Test Report

EN 61558-1

Safety of power transformers, power supplies, reactors and similar products – Part 1: General requirements and tests

Report reference No.	:	IL170107558
Date of issue	:	Jun.05, 2017
Reported by	:	Alan Huang (signature)
Reviewed by	:	Daniel Lin (signature)
Testing laboratory	:	Integrity EnE Lab Inc.
Address	:	12F, No.27-1, Ln. 169, Kangning St., Xizhi Dist., New Taipei City 221, Taiwan. (R.O.C.)
Applicant:		
Name	:	WATT ELECTRIC TECH CO., LTD.
Address	:	1F, NO. 492-8, Sec.1, Wanshou Rd., Guishan Dist., Taoyuan City 33350, Taiwan(R.O.C.)
Manufacturer:		
Name	:	WATT ELECTRIC TECH CO., LTD.
Address	:	1F, NO. 492-8, Sec.1, Wanshou Rd., Guishan Dist., Taoyuan City 33350, Taiwan(R.O.C.)
Test item:		
Product	:	THYRISTOR POWER REGULATOR
Trademark	:	WATT
Model and/or type reference	:	W7S4V100-21KF
Rating(s)	:	1~, 180-480 VAC, 45-65 Hz, 100 A
Classification of equipment	:	Class I
Series No.	:	W7SXVXXX-XXXXXXX
Testing:		
Date of receipt of test item	:	Jan.20, 2017
Date(s) of performance of test	:	Jan.20, 2017 - Jun.05, 2017
Tested according to	:	EN 61558-1:2005 +A1:2009
Conclusion	:	The Equipment Under Test (E.U.T.) is considered as ☐ Meeting specification ☑ Meeting specification with alterations And hence fulfills the requirements specified in Low Voltage Directive 2014/35/EU

Test case verdicts:

Test item does meet the requirement-------- : P(ass)

Test item does not meet the requirement--- : F(ail)

Test case does not apply to the test object-- : N/A

General remarks:

"(see remark #)" refers to a remark appended to the report.

"(see appended table #)" refers to a table appended to the report.

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The test results presented in this report relate only to the main item(s) tested of Model W7S4V100-21KF, we followed manufacturer's declaration and listed the serial model no. in the test report and verification.

The manufacturer declares that the series products share the identical circuit design with the main test sample. Model W7S4V100-21KF has highest total wattage of THYRISTOR POWER REGULATOR, different rating power.

The E.U.T. is intended to be installed in equipment or a metal enclosure with provided protective earthing connection and hence the E.U.T. is not accessible after installation.

All accessible metal parts earthed as intended

Marking label:

List of corrective actions for non-conformance items

1. Marking and instruction shall comply with Report Clause 8.
2. EUT shall marked rated power factor.
3. Creepage distance between primary winding and secondary winding of transformer shall be kept 4.4 mm at least.
4. Creepage distance between primary layout trace and secondary layout trace of PCB "WT-7MS2" shall be kept 4.4 mm at least.
   JF connector pin 1, 5 (AC INPUT 220V) and pin 3,4 (TH / NTC)
   JR connector pin 2 (AC INPUT 480V) and pin 4 (secondary circuit)
5. Creepage distance between primary layout trace (near R58) and screw (metal enclosure) of PCB "WT-7MS2" shall be kept 7.6 mm at least.
6. Creepage distance between primary layout trace (near R54) and secondary layout trace (near T1) of PCB "WT-7MS2" shall be kept 9.6 mm at least.
7. Distances through insulation thickness of transformer bobbin shall have 1.0 mm at least.
8. The equipment shall be withstood 3454VAC electric strength test between primary circuits and SELV on PCB "WT-7MS2".
9. The equipment shall be withstood 3454VAC electric strength test between primary winding and secondary winding of transformer.
10. Overcurrent protected of R45 shall employ approved type.
11. Capacitor C20 shall employ X2 type.

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Clause	**Requirement - Test**	**Result-Remark**	**Verdict**
6	**Ratings**		-
	Rating are indicated in the relevant different types of transformers.		N/A
7	**Classification**		-
7.1	Transformer are classified: According to their protection against electric shock		-
	- class I transformers		P
	- class II transformers		N/A
	- class III transformers		N/A
7.2	According to short-circuit protection		-
	- inherently short-circuit proof transformers		N/A
	- non-inherently short-circuit proof transformers		P
	- non-short-circuit proof transformers		N/A
	- fail-safe transformers		N/A
7.3	According to IEC 60529 IP system	IPX0	N/A
7.4	According to their mobility		-
	- stationary transformers		N/A
	- fixed transformers		P
	- portable transformers		N/A
	- hand-held transformers		N/A
7.5	According to operation		-
	- continuous operation		P
	- short-time operation		N/A
	- intermittent operation		N/A
7.6	According to the intended use:		-
7.6.1	Associated		N/A
	- incorporated		N/A
	- for specific use		N/A
7.6.2	Independent		P
7.7	Optionally (only for t_w marked transformers)		N/A
7.8	According to the environmental conditions where they are intended to be used:		-
	- normal environment		P
	- special environments		N/A

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Clause	**Requirement - Test**	**Result-Remark**	**Verdict**
8	**Marking and other information**		-
8.1	Transformers shall be marked with:		-
	a) rated supply voltage	180-480 VAC	P
	b) rated output voltage	180-480 VAC	P
	c) rated output in volt-amperes		N/A
	d) rated output current	100 A	P
	e) rated frequency	45 – 65 Hz	P
	f) rated power factor; above 25VA		F
	g) symbol or abbreviation DC for DC output current		N/A
	h) symbol indicating the kind		N/A
	i) trade mark of the manufacturer	WATT ELECTRIC TECH CO., LTD.	P
	j) model or type reference	W7S4V100-21KF	P
	k) vector group for three-phase		N/A
	l) symbol for class II		N/A
	m) symbol for class III		N/A
	n) indication of index IP	Not required	N/A
	o) rated maximum ambient temperature t_a, if other than 25℃		N/A
	p) rated minimum ambient temperature t_{amin}, if lower than +10℃		N/A
	q) duty cycls		N/A
	r) declared values of the rated maximum operating temperature of the winding		N/A
	s) transformers to be used with forced air cooling where the fan is not a part		N/A
	t) In addition, the manufacturer shall be prepared to provide the purchaser		N/A
8.2	Index IP00, or associated transformers, may be marked with only the name		N/A
8.3	If the transformer can be adjusted to suit different rated supply voltages		N/A
8.4	Transformer with tapped or multiple output windings		N/A

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Clause	**Requirement - Test**	**Result-Remark**	**Verdict**
8.5	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	Shall be marked fuse rating	F
	Manufacturer's model or type reference and rating of the device for non-inherently short-circuit proof transformers with incorporated replaceable protective device		F
	When replaceable protective devices other than fuses are used, appropriate information about their replacement shall be provided in an instruction sheet or the equivalent accompanying the transformer.		N/A
8.6	Terminals intended exclusively for the neutral conductor shall be indicated by the symbol		F
	Earthing terminals shall be indicated by the symbol		P
	Terminals of input and output windings shall be clearly identified	SOURCE / LOAD	P
8.7	Transformers shall be provided with markings indication connection		F
8.8	The instruction sheet shall contain		-
	- for type X attachments having a specially prepared cord		N/A
	- for type Y attachments		N/A
	- for type Z attachments		N/A
8.9	Symbol for indoor use only or the wording: " for indoor use only".		F
8.10	Class II symbol is not confused with other identification		N/A
8.11	When symbols are used on equipment or in instructions they shall be as follows:		P
8.12	The different positions of switches shall be indicated by figures, letters		N/A
8.13	Marking shall not be placed on screws or easily removable parts		P
8.14	If it is necessary to take special precautions for installation		P
8.15	Marking shall be durable and easily legible		P

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Clause	**Requirement - Test**	**Result-Remark**	**Verdict**
9	**Protection against electric shock**		-
	Transformers shall provide constructed protection against contact with hazardous live parts	The unit is intended to be installed in a equipment. The accessibility of hazardous live parts is to be prevented in the final system.	P
9.1	Protection against contact with hazardous live parts		-
9.1.1	Determination of hazardous live parts		-
	A live part is not a hazardous live part if it is separated from the supply by double or reinforced insulation		N/A
9.1.1.1	The voltage does not exceed 35V (peak) a.c. or 60 V d.c.		N/A
9.1.1.2	Where the voltage exceeds 35 V (peak) a.c. or 60 V ripple free d.c., the touch-current shall not exceed:		-
	– for a.c.: 0,7 mA (peak)		N/A
	– for d.c.: 2,0 mA.		N/A
9.1.1.2.1	The discharge shall not exceed 45μC for stored voltages between 60 V and 15kV		N/A
9.1.1.2.1	The energy of discharge shall not exceed 350 mJ for stored voltages exceeding 15 kV.		N/A
9.1.2	Accessibility to hazardous live parts		-
	Transformers shall be constructed to provide adequate protection against accessibility to hazardous live parts.	The unit is intended to be installed in a equipment. The accessibility of hazardous live parts is to be prevented in the final system.	N/A
	The test finger and the test pin are applied, without appreciable force, in every possible position.		N/A
	It shall not be possible to touch bare hazardous live parts or hazardous live parts protected only by lacquer, enamel, paper, cotton, oxide film or sealing compound,		N/A
	It shall not be possible to touch bare hazardous live parts with the test pin.		N/A
9.1.3	Accessibility to non hazardous live parts		-

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Clause	**Requirement - Test**	**Result-Remark**	**Verdict**
	Non hazardous live parts of the output circuit isolated from the input circuit by double or reinforced insulation may be accessible under the following conditions:	The unit is intended to be installed in a equipment. The accessibility of hazardous live parts is to be prevented in the final system.	N/A
	– for no-load output voltages not exceeding 35 V peak a.c. or 60 V ripple-free d.c., both poles may be accessible		N/A
	– for no-load output voltages exceeding 35 V peak a.c. or 60 V ripple-free d.c. and not exceeding 250 V a.c., only one of the poles may be accessible.		N/A
9.2	Protection against hazardous electrical discharge		-
	For transformers with a primary supply plug, the pins of the plug shall not be hazardous live measured 1s after withdrawal of the plug.		N/A
	For transformers without a primary supply plug, the terminals provided for connecting the transformer to the supply source shall not be hazardous live measured 5 s after disconnection of the supply source.	Primary not connected capacitor	N/A
10	**Change of input voltage setting**		-
	Transformers with more than one rated supply voltage shall be so constructed that the voltage setting	Not required setting different rated voltage.	N/A
	Plug connected transformers provided with a device to select the input connections		N/A
	Plug connected safety isolating transformers shall have only one rated supply voltage		N/A
11	**Output voltage and output current under load**		-
11.1	When the transformer is loaded the output voltage shall not differ by more than		P
	a) 10 % for the output voltage of inherently short-circuit proof transformers with one output		N/A

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Clause	**Requirement - Test**	**Result-Remark**	**Verdict**
	b) 10 % for the highest output voltage of inherently short-circuit proof transformer with more than one output		N/A
	c) 15 % for the other output voltages of inherently short-circuit proof transformer with more than one output		N/A
	d) 5 % for the output voltage of other transformer		P
11.2	If a transformer is marked with rated output,, rated output voltage, rated output current and rated power factor, these values shall be substantially in agreement with each other		P
12	**No-load output voltage**		-
	The relevant specifications are given in the parts 2		N/A
13	**Short-circuit voltage**		-
	If there is a marking for short-circuit voltage		N/A
14	**Heating**		-
14.1	General requirements		-
	Transformers and their supports shall not attain excessive temperature		P
	The test and the measurements are made in a draught-free location having dimensions such that the test results are not influenced		P
	Portable transformers are placed on a dull black painted plywood support.		N/A
	Stationary transformers are mounted as in normal use, on a dull black painted plywood support.		P
	Transformers provided with integral pins are tested in a flush-mounted socket-outlet		N/A
	Transformers with a protection index other than IP00 are tested in their enclosure.		P
	Transformers with a protection index IP00,		N/A
	Transformers with terminals shall have the connections subjected to a pull of 5 N before the heating test		P

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Clause	**Requirement - Test**		**Result-Remark**	**Verdict**
	Transformers are connected to rated supply voltage and loaded then the supply voltage is increased by 10%			P
	The test is repeated under no-load condition if this is a more unfavourable situation			N/A
	Associated transformers are operated under normal use			N/A
	During the test, the temperature shall not exceed the values			P
	Windings			-
	- of class A material	100℃		N/A
	- of class E material	115℃		N/A
	- of class B material	120℃	85.6 (winding)	P
	- of class F material	140℃		N/A
	- of class H material	165℃		N/A
	External enclosures of stationary transformers			-
	- metal	70℃	40.8 (Enclosure)	P
	- other material	80℃	35.4 (panel)	P
	External enclosures of portable transformers:			-
	- in normal use, there parts are continuously held			N/A
	• metal	55℃		N/A
	• other material	75℃		N/A
	- in normal use, there parts are not continuously held			N/A
	• metal	60℃		N/A
	• other material	80℃		N/A
	Terminals for external conductors and terminals of switches	70℃	34.2 (Input terminal block)	P
	Insulation of internal and external wiring			-
	- of rubber	65℃		N/A
	- of polyvinyl chloride	70℃	58.3 (Internal wire)	P
	Part of polyvinyl chloride and plastic material	65℃ PPHOX（95）		N/A
	Support	85℃	36.5	P
	Printed boards			-
	- bonded with phenol-formaldehyde	105℃ （130℃）	92.8 (PCB near Q6)	P

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Clause	**Requirement - Test**				**Result-Remark**	**Verdict**
	- bonded with epoxy	140℃				N/A
	Immediately after the test, the specimen shall withstand a dielectric strength test between input and output circuits					P
14.2	Application of 14.1 or 14.3 according to the insulation system					-
14.2.1	If the manufacturer has stated which class of insulation system				Class B	P
14.2.2	If the manufacturer has not stated which class of insulation system					N/A
14.2.3	If the manufacturer has not stated which class of insulation system has been used and the measured temperature of the winding exceeds the value given in Table 1 for class A insulation system					N/A
14.3	Accelerated ageing test for undeclared class of insulation system					-
	When applicable the live parts of the transformer are subjected to the following cycling test				Per 14.2.3	N/A
14.3.1	Heat run					N/A
	Depending on the type of insulation, the specimens are kept in a heating cabinet					N/A
14.3.2	Vibration test					N/A
	Specimens are fastened in their normal position of use of to the vibration generator					N/A
14.3.3	Moisture treatment					N/A
	The specimens are submitted for two days to a moisture treatment according to 17.2					N/A
14.3.4	Measurements					N/A
	After the cycle, the insulation resistance and dielectric strength test					N/A
15	**Short circuit and overload protection**					-
15.1	General					-
	Transformers shall not become unsafe due to short circuits and overloads					P
	For the tests of 15.2, 15.3 and 15.4, the temperatures shall not exceed table 3					P
	Insulation classification	A	E	B		-

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Clause	**Requirement - Test**				**Result-Remark**	**Verdict**
		Maximum temperature ℃				-
	Winding protected inherently	150	165	175		N/A
	Winding protected by protective device					-
	- during the time T	200	215	225	160 (winding)	P
	External enclosures	105			69.9	P
	Rubber insulation of wiring	85				N/A
	PVC insulation	85			85	P
	Supports	105			70	P
	During the test, the transformer shall not emit flames					P
	During and after all the tests the transformer shall comply with clause 9					P
	After the test, the insulation shall withstand the dielectric strength test in 18.3					F
15.2	Inherently short-circuit proof transformers					-
	Inherently short-circuit proof transformers are tested by short-circuiting the output windings until steady-state conditions are reached.					N/A
15.3	Non-inherently short-circuit proof transformers					-
15.3.1	Output terminals short-circuited: protection device operates					P
15.3.2	If protected by a fuse according to IEC 60269-2 or IEC 60269-3 or a technically equivalent fuse, transformer is loaded with time T and a current equal to k times values according to table 4.					P
15.3.3	If protected by a fuse according to IEC 127 or ISO 8820 or a technically equivalent fuse, transformer is loaded for the longest pre-arcing time with the redundant current as specified in the standard sheet					N/A
15.3.4	If protected by a circuit-breaker according to IEC 898 the transformer is loaded with a current equal to 1.45 times the value of the circuit-breaker					N/A
15.3.5	If other overload protection than a fuse or a circuit-breaker test with 0.95 times of operating current					N/A
15.4	Non-short-circuit proof transformer					-

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Clause	**Requirement - Test**	**Result-Remark**	**Verdict**
	Non-short-circuit proof transformers are tested as indicated in 15.3.		N/A
	The correct protective device specified by the manufacture is fitted to the relevant input or output circuit.		N/A
15.5	Fail-safe transformers		-
15.5.1	Three additional specimens are operated at 1,1 times the rated input voltage and loaded with 1,5 times the rated output current		N/A
	If the transformer fails, it shall comply, with the criteria given in 15.5.2		N/A
15.5.2	Enclosure shall not exceed 175℃		N/A
	Support shall nowhere exceed 125℃		N/A
	The transformers shall not emit flames		N/A
	The transformers shall withstand a dielectric strength test 35%		N/A
	Enclosures shall show no holes		N/A
16	**Mechanical strength**		-
16.1	General		-
	Transformers shall have adequate mechanical strength, to withstand rough handing in normal use		P
	After the test, the transformer shall show no damage		P
16.2	Stationary transformers		-
	The **transformer**, with covers and the like fitted, the transformer is subjected to three blows of impact （0,5± 0,05）J		P
	Parts of IP00 transformers, are not subjected to the test.		N/A
16.3	Portable transformers (except portable transformers with integral pins for introduction in socket-outlet in the fixed wiring)		N/A
	Portable transformers fall from a height of 25 mm onto concrete support. One hundred falls are carried out		N/A
16.4	Portable transformers provided with integral pins for introduction in socket outlets of the fixed wiring		N/A

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Clause	**Requirement - Test**	**Result-Remark**	**Verdict**
	Transformers provided with integrated pins are checked by the following test instead of the test of 16.3:		N/A
17	**Protection against harmful ingress of dust, solid objects and moisture**		-
17.1	Degrees of protection provided by enclosures (IP code)		N/A
	The enclosure shall comply with the 1P number marked	IPX0	N/A
	Transformers having provisions for draining water		N/A
	After completion of the test, the transformer shall withstand the dielectric strength test inspection shall show:		N/A
	d) no accumulation of water in drip-proof, rain-proof, splash-proof and jet-proof transformer		N/A
	f) no entry into the transformer by the relevant test probe for solid-object-proof transformers		N/A
17.1.1	Tests on transformers with enclosure		-
	A Solid-object-proof transformers（first characteristic 1P numeral 2）shall be tested with the standard test finger and the test pin specified in figure 3		N/A
	B Solid-object-proof transformers（first characteristic 1P numeral 3 and 4）shall be tested with a probe C or D		N/A
	C Dust-proof transformers（first characteristic 1P numeral 5）		N/A
	D Dust-tight transformers（first characteristic 1P numeral 6）		N/A
	E Drip-proof transformers（second characteristic 1P numeral 1）		N/A
	F Rain-proof transformers（second characteristic 1P numeral 3）		N/A
	G Splash-proof transformers（second characteristic 1P numeral 4）are sprayed for 10 min		N/A
	H Jet-proof transformers（second characteristic 1P numeral 5）		N/A

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Clause	**Requirement - Test**		**Result-Remark**	**Verdict**
	I Water-tight transformers（second characteristic 1P numeral 7）			N/A
	J Pressure watertight transformers（second characteristic 1P numeral 8）			N/A
17.2	Humidity treatment			-
	The humidity treatment is between 91% and 95% for:		93 %RH	P
	- two days（48 h）for ordinary transformers		48 h	P
	- seven days（168 h）for other transformers			N/A
18	**Insulation resistance, dielectric strength and leakage current**			-
18.1	General			-
	The insulation resistance and the dielectric strength of transformers shall be adequate			P
18.2	Insulation resistance			-
	The insulation resistance shall be not less than that shown in table 7			P
	- for basic insulation		> 100 MΩ Between live parts and metal parts	P
	- for reinforced insulation		> 100 MΩ Between live parts and non-metallic parts	P
18.3	Dielectric strength test			-
	The insulation is subjected for 1 min to a voltage given in table 8			-
	Application of test voltage	Working voltage 600V		P
	1) basic insulation	2500 V	2340 V Between live parts and metal parts	P

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Clause	**Requirement - Test**		**Result-Remark**	**Verdict**
	2) double or reinforced insulation	5000 V	4680 V Between live parts and non-metallic parts 3454 V 1. Between primary winding and secondary winding of transformer 2. Between hazardous live parts and SELV circuits	P F F
	No flashover or breakdown shall occur during the test			F
18.4	Insulation between and within windings			-
	One input is connected to a voltage equal to double the rated supply voltage during the test, there shall be no breakdown			P
18.5	Touch current and protective earth conductor current			-
18.5.1	Touch current		0.1 mA	P
18.5.2	Protective earth conductor current		Rated current > 20A Measurement: 0.1 mA	P
19	**Construction**			-
19.1	The input and output circuits shall be separated by insulation.		specified in the relevant part 2.	N/A
19.2	Materials which burn fiercely shall not be used			P
19.3	Portable transformers shall be either short-circuit proof or fail-safe transformers			N/A
19.4	Provisions shall be taken to prevent contact between accessible metal parts and conduits for class II transformers			N/A
19.5	Parts of class II transformers, which serve as reinforced insulation shall either:			N/A
	- they cannot be removed without being seriously damaged; or			N/A
	- be so designed that they cannot be replaced			N/A

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Clause	**Requirement - Test**	**Result-Remark**	**Verdict**
19.6	Should any wire, screw, nut, washer, become loose they cannot reduce creepage distances or clearances		P
19.7	Parts connected to accessible metal parts by resistors or capacitors shall be separated from the hazardous live parts by double insulation	Not used	N/A
19.8	Conductive parts separated by double or reinforced insulation e.g. live parts and the body or primary and secondary circuits, may be bridged by resistors or capacitors provided	Not used	N/A
19.9	Insulation material of natural or synthetic rubber shall be resistant to ageing	Not used	N/A
	Rubber parts are aged in an atmosphere of oxygen under pressure	Not used	N/A
19.10	When protection is ensured by insulating coating, this coating shall be capable of withstanding the following tests		-
	a) Ageing test		N/A
	b) Impact test		N/A
	c) Scratch test		N/A
	After this test, the coating shall withstand a dielectric strength test		N/A
19.11	Handles and the like shall be covered by supplementary insulation		N/A
19.12	Winding construction		-
19.12.1	Precautions shall be taken to prevent:		-
	- undue displacement of windings		P
	- undue displacement of wiring		P
	- undue displacement of parts		P
	The last turn of each winding shall be prevented from being displaced		P
19.12.2	Where serrated tape is used as insulation	Not used	N/A
	Where cheekless bobbins are used	Not used	N/A
19.12.3	Insulated winding wires, shall meet the following requirements.	Not used	N/A
	Where the insulation on the winding wire is used to provide basic insulation:		N/A
	- the insulated wire shall comply with annex K		N/A

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Clause	**Requirement - Test**	**Result-Remark**	**Verdict**
	- the insulation of the conductor shall consist of at least two layers		N/A
	For windings giving double or reinforced insulation, the following additional tests		N/A
19.13	Handles and the like shall be fixed so that they will not become loose		N/A
19.14	Covers providing protection against electric shock shall be securely fixed by at least two independent means	Screws used	P
19.15	Transformers provided with pins shall not impose undue strain on socket-outlets	Not used	N/A
19.16	Portable transformers with a rated output not exceeding 200 VA shall either be an ordinary transformer or have a protection index IP20 or higher		N/A
	Portable transformers having a rated output exceeding 200 VA		N/A
	Portable transformers having a rated output exceeding 2.5 kVA		N/A
19.17	Transformers having a protection index from IPX1 up to and including IPX6 shall have an drain hole		N/A
	The drain hole is not required if the transformer is completely filled		N/A
19.18	Transformers having a protection index higher than IPX1 shall be provided with a moulded-on plug		N/A
19.19	Class I portable transformers designed for connection by means of a flexible cable or cord with earthing conductor and plug with earthing		N/A
	Class I stationary transformer is equipped with a non-detachable flexible cable or cord with earthing conductor and plug with earthing	Not provided	N/A
19.20	Live parts of SELV- and PELV-circuits shall be electrically separated		F
19.20.1	Live parts of SELV-circuits shall not be connected to earth		P
	If the nominal voltage exceeds 25 V a.c. or 60 V d.c. protection against direct contact is generally unnecessary		P
19.20.2	For PELV-circuits, protection against direct contact shall be double insulation		N/A

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Clause	**Requirement - Test**	**Result-Remark**	**Verdict**
19.21	For FELV-circuits, protection against indirect contact shall be provided by insulation		N/A
19.22	Class II transformers shall not be provided with means for protective earthing		N/A
19.23	Class III transformers		N/A
20	**Components**		-
	Components such as switches, plugs, fuses, lampholders, capacitors and flexible cables and cords shall comply with the relevant IEC standard as far as it reasonably applies.		P
	Components incorporated in or supplied with the transformers are subjected to all tests of this standard as part of the transformer.		P
	Compliance with the IEC standard for the relevant component does not necessarily ensure compliance with the requirements of this standard.		P
20.1	Appliance couplers for mains supply shall comply with the IEC 60320		N/A
20.2	Automatic controls shall comply with IEC 60730		N/A
20.3	Thermal-links shall comply with IEC 60691		N/A
20.4	Switches forming part of the transformer assembly	Not used	N/A
20.5	Socket-outlets in the output circuit shall be no dangerous compatibility	Not used	N/A
	Plugs and socket-outlets for SELV shall comply with IEC 60906-3		N/A
	Plugs and socket-outlets for PELV systems shall comply with		N/A
	- plug shall not enter socket-outlets		N/A
	- socket-outlets shall not admit plugs		N/A
	- socket-outlets shall not have a protective earthing contact		N/A
	Plugs and socket-outlets for FELV systems shall comply		N/A
20.6	Thermal cut-outs, thermal links, overload relays, fuses and other overload protective devices shall have adequate breaking capacity.	Fuse	P
20.6.1	Fuses according to IEC 60127 and IEC 60269	Approved type	P

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Clause	**Requirement - Test**	**Result-Remark**	**Verdict**
20.7	Thermal cut-outs shall meet the requirements		N/A
20.7.1	Requirements according to IEC 60730-1		N/A
20.7.2	Thermal cut-outs shall have adequate breaking capacity.		N/A
20.7.3	A PTC resistor of indirect heating type is considered to be a non-self-resetting thermal cut-out by this standard.		N/A
20.8	Thermal-links shall be tested in one of the following two ways.		N/A
20.8.1	The thermal-link shall comply with IEC 60691		N/A
20.8.2	The thermal-link when tested as a part of a transformer		N/A
20.9	Self-resetting devices shall not be used unless	Not used	N/A
20.10	Thermal cut-outs intended to be reset by a soldering operation shall not be used for overload protection		N/A
20.11	Overload protection devices shall not operate in normal use		P
	The transformer, with no load, is connected to 1,06 times rated supply voltage. The supply voltage is then switched on and off 20 times there is no appreciable drop in voltage		P
21	**Internal wiring**		-
21.1	Internal wiring and electrical connections shall be protected		P
	Wire-ways shall be smooth and free form sharp edges		P
21.2	Openings in sheet metal shall have rounded edges with a radius not less than 1,5mm		N/A
21.3	Bare conductors shall be fixed		P
21.4	Internal wiring shall not work loose		P
21.5	Insulated conductors with temperature exceeding the limiting values shall have an insulation of heat-resisting material		P
22	**Supply connection and other external flexible cables or cords**		-
22.1	Flexible cords shall have suitable ratings	Not provided	N/A

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Clause	**Requirement - Test**	**Result-Remark**	**Verdict**
22.2	Separate entries shall be provided for the input and output wiring		N/A
	Inlet and outlet openings shall be of insulating material		N/A
	Bushings for external wiring shall be reliably fixed, and shall be unlikely to be damaged		N/A
	Bushings shall not be of natural rubber unless cord guard		N/A
22.3	Fixed transformers		P
	Transformers other than fixed unit may be provided with an appliance inlet		N/A
	The space for the wires inside shall be adequate		P
	It shall be possible to connect the external supply wires to terminals without contact with hazardous live parts		P
22.4	Portable transformers provided with power supply cords, the length of the cord shall:		N/A
	- not exceed 2 m for cross-sectional area of 0,5 mm2		N/A
	- exceed 2 m for cross-sectional areas greater than 0,5 mm2.		N/A
22.5	Power supply cords of transformers shall be as follows:		N/A
	- for transformers with a mass not exceeding 3 kg, not lighter than code (60227 IEC 52) or (60245 IEC 53);		N/A
	- for transformers with a mass exceeding 3 kg, not lighter than code (60227 IEC 53) or (60245 IEC 53)		N/A
22.6	Power supply cords may be a cord set fitted with an appliance coupler not exceeding 16A	Not provided	N/A
22.7	The nominal cross-sectional area of external flexible cable shall be not less than that show in table 9		N/A
22.8	Power supply cords of class I transformers shall be provided with a green/yellow covered core		N/A
	Power supply cords of single-phase portable transformers having an input current not exceeding 16A shall be provided with a plug complying with IEC 60083		N/A

EN 61558-1			
Clause	**Requirement - Test**	**Result-Remark**	**Verdict**
	Other portable transformers may be provided with		N/A
22.9	External flexible cable or cords shall be type X. Y or Z attachments		N/A
22.9.1	For type Z attachments		N/A
22.9.2	Inlet openings shall be provided with an inlet bushing		N/A
22.9.3	Inlet bushings shall:		N/A
	- prevent damage to flexible cord		N/A
	- be reliably fixed		N/A
	- not be removable without tool		N/A
	- not be of natural rubber, except if it		N/A
22.9.4	Transformers provided with cords which are moved		N/A
	Cord guards shall be of insulating material		N/A
22.9.5	Stationary and portable transformers shall have cord anchorages		N/A
	For type X attachments, glands shall not be used as cord anchorages		N/A
	Tying the cord into a knot or tying the ends with string, are not allowed		N/A
	Labyrinths or similar means are permitted		N/A
	For type X attachments, the cord anchorage shall be		N/A
	- replacement is possible		N/A
	- protection against strain and twisting clearly how		N/A
	- suitable for different types of cable unless only one type of cable for transformer		N/A
	- cable is capable of being mounted into the cord anchorage		N/A
	- cord unlikely to be damage when tightened and loosened		N/A
	- no contact between cable and accessible or electrically connected clamping screws		N/A
	For type X with a special cord, type Y and type Z attachments, the cores of power supply cord s insulated from accessible metal parts		N/A
	For type X with a special cord and type Y attachments, the cord anchorage		N/A

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Clause	**Requirement - Test**	**Result-Remark**	**Verdict**
	- replacement of power supply cord does not impair compliance with standard		N/A
	- cable capable of being mounted into the cord anchorage		N/A
	- cord unlikely to be damaged when tightened		N/A
	- cable not able to touch screw of accessible cord anchorage		N/A
	For type X attachments the terminal screws is tightened with a torque		N/A
	The cord is then subjected 25 times to a pull		N/A
22.9.6	The space for the supply cables		N/A
23	**Terminals for external conductors**		-
23.1	Transformer for connection to fixed wiring and transformer other than those provided with type Y and Z attachments: only connections by screws, nuts or equally effective devices.		P
	For transformers with type X attachment, soldered connections may be used		N/A
	For transformers with type Y and type Z attachments, soldered, welded, crimped and similar connections may be used for external conductors.	Screws	P
	For class II transformers reliance is not placed upon the soldering, crimping, or welding alone		N/A
23.2	Terminals for type X with a special cord, Y and Z attachments	5N	P
23.3	Terminals, other than type Y or Z attachments, shall be fixed		P
23.4	Terminals shall clamp the conductor between metallic surfaces		P
23.5	Terminal for connected to fixed wiring, and terminals with type X attachment shall be located near their associated terminals		N/A

EN 61558-1			
Clause	**Requirement - Test**	**Result-Remark**	**Verdict**
23.6	Terminal blocks shall not be accessible without the aid of a tool	The unit is intended to be installed in a equipment. The accessibility of hazardous live parts is to be prevented in the final system.	P
23.7	Terminations with type X attachments shall be shielded		N/A
	An 8 mm length of free wire is bent, the free wire shall not touch any metal part		N/A
23.8	Terminals without pressure plate shall be provided with at least two clamping screws if the current exceeds 25 A.		N/A
23.9	Terminal screws shall not come into contact with any metal part when the screw is loosened		P
24	**Provision for protective earthing**		-
24.1	Accessible metal parts of Class I transformers shall be permanently and reliably connected to a protective earthing terminal		P
	Class II transformer shall have no provision for earthing		N/A
24.2	Protective earthing terminal for connection to fixed wiring, and protective earthing terminal with type X attachment		P
	Their clamping means shall not be possible to loosen them without the aid of a tool		P
24.3	Protective earthing terminal shall be no risk of corrosion		P
24.4	The connection between the protective earthing terminal and parts required to be connected thereto shall be low resistance		P
	A current derived from an a.c. source, not exceeding 12V and equal to 1.5 times the rated input current or to 25A, whichever is greater, is pass for 1 min		P
	In no case shall the resistance exceed 0.1Ω		P

EN 61558-1			
Clause	**Requirement - Test**	**Result-Remark**	**Verdict**
24.5	For Class I transformer with external flexible cable or cords, the terminals shall be such that the current-carrying conductors become taut before the earthing conductor		N/A
25	**Screws and connections**		-
25.1	Screwed connections shall withstand the mechanical stresses		P
25.2	Screws in engagement with a thread of insulating material		N/A
25.3	Electrial connections shall be so designed that contact pressure is not transmitted through insulating material		P
25.4	Thread-forming screws shall not be used for the connection of current-carrying parts	Mechanical	P
25.5	Screws for current-carrying mechanical connection locked against loosening		P
25.6	Screwed glands shall comply with the following test		N/A
26	**Creepage distances, clearances and distances through insulation**		-
26.1	Creepage distance, clearances and distances through insulation shall be nit less than the values for group llla		P
	Values for printed wiring, shall be the same as unreduced values		P
	If the pollution generates high conductivity		N/A
26.2	Creepage distances and clearances（cr）		-
	The creepage distance and clearance values are shown in Tables 13, C.1 and D.1.		P
26.3	Distance through insulation（dti）		-
	1) insulation between input and output circuits (basic insulation)		P
Type of insulation	Working voltage (V)		-
	300V	600V	-
	cl / cr / cl / cr		-

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Clause	**Requirement - Test**					**Result-Remark**	**Verdict**
	a) Creepage distances and clearances between live parts of input or output circuits	3.0	3.0	5.5	6.0		N/A
	b) Distance through insulation between input or circuits and an earthed metal screen	No requirements of thickness					N/A
	c) Distances through insulation between input and output circuits	No requirements of thickness					N/A
	2) Insulation between input and output circuits (double or reinforced insulation)						-
	Type of insulation	Working voltage (V)					-
		300V		600V		220 V	-
		cl	cr	cl	cr		-
	a) Creepage distances and clearances between live parts of input or output circuits	5.5	6.0	8.0	12.0	< 4.4mm 1. Between primary winding and secondary winding of transformer 2. Between primary layout trace and secondary layout trace of PCB	F
	b) Distance through insulation between input or circuits and an earthed metal screen	0.5		0.7			N/A
	c) Distances through insulation between input and output circuits	1.0		1.5		Bobbin:0.8 mm	F
	3) Insulation between adjacent input circuits or insulation between adjacent output circuits						-
	Type of insulation	Working voltage (V)					-
		300V		600V			-
		cl	cr	cl	cr		-
	Creepage distances and clearance	0.5	3.0	1.5	6.0		N/A

EN 61558-1							
Clause	**Requirement - Test**					**Result-Remark**	**Verdict**
	4) Creepage distances and clearances between terminals for the connection of external cables and cords excluding those between screw terminals for input and for output circuits						-
	Type of insulation	Working voltage (V)					-
		300V		600V		480 V	-
		cl	cr	cl	cr		-
	a) up to and including 6A	6.0		9.0			N/A
	b) over 6A up to and including 16A	10.0		13.0			N/A
	c) over 15A	14.0		17.0		> 17 mm	P
	5) Basic or supplementary insulation						-
	Type of insulation	Working voltage (V)					-
		300V		600V		220 V / 480 V	-
		cl	cr	cl	cr		-
	a) Between live parts of different polarity	3.0	3.0	5.0	6.0	Terminals >2.1mm / >4.8mm	P
	b) Between live parts and the body if intended to be connected to protective earth	3.0	4.7	5.5	9.5	Between live parts and metal enclosure >3.6mm / <7.6mm	F
	6) Reinforced or double insulation						-
	Type of insulation	Working voltage (V)					-
		300V		600V		220 V	-
		cl	cr	cl	cr		-
	Between the body and live parts	5.5	6.0	8.0	12.0	Control panel >6.0 mm	P
	Between body and live parts of the output circuit if protected by additional provisions against transient voltage	1.5	6.0	3.0	12.0		N/A
	7)Distance through insulation (excluding insulation between input and output circuit)						-
	Type of insulation	Working voltage (V)					-
		300V		600V		220 V	-
		cl	cr	cl	cr		-
	Basic	No requirements of thickness					-

EN 61558-1					
Clause	**Requirement - Test**			**Result-Remark**	**Verdict**
	Supplementary	0.5	0.75		N/A
	Reinforced	1.0	1.5	Control panel enclosure >1.0 mm	P
27	**Resistance to heat, fire and tracking**				-
27.1	Resistance to heat				-
	subjecting parts made of insulating materials to a ball-pressure test according to 27.1.1 and 27.1.2				P
	After 1 h the diameter of the impression shall not exceed 2 mm				P
27.1.1	External accessible parts				-
	External accessible parts of insulating materials shall be resistant to heat.			Control panel enclosure	P
	The test is carried out at a temperature of (70 ± 2) °C, or at a temperature of (T + 15 ± 2) °C where T is the temperature test			70℃	P
27.1.2	Internal parts				
	Internal parts of insulating material retaining current carrying parts in position shall be resistant to heat.			Terminal block and transformer bobbin	P
	The test shall be performed at a temperature of (125 ± 2) °C, or at a temperature of (T + 15 ±2) °C where T is the temperature test			125 ℃	P
27.2	Resistance to abnormal heat under fault condition				-
	Transformers with protection index IP20 or higher, under fault conditions, shall not act as a source of ignition, and the insulation between the windings shall not result in breakdown, hazardous live parts shall not be accessible.				N/A
27.2.1	Portable transformers shall be placed on a dull black painted plywood support as described in 14.2.				N/A
	For transformers with self-resettable protective devices, all the protective devices are shortcircuited.				N/A
27.2.2	After the test of 27.2.1 and after cooling down to ambient temperature,				N/A
27.3	Resistance to fire				-

EN 61558-1			
Clause	**Requirement - Test**	**Result-Remark**	**Verdict**
	All parts of the transformer made of insulating material shall be resistant to ignition and spread of fire.		P
27.3.1	External accessible parts		-
	Enclosures and other external accessible parts shall be checked by glow-wire test	Control panel enclosure	P
27.3.2	Internal parts		-
	Parts of insulating materials retaining (keeping in position) current carrying parts shall be checked by glow-wire test	650℃: bobbin 850℃: terminal block	P
27.4	Resistance to tracking		-
	For transformers with an IP rating other than IPX0, insulating parts retaining current carrying parts in position shall have resistance to tracking	IPX0	N/A
28	**Resistance to rusting**		-
	Ferrous parts shall be adequately protected against rusting		P

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Critical Components

Object / part No.	manufacturer / trademark	Type / model	technical data	mark(s) of conformity[1])
Enclosure	Various	Various	Painted metal material, overall dimension: L190mm * W113mm * H185mm	-
Plastic cover	CHI MEI CORPORATION	PA-765A(+)	94V-0, 80℃	UL E56070
Fan	FULLTECH ELECTRIC CO LTD	UF 92B 23 BTH	AC:230V, 50/60Hz 16/14W	TUV AE50348466
AC wire	REI HSING WIRE CO LTD	1007	80℃, 300 Vac 22AWG	UL E108485
Fuse	HINODE ELECTRIC CO LTD	660GHX125	AC:660V, 125A	UL E143197
Current Transformer	--	CTL221K	--	-
Terminal block material	E I DUPONT DE NEMOURS & CO INC	101L	94V-2, 130℃	UL E41938
Power switching Semi-conductor	SEMIKRON INTERNATIONAL GMBH	SKKT 92B 12 E	1200V I_{TRMS} = 150A	UL E63532
Thermistor	UPPERMOST Electronic Industries	310	10KΩ at 25℃ 240VAC	UL E133510
Major components on PCB WT-7PG10				
PCB	KENT PRINTED CIRCUIT BOARD CO LTD	2	130℃ 94V-0	UL E213002

Critical Components

Object / part No.	manufacturer / trademark	Type / model	technical data	mark(s) of conformity[1])
Varistor (ZNR1)	SONG LONG ELECTRONIC CO.,	MOV 821KD14	AC:510V DC:670V	VDE 127031
Major components on PCB WT-7MS2				
PCB	KENT PRINTED CIRCUIT BOARD CO LTD	2	130℃ 94V-0	UL E213002
Terminal block (TB1)	SWITCHLAB INC (DECA)	ME020-50813 MC210-F113	16A 300V	VDE 40033562
	SWITCHLAB INC (DECA)	MC2 5.08	12A 300V	CE UL
Resistor fuse(R45)	--	--	150 Ω	--
Film Capacitor (C20)	--	--	0.01 μF 630 V	--
Relay (X1)	SUN HOLD ELECTRIC INC	RAS-1210	10A/120Vac 10A/24Vdc 7A/250Vac	TUV R 09452527
Optocoupler (U2)	Lite-On Technology Corporation	357T	V_{ISO}: 3750 V	VDE 138213
Transformer (TF1)	--	W7TTFCA00001 (EI35Z-220/14*2-15)	Primary : 220Vac Secondary : 14V, 14V, 15V	--
Major components on Transformer				
Laminated Steel Core	--	--	35.8*30*11mm	-

Critical Components

Object / part No.	manufacturer / trademark	Type / model	technical data	mark(s) of conformity[1])
Magnet wire	PACIFIC ELECTRIC WIRE & CABLE (SHENZHEN) CO LTD	UEW/U	130 ℃	UL E201757
Insulation tape	3M COMPANY	44(a)	130 ℃	UL E17385
Bobbin	SUMITOMO CHEMICAL CO LTD	E4008(j)	V-0, 130 ℃	UL E54705
Varnish	JOHN C DOLPH CO	BC-359	130 ℃	UL E317427

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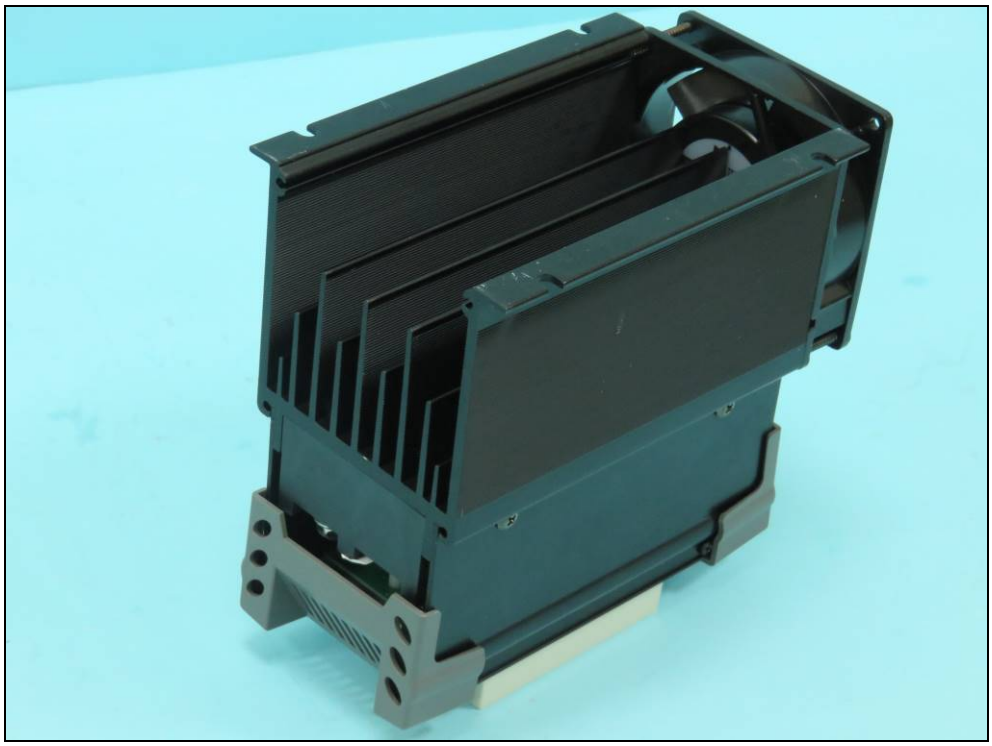
Photos

E.U.T. THYRISTOR POWER REGULATOR, Model W7S4V100-21KF

Photos

E.U.T. THYRISTOR POWER REGULATOR, Model W7S4V100-21KF



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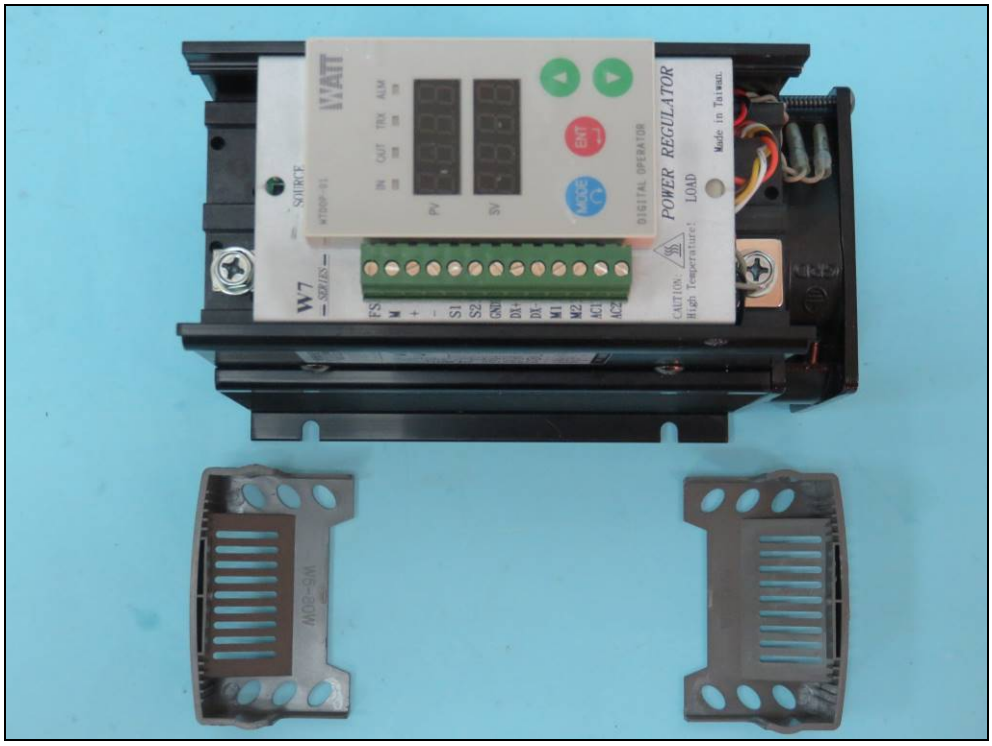

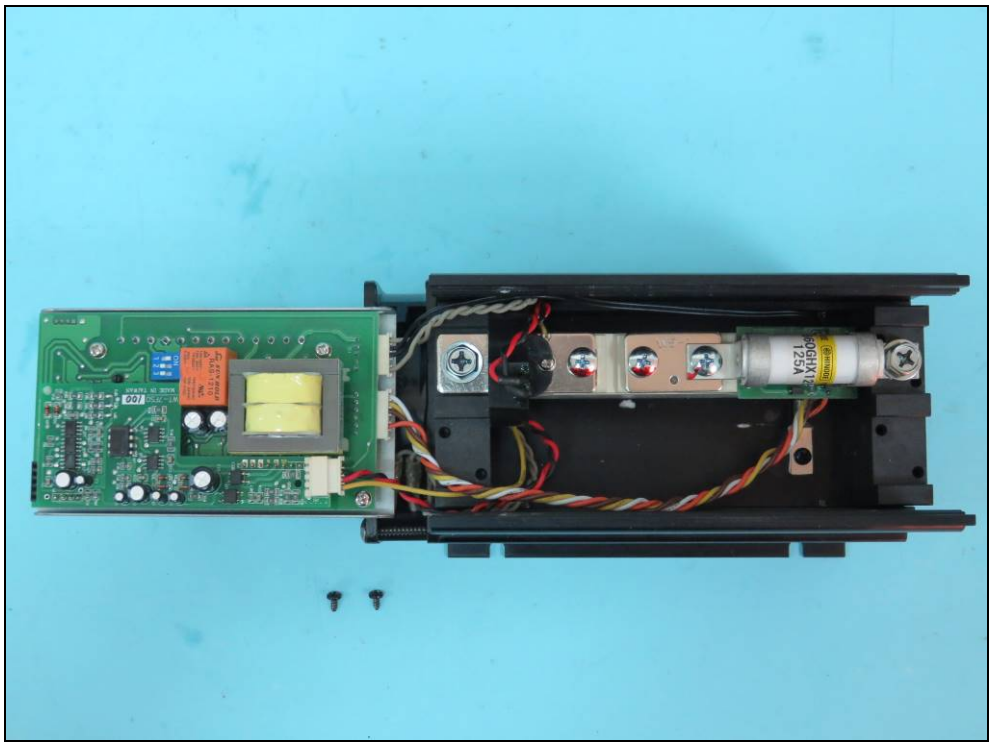

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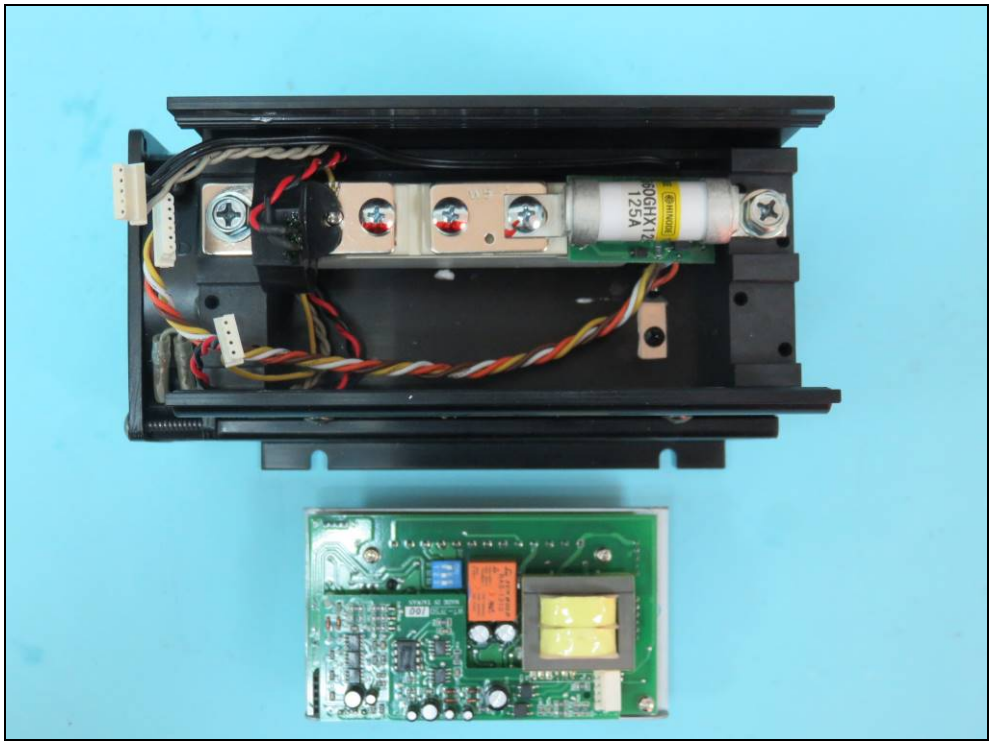

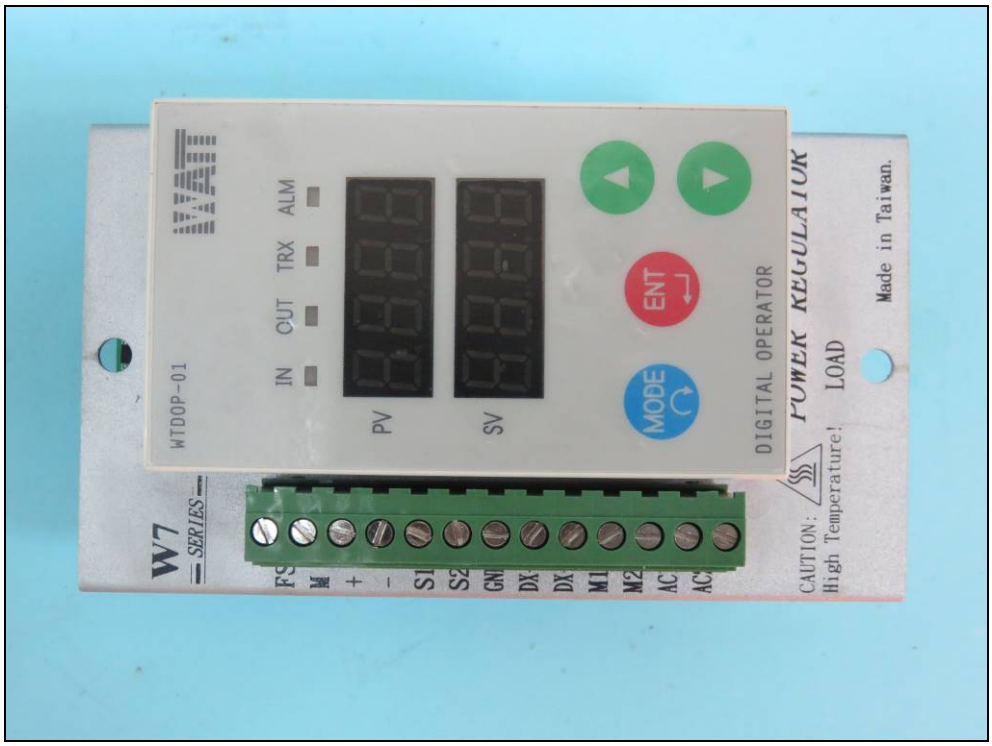

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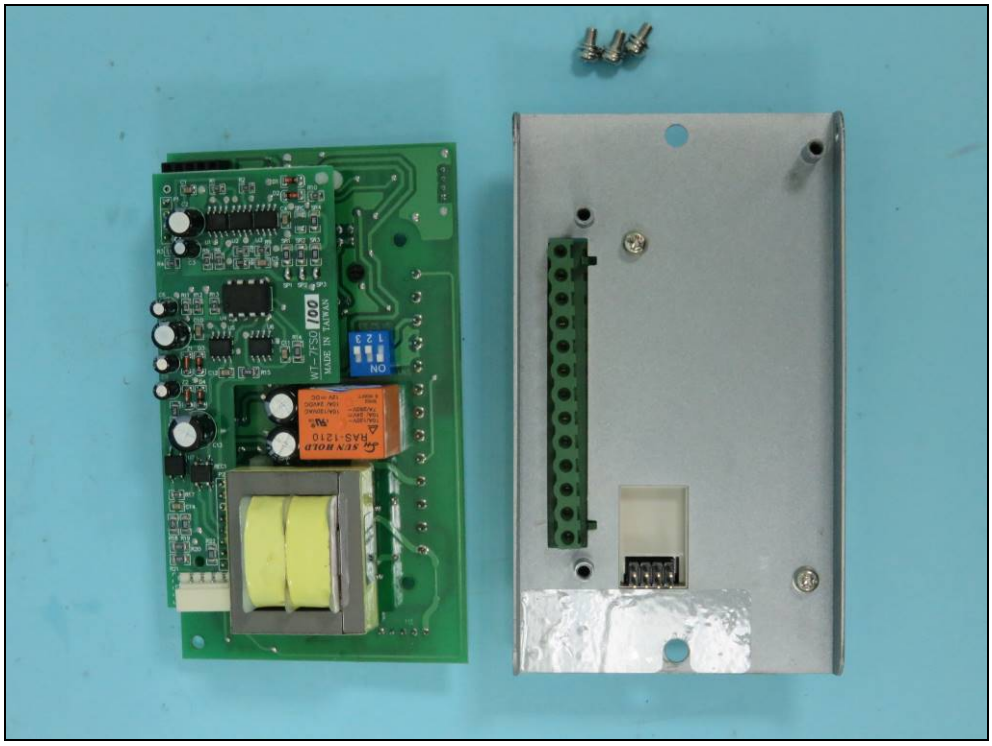

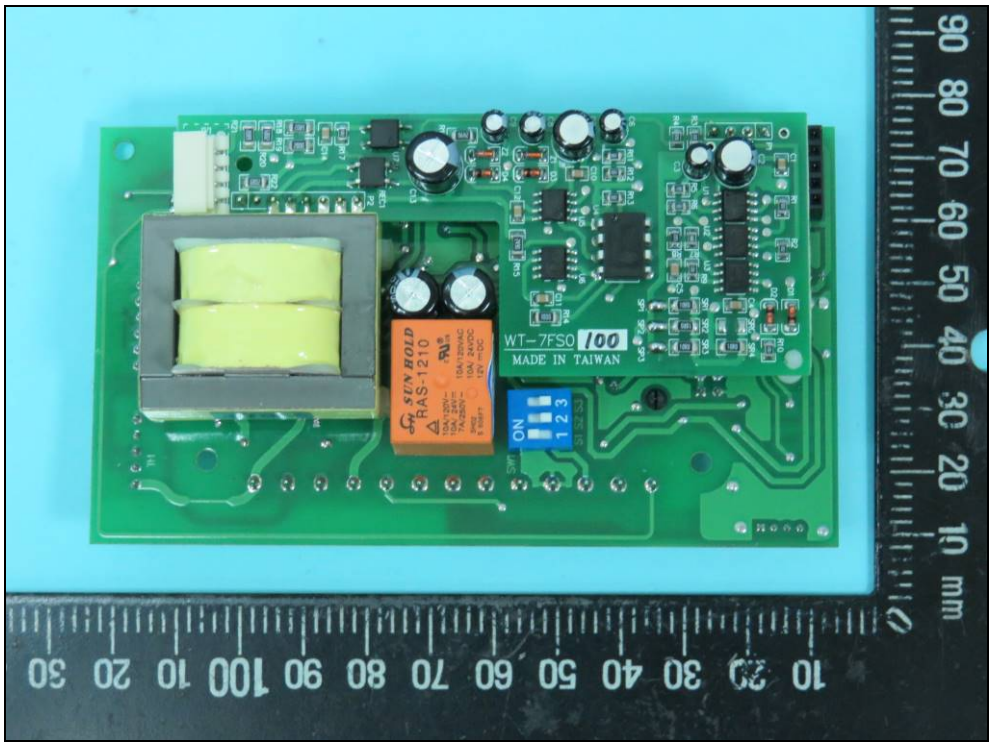

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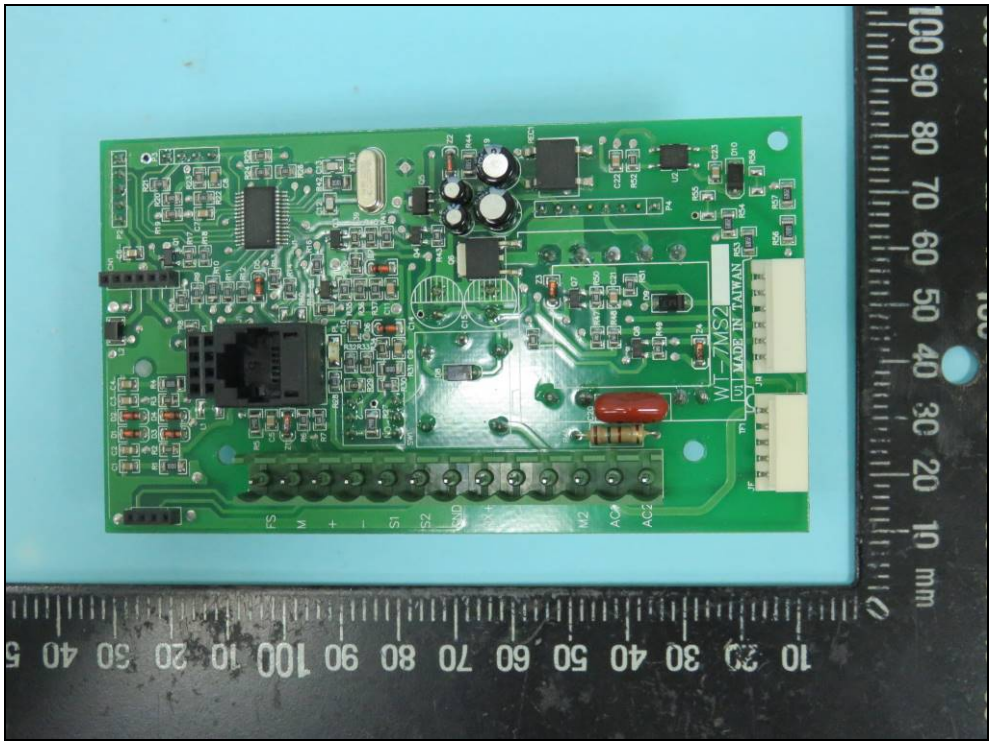

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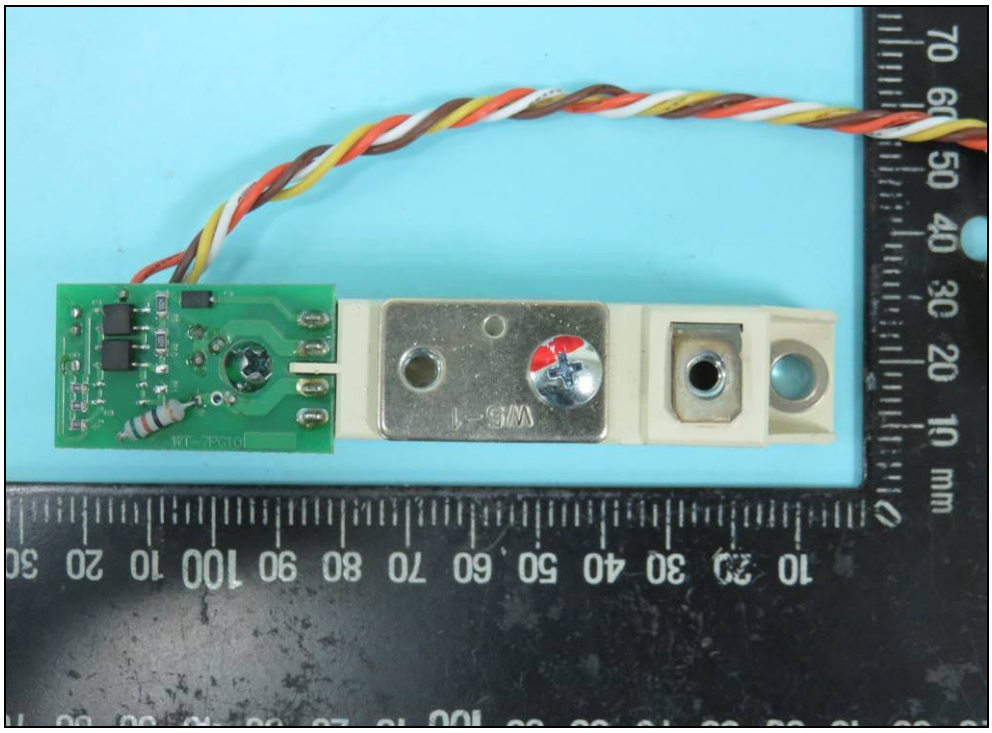

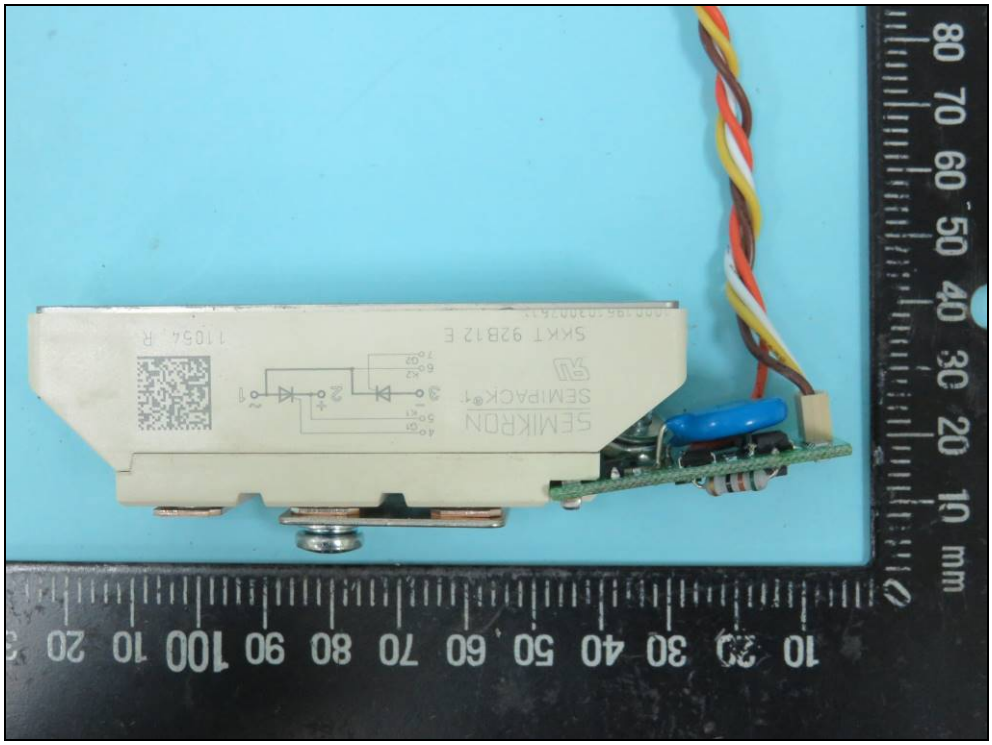

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