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TESTER
T-2500

Operation manual

T-2500/01.00.00RE

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1. DESIGNATION

- 1.1. Tester T-2500 (hereinafter– tester) is designed to test insulation of electrical technical equipment and materials by alternating sinusoidal voltage frequency of 50 Hz, controlled within 0-2500 V.
Scope of application is electrical engineering and power engineering.
Due to increased output current the tester can be used in testing on alternating voltage of large electric cars windings insulation. Can be successfully used for electrically -driven tools test.
- 1.2. Tester is designed for operation in premises or under a shed at working air temperature from +5 ° C to +40 ° C, relative humidity of 80 % at temperature +20 ° C and atmospheric pressure 84,0 – 106,7 kPa (630 – 800 mm Hg).
- 1.3. Power supply– a single phase network of a sinusoidal alternating current voltage 220 ± 20 V, frequency of 50 ± 1 Hz.
- 1.4. Tester is serviced by one operator with the permission to work on installations with voltage above 1000V.

2. SPECIFICATIONS

2.1	Output voltage control limits, V	0-2500
2.2	Relative error of installation and measurement of output voltage, %, not more	3
2.3	Maximum output current, mA	500
2.4	Measurement limits of output current, mA	10-500
2.5	Relative error of current measurement, %, not more than 3	
2.6	Threshold of current protection actuation	1,1 V
2.7	Power consumption VA, not more	1400
2.8	Leading dimensions, mm	480x350x200
2.9	Weight, kg, not more	25
2.10	Continuous operating time at maximum power, hr	2
2.11	Average life cycle of the device, years	6

NOTE. The device voltage meter measures an alternating voltage current value. The milliammeter measures operating current value.

3. COMPOSITION

3.1. Composition and complete set are given in Table 1.

Table 1

Name	Number	Note
1. Tester T -2500	1	
2 Network cable	1	
3.Connecting high voltage wire	2	Length 2 m
Tester T -2500. Operation manual T-2500/01.00.00RE	1	
<u>Spare parts</u>		
5. Fusible insert IIM-20 - 10 A	2	

4. DEVICE AND OPERATING PRINCIPLES

4.1. Circuit diagram of tester T-2500 is given in Appendix 1

T -2500 includes:

- Regulator of test voltage TR1 (LAT-8A);
- High-voltage transformers TR2 with an output voltage 1250 V, connected in succession on high side;
- Control board
- Switching board
- Measuring board
- Elements of switching and signaling system of low-voltage chains (switches, buttons, relay, bulbs).

Voltage is applied to the tester through connector SX1. Key "CIRCUIT" SB1 power is supplied to a switching board and a control board.

If limit switch of cover SX3 is closed and key "STOP" SB2 is not pushed, relay RL1 of a switching board closes the contacts and supplies power to triac VD1.

In transition to test regime the switching board switches on triac VD1 and power is supplied to contactor K1 winding. Contactor K1 switches on power supply of voltage TR1 regulator.

By pressing key "STOP" SB2 or breaking limit switch SX3 relay RL1 is disconnected and disconnects power supply of a contactor K1 winding. Simultaneously the signal arrives in a switching board.

4.2. Tester is in 200 mm high aluminum case.

Exterior of the tester is given in Fig.1. Designation of control and indication tools is given in Table 2.

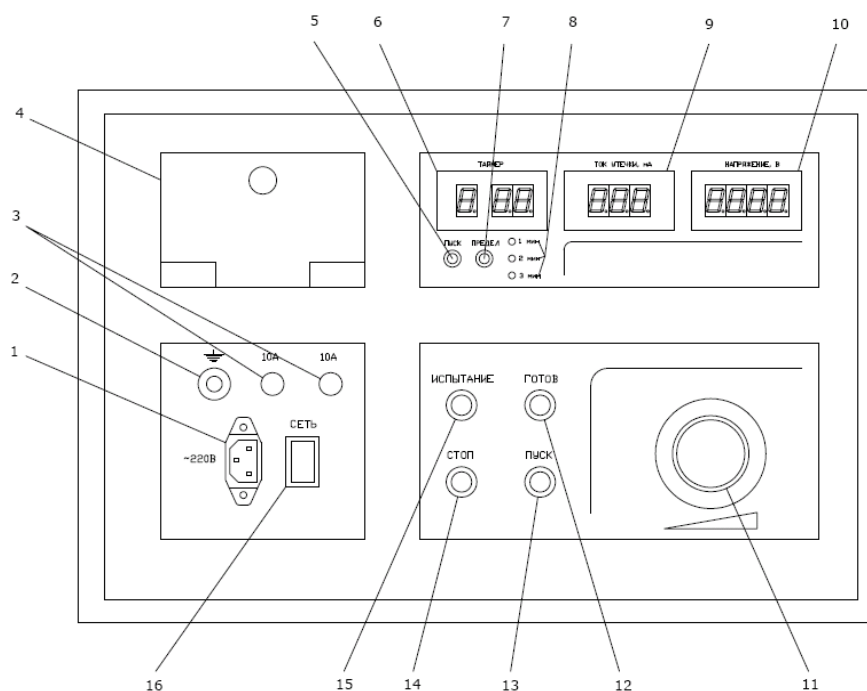


Fig.1 Tester T -2500. View of front panel.

Table 2.

№	Name	Marking
1	Circuit plug	«~ 220 V»
2	Earthing connection	
3	Power circuit fuse holder	«10 A»
4	Section with output clips closed with blocking cover	
5	Timer key	«START»
6	Timer indicator	«TIMER»
7	Switch of time limit	«LIMIT»
8	Light emitting diodes of timer limit indication	«1», «2», «3»
9	Milliammeter indicator	«LEAKAGE, mA»
10	Voltage meter indicator	«VOLTAGE, V»
11	Handle of high voltage regulator	
12	Indicator of readiness to work	«READY»
13	Key of high voltage switching on	«START»
14	Key of high voltage switching off	«STOP»
15	Indicator of high voltage switching on	«TEST»
16	Switch of circuit voltage	«CIRCUIT»

5. SAFETY MEASURES

5.1. All persons working on the tester should be preliminary trained for work and know "User Rules of Operating Electrical Equipment" and "Safety Rules of Operating Electrical Equipment.

5.2. The personnel working place should meet the requirements of fire safety in accordance with GOST 12. 1.004-76.

5.3. Work without earthing is forbidden! The tester earthing is carried out by the earthing terminal on the front panel.

5.4. Before detaching the object under the test from the source, make sure that high voltage is switched off, and the object under the test is under temporary earth.

6. PREPARATION TO OPERATION

6.1. Install the tester on a working place.

6.2. Provide security of high-voltage wires and an object from direct access. Connect the tester to the socket-outlet with a circuit cord.

6.3. Connect output wires to the object under test.

Install voltage regulator handle in an extreme position counter-clockwise.

7. OPERATING PROCEDURE

7.1. Turn off fixing screw, open a high-voltage compartment cover and connect high-voltage cables to output clips Close cover and fix screw.

7.2. Connect crimped locks of high-voltage cables to the object under the tests. ATTENTION! Black output clip is earthed-consider in object earthing.

7.3. Apply circuit voltage. Switch on the circuit switch. The green lamp thus should light up "Ready" and red digital indicators "TIMERS", «LEAK CURRENT» and "VOLTAGE".

7.4. If indicator "READY" scintillates, make sure that the handle of voltage regulator is set to minimum, and the cover of a high-voltage compartment is densely closed.

7.5. Switch on high voltage key "START-UP", the red lamp "TEST" thus should light up.

7.6. Turning the handle of a voltage regulator clockwise and watching voltage meter indications (current value of voltage is measured), install the required value of test voltage.

7.7. Measurement of acting load current is made by milliammeter.

7.8. It is possible to set test time. For this purpose install timer key "LIMIT" at a desirable interval from 1 to 3 minutes and push key "START-UP" of sector "TIMER". After stand-up there is a sound signal, high voltage is disconnected, timer indicator shows the completed time interval.

7.9. If during the test there is load breakdown (output current exceeds protection operating threshold), high voltage will be disconnected. Indicators show values of voltage, current and time in flickering regime When regulator returns to a zero position, all indications are nulled.

7.10. Upon termination of test the voltage regulator should be installed in an initial position turning the handle counter-clockwise against the stop. Further it is necessary to disconnect test voltage key "STOP". After that disconnect the tester from the circuit with power switch.

Before disconnecting the object under the test from the source, visually make sure there is no voltage on temporarily earthed object.

8. MEASUREMENT OF PARAMETERS, REGULATION AND ADJUSTMENT

8.1. Measurement of parameters (test) of tester

T- 2500 should be carried out once every two years.

8.2. Measurement tools (MT) indicated in Table 3 are required for testing, as well as current limiting resistor 1-5 κOm , not less than 1000 V assembled, for example, from TVO resistors.

Table 3

№	MT name	MT main technical characteristics		Recommended MT
		Measurements limits	Error	
1	Kilo voltage meter	3 кV	≤ 1%	Electrostatic kilo voltage meter C502
2	AC milliammeter	~I =600 mA;	≤ 1%	Multimeter И4311

8.3. List of operations on parameters test is given in Table 4.

Table 4

Number of techniques item	Name	MT
8.4.	Test of voltage meter calibration on AV	C502
8.5.	Calibration test of milliammeter on AC	И4311
8.6.	Test of threshold of current protection actuation	И4311

ATTENTION! All measurement tools have to be properly functioning and calibrated.

Test of voltage meter calibration on AV

8.4.1. Prepare the tester for work according to section 6.

8.4.2. Connect kilovoltmeter S502 to output T -2500

8.4.3. Switch on the tester in a circuit, switch on high voltage and install on the external kilovoltmeter output voltage $U_0 = 2500$ V.

8.4.4. Readout U_x of this voltage on T-2500 voltage meter scale. Calculate a relative error of γ by formula:

$$\gamma = [(U_x - U_0) / U_0] 100 \% (1)$$

The relative error of measurement γ in voltage 2500 V should not exceed 3 %. If $\gamma > 3$ % it is necessary to make adjustment by trimming resistor R ___ (nominal 10 K) on voltage meter T-2500 board.

8.4.5. When changing output voltage T-2500, take measurement of a relative error on all scale of voltage meter T-2500 within a working section of a scale (0,3-1,0) U_{Π} , where U_{Π} – measurement limit (in this case $U_{\Pi} = 2500$ V).

8.4.6. Then calculate a relative error of measurement γ by formula (1) in each point. It should not exceed 3 %.

8.4.7. Switch off high voltage.

8.5. Check out of milliammeter calibration on AC.

Prepare the tester for operation in accordance with section 6.

8.5.1. Connect AC milliammeter with limit not less than 500 mA to T-2500 output 500 mA in succession with limit resistor 1-5 кOm, not less than 1000 V.

Switch on the tester, switch on high voltage and set the current $I_0 = 500 \text{ mA}$ on outside milliammeter.

8.5.2. Count down I_x of this voltage on T-2500 milliammeter scale. Calculate relative error of the measurement γ by the formula:

$$\gamma = [(I_x - I_0) / I_0] 100\% \quad (2)$$

Relative error in measurement γ of current 100 mA should not exceed 3%.

If $\gamma > 3\%$, then regulate by trimming resistor R_{trim} (nominal 100 K) on control panel.

8.5.3. Check T-2500 milliammeter reading in range $B(0,3-1,0) I_{\text{lim}}$, where I_{lim} – measurement limit. Calculate the error of measurement sin these points by formula (2). It should not exceed 3%.

8.5.4. Switch off the tester.

8.6. Check out of current protection threshold

8.6.1. Connect AC milliammeter with limit not less than 600 mA to T-2500 output 500 mA in succession with limit resistor 1-5 $\kappa\Omega$, not less than 1000 V.

8.6.2. Switch on testing voltage.

8.6.3. Turning the handle of voltage regulator and watching the readings of outside milliammeter, increase current more than 500mA. Protection should work at current values more than 550mA .

8.6.4. Switch off the tester from the circuit.

9. Possible malfunctions and ways of their elimination.

9.1 List of possible malfunctions is given in table 6.

Table 6

Name of malfunction, external symptoms and additional signs	Possible cause	Way of elimination
1. connected to circuit red light indicators are dead	1.1. Burnt fuse 10 A. 1.2. Disconnection of circuit cord	1.1. Change fuse 1.2. Check cord with ohm-meter and ,if necessary, repair or replace the cord
2. When press "ON" high voltage does not switch on (green signal lamp "READY" does not shine).	Voltage regulator handle is not in extreme left position counterclockwise (i.e. LAT blocking contacts are disconnected).	While switching on, set high voltage regulator handle into extreme left position

10. MAINTENANCE SERVICE

10.1. Regularly keep insulating surfaces clean and look after the contact surfaces of high voltage output and short -circuit jumper. If necessary wash insulating surfaces with ethanol, and polish metal surfaces with fine sand paper.

10.2. At least once a month remove contact material waste from voltage regulator contact track with soft brush.

11. CERTIFICATE OF ACCEPTANCE

Tester T-2500 serial №_____, conform the requirements of technical documents, User Rules of Operating Electrical Equipment" and "Safety Rules of Operating Electrical Equipment" for devices with voltage more than 1000V and is considered serviceable.

Date of manufacture _____
Stamp Quality Department _____

12. WARRANTY OF MANUFACTURER (SUPPLIER)

- 12.1. The manufacturer guarantees the tester's compliance with requirements of current technical documents and norms of User Rules of Operating Electrical Equipment" and "Safety Rules of Operating Electrical Equipment".
- 12.2. Warranty period is 12 months from the date of shipment to the customer.
During the warranty period of operation the manufacturer carries out in-service repair of the out of service equipment provided the customer did not abuse operating rules.
The warranty does not include the equipment with mechanical faults received as a result of negligent transportation.
- 12.3. After warranty period expires, the manufacturer provides service according to a separate agreement.