltage between 60 V and 15 kV		N
9.1.1.2.2	The energy of discharge shall not exceed 350 mJ for stored voltage exceeding 15 kV		N
9.1.2	Accessibility to hazardous live parts	Comply whit requirement	P
	Transformers shall be constructed to provide adequate protection against accessibility to hazardous live parts		P
	Class I and II transformers shall be so constructed and enclosed that there is adequate protection against accidental contact with hazardous live parts	Class I	P
	For class I transformers, accessible parts shall be separated from hazardous live parts by at least basic insulation		P
	Class II transformers shall be so constructed and enclosed that there is adequate protection against accessibility to basic insulation and to conductive parts separated from hazardous live parts by basic insulation only. Only parts separated from hazardous live parts by double or reinforced insulation may be accessible	Class I	N
	Hazardous live parts shall not be accessible after removal of detachable parts except for:	Not be accessible parts	P
	– lamps having caps larger than B9 and E10		N
	– type D fuse-holders		N
	Lacquers, enamel, paper, cotton, oxide film on metal parts not used for protection against accidental contact with hazardous live parts:		---
	Shafts, handles, operating levers, knobs and the like shall not be hazardous live parts	Plastic handles, not live parts	P

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Clause	Requirement – Test	Result - Remark	Verdict
	- Compliance is checked by inspection and by relevant tests according to IEC 60 529		P
	- Ordinary transformer: test according to fig. 2 (test finger)		P
	- Class II transformers and Class II parts of Class I construction are tested with the test pin shown in fig. 3	Class I	N
	- hazardous live parts shall not be touchable by test finger		P
	- for Class II transformers: metal parts separated by basic insulation from hazardous live parts not touchable by test finger		N
	- hazardous live parts shall not be touchable with the test pin	Not be touch live parts	P
9.1.3	Accessibility to non hazardous live parts	Not be touch non hazardous live parts	N
	Non hazardous live parts of the output circuit isolated from the input circuit by double or reinforced insulation may be accessible under the following conditions:		N
	– for no-load output voltages not exceeding 35 V peak a.c. or 60 V ripple-free d.c., both poles may be accessible		N
	– for no-load output voltages exceeding 35 V peak a.c. or 60 V ripple-free d.c. and not exceeding 250 V a.c., only one of the poles may be accessible		N
9.2	Protection against hazardous electrical discharge		P
	For transformers with a primary supply plug, the pins of the plug shall not be hazardous live measured 1s after withdrawal of the plug	No used plug	N
	For transformers without a primary supply plug, the terminals provided for connecting the transformer to the supply source shall not be hazardous live measured 5 s after disconnection of the supply source	no such capacitor	N
	Compliance is checked by the specified test		N
	Except nominal capacitance across the pins does not exceed 0,1 μ F		N

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Clause	Requirement – Test	Result - Remark	Verdict

10	CHANGE OF INPUT VOLTAGE SETTING		---
	Voltage setting not possible to change without a tool	No such device	N
	Different rated supply voltages:		---
	- indication of voltage on the transformer discernible		N

11	OUTPUT VOLTAGE AND OUTPUT CURRENT UNDER LOAD		--
11.1	The output voltage shall not differ from the rated value by more than the regulation tolerance.		P
	Measuring the output voltage when steady-state conditions are established		P
	For transformers incorporating a rectifier, the output voltage is measured at the terminals of the d.c. circuit by means of a voltmeter giving the arithmetical mean value, unless the effective (r.m.s.) value is specifically stated (see 8.1)	No used rectifier	N
	For transformers with more than one rated supply voltage, the requirement is applicable for each of the rated supply voltages.		N
	For transformers with multiple output windings, the loads are applied to every multiple section simultaneously, unless otherwise declared.		N
11.2	The rated output, the rated output voltage, the rated output current, and the rated power factor, shall be substantially in agreement with each other	See Unit marking	P
	If no rated output current is assigned to the transformer, the rated output current for the of this specification can be calculated from the purpose rated output and the rated output voltage		N

12	NO-LOAD OUTPUT VOLTAGE (see supplementary requirements in Part 2)		---
	Remark: with rectifier measuring on both sides of the rectifier		N
12.101	The no-load output voltage shall not exceed		--
	1 000 V a.c. or 1 415 V ripple-free d.c. for constant voltage auto-transformers and constant voltage separating transformers;	220-230V~±10%	P
	500 V a.c. or 708 V ripple-free d.c. for constant voltage isolating transformers;		N
	50 V a.c. or 120 V ripple-free d.c. for constant voltage safety isolating transformers		N

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Clause	Requirement – Test	Result - Remark	Verdict
	The no-load output voltage shall exceed		--
	50 V a.c. or 120 V ripple-free d.c. for constant voltage independent auto- and separating transformers.	220-230V~±10%	P
12.102	The difference between the no-load output voltage and the output voltage under load shall not be exceed 10%. $\frac{U_{no-load} - U_{load}}{U_{load}} \times 100 \%$		P
13	SHORT-CIRCUIT VOLTAGE		---
	Difference from marking for short-circuit voltage ≤ 20%	No short-circuit voltage marked	N
	The transformer being at ambient temperature		N
14	HEATING		---
14.1	No excessive temperature in normal use	See appended table	P
	Upri (V): 1,06 times rated supply voltage	275.6V~, 60Hz	P
	Cos φ = rated power factor	0,85	P
	Room temperature: rated ambient temperature (°C)	40°C	P
	Type X, Y, Z attachments: 1 pull (5 N) to the connection windings	Type Y	P
	Electric strength between input and output windings (18.3, 1 min); test voltage (V)	See 18.3	P
14.2	Application of 14.1 or 14.3 according to the insulation system		P
	Modification of the ninth paragraph starting with "Transformers are connected..." as follows:		--
	The constant voltage transformers are connected to rated supply voltage and loaded with an impedance which would give rated output, at rated output voltage and, for a.c., at rated power factor. The supply voltage is then increased to the value of the highest input voltage variation declared by the manufacturer. After this voltage increase, no change or adjustment is made in the circuit.		P
	The test is repeated under no-load condition if this is a more unfavourable situation.		N
14.2.1	Classified material according to IEC 60 085 and IEC 60 216 insulating class temperature index	Class B	P
14.2.2	No classified material but the measured temperature does not exceed the value of Class A		N

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Clause	Requirement – Test	Result - Remark	Verdict
14.2.3	No classified material 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
14.3	Accelerated ageing test (10 cycles):		---
	- no load current (mA) (18.4)	Does not subjected to tests of this clause	N
	- no load input (18.4)		N
14.3.1	- heat run (temperature in table 2)		N
14.3.2	- vibration test: 30 min; amplitude 0,35 mm; frequency range: 10 Hz, 55 Hz, 100 Hz		N
14.3.3	- moisture treatment (48 h, 17.2)		N
14.3.4	After each test:		N
	- insulation resistance (18.1 and 18.2)		N
	- electric strength, no breakdown (18.3); 2 min; test voltage 35% of specified value (table VI)		N
	- electric strength, no breakdown (18.4); no load; duration (min): 2 min; Upri (V): 2 times rated supply voltage; frequency (Hz): 2 times rated frequency ...:		N
	- no load current \leq 30% (18.4) deviates from the first measurement		N
	- no load input \leq 30% (18.4) deviates from the first measurement		N
15	SHORT-CIRCUIT AND OVERLOAD PROTECTION		---
15.1	which are carried out immediately after the test according to 14.2,		P
15.2	Inherently short-circuit-proof constant voltage transformers		N
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	The output windings are short-circuited or overloaded as stated in 15.2.	Breaker protective	P
15.3.2	If protected by a fuse according to IEC 60269-2 or IEC 60269-3 or a technically equivalent fuse, transformer is loaded with time T and a current equal to k times values according to table 4	No used fuse	N

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Clause	Requirement – Test	Result - Remark	Verdict
15.3.3	If protected by a fuse according to IEC 60 127 or ISO 8820 or a technically equivalent fuse, transformer is loaded for the longest pre-arcing time with the redundant current as specified in the standard sheet		N
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		N
15.3.5	If other overload protection than a fuse (IEC 60 127), a circuit-breaker (IEC 60 898) or an intentional weak part test with 0,95 times of operating current		N
15.4	For non-short-circuit proof transformers: temperature rises \leq values in table 3		P
15.5	For fail-safe transformers:		---
15.5.1	Three additional new specimens are used only for the following test.		N
	- Upri (V): rated supply voltage variation declared ..	Auto-transformer	N
	- Isec (A): 1,5 times rated output current		N
	- time until steady-state conditions t1 (h)		N
	- time until failure t2 (h): \leq t1; \leq 5 h		N
	During the test:		---
	- no flames, molten material, etc.		N
	- temperature of enclosure \leq 175 °C		N
	- temperature of plywood support \leq 125 °C		N
	After the test:		---
	- electric strength (Cl. 18, 1 min, test voltage: 35% of specified value); no flashover or breakdown for primary-to-secondary only for safety isolating, isolating and separating transformer and for primary-to-body for all kinds of transformer		N
	- bare hazardous live parts not accessible by test finger through holes of enclosure		N
16	MECHANICAL STRENGTH		---
16.1	After tests of 16.2 and 16.3 and 16.4:		---
	- no damage		P
	- hazardous live parts not accessible by test pin according to 9.2		P

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Clause	Requirement – Test	Result - Remark	Verdict
	- no damage for insulating barriers		P
	- handles, levers, etc. have not moved on shafts		P
16.2	For stationary transformers: 3 blows, impact energy 0.5 Nm		N
16.3	For portable transformers: 100 falls, 25 mm		P
16.4	Transformers with integrated pins, the following tests are carried out:		---
	a) plug-in transformers: tumbling barrel test: 50 x ≤ 250 g; 25 x ≤ 250 g	Without integrated pins	N
	b) torque test of the plug pins with 0,4 Nm		N
	c) pull force according to table 5 for each pin		N
17	PROTECTION AGAINST HARMFUL INGRESS OF DUST, SOLID OBJECTS AND MOISTURE		---
17.1	IP number marked on the transformer	IPX0	P
	Test according to 17.1.1 and for other IP ratings test according to IEC 60 529:		---
	- stable operating temperature before starting the test for < IPX8		N
	- transformer mounted and wired as in normal use		N
	- fixed transformer mounted as in normal use by the tests according to 17.1.1 A to J		N
	- portable transformers placed in the most unfavourable position and wired as in normal use		N
	- glands tightened with a torque equal to two-thirds of 25.6		N
	After the tests:		---
	- dielectric strength test according to 18.3		N
	Inspection:		---
	a) in dust-proof transformers no deposit of talcum powder		N
	b) no deposit of talcum powder inside dust-tight transformers		N
	c) no trace of water on live parts or insulation if hazard for the user or surroundings no reduction of creepage distances		N
	d) no accumulation of water in transformers > IPX1 so as to impair safety		N
	e) no trace of water entered in any part of watertight transformer		N

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Clause	Requirement – Test	Result - Remark	Verdict
	f) no entry into the transformer by the relevant test probe		N
17.1.1	Tests on transformers with enclosure		---
	A) Solid-object-proof transformers: first IP numeral 2 test finger (IEC 60 529) and test pin (fig. 3)		N
	B) Solid-object-proof transformers:		---
	- first IP numeral 3, wire 2,5 mm; force 3 N		N
	- first IP numeral 4, wire 1 mm; force 1 N		N
	C) Dust-proof transformers, first characteristic IP numeral 5; dust chamber according to IEC 60 529, fig. 2:		---
	a) transformer has operating temperature		N
	b) transformer, still operating, is placed in the dust chamber		N
	c) the door of the dust chamber is closed		N
	d) fan/blower is switched on		N
	e) after 1 min transformer is switched off for cooling time of 3 h		N
	D) Dust-tight transformers (IPX6) test according to C)		N
	E) Drip-proof transformers (IPX1) test according to fig. 3 of IEC 60 529 for 10 min		N
	F) Drip-proof transformers (IPX2) test according to fig. 3 of IEC 60 529 For 10 min with any angle up to 15°		N
	G) Spray-proof transformers (IPX3) test according to fig. 4 of IEC 60 529 for 10 min in operation and 10 min switched off (the tube shall oscillate 2 x 120 °C)		N
	H) Splash-proof transformers (IPX4) test according to fig. 4 of IEC 60 529 (see F) for 10 min in operation and 10 min switched off (the tube shall oscillate 2 x 360 °C)		N
	I) Jet-proof transformer test according to fig. 6 of IEC 60 529		N
	J) Powerful jet-proof transformers test according to fig. 6 of IEC 60 529		
	K) Water-tight transformers (IPX7)		N
	L) Pressure watertight transformers (IPX8)		N
17.2	Humidity treatment		P

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Clause	Requirement – Test	Result - Remark	Verdict

	After moisture test (48 h for ≤ IP20, 168 h for other transformers):		---
	- insulation resistance and electric strength (Cl. 18)	No breakdown	P

18	INSULATION RESISTANCE AND ELECTRIC STRENGTH		---
18.2	Insulation resistance between:		---
	- live parts and body for basic insulation > 2 MΩ	> 2 MΩ, input/output to metal enclosure	P
	- live parts and body for reinforced insulation > 7 MΩ	> 7 MΩ	P
	- input circuits and output circuits for basic insulation > 2 MΩ	Constant voltage auto-transformers, this subclause is not applicable	N
	- input circuits and output circuits for double or reinforced insulation > 5 MΩ	>100MΩ, input circuits to LCD display	P
	- each input circuit and all other input circuits connected together > 2 MΩ		N
	- each output circuit and all other output circuits connected together > 2 MΩ	>100MΩ, output circuit to LCD display	P
	- hazardous live parts and metal parts with basic insulation (Class II transformers) > 2 MΩ	No such construction	N
	- body and metal parts with basic insulation (Class II transformers) > 5 MΩ	No such construction	N
	- metal foil in contact with inner and outer surfaces of enclosures (class II transformers) > 7 MΩ	No such construction	N
18.3	Electric strength test (1 min): no flashover or breakdown:		---
	1) basic insulation between input circuits and output circuits; working voltage (V); test voltage (V)	Constant voltage auto-transformers	N
	2) double or reinforced insulation between input circuits and output circuits; working voltage (V); test voltage (V)	Working voltage: 260V~ Test voltage:4200V~	P
	3) basic or supplementary insulation between:		--
	a) live parts of different polarity; working voltage (V); test voltage (V)	Constant voltage auto-transformers	N
	b) live parts and the body if intended to be connected to protective earth	Working voltage: 260V~ Test voltage: 2100V~	P
	c) inlet bushings and cord guards and anchorages		N
	d) live parts and an intermediate conductive part ...		N

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Clause	Requirement – Test	Result - Remark	Verdict

	e) intermediate conductive parts and body		N
	f) each input circuit and all other input circuits connected together		N
	4) Reinforced insulation between the body and live parts; working voltage (V); test voltage (V)		N
18.4	Upri (V): 2 times rated input voltage; no load; frequency (Hz): 2 times rated frequency; duration (min): 5 min	520V, 100Hz, 5mins	P
	No breakdown between:		--
	- turns of winding		P
	- input and output windings		P
	- adjacent input or output windings		P
	- windings and iron core		P
18.5	Touch current and protective earth conductor current		P
	Measured as described under 18.5.1 and 18.5.2		P
18.5.1	Touch current		P
	the touch current measured shall be equal to or less than in Table 8b	0,17mA<10mA	--
18.5.2	Protective earth conductor current		P
	The protective earth conductor current (s) shall not exceed the values specified in Table 8b	0,42mA<10mA	--

19	CONSTRUCTION		---
A)	Constant voltage auto-transformers		P
19.101.A) to 19.105.A)	Void.		N
19.106.A)	Plug-connected constant voltage auto-transformers, where the rated supply voltage is higher than the rated output voltage, shall not have any potential to earth at the output socket higher than the rated output voltage.		P
19.106.1.A)	Polarized input and output plug and socket-outlet system		P
19.106.2.A)	Self-acting device		P
	Not exceed the rated output voltage.		P

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Clause	Requirement – Test	Result - Remark	Verdict
	The measured potential to earth of each pole shall not exceed the maximum output voltage under load		P
	The contact separation of the device shall be 3 mm minimum in each pole.	>3mm	P
	This current shall not exceed 0,75 mA and shall only flow for the period of measurement until the output voltage is turned on.		N
	The potential to earth of each pole shall not exceed the maximum output voltage under load plus the highest output voltage variation for more than 5 s.		N
19.107.A) to 19.110.A)	Void.		N
B)	Constant voltage separating transformers	Constant voltage auto-transformers	N
19.1.B)	The input and output circuits shall be electrically separated from each other, and the construction shall be such that there is no possibility of any connection between these circuits, either directly or indirectly, via other metal parts.		N
19.1.1.B)	The insulation between the input and output winding(s) shall consist of at least basic insulation.		N
19.1.2.B)	For constant voltage transformers with intermediate metal part (for example, the iron core) or a resonant circuit, not connected to the body and located between the input and output windings, the insulation between the intermediate metal part (or a resonant circuit) and the input windings or between the intermediate metal part (or a resonant circuit) and the output windings shall consist of at least basic insulation.		N
19.101.B)	Parts of output circuits may be connected to protective earth.		N
19.102.B)	There shall be no connections between the output circuit and the body unless this is allowed by the relevant equipment standard for associated transformers.		N
C)	Constant voltage isolating and safety isolating transformers		N
19.1.C)	The input and output circuits shall be electrically separated from each other, and the construction shall be such that there is no possibility of any connection between these circuits, either directly or indirectly, via other metal parts.		N

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Clause	Requirement – Test	Result - Remark	Verdict
19.1.1.C)	The insulation between the input and output winding(s) shall consist of double or reinforced insulation, unless the requirements of 19.1.3 are complied with.		N
19.1.2.C)	For constant voltage transformers with intermediate metal parts (for example, the iron core) or a resonant circuit not connected to the body and located between the input and output windings, the insulation between the intermediate metal part (or a resonant circuit) and the input windings or between the intermediate metal part (or a resonant circuit) and the output windings shall consist of at least basic insulation.		N
19.1.3.C)	For class I constant voltage transformers with protective screening, the insulation between the input and output windings may consist of basic insulation plus protective screening instead of double or reinforced insulation		N
19.1.4.C)	Transformers shall not be provided with capacitors which electrically connect input and output circuits.		N
19.101.C)	There shall be no connections between the output circuit and the protective earth		N
19.102.C)	There shall be no connections between the output circuit and the body		N
19.103.C)	The input and output terminals for the connection of external wiring shall not less than 25 mm.		N
19.104.C)	Portable transformers having a rated output not exceeding 630 VA shall be of class II.		N
19.105.C)	For transformers intended for connection to the mains supply by means of a plug of any type, the alternative construction with basic insulation plus protective screening is not allowed.		N
19.106.C) to 19.110.C)	Void		N
19.2	Fiercely burning material not used		P
	Unimpregnated cotton, silk, paper and fibrous material not used as insulation	No such materials used	P
	Wax, impregnants, etc. not used	No such materials used	P
19.3	Portable transformer: short-circuit proof or fail-safe		P

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Clause	Requirement – Test	Result - Remark	Verdict
19.4	Class II transformers: contact between accessible metal parts and conduits or metal sheaths of supply wiring impossible	Class I	N
19.5	Class II transformers: part of supplementary or reinforced insulation, during reassembly after routine servicing not omitted		N
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	Parts connected to accessible metal parts by resistors or capacitors shall be separated from hazardous live parts by double or reinforced insulation	No such construction	N
19.8	Resistors or capacitors connected between hazardous live parts and accessible metal parts consist of:		---
	- at least two separate components	No such construction	N
	- if one component is short-circuited or open circuited, values specified in Cl. 9 shall not be exceeded		N
	- components according to IEC 60 065, 14.1 or capacitor Y1 according to IEC 60 384-14		N
19.9	Insulation material separating input/output windings, and supplementary insulation of rubber resistant to ageing		P
	Creepage distances (if cracks) > specified values (Cl. 26)		P
19.10	Protection against accidental contact by insulating coating:		---
	a) ageing test (section I, IEC 60 068-2-2), test Ba: 168 h; 70 °C		N
	b) impact test (spring-operated impact hammer according to IEC 60 068-2-63; 0,5 ± 0,05 J)		N
	c) scratch test (hardened steel pin) electric strength test according to Cl. 18		N
19.11	Handles, levers, knobs, etc.:		---
	- insulating material		N
	- supplementary insulation covering		N
	- separated from shafts or fixing by supplementary insulation		P
19.12	Windings construction		P

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Clause	Requirement – Test	Result - Remark	Verdict
19.12.1	In all types of transformer, precautions shall be taken to prevent:		---
	- undue displacement of input or output windings or turns thereof		P
	- undue displacement of internal wiring or wires for external connection		P
	- undue displacement of parts of windings or of internal wiring in case of rupture or loosening		P
19.12.2	Serrated tape:		---
	- distance through insulation according to table 13		N
	- one additional layer of serrated tape, and		N
	- one additional layer without serration		N
	- in case of cheekless bobbins the end turns of each layer shall be prevented from being displaced		N
19.12.3	Insulated windings wires:		---
	- to all types of transformers for basic or supplementary insulation taken separately		N
	- transformers for switch mode power supplies for all types of insulation even in combination		N
	a) Winding wire with basic insulation:		---
	- comply with Annex K		N
	- the insulation of the conductor: two layers		N
	b) Winding wire with reinforced insulation:		N
	- comply with Annex K		N
	- the insulation of the conductor: three layers		N
	- subjected to the relevant dielectric strength test of 18.3		N
	An additional insulation complying with dti in Table 13 for supplementary insulation shall be provided between the insulated wires and the core or between the insulated wires and the enamelled wires		N
	The manufacturer of the transformer shall demonstrate that the winding wire has been subjected to 100 % routine dielectric strength test as in K.3		N
	No requirements for creepage distances and clearances are applicable for the insulated winding wires		N

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Clause	Requirement – Test	Result - Remark	Verdict
	For windings providing reinforced insulation, no value is required in box 2) c) of Table 13, Table C.1 and Table D.1		N
19.13	Handles, operating levers and the like shall be fixed		P
19.14	Protection against electric shock: covers securely fixed, 2 independent fixing means, one with tool		P
19.15	Transformer with pins for fixed socket-outlets: no strain on socket-outlet	No such pins	N
	Additional torque $\leq 0,25$ Nm		N
19.16	Protection index for portable transformers:		---
	≤ 200 VA > IP20 and instructions for use		N
	> 200 VA $\leq 2,5$ kVA > IPX4 (single-phase)		N
	> 200 VA $\leq 6,3$ kVA > IPX4 (polyphase)		N
	> 2,5 KVA (single-phase) > IP21		N
	> 6,3 KVA (polyphase) > IP21		N
19.17	Transformers IPX1-IPX6 totally enclosed, except for drain hole (diameter > 5 mm or 20 mm ² with width > 3 mm); drain hole not required for transformer completely filled with insulating materials		N
	Transformers > IPX7 totally enclosed		N
19.18	Transformers > IPX1 with a moulded, if any		N
19.19	Class I transformers with a non-detachable flexible cable or cord with earthing conductor and a plug with earthing contact	Class I	N
19.20	Live parts of SELV and PELV-circuits: separation not less than PRI/SEC of a safety isolating transformer		N
19.20.1	SELV circuits and parts not connected to 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		N
19.20.2	PELV-circuits double or reinforced insulation is necessary		N
19.21	PELV-circuits: protection against contact fulfils the min. test voltage required for the primary circuit		N

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Clause	Requirement – Test	Result - Remark	Verdict
19.22	Class II transformers shall not be provided with means for protective earthing	Class I	N
	For fixed transformers an earthing conductor with double or reinforced insulation to accessible metal parts is allowed		N
19.23	Class III transformers shall not be provided with means for protective earthing	Class I	N

20	COMPONENTS		---
	Switches, plugs, fuses, lampholders, flexible cables and cords comply with relevant IEC standard	See appended table	P
20.1	Appliance couplers for main supply shall comply with:		---
	- IEC 60 320 for IPX0		N
	- IEC 60 309 for other		N
20.2	Automatic controls shall comply with IEC 60 730 series and appropriate parts 2 unless they are tested with the transformer		N
20.3	Thermal-links shall comply with IEC 60691 as far as reasonable		N
20.4	Switches forming part of the transformer assembly shall comply with Annex F		P
20.5	Socket-outlets in the output circuit shall not comply with socket-outlets of the input circuit		N
	Plugs and socket-outlets for SELV for general use comply with the requirements of IEC 60 906-3 and 60884-2-4		P
	Plugs and socket-outlets for SELV systems with both a rated current ≤ 3 A and a maximum voltage of 24 V a.c. or 60 V d.c. with a power not exceeding 72 W:		P
	- plugs shall not be able to enter in socket-outlets of other standardized voltage systems		P
	- socket-outlets shall not admit plugs of other standardized voltage		P
	- no protective earthing contact on socket-outlets		P
	Plugs and socket-outlets for PELV systems shall comply with:		---
	- plugs shall not be able to enter in socket-outlets of other standardized voltage systems		P

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Clause	Requirement – Test	Result - Remark	Verdict
	- socket-outlets shall not admit plugs of other standardized voltage systems		P
	- no protective earthing contact on socket-outlets		P
	Plugs and socket-outlets for FELV systems shall comply with:		---
	- plugs shall not be able to enter in socket-outlets of other standardized voltage systems		P
	- socket-outlets shall not admit plugs of other standardized voltage systems		P
20.6	Thermal cut-outs, thermal links, overload relays, fuses and other overload protective devices shall have adequate breaking capacity		P
20.6.1	Fuses according to IEC 60127 and IEC 60269 are allowed to be continuously loaded by a current not exceeding 1,1 times the rated value	No fuse	N
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		P
20.7.1	Requirements according to IEC 60730-1		P
20.7.1.1	Thermal cut-outs when tested as separate components shall comply with the appropriate requirements and tests of IEC 60730-1		P
20.7.1.2	A thermal cut-out when tested as part of a transformer		N
20.7.2	Thermal cut-outs shall have adequate breaking capacity		P
20.7.2.1	A transformer with a non-self-resetting thermal cut-out		N
20.7.2.2	A transformer with a self-resetting thermal cut-out		P
20.7.2.3	A PTC resistor of indirect heating type is considered to be a non-self-resetting thermal cut-out by this standard		N
20.8	Thermal-links shall be tested in one of the following two ways		N
20.8.1	The thermal-links, when tested as separate components, shall comply with the requirements and tests of IEC 60691		N
20.8.2	Thermal-links tested as part of a transformer		N
20.9	Self-resetting thermal protective devices shall not be used unless no mechanical, electrical, or other hazards occur from their operation during and after the tests of this standard		N

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Clause	Requirement – Test	Result - Remark	Verdict
20.10	Thermal cut-outs intended to be reset by soldering operation shall not be used for overload protection		N
20.11	Overload protective devices shall not operate when the supply voltage is switched on		P
21	INTERNAL WIRING		---
21.1	Internal wiring and electrical connections protected or enclosed		P
	Wireways smooth and free from sharp edges		P
21.2	Openings in sheet metal: edges rounded (radius > 1,5 mm) or bushings of insulating material	Provided with bushing of insulating material.	P
21.3	Bare conductors: distances adequately maintained	No have bare conductors	N
21.4	When external wires are connected to terminal, internal wiring shall not work loose		P
21.5	Insulation of heat-resistant and non-hygroscopic material for insulated conductors subject to temperature rise > limiting values given in 14.2		P
22	SUPPLY CONNECTION AND EXTERNAL FLEXIBLE CABLES AND CORDS		---
22.1	All cables, flexible cords etc. shall have appropriate current and voltage ratings		P
22.2	Input and output wiring inlet and outlet openings for external wiring: separate entries without damage to protective covering of cable or cord		P
	Input and output wiring inlet and outlet openings for flexible cables or cords: insulating material or bushing of insulating material		P
	Bushings for external wiring: reliably fixed, not of rubber unless part of cord guard		N
22.3	Fixed transformer:		---
	- possible to connect after fixing		N
	- inside space for wires allow easy introduction and connection of conductors		N
	- fitting of cover without damage to conductors		N
	- contact between insulation of external supply wires and live parts of different polarity not allowed		N
22.4	Length of power supply cord for portable transformers	No power supply cord used	N
22.5	Power supply cords:		---

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Clause	Requirement – Test	Result - Remark	Verdict
	- for transformers IPX0 for indoor use only with a mass < 3 kg: H03 VV-F		P
	- for transformers IPX0 for outdoor use only with a mass > 3 kg: H05 RR-F or H05 VV-F		P
	- for transformers IPX0 for outdoor use: H05 RN-F		N
22.6	Power supply cords for single-phase portable transformers with input current ≤ 16 A:		---
	- cord set fitted with an appliance coupler in accordance with IEC 60 320		P
22.7	Nominal cross-sectional area (mm ²); 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 earthing terminal		P
	Plug for single-phase transformer with input current at rated output ≤ 16 A according to IEC 60 083, IEC 60 906-1 or IEC 60 309		N
22.9	Type X, Y, or Z attachments, unless otherwise specified in the relevant Part 2	Type Y	P
22.9.1	For type Z attachment: moulding enclosure and power supply cable do not affect insulation of cable		N
22.9.2	Inlet openings or inlet bushing: without risk of damage to protective covering of power supply cord		P
	Insulation between conductor and enclosure:		---
	- for Class I transformer: insulation of conductor plus separate basic insulation		P
	- for Class II transformer: insulation of conductor plus double or reinforced insulation		N
22.9.3	Inlet bushings:		---
	- no damage to power supply cord		P
	- reliably fixed		P
	- not removable without tool		P
	- not integral with power supply cord (for type X attachment)		N
	- not of natural rubber except for Class I transformer with type X, Y and Z attachments	Type Y	P
22.9.4	For portable transformers which are moved while operating:		---
	- cord guards, if any, of insulating material and fixed		N

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Clause	Requirement – Test	Result - Remark	Verdict
	Compliance is tested by the oscillating test according to fig. 7:		---
	- loaded force during the test according to fig. 7		N
	- 10 N for a cross-sectional area > 0,75		N
	- 5 N for a cross-sectional area ≤ 0,75		N
	After the test according to fig. 7:		---
	- no short-circuit between the conductors		N
	- no breakage of more than 10% of stands of any conductor		N
	- no separation of the conductor from the terminal		N
	- no loosening of any cord guards		N
	- no damage of the cord or cord guard		N
	- no broken strands piercing the insulation and not becoming accessible		N
22.9.5	Cord anchorages for type X attachment:	Type Y	N
	- glands in portable transformers not used unless possibility for clamping all types and sizes of cable	No used glands	N
	- moulded-on designs, tying the cable into a knot and tying the end with string not allowed		N
	- labyrinths, if clearly how, permitted		N
	- replacement of cable easily possible		N
	- protection against strain and twisting clearly how		N
	- suitable for different types of cable unless only one type of cable for transformer		N
	- the whole flexible cable or cord with covering can be mounted into the cord anchorage		N
	- if tightened or loosened no damage		N
	- no contact between cable or cord and accessible or electrically connected clamping screws		N
	- cord clamped by metal screw not allowed		N
	- one part securely fixed to transformer		N
	- screws do not serve to fix any other component unless if omitted or incorrectly mounted the transformer is inoperative or clearly incomplete; compliance or parts not removable without tool		N
	- for Class I transformer: insulating material or insulated from metal parts		P

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Clause	Requirement – Test	Result - Remark	Verdict
	- for Class II transformers: insulating material or supplementary insulation from metal parts		N
	Cord anchorages for type X, Y, Z attachments: cores of external flexible cable or cord insulated from accessible metal parts by:		---
	- basic insulation (Class I transformers), separate insulating barrier/cord anchorage		P
	- supplementary insulation (Class II transformers), special lining/cable or cord sheath of cable sheath of cable		N
	Cord anchorages for type X and Y attachments:		P
	- replacement of external flexible cable or cord does not impair compliance with standard		P
	- the whole flexible cable or cord with covering can be mounted into the cord anchorage		P
	- if tightened or loosened no damage		P
	- no contact between cable or cord and accessible or electrically connected clamping screws		P
	- cord clamped by metal screws not allowed		P
	- knots in cord not used		N
	- labyrinths, if clearly how, permitted		N
	Tests for type X with special cords, type Y, type Z		P
	Test for type X attachments one test with a cord with smallest and one test with a cord with the largest cross-sectional area:		---
	- for the test with clamping screws or tightened with torque 2/3 of that specified in table 11		P
	- not possible to push cable into transformer		P
	- 25 pulls of 1 s		P
	- 1 min torque according to table 10		P
	- mass (kg); pull (N); torque (Nm)		—
	- not possible to push cable into transformer		P
	- during test: cable not damaged		P
	- after test: longitudinal displacement ≤ 2 mm for cable or cord and ≤ 1 mm for conductors in terminals		P
	- creepage distances and clearances $>$ values specified in Cl. 26		P
22.9.6	Space for supply cables or external flexible cable or cord for fixed wiring and for type X, and Y attachments:		---

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Clause	Requirement – Test	Result - Remark	Verdict
	- before fitting cover, possibility to check correct connection and position of conductors		N
	- cover fitted without damage to supply cords		N
	- for portable transformers: contact with accessible metal parts if conductor becomes loose not allowed unless for type X, Y attachments terminations of cords do not slip free of conductor		P
	Space for external cords or cable for type X attachment and for connection to fixed wiring, in addition:		---
	- conductor easily introduced and connected		P
	- possibility of access to terminal for external conductor after removal of covers without special purpose tool		N
23	TERMINALS FOR EXTERNAL CONDUCTORS		---
23.1	Transformer for connection to fixed wiring and transformer without power supply cords with type Y and Z attachments: only connections by screws, nuts terminals		P
	Terminals are integral part of the transformer:		---
	- comply with IEC 60 999-1 under transformer conditions		N
	Other terminals:		---
	- separately checked according to IEC 60 998-2-1, IEC 60 998-2-2 or IEC 60 947-7-1		N
	- used in accordance with their marking		N
	- checked according to IEC 60 999-1 under transformer conditions		N
	Transformer with type X attachments: soldered connection permitted if reliance not placed upon soldering, crimping or welding alone unless by barriers, creepage distances and clearances between hazardous live parts and metal parts should conductor break away > 50% of specified value (Cl. 26)		N
	Transformer with type Y and Z attachments for external conductors: soldered, welded, crimped, etc. connections allowed	Crimped	P

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Clause	Requirement – Test	Result - Remark	Verdict
	For Class II transformer: reliance not placed upon soldering, crimping or welding alone unless by barriers, creepage distances and clearances between hazardous live parts and metal parts should conductor break away > 50% of specified value (Cl. 26)		N
23.2	Terminals for type X with special cords Y and Z attachments shall be suitable for their purpose:		---
	- test by inspection according to 23.1 and 23.2		P
	- pull of 5 N to the connection before test according to 14.2		P
23.3	Other terminals than Y and Z attachments shall be so fixed that when the clamping means is tightened or loosened:		---
	- terminal does not work loose		N
	- internal wiring is not subjected to stress		N
	- creepage distances and clearance are not reduced below the values specified in Cl. 26		N
23.4	Other terminals than Y and Z attachments shall be so designed that:		---
	- they clamp the conductor between metallic surfaces with sufficient contact pressure		N
	- without damage to the conductor		N
	- test by inspection according to 23.3 and 23.4		N
	- 10 times fastening and loosening a conductor with the largest cross-sectional area with 2/3 of the torque specified in Cl. 25		N
23.5	Terminals for fixed wiring and for type X: located near their associated terminals of different polarities and the earthing terminal if any	Type Y	N
23.6	Terminal blocks not accessible without the aid of a tool		P
23.7	Transformer with type X attachments: stranded conductor test (8 mm removed):		---
	- Class I transformers: no connection between live parts and accessible metal parts		P
	- free wire of earthing terminal: no touching of live parts		P
	- 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
23.8	Terminals for a current > 25 A:		---

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Clause	Requirement – Test	Result - Remark	Verdict
	- pressure plate, or		N
	- two clamping screws		N
23.9	When terminal, other than protective earthing conductor, screws loosened as far as possible, no contact:		---
	- between terminal screws and accessible metal parts		P
	- between terminal screws and accessible metal parts for Class II transformers		N
24	PROVISION FOR PROTECTIVE EARTHING		---
24.1	Class I transformers: accessible parts connected to earthing terminal		P
	Class II transformers: no provision for earthing		N
24.2	Protective earthing 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
24.3	No risk of corrosion from contact between metal of earthing terminal and other terminal		P
	In case of earthing terminal body of A1, no risk of corrosion from contact between Cu and A1		P
	Body of earthing terminal or screws/nuts of brass or other metal resistant to corrosion		P
24.4	Resistance of connection between earthing terminal and metal parts $\leq 0,1 \Omega$ with a min. 25 A or 1,5 times rated input current at 1 min	Resistance: 0,035 Ω	P
24.5	Class I transformers with external flexible cables or cords		---
	- current-carrying conductors becoming taut before the earthing conductor		P
25	SCREWS AND CONNECTIONS		---
25.1	Screwed connections withstand mechanical stresses		P
	Screws transmitting contact pressure or likely to be tightened by the user or having a diameter < 2.8 mm, shall screw into metal		P
	Screws not of metal which is soft or liable to creep (Zn, Al)		P
	Screws of insulating material: not used for electrical connection		P

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Clause	Requirement – Test	Result - Remark	Verdict
	Screws not of insulating material if their replacement by metal screws can impair supplementary or reinforced insulation		P
	Screws to be removed (replacement etc. of power supply cord) not of insulating material if their replacement by metal screws can impair basic insulation		P
	No damage after torque test: diameter (mm); torque (Nm); ten times	3,8mm, 1,2Nm	P
25.2	Screws in engagement with thread of insulating material:		---
	- length of engagement > 3 mm + 1/3 screw diameter or 8 mm	Metal screws	N
	- correct introduction into screw hole		N
25.3	Electrical connections: contact pressure not transmitted through insulating material		P
25.4	In case of use of thread-forming (sheet metal) screws for connection of current-carrying parts: clamping and locking means provided		N
	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
	Thread-cutting screws and thread-forming screws used for earthing 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
25.5	Screws for current-carrying mechanical connections locked against loosening		P
	Rivets for current-carrying connections subject to torsion locked against loosening		N
25.6	Screwed glands shall comply with the following test		N

26	CREEPAGE DISTANCES AND CLEARANCES		---
26.1	Specified values according to:		---
	- table 13, material group III		P
	- table C, material group II (except for box 1 of C.1)		N
	- table D, material group I (except for box of D.1)		N
	1. Insulation between input and output circuits (basic insulation):		---
	a) measured values > specified values (mm)		N

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Clause	Requirement – Test	Result - Remark	Verdict
	b) measured values > specified values (mm)		N
	c) measured values > specified values (mm)		N
	2. Insulation between input and output circuits (double or reinforced insulation):		---
	a) measured values > specified values (mm)	Cr>7.7mm,limit:6.0mm Cr>6.2mm,limit:5.5mm Between live part and metal enclosure	P
	b) measured values > specified values (mm)		N
	c) measured values > specified values (mm)		N
	3. Insulation between adjacent input circuits: measured values > specified values (mm)		N
	Insulation between adjacent output circuits: measured values > specified values (mm)		N
	4. Insulation between terminals for external connection:		---
	a) measured values > specified values (mm)		N
	b) measured values > specified values (mm)		N
	c) measured values > specified values (mm)		N
	5. Basic or supplementary insulation:		---
	a) measured values > specified values (mm)	Cr=Ci=10,2mmfor Live parts of different polarity	P
	b) measured values > specified values (mm)	Cr=Ci=4,4mm for Between live parts and enclosure	N
	c) measured values > specified values (mm)		N
	d) measured values > specified values (mm)		N
	e) measured values > specified values (mm)		N
	6. Reinforced or double insulation: measured values > specified values (mm)		N
	7. Distance through insulation:		---
	a) measured values > specified values (mm)		N
	b) measured values > specified values (mm)		N
	c) measured values > specified values (mm)		N
	d) measured values > specified values (mm)		N
	Creepage distances and clearances are measured:		---
	- for fixed wiring and type X attachments with max. and min. size		N

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Clause	Requirement – Test	Result - Remark	Verdict
	- for type X with a special cord, Y or Z attachments with the supply cable as delivered		N
	- for layers of serrated tapes the values are so determined as if the serration coincided through the different layers		N
	- for printed wiring shall be used the unreduced values for live parts as in table 13, C.1 or D.1, except if printed wiring complies with IEC 60 664-3		N
	If the pollution generates high and persistent conductivity caused, for instance, by conductive dust or by rain or snow:		---
	- clearances of P3 increased with min. 1,6 mm		N
	- value X in Annex A increased with 4,0 mm		N
26.2	Creepage distances and clearances (cr)		N
	The creepage distance and clearance values are shown in Tables 13, C.1 and D.1		N
26.2.1	Windings covered with adhesive tape		N
26.2.2	Uncemented insulation parts		P
26.2.3	Cemented insulating parts		N
26.2.4	Enclosed parts		N
26.3	Distance through insulation (dti)		P
	The distances through insulation (dti) are required for supplementary, double or reinforced insulation only as shown in boxes 2b,2c and 7 of Tables 13, C.1 and D.1		P
	The insulation shall fulfil either the material classification as given in IEC 60085 and IEC 60216 or the test of 14.3		P
	The requirements concerning distance through insulation do not imply that the prescribed distance shall be through solid or thin sheet insulation only. It may consist of the thickness of solid or thin sheet insulation plus a specified clearance distance		P
26.3.1	solid insulation		P
26.3.2	Insulation constructed of thin sheets of insulated material		P
26.3.3	the mandrel test		N

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Clause	Requirement – Test	Result - Remark	Verdict
27	RESISTANCE TO HEAT, ABNORMAL HEAT, FIRE AND TRACKING		---
27.1	Ball-pressure test: diameter of impression ≤ 2 mm; heating cabinet temperature ($^{\circ}\text{C}$)	Terminal: 125°C , 1,21mm Bobbin: 125°C , 0,60mm	P
27.2	Insulating material retaining live parts in position of transformers > IP20: no source of ignition for surroundings in case of abnormal heat or fire		P
	Two special prepared specimens for the test in which short-circuit windings are built-in		N
27.2.1	Portable transformers are placed on a dull painted plywood support		N
	Stationary transformers fixed in the most unfavourable position on a dull painted support:		---
	- if this position for use is vertical or ceiling transformer and support 200mm above a pinewood board with tissue paper		N
	Self-resettable devices are short-circuit		N
	Input circuits protected with 10 times rated current, min. 16 A (fuse)		N
	Test time for protective devices of the transformer without load:		---
	- max. 15 days, or		N
	- definitive interruption in the input circuit		N
	If non-self-resettable or replaceable protective devices are used the following cycle test is necessary:		---
	- non-self-resettable: 30 cycles with no load until interruption and 2 h cool down		N
	- replaceable protective device: 10 cycles with no load until interruption and 2 h cool down		N
	During the tests:		---
	- no flames occur		N
	-support temperature shall not exceed 125°C		N
	- no ignition of the tissue paper		N
27.2.2	After the tests:		---
	a) transformer with definitive interruption in the input circuit withstands the test with 35% of the values according to table 8		N
	b) transformer with no definitive interruption withstands the test voltage (100%) according to table 8 of Cl. 18: hazardous live parts are not touchable by the stranded test finger		N

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Clause	Requirement – Test	Result - Remark	Verdict
27.3	Glow-wire test:	Terminal	P
	- any flame or glowing of the specimen extinguish within 30 s of withdrawing the glow-wire		P
	- no ignition of a single layer of tissue paper		P
27.4	Resistance to tracking		N
28	RESISTANCE TO RUSTING		---
	Ferrous parts protected against rusting		P
F	ANNEX F, REQUIREMENTS FOR SWITCHES COMPLYING WITH IEC 61058		---
F.1	a) Manually operated mechanical switches shall comply with IEC 61058 with the conditions specified under F.1 a) and F.5		P
	b) Manually operated mechanical switches tested as part of the apparatus shall comply with the conditions specified under F.2, F.3, F.4 and F.5		N
H	ANNEX H, ELECTRONIC CIRCUITS		---
H.15	Short-circuit and overload protection		---
H.15.6	Circuits designed and applied so that fault conditions do not render the appliance unsafe		P
	During and after each test:		---
	- temperatures do not exceed values specified in table 3 of Cl. 15		P
	- transformer complies with conditions specified in 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		P
H.15.7	Fault conditions a) to f) of B.15.8 are not tested if the following conditions are met:		---
	- electronic circuit is a low-power circuit as specified		P
	- safety of the appliance as specified does not rely on correct functioning of the electronic circuit		P
H.15.8	Fault conditions tested as specified when relevant:		---
	a) short-circuit of creepage distances and clearances, if less than specified in Cl. 26		P

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Clause	Requirement – Test	Result - Remark	Verdict
	b) open circuit at the terminals of any component	Relay open	P
	- short-circuit of capacitors, unless they comply with IEC 60 384-14		P
	d) short-circuit of any two terminals of an electronic component as specified		P
	e) any failure of an integrated circuit as specified		N
	f) low-power circuit: low-power points are connected to the supply source		N
	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		N
	Fault condition e) is applied for encapsulated and similar components		N
	PTC's and NTC's are not short-circuited if they are used as specified		N
H.15.9	If for a fuse-link complying with IEC 60 127-3 rated fuse current I1 is used, current I2 is measured as specified:		---
	- if $I2 < 2,1 \times I1$ test of 15.8 is repeated with fuse-link short-circuited		N
	- if $I2 > 2,75 \times I1$, no other tests are necessary		N
	If $I2 > 2,1 \times I1$ and $I2 < 2,75 \times I1$ test of 15.8 is repeated as specified		N
	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
H.26	CREEPAGE DISTANCES, CLEARANCES AND DISTANCES THROUGH INSULATION		---
H.26.1	For conductive pattern's on pcb's, except their edges, creepage distances between different polarity may be reduced as specified		N
	For peak voltages > 50 V reduced creepage distances only apply if proof tracking index (PTI) has a resistance to tracking corresponding to at least material group IIIa		N
	The distances may be further reduced as specified (see H.15)		N
	Creepage distances and clearances within optocouplers are not measured as specified		N
H.26.2	For optocouplers the conditioning procedure of 26.2 is carried out as specified		N

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Clause	Requirement – Test	Result - Remark	Verdict

K	ANNEX K, INSULATED WINDING WIRES FOR USE AS MULTIPLE LAYER INSULATION		---
K.1	Wire construction:		---
	- insulated winding wire with min. two layers for basic or supplementary insulation		N
	- insulated winding wire with min. three layers for reinforced insulation		N
	- winding insulation material		N
K.2	Conformance test		N
K.2.1	Test 13 of IEC 60 851-5 nominal conductor diameter > 0,018 mm ≤ 0,1 mm		N
	Test as specified in 4.2.1 and 4.2.2 of IEC 60 851-5		N
	Nominal conductor diameter > 0,1 mm, ≤ 2,5 mm, test as specified in 4.3.1 and 4.3.2 of IEC 60 851-5		N
	Nominal conductor diameter < 2,5 mm, test as specified in 4.4.1 and 4.4.2 of IEC 60 851-5		N
	High voltage test immediately after the above specified tests:		---
	- test voltage for two layers 3 kV		N
	- test voltage for three layers 5,5 kV		N
K.2.2	Adherence and flexibility, test as specified under 5.1.4 of IEC 60 851-3		---
	- high voltage test immediately after this test		N
	- test voltage for two layers 3 kV		N
	- test voltage for three layers 5,5 kV		N
K.2.3	Heat shock, test as specified under 3.1 or 3.2 of IEC 60 851-6:		---
	- high voltage test immediately after this test		N
	- test voltage for two layers 3 kV		N
	- test voltage for three layers 5,5 kV		N
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		---
	- high voltage test immediately after this test		N
	- test voltage for two layers 3 kV		N
	- test voltage for three layers 5,5 kV		N

11. 12		TABLE: output voltage and output current under load; no-load output voltage				P
Clause		11		12		further information
type / rated output	rated output voltage V	Measured sec. voltage V	delta Usec %	Measured sec. voltage under no-load V	delta Usec %	
220-230V~, 1000VA	230	223.5	-2.8%	232.7	1.2%	126V~, 50Hz
220-230V~, 1000VA	230	224.7	-2.3%	232.7	1.2%	140V~, 50Hz
220-230V~, 1000VA	230	225.5	-1.9%	234.5	1.6%	260V~, 50Hz
220-230V~, 1000VA	230	226.4	-1.5%	234.7	2.0%	286V~, 50Hz
220-230V~, 1000VA	230	224.1	-2.5%	233.0	1.3%	126V~, 60Hz
220-230V~, 1000VA	230	224.5	-2.4%	233.0	1.3%	140V~, 60Hz
220-230V~, 1000VA	230	225.3	-2.0%	235.5	2.4%	260V~, 60Hz
220-230V~, 1000VA	230	225.9	-1.8%	235.5	2.4%	286V~,60Hz

Remark: Limit of difference between output voltage under rated load and rated output voltage is 10%

14		TABLE: heating				P
room temperature t1 (°C)		40,0		---		
room temperature t2 (°C)		40,0		---		
test condition		275.6V/60Hz		---		
temperature T of part/at:		T (°C)		required T (°C)		
Power switch		64.2		85		
Transformer winding		92.1		120		
Socket inside		48.9		85		
Power cord inside		59.9		90		
PCB		66.8		130		
Relay		56.4		105		
C8 Body		78.1		105		
Internal wire near transformer		57.9		105		
Breaker body		50.2		85		
Front pannel plastic		54.5		95		
Outside enclosure near transformer		50.1		80		
temperature rise of winding:		R ₁ (Ω)	R ₂ (Ω)	dT (K)	required dT (K)	insulation class
		---	---	---	---	---

Note:

15	TABLE: short-circuit and overload protection						P
	ambient temperature (°C): T1:24,8°C, T2:24,9°C					—	
Clause 15							
type/rated output	r-cold Ω	r-warm Ω	temp. °C	ext. encl. °C	input wire °C	Output wire °C	further information
1000VA	---	---	117.3	48.1	69.2	70.8	275.6Vac/60Hz
Note: overload							

18	TABLE: electric strength tests and impulse tests		P
test voltage applied between:		test voltage (V)	breakdown
Input and enclosure		2100	No breakdown
Output and enclosure		2100	No breakdown
Input and voltage/current meter		4200	No breakdown

20.1	TABLE: components					P
object/part No.	manufacturer/trademark	type/model	technical data	standard	mark(s) of conformity ¹⁾	
Plugs with cord	NINGBO QIAOFU ELECTRIC CO., LTD	H05VV-F	250V, 10/16A; 3G0.75mm ²	VDE 6020	VDE	
(Alternative)	Various	Various	250V, 10/16A; 3G0.75mm ²	VDE 6020	VDE	
Power switch	JIXING	TC-111	16A, 250V AC	EN 61058	VDE	
Fuse	Kuoyuh W.L. Enterprise Co., Ltd	88series	8A, 125/250Vac	EN 60947	VDE	
Thermal control	Zhongshan Chang Hong Thermal Protector Factory	RS-x	250V, 10A, 120°C	---	VDE	
Internal wire	ZHONGSHAN DONGFENG ZHOUSHISHENLONG ELECTRONIC WIRE CO LTD	2468	300V, 24AWG, 80°C	UL 758	UL	
	GUANG DONG XIN LONG ENTERPRISE CO LTD	1015	600V, 18AWG, 105°C	UL 758	UL	
Transformer (Main)	Dianxing Electrical Appliance Industry Co., Ltd.	SDC-500VA-230V	Input:140-260Vac, Output:220-230Vac, 500W	EN 61558-2-12	Test in appliance	
HEAT-SHRINKABLE Tubing	DONG GUAN HUANG FENG INSULATION MATERIAL CO LTD	HFT-2	600V, 125°C	UL 224	UL	
Relay(A19)	BEYONG	SR-PS-S12D	AC 240V, 10A, DC 24V	EN 61810-1 EN 60255-23	VDE	
PCB	Various	Various	V-0, 130°C	UL 94	UL	

object/part No.	manufacturer/trademark	type/model	technical data	standard	mark(s) of conformity ¹⁾
Enclosure	Various	Various	HB, 80°C	UL 94	UL

26	TABLE: creepage distances and clearances and distances through insulation					N
	Test with three transformers					
cycles with 2 x working voltage between pri / sec	68 h at the temperature acc. Cl. 14 (min. 85 °C)	1 hour 25 °C	2 hour 0 °C	1 hour 25 °C		
1.	--	--	--	--	--	
2.	--	--	--	--	--	
3.	--	--	--	--	--	

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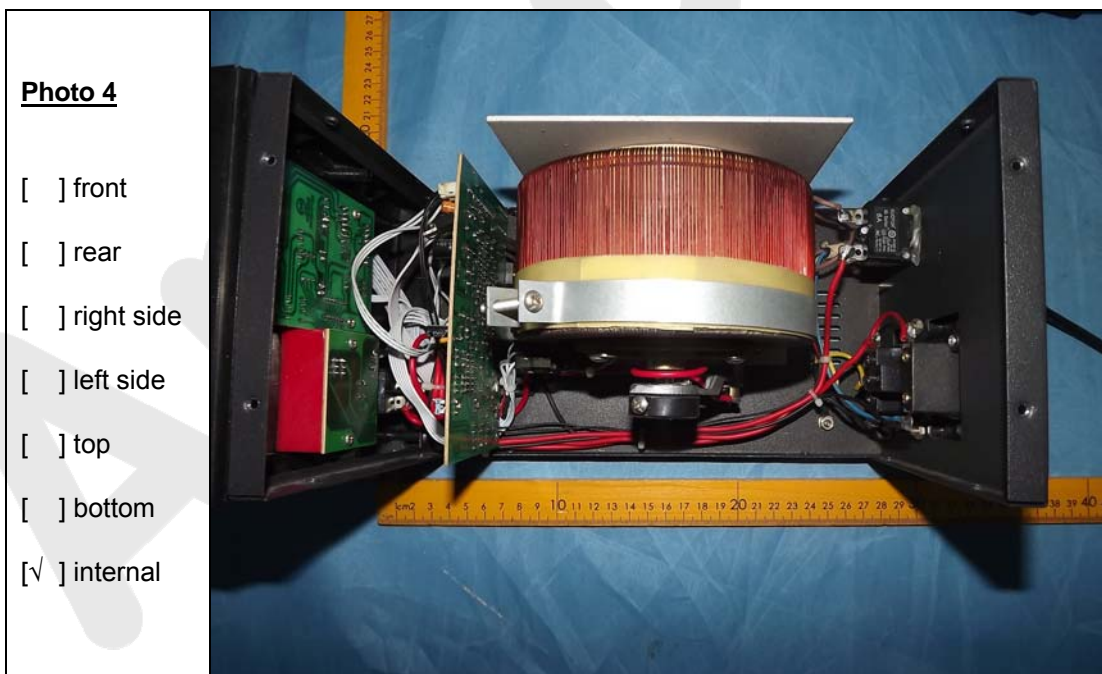
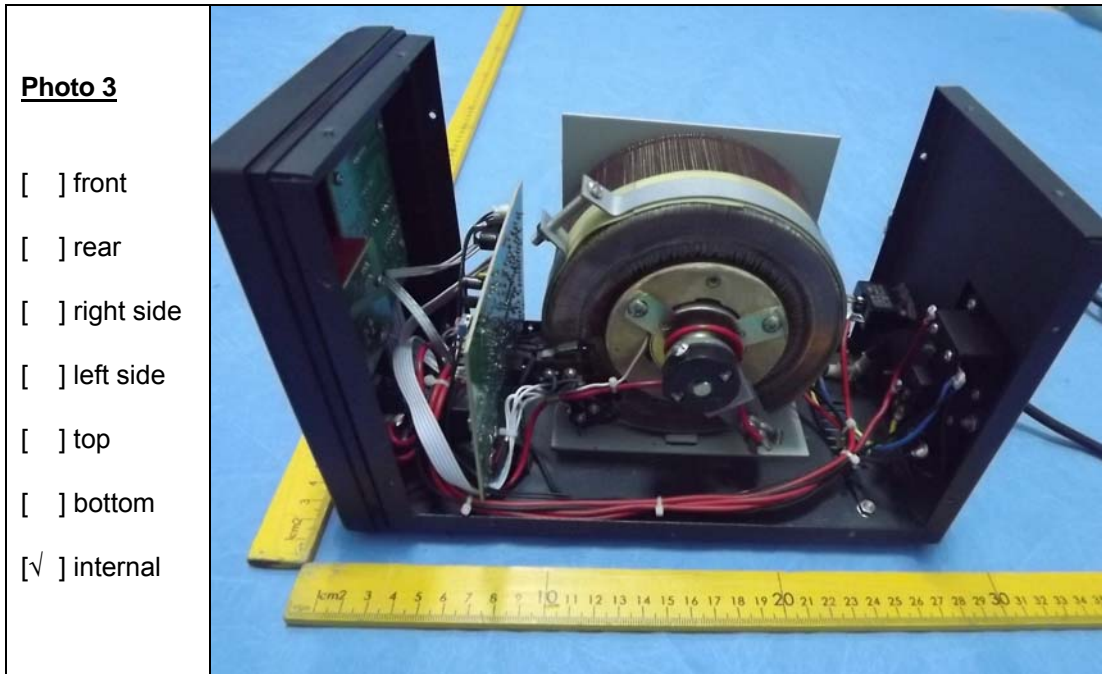


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