



<p>TEST REPORT EN 61558-2-2 Safety of power transformers, power supply units and similar products Part 2: Particular requirements and tests for control transformers and power supplies incorporating control transformers</p>	
Report Reference No.	100092480ATL-005C
Date of issue	2010-05-06
Total number of pages	69
CB Testing Laboratory	Intertek Testing Services NA, Inc.
Address	1950 Evergreen Blvd, Suite100, Duluth, GA 30096, USA
Applicant' s name	Electro Plastics, Inc.
Address	11147 Dorsett Road, Maryland Heights, MO 63043, USA
Test specification:	
Standard	EN 61558_2_2:2007 use in conjunction with EN 61558-1:2005; IEC 61558-1 (ed.2)
Test procedure	CE
Non-standard test method	N/A.
Test Report Form No.	EN61558_2_2D
Test Report Form(s) Originator.	VDE Testing and Certification Institute
Master TRF	Dated 2007-04
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Test item description	Power supply
Trade Mark.....	-
Manufacturer.....	Same as applicant
Address.....	Same as above

Model/Type reference..... : EPI-LX series:
 1) EPI-LX-500W-120V, 2) EPI-LX-1000W-120V, 3) EPI-LX-1500W-120V,
 4) EPI-LX-500W-208V, 5) EPI-LX-1000W-208V, 6) EPI-LX-1500W-208V,
 7) EPI-LX-500W-230V, 8) EPI-LX-1000W-230V, 9) EPI-LX-1500W-230V;
EPI-LX-R series:
 10) EPI-LX--R-500W-120V, 11) EPI-LX-R-1000W-120V, 12) EPI-LX-R-1500W-120V,
 13) EPI-LX-R-500W-208V, 14) EPI-LX-R-1000W-208V, 15) EPI-LX-R-1500W-208V,
 15) EPI-LX-R-500W-230V, 17) EPI-LX-R-1000W-230V, 18) EPI-LX-R-1500W-230V
 Tested models: EPI-LX-1500W-120V, 60Hz and EPI-LX-R-1500W-230V, 50/60Hz

Rating(s) : 1),10): Input: 120V~, 60Hz, 500W; Output: 24V~, 20.8, 500W max,
 2), 11): Input: 120V~, 60Hz, 1000W; Output: 24V~, 20.8, 1000W max,
 3), 12): Input: 120V~, 60Hz, 1500W; Output: 24V~, 20.8, 1500W max,
 4),13): Input: 208V~, 60Hz, 500W; Output: 24V~, 20.8, 500W max,
 5), 14): Input: 208V~, 60Hz, 1000W; Output: 24V~, 20.8, 1000W max,
 6), 15): Input: 208V~, 60Hz, 1500W; Output: 24V~, 20.8, 1500W max,
 7),16): Input: 230V~, 60/50Hz, 500W; Output: 24V~, 20.8, 500W max,
 8), 17): Input: 230V~, 60/50Hz, 1000W; Output: 24V~, 20.8, 1000W max,
 9), 18): Input: 230V~, 60/50Hz, 1500W; Output: 24V~, 20.8, 1500W max

Testing procedure and testing location:	
<input checked="" type="checkbox"/> CB/CCA Testing Laboratory:	Intertek Testing Services NA, Inc.
Testing location/ address	1950 Evergreen Blvd, Suite100, Duluth, GA 30096 USA
<input type="checkbox"/> Associated CB Laboratory:	
Testing location/ address	
Tested by (name + signature)	Dharmesh Panchal 
Approved by (+ signature).....	Hakim Hasan 
<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:
Cl. 8.15 Rub test	Intertek Testing Services NA, Inc. 1950 Evergreen Blvd, Suite100, Duluth, GA 30096 USA
Cl. 10 Cap discharge test	
Cl. 11 Output Voltage and current under load	
Cl. 13 Short-circuit voltage	
Cl. 14 Heating	
Cl.15.1 Tests direct after 14.1 at the same ta and without changing position.	
Cl.15.3.1: Short circuit	
Cl. 15.3.4: OP overload	
18.2 IR testing	
18.3 Dielectric strength	
18.4 Double voltage/double frequency Transformer test	
18.5 Touch current and protective earth current	
18.5.2 Protective earth conductor current	

TABLE OF TEST EQUIPMENT USED

Item	Equipment Type	Equipment #	Cal. Due Date
1	Power Analyzer	211807	2011-02-10
2	Fluke NetDaq	211738	2010-12-17
3	Ammeter Clamp	211602	2010-10-01
4	Fluke 43B	211603	2010-09-16
5	Load Bank	211576	NCR
6	Stop Watch	211697	2010-05-12
7	Hypot Tester (mid range)	211342	2010-07-15
8	Hydra Data Bucket	215131	2011-02-10
9	Digital Pocket Weatherman	211759	11/04/10
10	Power Analyzer	211508	2011-04-14
11	Load Bank	211109	NCR
12	Load Bank	211109	CNR
13	Knief switch	211543	CNR
14	DMM	211204	2010-07-15
15	Variac	211212, 213090	CNR
16	Current Clamp meter	013871	2010-05-27
17	Current clamp meter probe	A003-217	2010-08-27
18	Step down transformer	211843	CNR
19	Force gauge	211066	2010-08-04
20	Caliper	211202	2010-05-26
21	Steel sphere impact ball	211722	2010-10-17
22	Impact test guide tube for 2" metal sphere	211803	CNR
23	Test finger	211357	2017-10-11
24	Test pin	211246	2017-10-11
25	IR tester	211856	2011-02-10
26	LCR meter	211797	2011-01-16
27	Humidity chamber	211532	2011-04-08
28	Leakage meter	211845	2010-08-28
29	Leakage box	211825	CNR
30	Power source	211297	CNR (Verified with 211204)
31	Step up transformer	211375	CNR
	CNR = Calibration Not Required		

Statement on Measurement Uncertainty – Specific measurement uncertainty calculations are not necessary under the following provision: All measurements in this data packet are taken with instruments that meet the minimum tolerances established in current CTL decisions.

Summary of compliance with National Differences:

None.

Copy of marking plate: Representative label marking for all models:

ELECTRO
plastics, inc.

EPI-LX LOW VOLTAGE POWER SUPPLY SERIES

MODEL:

EPI-LX	250W	120V~	12V~	50/60Hz
EPI-LX-R	500W	208V~	24V~	60Hz
	1000W	230V~	30V~	
	1500W	277V~		

**SEE PRODUCT LITERATURE FOR
INSTALLATION INSTRUCTIONS**

WARNING: RISK OF FIRE. IF INSTALLATION INVOLVES RUNNING WIRES THROUGH A BUILDING STRUCTURE, SPECIAL WIRING METHODS ARE NEEDED. CONSULT A QUALIFIED ELECTRICIAN.

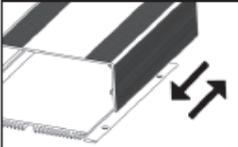





CONFORMS TO:
CENELEC EN 61558-1, IEC 61558-1, IEC 61558-2-2, UL 5085-1, UL 5085-2-2, CSA C22.2 No. 66

MANUFACTURED BY: ELECTRO PLASTICS, INC.
11147 DORSETT RD.
MARYLAND HEIGHTS, MO 63043, USA
TEL: (877) STEP-TEC

WWW.ELECTROPLASTICS.COM



SLIDE COVER TO OPEN



UNHINGE COVER TO OPEN
(W/ SCREWDRIVER)

- OR -

🏠 FOR INDOOR USE ONLY

Test item particulars	
Type of transformers	
Application	stationary / portable / hand-held
Protection against electric shock.....	Class I
Short-circuit protection.....	
inherently short-circuit proof.....	Yes / No
non-inherently short-circuit proof.....	Yes / No
non short-circuit proof.....	Yes / No
fail safe	Yes / No
Protection index.....	IPX0
Other characteristics.....	
Rated ambient temperature ta (°C)	25
Short-circuit voltage (V).....	N/A
Possible test case verdicts:	
- test case does not apply to the test object.....	N/A
- test object does meet the requirement.....	P (Pass)
- test object does not meet the requirement.....	F (Fail)
Testing	
Date of receipt of test item.....	2010-04-15
Date (s) of performance of tests.....	2010-04-20 through -30, 2010-05-05 through 06, ATL1004151419-001 through 009
General remarks:	
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.	
Note: EN Group Differences together with National Differences and Special National Conditions, if any, are in the Appendix to the main body of this TRF.	
Throughout this report a point is used as the decimal separator.	

General product information:

Power supply is considered Class I with metal enclosure. A terminal block provided to connect to the mains. There are two series, EPI-LX and EPI-LX-R, where EPI-LX series is provided with only interface board and EPI-LX-R series provided with interface and control board. Both series provided with 500W with one toroidal transformer, 1000W with two toroidal transformers in parallel and 1500W with three toroidal transformers in parallel. Top cover plate is provided in two options. One type of cover plate has numerous openings on the top measured 2.3mm and another type of cover plate has five vent plugs on the top where each vent plug has nine circular openings measured 2.35 mm. Cover plate with five vent plugs considered worse case for testing. There are four plastic bushings in the bottom of the enclosure for power conductor entries. Metal enclosure of EPI-LX series are measured Aluminum, 3.3 mm thick, 500 W enclosure measured 280x160x88mm, 1000W enclosure measured 435x160x88mm and 1500W enclosure measured 584x160x88mm, and EPI-LX-R series are Aluminum, 3.3 mm thick, 500 W enclosure measured 360x160x88mm, 1000W enclosure measured 470x160x88mm and 1500W enclosure measured 720x160x88mm.

All power supplies rated 25°C. EPI-LX-120V, 60Hz and EPI-LX-R-230V, 50Hz, 1500W transformer tested considering worse case at 80% constant output load (49.9A for 1500W power supply unit).

EN 61558-2-2			
Clause	Requirement + Test	Result - Remark	Verdict
8	MARKING AND OTHER INFORMATION		P
8.1	Transformer marked with:	Recognized transformer is a part of power supply / marking provided in the enclosure.	P
	a) rated supply voltage or voltage range (V)		P
	b) rated output voltage (V)		P
	c) rated thermal output / admissible instantaneous output (e.g. 100/300 VA) (IEC 61558-2-2:2007)		N/A
	d) not applicable (IEC 61558-2-2:2007)		N/A
	e) rated frequency (Hz)	120/208V~, 60Hz and 230V~, 50/60Hz	P
	f) rated power factor (if not 1)		N/A
	g) symbol AC for alternating current, or DC for direct current-output	AC symbol "~" provided.	P
	h) The transformer is marked with one of the following symbol's (IEC 61558-2-1:2007)	Not required, certified transformers are inside the power supply.	N/A
	<ul style="list-style-type: none"> Fail-safe control transformer 		N/A
	<ul style="list-style-type: none"> Non-short-circuit proof control transformer 		N/A
	<ul style="list-style-type: none"> Short-circuit-proof control transformer 		N/A
	i) manufacturer's name or trademark or name of the responsible vendor	Manufacturer's name on the unit.	P
	j) model or type reference		P
	k) vector group according to IEC 60076 for three-phase transformer	Single phase.	N/A
	l) symbol for Class II	Class I.	N/A
	m) symbol for Class III	Class I.	N/A
	n) index IPXX if other than IP00	IPX0	N/A
	o) rated max. ambient temperature t_a (if not 25 °C)	25°C provided in the instruction manual.	P
	p) rated minimum ambient temperature $t_{a \text{ min}}$, if <10° C and if a temperature sensitive device is used	None used.	N/A
	q) short-time duty cycle: operating time Intermittent duty cycle: operating and resting time (e.g. 5min/30min)	Continuous.	N/A

EN 61558-2-2			
Clause	Requirement + Test	Result - Remark	Verdict
	r) for tw-marked transformers marked with the rated max. operating temperature, increased by multiples of 5 (e.g. tw 120; tw 125)		N/A
	s) transformers used with forced air cooling shall be marked with "AF" in m/s	Not used with forced air cooling.	N/A
	t) Information from the manufacturer to the purchaser (data sheet) :		P
	- short-circuit voltage (% rated supply voltage) for stationary transformers > 1000 VA	Each transformer is rated 500W output.	N/A
	- electrical function of the transformer		P
8.2	Marking for transformers IP00 or for associated transformers: type and trademark, instruction sheets	"For indoor use only" with symbol  provided in the instruction sheet.	P
8.3	Adjusted voltage easily and clearly discernible	Not adjustable voltage.	N/A
8.4	For each tapping or winding: rated output voltage and rated output		P
	necessary connections clearly indicated		P
8.5	For short-circuit proof transformers or non-inherently short-circuit proof transformers:	Non-inherently short-circuit proof transformer.	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	Input and output of transformer are protected by resettable circuit breaker, no marking required.	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)	Not user replaceable circuit breaker.	N/A
	Construction sheet for transformers with replaceable protective device (other than fuses) information with information about the replacement.	None.	N/A
8.6	Terminals for neutral: "N"		P
	Terminal for protective earth marked with earthing symbol		P
	Identification of input terminals: "PRI"		P
	Identification of output terminals: "SEC"		P
	Symbol for any point/terminal in connection with frame or core	None.	N/A
8.7	Indication for correct connection		P
8.8	Instruction sheet for type X, Y, Z attachments	None provided.	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.	Class I.	N/A

EN 61558-2-2			
Clause	Requirement + Test	Result - Remark	Verdict
	Class II transformer with parts to be mounted – delivered with all parts for class II after mounting.		N/A
	Symbol for class II transformer placed on the part which provide class II.		N/A
8.11	Correct symbols:		P
	Volts	V	P
	Amperes	A (mA)	N/A
	Volt amperes (or volt-amperes reactive for reactors)	VA or (VAR)	N/A
	Watts	W	P
	Hertz	Hz	P
	Input	AC input provided near input connection.	P
	Output	SEC	P
	Direct current	d.c. (DC) or 	N/A
	Neutral	N	P
	Single-phase a.c.		P
	Three-phase a.c.	Single phase.	N/A
	Three-phase and neutral a.c.		N/A
	Power factor		N/A
	Class II construction	Class I.	N/A
	Class III construction		N/A
	Fuse-link	CB provided.	N/A
	Rated max. ambient temperature	$t_a = 50^\circ\text{C}$	P
	Frame or core terminal		N/A
	Protective earth		P
	IP number	IPX0	N/A
	Earth (ground for functional earth)		N/A
	For indoor use only		P
	tw5 YYY	None provided.	N/A
	tw10 YYY		N/A
	twx YYY		N/A
8.12	Figures, letters or other visual means for different positions of regulating devices and switches	None.	N/A
	OFF position indicated by figure 0		N/A
	Greater output, input etc. indicated by higher figure		N/A

EN 61558-2-2			
Clause	Requirement + Test	Result - Remark	Verdict
8.13	Marking not on screws or other easily removable parts	Marking on the top cover.	P
	Marking clearly discernible (transformer ready for use)		P
	Marking for terminals clearly discernible if necessary after removal of the cover		P
	Marking for terminals: no confusion between input and output		P
	Marking for interchangeable protective devices positioned adjacent to the base	None.	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:	No special instruction required.	N/A
	For non-inherently short-circuit proof transformers with non-self-resetting or non replaceable devices (weak-point, thermal link): The device can not be resetted or replaced	Non-inherently short-circuit proof transformer protected by resettable circuit breaker on pri and sec side inside power supply.	N/A
	For transformers generating a protective earth conductor current of 10 mA (see also cl. 18.5.2): The installation shall be made according to the wiring rules.		N/A
	For associated- and IP00-transformers: At 10% over or under voltage in the supply voltage, the rated output of the transformer shall be selected accordingly.		N/A
	For stationary transformers exceeding 1000 VA: The short circuit voltage in % of the rated voltage	Each transformer is not rated 1000VA.	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)		N/A
	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 – an information in the in the instruction sheet: the transformer is not intended for series/parallel connection		N/A

EN 61558-2-2			
Clause	Requirement + Test	Result - Remark	Verdict
8.15	Marking durable and easily legible	Tested 15s with water and with petroleum spirit. Tested on 2010-04-27, Equipment ID:211697	P
8.101	Input tapping are marked with the value of the variation (e.g. +5 V or -5 V)	Not provided with input tapping.	N/A

9	PROTECTION AGAINST ELECTRIC SHOCK		P
9.1	Protection against contact with hazardous live parts	Adequate protection provided.	P
9.1.1	A live part is not a hazardous live part if:	Part of certified transformer.	P
	– the 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 ≤ 35 V(peak) a.c. or ≤ 60 Vd.c.	Output is 24Vac.	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:	Output is 24Vac.	N/A
	The touch current shall not exceed:		N/A
	– for a.c. 0,7 mA (peak)		N/A
	– for d.c. 2,0 mA (see Annex J)		N/A
	In addition, when a capacitor is connected to live parts:		—
9.1.1.2.1	discharge: $< 45 \mu\text{C}$ (between 60 V and 15 kV)		N/A
9.1.1.2.2	energy: ≤ 350 mJ (voltage > 15 kV)		N/A
9.1.2	Transformers shall have an adequate protection against accessibility to hazardous live parts:	Metal enclosure provided.	P
	The enclosure of class I and class II transformers gives a 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.	Accessible parts of enclosure protected by basic insulation.	P
	Class II transformers: no accessibility to basic insulation, or conductive parts separated from hazardous live parts by basic insulation.	Class I.	N/A
	Hazardous live parts are not accessible after removal of detachable parts.	No detachable parts.	N/A
	Hazardous live parts are not accessible after removal of detachable parts except for:		N/A
	– lamps having caps larger B9 and E10		N/A
	– type D fuse holder		N/A

EN 61558-2-2			
Clause	Requirement + Test	Result - Remark	Verdict
	Lacquers, enamel, paper, cotton, oxide film on metal parts not used for protection against accidental contact with hazardous live parts:		P
	Shafts, handles, operating levers, knobs are not hazardous life parts.	No such parts.	N/A
	Compliance is checked by inspection and by relevant tests according to IEC 60 529		N/A
	Class II transformers and Class II parts of Class I construction are tested with the test pin (fig. 3)	Class I.	N/A
	Hazardous live parts shall not be touchable by test finger (fig. 2)	Tested on 2010-04-27, Equipment ID: 211357	P
	for Class II transformers: metal parts separated by basic insulation from hazardous live parts not touchable by test finger	Class I.	N/A
	hazardous live parts shall not be touchable with the test pin	No access to live parts touchable with test pin, tested on 2010-04-27, Equipment ID: 211246	P
9.1.3	Accessibility of non hazardous live parts		P
	Non hazardous live parts of the output circuit may be accessible if they are isolated from the input circuit by double or reinforced insulation and if the following conditions are fulfilled:		P
	– The no load output voltage is ≤ 35 V peak a.c. or ≤ 60 V ripple free d.c., both poles are accessible	Output voltage is rated 24Vac.	P
	– The no load output voltage is > 35 V peak a.c. or > 60 V ripple free d.c., only one pole are accessible	Output voltage is rated 24Vac.	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.	No primary supply plug, terminal block only.	N/A
	Transformers without a primary supply plug: 5 s after the interruption of the supply the voltage between the input terminals do not exceed 35 V (peak) a.c. or 60 V ripple free d.c.		N/A
	The following tests are required :		P
	If the nominal capacitance is $\leq 0,1$ μ F – no test is conducted.	0.002 μ F measured on 2010-04-27, Equipment ID: 211797	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		N/A
	If the measured voltage is > 60 V ripple free d.c., the discharge must be ≤ 45 μ C.		N/A
10	CHANGE OF INPUT VOLTAGE SETTING		P

EN 61558-2-2			
Clause	Requirement + Test	Result - Remark	Verdict
	Voltage setting not possible to change without a tool		P
	Different rated supply voltages:	Factory setup to single supply voltage.	N/A
	– indication of voltage for which the transformer is set, is discernible on the transformer .		P

11	OUTPUT VOLTAGE AND OUTPUT CURRENT UNDER LOAD		P
11.1	Difference from rated value to measured value with rated load $\leq 5\%$ (EN 61558-2-2:2007)	(see appended table)	P
	Measured value with admissible instantaneous output (power factor 0,5 ind.) $\geq 95\%$ of the measured value with rated load (EN 61558-2-2:07)	(see appended table)	P

12	NO-LOAD OUTPUT VOLTAGE		P
	Remark: with rectifier measuring on both sides of the rectifier		-
12.101	The no load output voltage does not exceed 1000 V even when output windings are connected in series (IEC 61558-2-2:2007)	No load output measured 26Vac.	P
12.102	The difference between the no-load output voltage and the output voltage under load does not exceed 10 % (IEC 61558-2-2:2007)	24Vac under load.	P

13	SHORT-CIRCUIT VOLTAGE		N/A
		No short-circuit marking provided.	N/A
	Difference from marking for short-circuit voltage $\leq 20\%$		N/A

14	HEATING		P
14.1	General requirements		P
	No excessive temperature in normal use	All components are within allowed limits.	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	No such attachment.	N/A
	Upri (V): 1,1 times rated supply voltage loaded with rated impedance – for independent transformers		—
	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		—

EN 61558-2-2			
Clause	Requirement + Test	Result - Remark	Verdict
	Type X, Y, Z attachments: 1 pull (5 N) to the connection windings		N/A
	Max. temperature windings	(see appended table)	P
	– Class A: $\leq 100\text{ }^{\circ}\text{C}$	Class B.	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:		P
	– metal: $\leq 70\text{ }^{\circ}\text{C}$	61.5°C measured.	P
	– 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)	Enclosure may touch.	N/A
	Temperature of external enclosures, handles, etc. of portable transformers:	Not a portable transformer.	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 $\leq 70\text{ }^{\circ}\text{C}$		N/A
	Temperature of terminals of switches $\leq 70\text{ }^{\circ}\text{C}$	No switches.	N/A
	Temperature of internal and external wiring:		P
	– rubber: $\leq 65\text{ }^{\circ}\text{C}$		N/A
	– PVC: $\leq 70\text{ }^{\circ}\text{C}$		N/A
	Temperature of parts where safety can be affected:		P
	– rubber: $\leq 75\text{ }^{\circ}\text{C}$		N/A
	– phenol-formaldehyde: $\leq 105\text{ }^{\circ}\text{C}$	Measured 76°C max.	P
	– urea-formaldehyde: $\leq 85\text{ }^{\circ}\text{C}$		N/A
	– impregnated paper and fabric: $\leq 85\text{ }^{\circ}\text{C}$		N/A
	– impregnated wood: $\leq 85\text{ }^{\circ}\text{C}$		N/A
	– PVC, polystyrene and similar thermoplastic material: $\leq 65\text{ }^{\circ}\text{C}$		N/A
	– varnished cambric: $\leq 75\text{ }^{\circ}\text{C}$		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Temperature rise of supports ≤ 85 °C	No supports.	N/A
	Temperature of printed boards:		P
	– bonded with phenol-formaldehyde: ≤ 105 °C	88°C measured.	P
	– 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)	Passed at 2500Vac between input and output. Tested on 2010-04-27, Equipment ID: 211342, 211697	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	Class B insulation 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 $\leq 30\%$		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

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Clause	Requirement + Test	Result - Remark	Verdict
15	SHORT-CIRCUIT AND OVERLOAD PROTECTION		P
15.1	General		P
	Tests direct after 14.1 at the same t_a 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.	Each transformer has only one output.	N/A
	Winding protected inherently (15.2)		N/A
	– Max. temperature of winding protected inherently (insulation class): $\leq 150\text{ °C}$ (A); $\leq 165\text{ °C}$ (E); $\leq 175\text{ °C}$ (B); $\leq 190\text{ °C}$ (F); $\leq 210\text{ °C}$ (H)		N/A
	Winding protected by protective device:		P
	– a) 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): $\leq 200\text{ °C}$ (A); $\leq 215\text{ °C}$ (E); $\leq 225\text{ °C}$ (B); $\leq 240\text{ °C}$ (F); $\leq 260\text{ °C}$ (H)	Tested according to 15.3.4, output secondary side circuit breaker opened during output short circuit and over load test.	P
	– b) Test according 15.3.1: max. temperature of winding during the first hour, peak value (insulation class): $\leq 200\text{ °C}$ (A); $\leq 215\text{ °C}$ (E); $\leq 225\text{ °C}$ (B); $\leq 240\text{ °C}$ (F); $\leq 260\text{ °C}$ (H)		N/A
	– b) Test according 15.3.1: max. temperature of winding after first hour, peak value (insulation class): $\leq 175\text{ °C}$ (A); $\leq 190\text{ °C}$ (E); $\leq 200\text{ °C}$ (B); $\leq 215\text{ °C}$ (F); $\leq 235\text{ °C}$ (H)		N/A
	– b) Test according 15.3.1: max. temperature of winding after first hour, arithmetic mean value (insulation class): $\leq 150\text{ °C}$ (A); $\leq 165\text{ °C}$ (E); $\leq 175\text{ °C}$ (B); $\leq 190\text{ °C}$ (F); $\leq 210\text{ °C}$ (H)		N/A
	Max. temperature of external enclosures (accessible by test finger) $\leq 105\text{ °C}$		N/A
	Max. temperature of insulation of wiring (rubber and PVC) $\leq 85\text{ °C}$		N/A
	Temperature rise of supports $\leq 105\text{ °C}$		N/A
15.2	For inherently short-circuit proof transformers and for transformers with rectifiers test by short circuit of the output winding at rated supply voltage x 1,1: temperature rises \leq values in table 3		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
15.3	For non-inherently short-circuit proof transformers and for transformers with rectifiers: temperature rises \leq values in table 3	Tested according to 15.3.4, output secondary side circuit breaker opened during output short circuit and over load test.	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.	Protective devices are circuit breakers.	N/A
15.3.3	If protected by a fuse accordance with either IEC 60 127 or ISO 8820, or a technical equivalent fuse, the transformer is loaded with the current as specified for the longest pre arcing time. <i>If protected by a miniature fuses in accordance to IEC 60127, 1,5 times of the rated fuse, until steady state condition (in addition)</i>		N/A
15.3.4	If protected by a circuit-breaker according to IEC 60 898 the transformer is loaded with a current equal to 1,45 times the value of the circuit-breaker rated current	Secondary side circuit breaker opened.	P
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	CB provided.	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
15.3.6	If thermal cut-outs, test with 0,95 times of operating current	Part of certified transformer.	N/A
15.4	For non-short-circuit proof transformers: temperature rises \leq values in table 3, tests as indicated in 15.3		P
15.5	For fail-safe transformers:	Not a fail safe transformer.	N/A
	– U _{pri} (V): 1,1 times rated supply voltage		—
	– I _{sec} (A): 1,5 times rated output current		—
	– time until steady-state conditions t ₁ (h)		—
	– time until failure t ₂ (h): \leq t ₁ ; \leq 5 h		N/A
	During the test:		N/A
	– 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

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Clause	Requirement + Test	Result - Remark	Verdict
	– electric strength (Cl. 18, 1 min, test voltage: 35% of specified value); no flashover or breakdown for primary-to-secondary only for safety isolating, isolating and separating transformer and for primary-to-body for all kinds of transformer		N/A
	– bare hazardous live parts not accessible by test finger through holes of enclosure		N/A

16	MECHANICAL STRENGTH		P
16.1	General		P
	After tests of 16.2, 16.3 and 16.4		P
	– no damage		P
	– hazardous live parts not accessible by test pin according to 9.2		P
	– no damage for insulating barriers		P
	– handles, levers, etc. have not moved on shafts	None.	N/A
16.2	Transformers (stationary and portable s. 16.1)		P
	For stationary and portable transformers: 3 blows, impact energy 0,5 Nm	No dent or access to hazardous parts. Tested on 2010-04-28, Equipment ID: 211095	P
16.3	Portable transformers (except of plug in transformers)	Not a portable.	N/A
	For portable transformers: 100 falls, 25 mm		N/A
16.4	Transformers with integrated pins (plug in transformers), the following tests are carried out:	No plug in transformer.	N/A
	a) plug-in transformers: tumbling barrel test: 50 x ≤ 250 g; 25 x ≤ 250 g		N/A
	b) torque test of the plug pins with 0,4 Nm		N/A
	c) pull force according to table 5 for each pin		N/A

17	PROTECTION AGAINST HARMFUL INGRESS OF WATER AND MOISTURE		N/A
17.1	Degree of protection (IP code marked on the transformer)	IPX0	N/A
	Test according to 17.1.1 and for other IP ratings test according to IEC 60 529:		N/A
	– 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		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– 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:		N/A
	– dielectric strength test according to 18.3		N/A
	Inspection:		N/A
	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		N/A
17.1.1	Tests on transformers with enclosure:		N/A
	A) Solid-object-proof transformers:		N/A
	– 2 IP2X test finger (IEC 60 529) and test pin (fig. 3)		N/A
	B) Solid-object-proof transformers:		N/A
	– wire 2,5 mm; force 3 N		N/A
	– IP4X, wire 1 mm; force 1 N		N/A
	C) Dust-proof transformers, IP5X; dust chamber according to IEC 60 529, fig. 2:		N/A
	a) transformer has operating temperature		N/A
	b) transformer, still operating, is placed in the dust chamber		N/A
	c) the door of the dust chamber is closed		N/A
	d) fan/blower is switched on		N/A
	e) after 1 min transformer is switched off for cooling time of 3 h		N/A
	D) Dust-tight transformers (IP6X) test according to C)		N/A
	E) Drip-proof transformers (IPX1) test according to fig. 3 of IEC 60 529 for 10 min		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	F) Rain-proof transformers (IPX2) test according to fig. 3 of IEC 60 529 for 10 min in operation, any angle up to 15°		N/A
	G) Spray proofed transformers (IPX3) test according to fig. 4 of IEC 60 529 for 10 min in operation and 10 min switched off , time for complete oscillation (2 x 120°) is 4 sec.		N/A
	H) Splash-proof transformers (IPX4) test according to fig. 4 of IEC 60 529 (see F) for 10 min in operation and 10 min switched off (the tube shall oscillate ≈360 °)		N/A
	I) Jet-proof transformer (IPX5) test according to fig. 6 of IEC 60 529 (nozzle 6,3mm)		N/A
	J) Powerful Jet-proof transformer (IPX6) test according to fig. 6 of IEC 60 529 (nozzle 12 mm)		N/A
	K) Watertight transformers (IPX7)		N/A
	L) Pressure watertight transformers (IPX8)		N/A
17.2	After moisture test (48 h for ≤ IP20, 168 h for other transformers):	Tested from 2010-04-26 through 28, Equipment ID: 211532	P
	– insulation resistance and electric strength (Cl. 18)	See Cl. 18	P

18	INSULATION RESISTANCE AND ELECTRIC STRENGTH		P
18.2	Insulation resistance between:		P
	– live parts and body for basic insulation $\geq 2 \text{ M}\Omega$	>550M Ω , Tested on 2010-04-28, Equipment ID: 211856	P
	– 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 $\geq 5 \text{ M}\Omega$	>550M Ω	P
	– each input circuit and all other input circuits connected together $\geq 2 \text{ M}\Omega$	Not connected together.	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) $\geq 2 \text{ M}\Omega$	>550M Ω	P
	– 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

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Clause	Requirement + Test	Result - Remark	Verdict
18.3	Electric strength test (1 min): no flashover or break-down:		P
	All values of test voltages according Table 8a are multiplied by 1,4 (IEC 61558-2-2:2007)		P
	1) basic insulation between input circuits and output circuits; working voltage (V); test voltage (V)		N/A
	2) double or reinforced insulation between input circuits and output circuits; working voltage (V); test voltage (V)	Tested at 5940Vdc on 2010-04-28, Equipment ID: 211342, 211697.	P
	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	Tested at 2970Vdc on 2010-04-28, Equipment ID: 211342, 211697.	P
	c) inlet bushings and cord guards and anchorages		N/A
	d) live parts and an intermediate conductive part		N/A
	e) intermediate conductive parts and body		N/A
	4) Reinforced insulation between the body and live parts; working voltage (V); test voltage (V)	Tested at 4200Vdc on 2010-04-28, Equipment ID: 211342, 211697.	P
18.4	Upri (V): 2 times rated input voltage; no load; frequency (Hz): 2 times rated frequency; duration (min): 5 min	Tested on 2010-04-29, Equipment ID: 211204, 211297, 211375, 211759, 211342	P
	No breakdown between:		P
	– turns of winding		P
	– input and output windings		N/A
	– adjacent input or output windings		N/A
	– windings and iron core		N/A
18.5	Touch current and protective earth current		P
18.51	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).		P

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Clause	Requirement + Test	Result - Remark	Verdict
	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		N/A
	– switch n: off and switch e: on	0.035mA max. measured, tested on 2010-04-28, Equipment ID: 211825, 211845, 211204.	P
	– switch n: on and switch e: off	0.02mA max. measured, tested on 2010-04-28, Equipment ID: 211825, 211845, 211204.	P
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	Transformer has no earth terminal.	N/A
	The measured values are less than the required values of table 8b.		N/A

19	CONSTRUCTION		P
19.1	Input and output circuits electrically separated. (EN 61558-2-2:2007)		P
	No possibility of any connection between these circuits (IEC 61558-2-2:2007)		P
19.1.1	The insulation between input and output winding(s) consist of basic insulation (IEC 61558-2-2:2007)	Reinforce insulation.	N/A
	Class I transformers (EN 61558-2-2:2007):		P
	<ul style="list-style-type: none"> Insulation between input windings and body consist of basic insulation 	Class II transformer enclosed in Class I enclosure.	P
	<ul style="list-style-type: none"> Insulation between output windings and body consist of basic insulation 		P
	Class II transformers (EN 61558-2-2:2007):		N/A
	<ul style="list-style-type: none"> Insulation between input windings and body consist of double or reinforced insulation 		N/A
	<ul style="list-style-type: none"> Insulation between output windings and body consist of double or reinforced insulation 		N/A
19.1.2	The insulation between input windings and intermediate conductive parts and the output windings and intermediate part consist of basic insulation (IEC 61558-2-2:2007)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	For class I transformers the insulation between input and output windings via the intermediate conductive parts consist of basic insulation (IEC 61558-2-2:2007)		N/A
	For class II transformers the insulation between input winding and the body and between the output windings and the body via the intermediate conductive parts consist of double or reinforced insulation. (IEC 61558-2-2:2007)	Class II transformer enclosed in Class I enclosure.	P
19.101	Output circuits may be connected to protective earth. (IEC 61558-2-2:2007)	Not connected to PE.	N/A
19.102	For associated transformers, no connection between the output circuits and the body, unless allowed by the relevant equipment standard (IEC 61558-2-2:2007)	Not associate transformer.	N/A
19.2	Fiercely burning material 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	Not portable transformer.	N/A
19.4	Class II transformers: contact between accessible metal parts and conduits or metal sheaths of supply wiring impossible	Class I.	N/A
19.5	Class II transformers: part of supplementary or reinforced insulation, during reassembly after routine servicing not omitted		N/A
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)		N/A
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	Not connected by resistor or capacitors.	N/A
19.8	Resistors or capacitors connected between hazardous live parts and the body (accessible metal parts) consist of:		N/A
	– components according to IEC 60 065, 14.1 or capacitor Y1 according to IEC 60 384-14		N/A
	– at least two separate components		N/A
	– if one component is short-circuited or opened, values specified in Cl. 9 shall not be exceeded		N/A
	– if the working voltage is ≤ 250 V, one Y1 capacitor according 60384-14 is allowed		N/A
19.9	Insulation material input/output and supplementary insulation of rubber resistant to ageing	No such resistant ageing.	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Creepage distances (if cracks) \geq specified values (Cl. 26)		N/A
19.10	Protection against accidental contact by insulating coating:		N/A
	a) ageing test (section I, IEC 60 068-2-2), test Ba: 168 h; 70 °C		N/A
	b) impact test (spring-operated impact hammer according to IEC 60 068-2-63; $0,5 \pm 0,05$ J)		N/A
	c) scratch test (hardened steel pin) electric strength test according to Cl. 18		N/A
19.11	Handles, levers, knobs, etc.:	None.	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	Part of certified transformer.	N/A
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
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
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
	– 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

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Clause	Requirement + Test	Result - Remark	Verdict
	- 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	Certified transformer used.	N/A
19.13	Handles, operating levers and the like shall be fixed		N/A
19.14	Protection against electric shock: covers securely fixed, 2 independent fixing means, one with tool		N/A
19.15	Transformer with pins for fixed socket-outlets: no strain on socket-outlet		N/A
	Additional torque $\leq 0,25$ Nm		N/A
19.16	Protection index for portable transformers:	Not portable transformer.	N/A
	≤ 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 ≥ 5 mm or 20 mm ² with width ≥ 3 mm); drain hole not required for transformer completely filled with insulating materials	IPX0.	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	No cord provided.	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	SELV circuit is not connected to PE.	N/A
	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	Class I.	N/A
	For fixed transformers an earth conductor with double or reinforced insulation to accessible metal parts is allowed		N/A
19.23	Class III transformers shall not be provided with means for protective earth		N/A

20	COMPONENTS		P
	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	Certified transformer used.	P
	Testing of components separately to the transformer according the relevant standard:		P
	– Ratings of the component in line with the transformer ratings, including inrush current. Component test according the component standard, based on the component marking (rating).		P
	– Components without markings tested under transformer conditions including inrush current.		P
	– If no IEC standard exists, the component is tested under transformer conditions.	No such components.	N/A
20.1	Appliance couplers for main supply shall comply with:	No appliance couplers.	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	None.	N/A
20.3	Thermal-links comply with IEC 60691	May part of certified transformer.	P
20.4	Switches shall comply with annex F	None.	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Disconnection from the supply:	None provided.	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.	No socket outlets.	N/A
	Plugs and socket-outlets for SELV systems with both a rated current $\leq 3A$ and a rated voltage $\leq 24 V$ 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	None.	N/A
	– 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	Resettable circuit breaker provided.	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.	None.	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 rest have a trip free mechanism (type 1E and 2E) (see IEC 60730-1)		N/A
	d) The number of cycles of automatic action shall be:		N/A
	- 3000 cycles for self resetting thermal cut-outs		N/A
	- 300 cycles for non self resetting thermal cut-outs resetting by hand		N/A
	- 300 cycles for non self resetting thermal cut-outs resetting disconnecting		N/A
	- 30 cycles for non self resetting thermal cut-outs which are only resettable by a tool		N/A
	e) Thermal cut outs fulfil the electrical stress according IEC 60730-1, 6.14.2		N/A
	f) Characteristic of thermal cut-outs:		N/A
	- ratings according IEC 60730-1, cl. 5		N/A
	- classification according to:		N/A
	1) nature of supply to IEC 60730-1, cl. 6.1		N/A
	2) type of load controlled to IEC 60730-1, cl. 6.2		N/A
	3) degree of protection IPX0 to IEC 60730-1, cl. 6.5.1		N/A
	4) degree of protection IP0X to IEC 60730-1, cl. 6.5.2		N/A
	5) pollution degree to IEC 60730-1, cl. 6.5.3		N/A
	6) comparative tracking index to IEC 60730-1, cl. 6.13		N/A
	7) max. ambient temperature to IEC 60730-1, cl. 6.7		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
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:	None.	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
	After the test: withstand the test of clause 18, show no damage in sense of this standard, and be operational.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
20.8	Thermal links shall be tested in one of the following two ways.	None.	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		P
20.10	Thermal cut-outs which can be reset by soldering operation are not allowed		N/A
20.9	Overload protection devices do not operate during test (20 times switched on and off, at no load); Upri (V): 1,1 times rated supply voltage.		N/A

21	INTERNAL WIRING		P
21.1	Internal wiring and electrical connections protected or enclosed		P
	Wire-ways smooth and free from sharp edges		P
21.2	Openings in sheet metal: edges rounded (radius ≥ 1,5 mm) or bushings of insulating material	Edges rounded.	P
21.3	Bare conductors: distances adequately maintained	No bare conductors.	N/A
21.4	When external wires are connected to terminal, internal wiring shall not work loose	Part of certified terminal.	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		P
22.1	All cables, flexible cords etc. shall have appropriate current and voltage ratings		P

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Clause	Requirement + Test	Result - Remark	Verdict
22.2	Input and output wiring inlet and outlet openings for external wiring: separate entries without damage to protective covering of cable or cord		P
	Input and output wiring inlet and outlet openings for flexible cables or cords: insulating material or bushing of insulating material		P
	Bushings for external wiring: reliably fixed, not of rubber unless part of cord guard		P
22.3	Fixed transformer:		P
	– possible to connect after fixing		P
	– inside space for wires allow easy introduction and connection of conductors	Required to remove cover.	P
	– fitting of cover without damage to conductors		P
	– contact between insulation of external supply wires and live parts of different polarity not allowed	Proper marking provided.	P
22.4	Length of power supply cord for portable transformers between 2 m and 4 m; without 0,5 mm ²		N/A
22.5	Power supply cords for transformers IPX0 and transformers “for indoor use only” ≥ IPX0:	No power supply cord provided.	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:	No power supply cord.	N/A
	– cord set fitted with an appliance coupler in accordance with EN 60320		N/A
22.7	Nominal cross-sectional area (mm ²); input current (A) at rated output not less than shown in table 9		N/A
22.8	Class I transformer with power supply flexible cable: green/yellow core connected to earth terminal		N/A
	Plug for single-phase transformer with input current at rated output ≤ 16 A according to IEC 60 083, IEC 60 906-1 or IEC 60 309		N/A
22.9	Type X, Y or Z attachments: see relevant part 2		N/A
22.9.1	For type Z attachment: moulding enclosure and power supply cable do not affect insulation of cable		N/A
22.9.2	Inlet openings or inlet bushing: without risk of damage to protective covering of power supply cord		N/A
	Insulation between conductor and enclosure:		N/A

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

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Clause	Requirement + Test	Result - Remark	Verdict
	– suitable for different types of cable unless only one type of cable for transformer		N/A
	– the entire flexible cable or cord with covering can be mounted into the cord anchorage		N/A
	– if tightened or loosened no damage		N/A
	– no contact between cable or cord and accessible or electrically connected clamping screws		N/A
	– cord clamped by metal screw not allowed		N/A
	– one part securely fixed to transformer		N/A
	– for Class I transformer: insulating material or insulated from metal parts		N/A
	– for Class II transformers: insulating material or supplementary insulation from metal parts		N/A
	Cord anchorages for type X, Y, Z attachments: cores of power external flexible cable or cord insulated from accessible metal parts by:		N/A
	– basic insulation (Class I transformers), separate insulating barrier/cord anchorage		N/A
	– supplementary insulation (Class II transformers), special lining/cable or cord sheath of cable sheath of cable		N/A
	Cord anchorages for type X and Y attachments:		N/A
	– replacement of external flexible cable or cord does not impair compliance with standard		N/A
	– the entire flexible cable or cord with covering can be mounted into the cord anchorage		N/A
	– if tightened or loosened no damage		N/A
	– no contact between cable or cord and accessible or electrically connected clamping screws		N/A
	– cord clamped by metal screws not allowed		N/A
	– knots in cord not used		N/A
	– labyrinths, if clearly how, permitted		N/A
	Tests for type X with special cords, type Y, type Z	No power cord provided.	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
	– 25 pulls of 1 s		N/A
	– 1 min torque according to table 10		N/A
	– mass (kg); pull (N); torque (Nm)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– 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 \geq values specified in Cl. 26		N/A
22.9.6	Space for external cords or cable for fixed wiring and for type X and Y attachments:		N/A
	– before fitting cover, possibility to check correct connection and position of conductors		N/A
	– cover fitted without damage to supply cords		N/A
	– for portable transformers: contact with accessible metal parts if conductor becomes loose not allowed unless for type X and Y attachments terminations of cords do not slip free of conductor		N/A
	Space for external cords or cable for type X attachment and for connection to fixed wiring, in addition:		N/A
	– conductor easily introduced and connected		N/A
	– possibility of access to terminal for external conductor after removal of covers without special purpose tool		N/A

23	TERMINALS FOR EXTERNAL CONDUCTORS		P
23.1	Transformer for connection to fixed wiring and transformer without power supply cords with type Y and Z attachments: only connections by screws, nuts, terminals	Terminals are part of certified terminal block.	P
	Terminals are integral part of the transformer:	Not integral part of the transformer.	N/A
	– 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		P
	– used in accordance with their marking		N/A
	– checked according to IEC 60 999-1 under transformer conditions		N/A
	Transformer with type X attachments: soldered connection permitted if reliance not placed upon soldering, crimping or welding alone unless by barriers, creepage distances and clearances between hazardous live parts and metal parts should conductor break away $\geq 50\%$ of specified value (Cl. 26)	Not with X type attachment.	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Transformer with type Y and Z attachments for external conductors: soldered, welded, crimped, etc. connections allowed	Not with X type attachment.	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 14.2		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	Part of certified terminal blocks.	P
	– 10 times fastening and loosening a conductor with the largest cross-sectional area with 2/3 of the torque specified in Cl. 25		N/A
23.5	Terminals for fixed wiring and for type X: located near their associated terminals of different polarities and the earth terminal if any		P
23.6	Terminal blocks not accessible without the aid of a tool	Required to open a cover.	P
23.7	Transformer with type X attachments: stranded conductor test (8 mm removed):		N/A
	– Class I transformers: no connection between live parts and accessible metal parts		N/A
	– free wire of earth terminal: no touching of live parts		N/A
	– Class II transformers: no connection between live parts and accessible metal parts, no connection between live parts and metal parts separated from accessible metal parts by supplementary insulation		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
23.8	Terminals for a current > 25 A:	Current is not > 25A.	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:	Part of certified terminal block; not possible to screw loosen.	P
	– between terminal screws and accessible metal parts		P
	– between terminal screws and inaccessible metal parts for Class II transformers		P

24	PROVISION FOR PROTECTIVE EARTHING		P
24.1	Class I transformers: accessible conductive parts connected to earth terminal	Enclosure is PE.	P
	Class II transformers: no provision for earth		N/A
24.2	Protective earth terminal for connection to fixed wiring and for type X attachment transformers: comply with Cl. 23, adequately locked, not possible to loosen without a tool	Part of certified terminal block.	P
24.3	No risk of corrosion from contact between metal of earth terminal and other terminal		P
	In case of earth terminal body of Al, no risk of corrosion from contact between Cu and Al	Not of Al.	N/A
	Body of earth terminal or screws/nuts of brass or other metal resistant to corrosion		P
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	0.003 ohm measured.	P
24.5	Class I transformers with external flexible cables or cords:		P
	– current-carrying conductors becoming touch before the earth conductor		P

25	SCREWS AND CONNECTIONS		P
25.1	Screwed connections withstand mechanical stresses	Not used for contact pressure.	P
	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	Not used.	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		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:	Not in engagement with thread of insulating material.	N/A
	– length of engagement $\geq 3 \text{ mm} + 1/2$ screw diameter or 8 mm		N/A
	– correct introduction into screw hole		N/A
25.3	Electrical connections: contact pressure not transmitted through insulating material		P
25.4	In case of use of thread-forming (sheet metal) screws for connection of current-carrying parts: clamping and locking means provided	Not used for connection of current-carrying parts.	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	Not for current-carrying mechanical connections.	N/A
	Rivets for current-carrying connections subject to torsion locked against loosening		N/A
25.6	Test of screwed glands with a torque according table 12. After the test no damage at the transformer and the gland.		N/A

26	CREEPAGE DISTANCES AND CLEARANCES		P
26.1	Specified values according to:		P
	– table 13, material group IIIa		N/A
	– table C, material group II		P
	– table D, material group I		N/A
	1. Insulation between input and output circuits (basic insulation) values x 1,4:	Part of certified transformer, 5.3 mm measured across OC1.	P

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Clause	Requirement + Test	Result - Remark	Verdict
	a) measured values \geq specified values (mm) ..:		N/A
	2. (not applicable - (IEC 61558-2-2:2007))		N/A
	3. Insulation between adjacent input circuits values x 1,4: 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:	Part of certified terminal blocks.	P
	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 values x 1,4:		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
	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
	Creepage distances and clearances are measured:		N/A
	– for fixed wiring and type X attachments with max. and min. size		N/A
	– for type X with a special cord, Y or Z attachments with the supply cable as delivered		N/A
	– for layers of serrated tapes the values are so determined as if the serration coincided through the different layers		N/A
	– 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/A
	If the pollution generates high and persistent conductivity caused:		N/A
	– clearances of P3 increased with min. 1,6 mm		N/A
	– value X in Annex A increased with 4,0 mm		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
26.2	Creepage distances (cr) and clearances (cr)	CE Certified transformer.	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		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
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 μ s waveform) – see Annex R of IEC 61558-1		N/A
26.2.4	Enclosed parts, by impregnation or potting	Not potted.	N/A
26.2.4.1	– The requirements of reduced values as stated for pollution degree 1 (P1) are fulfilled		N/A
	– all isolating materials are classified acc. to IEC 60085 and IEC 60216		N/A

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

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Clause	Requirement + Test	Result - Remark	Verdict
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
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		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
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
27	RESISTANCE TO HEAT, FIRE AND TRACKING		P
27.1	Resistance to heat	CE certified transformer.	P
	All insulating parts are resistant to heat		N/A
	For parts of rubber, which passed the test of 19.9, no additional test is required.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The tests are not required for cables and small connectors with a rated current ≤ 3 A, a rated voltage ≤ 24 V a.c. or 60 V d.c. and a power ≤ 72 W		N/A
27.1.1	External accessible parts		N/A
	The Ball-pressure test -: diameter of impression ≤ 2 mm; heating cabinet temperature ($^{\circ}$ C) at 70° C or the temperature T of 14.2 (T + 15) - is fulfilled.		N/A
27.1.2	Internal parts		N/A
	For insulating material retaining current carrying parts in position , the ball-pressure test -: diameter of impression ≤ 2 mm; heating cabinet temperature ($^{\circ}$ C) at 125° C or the temperature T of 14.2 (T + 15) - is fulfilled		N/A
27.2	Resistance to abnormal heat under fault conditions		N/A
	Insulating material of transformers \geq IP20: no source of ignition for surroundings in case of abnormal heat or fire. Hazardous live parts shall not be accessible.		N/A
	Two special prepared specimens for the test in which short-circuit windings are built-in		N/A
27.2.1	Portable transformers are placed on a dull painted plywood support, as described in 14.2		N/A
	Stationary transformers fixed in the most unfavourable position on a dull painted support:		N/A
	– if this position for use is vertical or ceiling transformer and support 200 mm above a pinewood board with tissue paper		N/A
	Self-resettable devices are short-circuit		N/A
	Input circuits protected with 10 times rated current, min. 16 A (fuse)		N/A
	Test time for protective devices of the transformer without load:		N/A
	– max. 15 days, or		N/A
	– definitive interruption in the input circuit		N/A
	If non-self-resettable or replaceable protective devices are used the following cycle test is necessary:		N/A
	– non-self-resettable: 30 cycles with no load until interruption and 2 h cool down		N/A
	– replaceable protective device: 10 cycles with no load until interruption and 2 h cool down		N/A
	During the tests:		N/A
	– no flames occur		N/A
	– support temperature shall not exceed 125° C		N/A
	– no ignition of the tissue paper		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
27.2.2	After the tests:		N/A
	a) transformer with definitive interruption in the input circuit withstands the test with 35% of the values according to table 8a		N/A
	b) transformer with no definitive interruption withstands the test voltage (100%) according to table 8a of Cl. 18: hazardous live parts are not touchable by the stranded test finger		N/A
27.3	Resistance to fire		N/A
	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		N/A
27.3.1	External accessible parts (glow wire tests)		N/A
	– 650° C for enclosures		N/A
	– 650 ° C for parts retaining current carrying parts in position and terminals for external conductors Current $\leq 0,2$ A		N/A
	– 750° C for parts retaining current carrying parts in position and terminals for external conductors with fixed wiring. Current $> 0,2$ A		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
27.3.2	Internal parts		N/A
	– 550° C for internal insulating material – not retaining current carrying parts in position		N/A
	– 650° C for coil formers (bobbin)		N/A
	– 650 ° C for parts retaining current carrying parts in position and terminals for external conductors . Current $\leq 0,2$ A		N/A
	– 750° C for parts retaining current carrying parts in position and terminals for external conductors with fixed wiring. Current $> 0,2$ A		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
28	RESISTANCE TO RUSTING		N/A
	Ferrous parts protected against rusting		N/A

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Clause	Requirement + Test	Result – Remark	Verdict

E	ANNEX E , GLOW WIRE TEST		N/A
	The test is required according to IEC 60695-2-10 and IEC 60695-2-11 with the following additions:		N/A
E.1	Clause 6, “Severities” of IEC 6095-2-11, apply with the temperature stated in 27.3 of IEC 61558-1		N/A
E2	Clause 8, “Conditioning”, of IEC 60695-2-11 apply, preconditioning is required		N/A
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

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.	None.	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 (EN 61558-1)		N/A
H1	General notes on tests (addition to clause 5)		N/A
			N/A
H.2	SHORT-CIRCUIT AND OVERLOAD PROTECTION (ADDITION TO CLAUSE 15)		N/A
H..2.1	Circuits designed and applied so that fault conditions do not render the appliance unsafe	Primary and secondary circuit of power supply is protected by certified circuit breakers.	N/A
	During and after each test:		N/A
	– temperatures do not exceed values specified in table 3 of Cl. 15.1		N/A
	– transformer complies with conditions specified in sub-clause 15.1		N/A
	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:	Low power circuit is separated by certified transformer.	N/A
	– electronic circuit is a low-power circuit as specified		N/A
	– safety of the appliance as specified does not rely on correct functioning of the electronic circuit		N/A

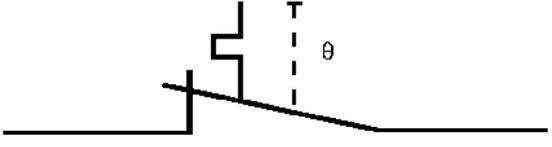
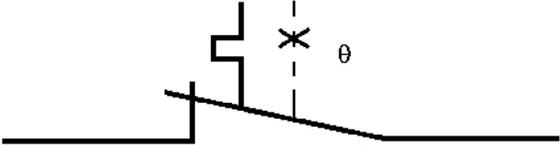
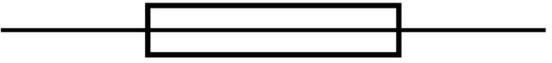
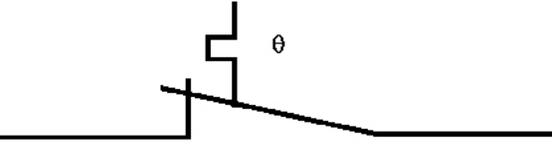
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Clause	Requirement + Test	Result – Remark	Verdict
H.2.3	Fault conditions tested as specified when relevant:		N/A
	a) short-circuit of creepage distances and clearances, if less than specified in Cl. 26		N/A
	b) open circuit at the terminals of any component		N/A
	c) short-circuit of capacitors, unless they comply with IEC 60 384-14		N/A
	d) short-circuit of any two terminals of an electronic component as specified		N/A
	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		N/A
	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		P
H.3.1	For live parts separated by basic insulation smaller cr and cl as in 26 are allowed, if H2 is fulfilled.	None.	N/A
	In optocouplers no requirements of cr and cl	Certified optocoupler used.	P
	For coatings annex W applies. Smaller distances as required in IEC 60664-3, clause 4 are applicable,		N/A
	For potted transformers cycling tests acc, 26.2. are applicable		N/A
H.3.2	The ma. surface temperature of optocouplers is 50 K		N/A

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Clause	Requirement + Test	Result – Remark	Verdict
K	ANNEX K, INSULATED WINDING WIRES FOR USE AS MULTIPLE LAYER INSULATION		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
U	ANNEX U – INFORMATIVE – OPTIONAL TW – MARKING FOR TRANSFORMERS		
	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.		

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Clause	Requirement + Test	Result – Remark	Verdict
U1	General notes and tests		
	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
	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

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Clause	Requirement + Test	Result – Remark	Verdict
	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 ₂ at temperature T ₂ according to U4		N/A
	Test 2, based on clause U.5.1 but at a calculated room temperature T ₂ (for 120 days). The test time with T ₂ exceeds L ₂ .		N/A
	If all transformers fail before L ₂ , the result is negative.		N/A

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

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Clause	Requirement + Test	Result – Remark	Verdict

11 and 12	TABLE: OUTPUT VOLTAGE AND OUTPUT CURRENT UNDER LOAD; NO-LOAD OUTPUT VOLTAGE					P
Clause	11			12		
type/rated output/	rated voltage (V)	sec. voltage (V)	delta Usec (%)	Usec V no-load output	delta Usec no-load output %	further information
Output	230	24.0	--	25.5	--	
	120	24.2	--	25.6	--	
Supplementary Information:						

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Clause	Requirement + Test	Result – Remark	Verdict

14	TABLE: HEATING						P
type/rated output	r-cold Ω	r-warm Ω	temp. $^{\circ}\text{C}$	ext. encl. $^{\circ}\text{C}$	support $^{\circ}\text{C}$	Int. + ext. wire	further information
24Vac	--	--	117 on transformer windings	61.5	--	82.6	See supplement ary information

Supplementary information: EPI-LX-1500W-230V, 50/60Hz unit considered as worse case. Unit is rated for 20.8A of each output of the transformer. There are three transformers in parallel to gain 1500W (each rated 500W). Unit tested with 80% capacity (16.6A, total 49.9A) of the rated output load (20.8A, total 60A) Output of the unit loaded to 80% capacity of the rated load @ 25°C.

CI. 14: TABLE: temperature measurements:						
#	LOCATION	264V~, 50Hz	207V~, 50Hz			Allowed temperat ure
	Test durations	6.5 hrs	1.15 hrs			
1	Input Power Connector	53.3	52.4			105
2	Input Power CB	64.6	63.6			85
3	Input Circuit Board	57.7	56.8			105
4	Input Internal Wiring	76.1	74.8			105
5	Low X-former Coil	101.2	99.2			120
6	Medium X-former Coil	111.8	109.2			120
7	High X-former Coil	117.5	114.3			120
8	Secondary Wiring TOP X-former	105.0	102.6			105
9	Secondary CB	73.7	73.0			85
10	Control Circuit Board Surface	88.0	84.7			105
11	Control Circuit Board X-former	92.8	86.6			120
12	Enclosure Top	54.6	53.7			65
13	Enclosure Front	61.5	60.2			65
14	Ambient	25.0	25.0			105
<p>Comment:</p> <p>EPI-LX-1500W-230V, 50/60Hz unit considered as worse case, which provided with interface and control board. Unit is rated for 20.8A of each output of the transformer. There are three transformers in parallel to gain 1500W (each rated 500W). Unit tested with 80% capacity (16.4A, total 49.9A) of the rated output load (20.8A, total 60A) Output of the unit loaded to 80% capacity of the rated load.</p> <p>Tested on 2010-05-06 to 07, equipments ID: 211204, 211807, 211738, 211602, 211603, 211576, 215131, 211508, 211109, 211212, 213090, A003-217</p>						

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Clause	Requirement + Test	Result – Remark	Verdict

15	TABLE: SHORT-CIRCUIT AND OVERLOAD PROTECTION							P
	ambient temperature (°C)							
type/rated output	r-cold Ω	r-warm Ω	temp. °C	ext. encl. °C	support °C	Int. + ext. wire	further information	
Supplementary information: During short circuit and overload test output circuit breaker opened. Tested on 2010-04-28, 29; Equipments used: 211212, 211807, 215131, 211576, 211204, 211697, 211603, A003-217								

26.2 TEST A	TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION					N/A
	Test with three special prepared specimens with uninsulated wires, without potting or impregnation					
	cycles with 2 x working voltage between pri / sec	68 h at the temperature acc. Cl. 14 (min. 85 °C)	1 hour 25 °C	2 hour 0 °C	1 hour 25 °C	
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						

EN 61558-2-2					
Clause	Requirement + Test	Result – Remark			Verdict
26.2 TEST B	TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION				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
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					

26.2 TEST C	TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION				N/A
	Test with three specially prepared specimens with potting (only dti is required)				
	cycles with 2 x working voltage between pri / sec	68 h at the temperature acc. Cl. 14 (min. 85 °C)	1 hour 25 °C	2 hour 0 °C	1 hour 25 °C
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					

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Clause	Requirement + Test	Result – Remark	Verdict

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

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 removed for test														
tw														
S														
Objective test duration (days)														
Theoretical test temperature														
Sample	1		2		3		4		5		6		7	
Winding	PRI	SEC	PRI	SEC	PRI	SEC	PRI	SEC	PRI	SEC	PRI	SEC	PRI	SEC
Start – Rk														
After 4 h – Rw														
After 4 h – winding temperature														
After 4 h - oven temperature														
After 24 h – Rw														
After 24 h – winding temperature														
After 24 h - oven temperature														
Final test period (days)														
Output voltage (11.1) under load														
Insulating resistance														
High voltage test (35% of the values in Table 8.a														

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 removed for test														
tw														
S														
Objective test duration (days)														
Theoretical test temperature														
Sample	1		2		3		4		5		6		7	
Winding	PRI	SEC	PRI	SEC	PRI	SEC	PRI	SEC	PRI	SEC	PRI	SEC	PRI	SEC
Start – Rk														
After 4 h – Rw														
After 4 h – winding temperature														
After 4 h - oven temperature														
After 24 h – Rw														
After 24 h – winding temperature														
After 24 h - oven temperature														
Final test period (days)														
Output voltage (11.1) under load														
Insulating resistance														
High voltage test (35% of the values in Table 8.a														

	ANNEX 1: components	
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object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of con- formity
Metal enclosures for EPI-LX series	Electro Plastics or equivalent	Various	Aluminum, 3.3 mm thick, 500 W enclosure meas- ured 280x160x88mm, 1000W enclo- sure measured 435x160x88mm and 1500W en- closure meas- ured 584x160x88mm	EN 61558-1, - 2-2	Part of this evaluation.
Metal enclosures for EPI-LX-R se- ries	Electro Plastics or equivalent	Various	Aluminum, 3.3 mm thick, 500 W enclosure meas- ured 360x160x88mm, 1000W enclo- sure measured 470x160x88mm and 1500W en- closure meas- ured 720x160x88mm	EN 61558-1, - 2-2	Part of this evaluation.
Toroidal Trans- former (3 max)	Tortran Inc	Series/S 500- 9361643	Rated Pri 0- 117V, Sec 0- 24V/20.8A, 60Hz, Class B	UL 506 / EN 61558-1	cURus, CE
Toroidal Trans- former (3 max)	Tortran Inc	Series/S 500- 9366857	Rated Pri 0- 230V, Sec 0- 24V/20.8A, 50/60Hz, Class B	UL 506 / EN 61558-1	cURus, CE
Toroidal Trans- former (3 max)	Tortran Inc	Series/S TD500/208- 124-9361643 439	Rated Pri 0- 208V, Sec 0- 24V/20.8A, 60Hz, Class B	UL 506 / EN 61558-1	cURus, CE
Secondary circuit breakers	Snap Action Inc	MB1 series	Rated 25A / 250Vac / 32Vdc	ANSI/UL 1077, IEC 934	VDE, TUV, SEMKO, UR, CSA
Primary circuit breakers	Snap Action Inc	MB1 series	Rated 5A, 10A, 15A or 20A / 250Vac / 32Vdc	ANSI/UL 1077, IEC 934	VDE, TUV, SEMKO, UR, CSA
(4x) Sanp Bushing	Richco, Inc or equivalent	PGSB-4-X 06 & 4-07	Rated 94 V-2, Open type	UL 94	UR
Varistor Z1	Epcos or equivalent	Series S10, S10K250	Rated 250Vrms, 300Vdc, 8000 imax (8/20us)	UL 94, IEC 60068-1	VDE, CSA, UL, SEV
Terminal block J9-J11 on inter- face board, J1 and J3 on control board	Molex or equivalent	39380 series, 0393800103	Three conductor, rated 300V/30A, 110°C, 10- 30AWG, housing UL 94V-0	UL 94, UL 1977, IEC 61810	cURus

Terminal block J12-J20 on interface board, J2 on the control board	Molex or equivalent	39380 series, 0393800102	Two conductor, rated 300V/30A, 110°C, 10-30AWG, housing UL 94V-0	UL 94, UL 1977, IEC 61810	UR
Terminal block J5 on the control board	Molex or equivalent	39544 series, 0395443003	Two conductor, rated 300V/15A, 105°C, 22-12 AWG	UL 94, UL 1977, IEC 61810	UR
Terminal block J4 on the control board	Molex or equivalent	39544 series, 0395443003	Two conductor, rated 300V/15A, 105°C, 22-12 AWG	UL 94, UL 1977, IEC 61810	UR
PWB	Siemens Mfg. Co., Inc. Or equivalent	Various	V-0 rated, 105°C	UL 94	UR
Transformer T1 on control board	Triad Magnet	FS24-100	Rated 115/230Vac, 50/60Hz, 24V@0.1A in series, 12V@0.2A, Class B insulation system	UL 506 / EN 61558-1	cURus, CE
Optocoupler OC1 on control board	Fairchild Semiconductor or equivalent	MOC3052M	Rated Viso 7500Vac, 85°C	IEC 60747-5-2, IEC 60950-1, UL 1577	VDE, FIMKO, cURus
(5x) Vent plugs	Heyco or equivalent	3152 / VPT-875	Rated 94V-2, max temp 105°C	UL514A or B or D	UR, CSA

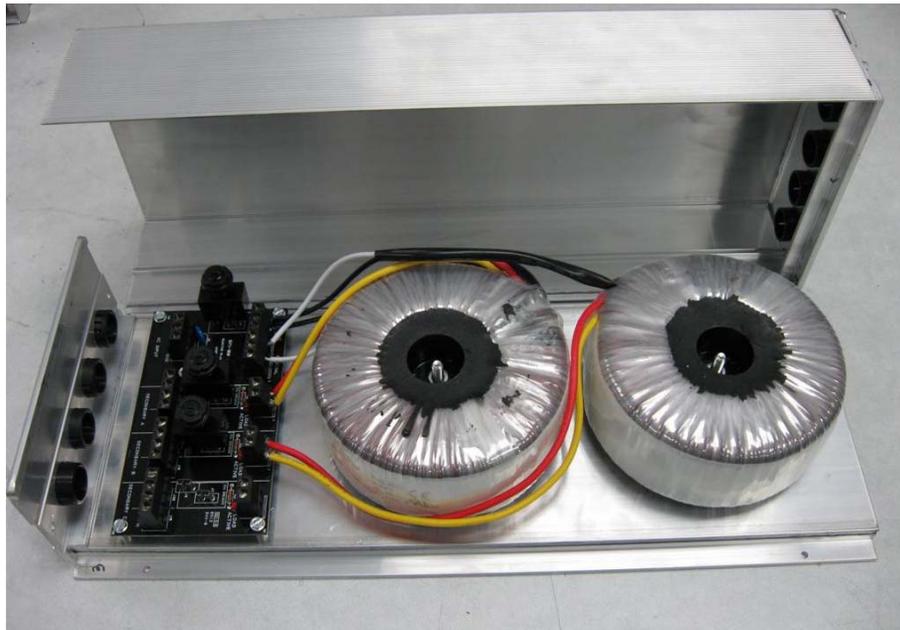
ANNEX 2: Photographs

Over all view of EPI-LX series:

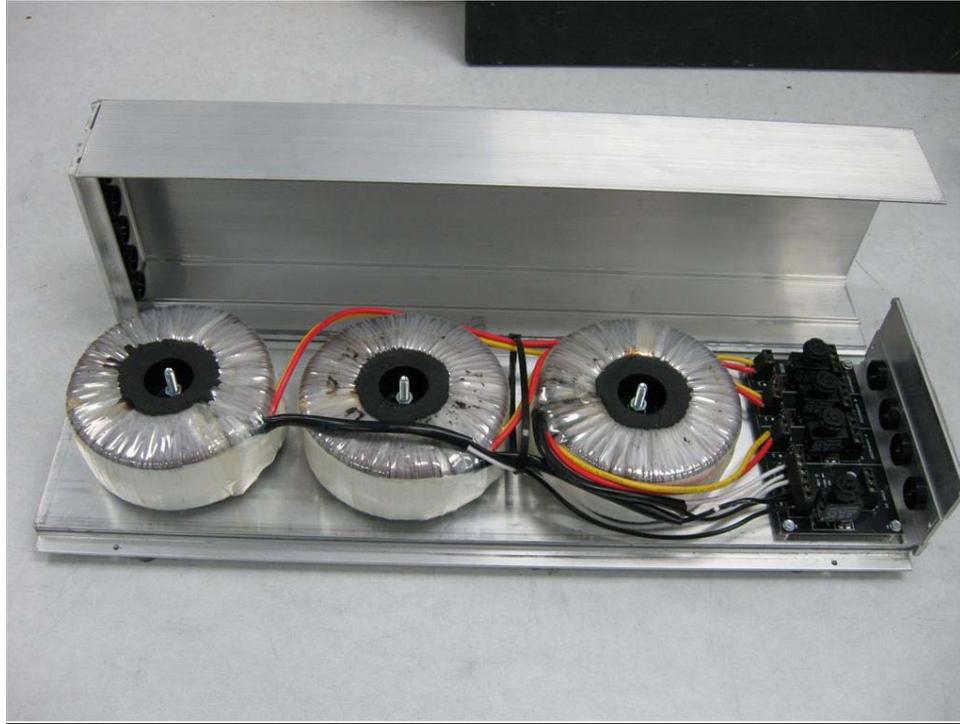
EPI-LX-500W



EPI-LX-1000W



EPI-LX-1500W



EPI-LX-R series:

EPI-LX-R-500



EPI-LX-R-1000W



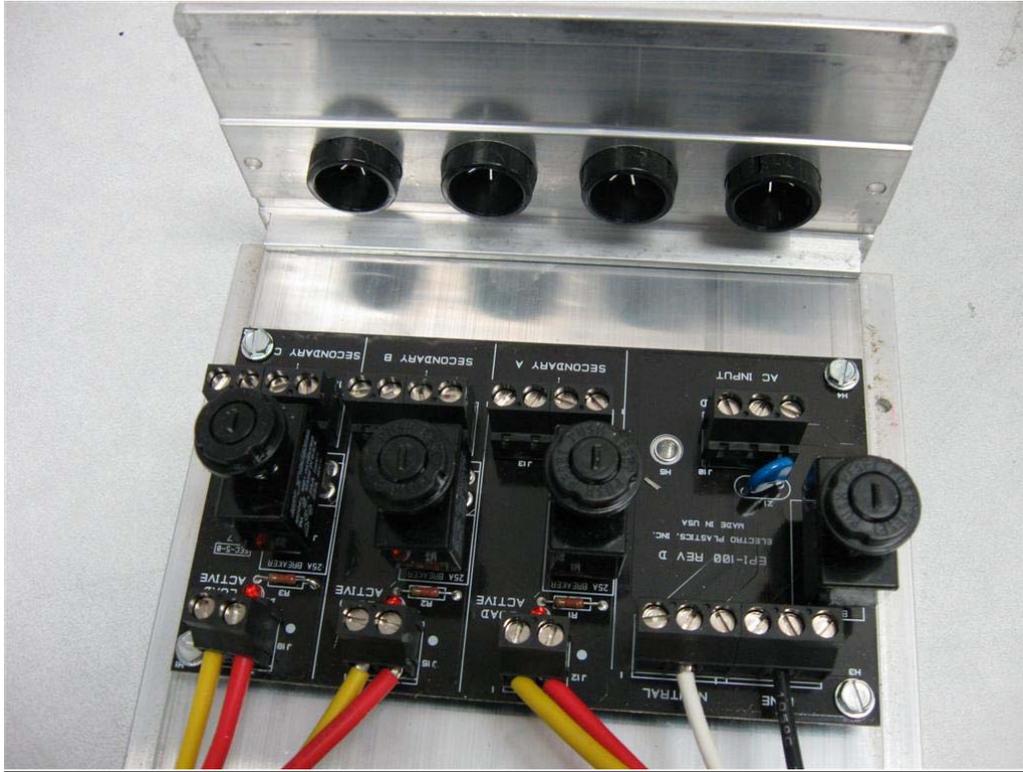
EPI-LX-R-1500W



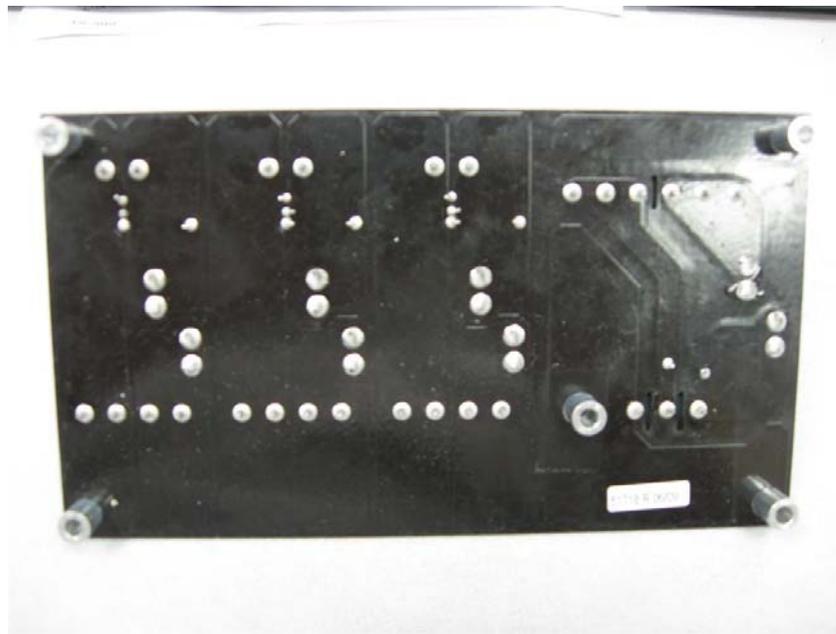
Top cover plates



Interface board top :



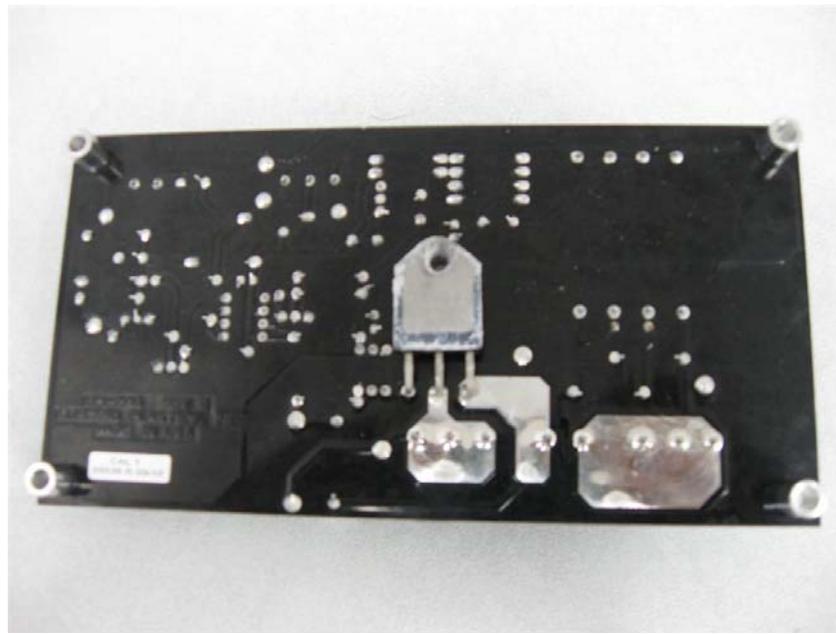
Interface board bottom :



Controller board top

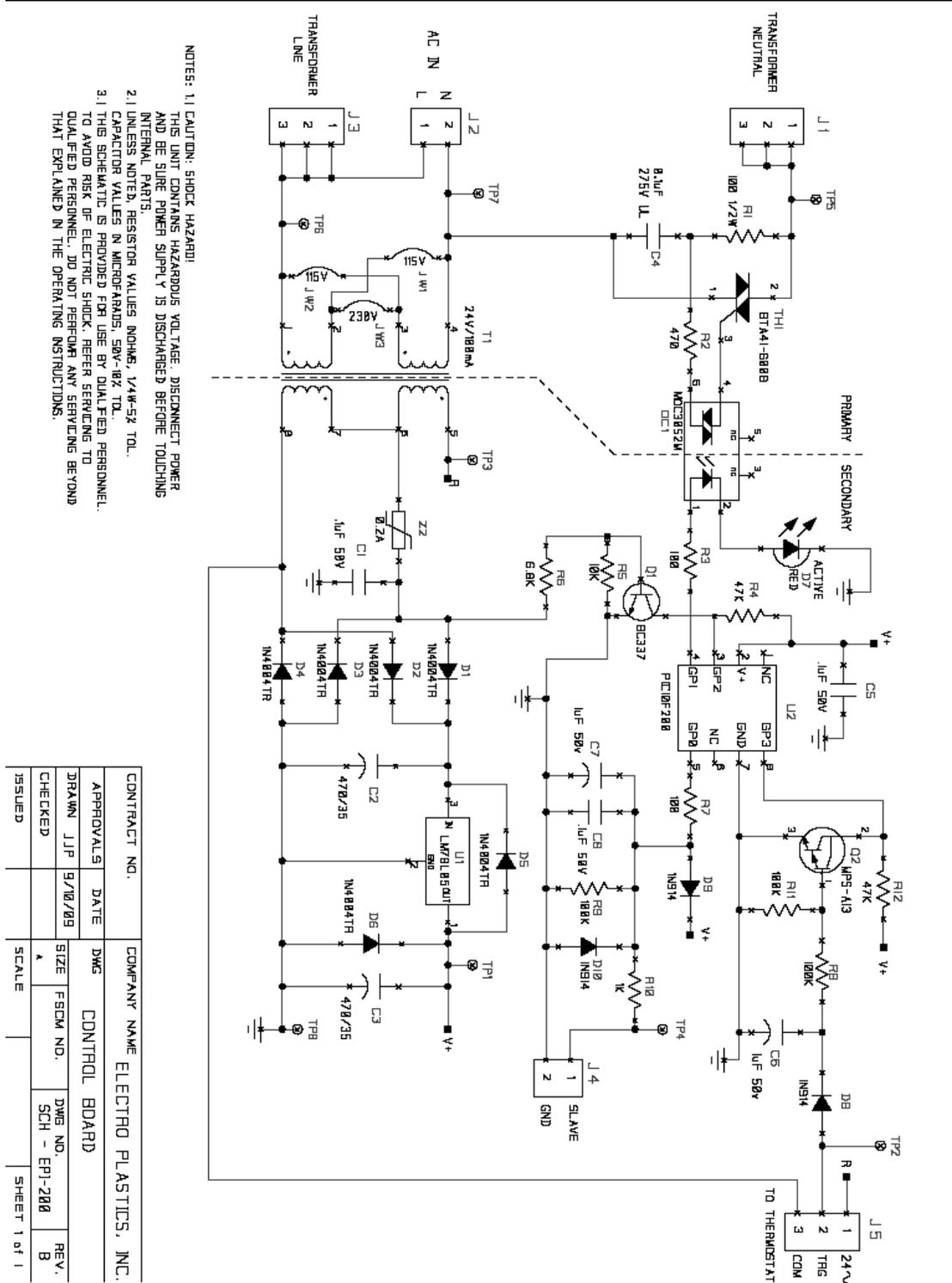


Controller board bottom

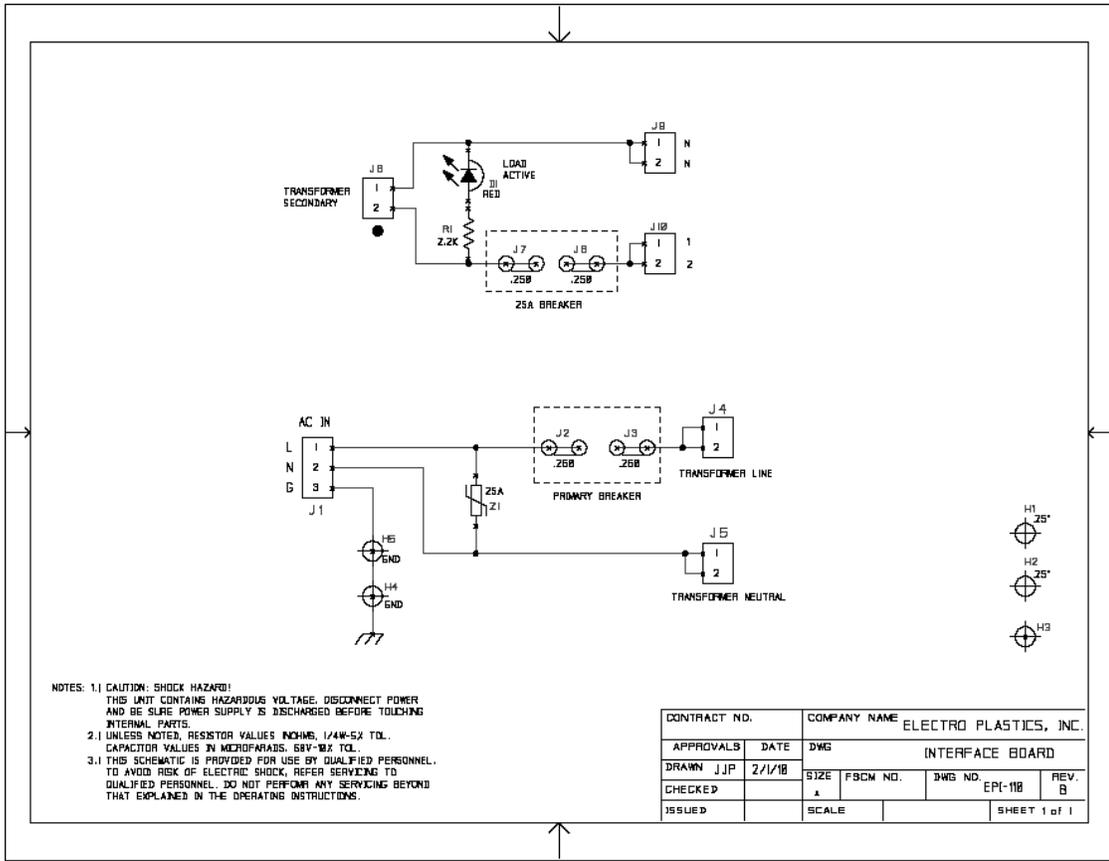


ANNEX 3: Schematics_Artwork

Controller board schematics only for EPI-LX-R series:



Interface board schematic:



NOTES: 1.1 CAUTION: SHOCK HAZARD!
 THIS UNIT CONTAINS HAZARDOUS VOLTAGE. DISCONNECT POWER AND BE SURE POWER SUPPLY IS DISCHARGED BEFORE TOUCHING INTERNAL PARTS.
 2.1 UNLESS NOTED, RESISTOR VALUES IN OHMS, 1/4W-5% TOL. CAPACITOR VALUES IN MICROFARADS, 50V-10% TOL.
 3.1 THIS SCHEMATIC IS PROVIDED FOR USE BY QUALIFIED PERSONNEL. TO AVOID RISK OF ELECTRIC SHOCK, REFER SERVICING TO QUALIFIED PERSONNEL. DO NOT PERFORM ANY SERVICING BEYOND THAT EXPLAINED IN THE OPERATING INSTRUCTIONS.

CONTRACT NO.		COMPANY NAME: ELECTRO PLASTICS, INC.			
APPROVALS	DATE	DWG. INTERFACE BOARD			
DRAWN JJP	2/1/10	SIZE	FSCM NO.	DWG NO. EPI-110	REV. B
CHECKED		4			
ISSUED		SCALE			SHEET 1 of 1