



Test generator  
of supply voltage  
dynamic changes  
IGD 8.1m

## CONTENTS

P.

1. Product features.....	4
2. Technical specifications.....	4
3. Packing contents.....	5
4. Feature and operation concept.....	5
5. Safety precautions.....	6
6. Preliminary starting procedure.....	6
7. Working sequence.....	7
8. Maintenance.....	11
9. Problems and solutions.....	11
10. Equipment qualification procedure.....	12
11. Maintenance conditions.....	16
12. Shipment.....	17
13. Storage precautions.....	17
14. Certificate of acceptance.....	17



## 1. Product features.

1.1 Test generator of supply voltage dynamic changes (hereinafter – the generator IGD 8.1m) is manufactured by "PRORYV" Research and development enterprise.

The IGD 8.1m test generator is designed to generate rated supply voltage dynamic changes (voltage interruptions, power failures and long interruptions) when testing the equipment (hereafter – TE) that are powered by the single-phase network 220 V; 50 Hz, GOST 30804.4.11-2013, GOST R 50009-2000, (IEC 30804-4-11:2004).

## 2. Technical specifications.

- maximum current value drawn by a tested TE from mains at 220 V 10 A
- output voltage during interruptions:
  - 80% $U_{rated}$  176 V
  - 70% $U_{rated}$  154 V
  - 40% $U_{rated}$  88 V
- output voltage during interruptions 0% $U_{mst}$  1 V maximum
- adjustment range when installing  $U_{mst}$   $\pm 10\%$  minimum
- output voltage change when changing the load current:
  - from 0 to 8 A when the output voltage is 220 V 5%  $U_{mst}$  maximum \*
  - from 0 to 10 A when the output voltage is 176 V 5%  $U_{mst}$  maximum \*
  - from 0 to 11.5 A when the output voltage is 154 V 5%  $U_{mst}$  maximum \*
  - from 0 to 20 A when the output voltage is 88 V 5%  $U_{mst}$  maximum \*
- voltage dynamic change length setup: from 10 ms (1 half-wavelength) to 99000 ms (9900 half-wavelengths)
- voltage dynamic change period setup: from 20 ms (2 half-wavelength) to 99980 ms (9998 half-wavelengths)
- voltage dynamic change initial and final stage setup from 0 to 315° at a pitch of 45°
- error of the voltage dynamic change initial and final stage setup 10° (0.56ms) maximum
- surge value during step output voltage change at 100  $\Omega$  load resistance 5%  $U_{mst}$  maximum
- output voltage rise and fall time during its step change at 100  $\Omega$  load resistance from 1 to 5  $\mu$ s
- peak loading current when the output voltage is 220 V 500 A\* minimum
- error of output voltage measurement  $\pm(0.01U_{mst}+0.2 V)$  maximum
- error of output current measurement  $\pm(0.01I_{mst}+0.1A)$  maximum
- import power 20 W max
- dimensions: 450 x 434 x 214 mm
- device mass: 14 kg max
- service life 10 years

*Note: the characteristics marked by the sign(\*) are implemented when the total resistance of the power supply at the place of the test generator connection is 0.3 Ohm maximum.*



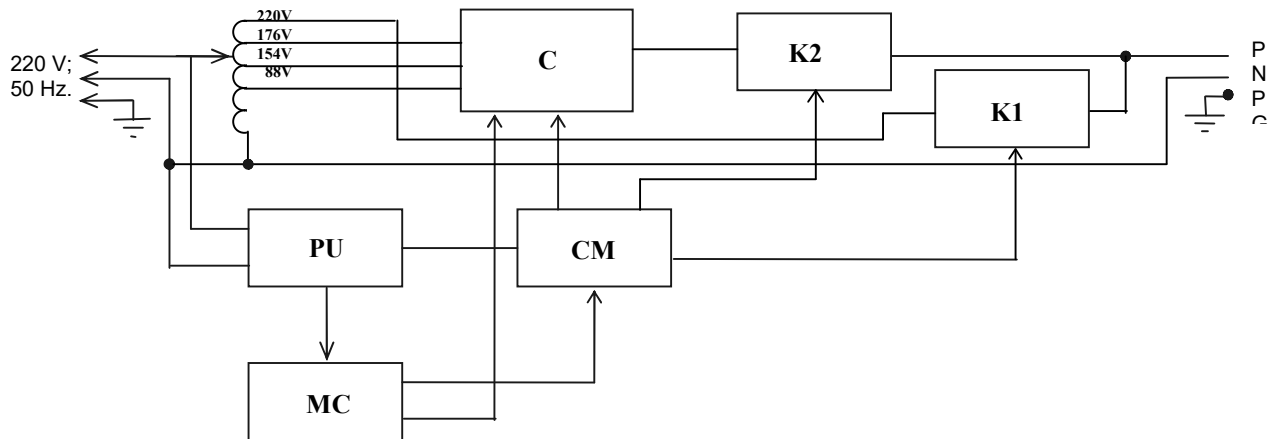
### 3. Packing contents.

The package includes:

- test generator IGD 8.1m 1 unit
- mains cable 1 unit
- fuse 10 A 2 units
- fuse 1A 2 units
- technical passport 1 unit

### 4. Feature and operation concept.

4.1. The functional chart of the test generator IGD 8.1m is shown in **Figure 1**.



**Fig. 1** The functional chart of the test generator IGD 8.1m

1. Power Unit (PU)
2. Microprocessor Controller (MC)
3. Control Means (CM)
4. Central Control Unit (CCU)
5. Keys (K1 and K2)

4.2. The power unit (PU) generates + 5V, + 10V and - 5V, which are required for appropriate functioning of the microprocessor controller and the control means.

4.3. The microprocessor controller (MC) manages the operation of the generator, keyboard input, readout, the synchronization with the supply network frequency, output voltage and current measurement, and generates signals for the control means.

4.4. The control means (CM) generates control signals for the keys (K1) and (K2), timing impulses when the network voltage goes through neutral and the network voltage polarity signal for the MC, normalizes the output voltage and current for the integrated analog-digital converter.

4.5. Central Control Unit (CCU) switches the ends of the autotransformer, depending on the generator's operation mode. The K1 key in the closed condition brings nominal voltage (220 V) to the output of the generator. The key K2 in this time is in open condition. When a failure or a surge are formed the K1 key is open, and the k2 key is closed. The output voltage is determined by the condition of the central control unit (CCU). When the interruptions are formed the both keys are open.

## 5. Safety precautions.

5.1. Only persons who have read and understood "The rules of technical operation of electric installations of consumers", have an approved group-based electrical safe work practices (not less than level 3), have been instructed

"On safety measures for work with electronic test equipment", and have examined technical specification and the manual, are permitted to use the test generator.

5.2. The repair of the generator shall be done only by the manufacturer's representatives.

5.3. *Do not cut the test generator into mains when the upper cap is removed.*

5.4. *A protective ground connection is required.*

## 6. Preliminary starting procedure.

6.1. After transfers in winter or high humidity conditions, the product should be kept under normal conditions 2 hours minimum before using.

6.2. Check 1A and 10A fuses are inserted in the rear panel holders.

6.3. Measure the supply network internal impedance in the potential connection place. In order to do that, measure the voltages in the power outlet without load by means of the digital AC voltmeter, then connect an active load with a resistance of 50 Ω and power of 1 kW (for example, tubular heating element) to the same outlet and remeasure the voltage in the outlet at the place of load connection. The total internal resistance of the supply network, calculated according to the formula (6.1), shall not exceed 0.3 Ω for ensuring the consistency with the required values of all technical characteristics (ref. Notes to item 2).


$$R_i = R_n \times \left( \frac{U_{xx}}{U_n} - 1 \right), \quad (6.1)$$

where  $U_{xx}$  is the voltage measured without the load,

$U_n$  is the voltage measured with the load,

$R_n$  is the load resistance,

$R_i$  is the total supply network resistance.

6.4. Connect the protective ground to the connecting device  on the rear panel by a wire sections of 1.5 mm<sup>2</sup> min.

6.5. Connect the power cable to the socket on the rear panel and to the power outlet 220 V ; 50 Hz. Turn on the test generator by "POWER (CETЬ)" switch. The message shown in Figure 2 should be displayed in few moments.



Figure 2

If the message "**MISCONNECTION! (НЕПРАВИЛЬНОЕ ПОДКЛЮЧЕНИЕ!)**" is displayed, turn off the generator and upturn the plug. If the same message is shown when you turn it on again, check the existence and integrity of the power ground.

6.6. The phase and the neutral in the "**OUTPUT (ВЫХОД)**" socket correspond to "**Р (Φ)**" and "**0(N)**" signs on the front panel.

## 7. Working sequence.

7.1. The tested equipment (with drawn current of 10 A maximum) is recommended to be connected to "**OUTPUT (ВЫХОД)**" outlet when the generator power is off.

7.2. After connecting of the TE to the generator, turn on "**POWER (СЕТЬ)**" of the generator and the power of the TE.

7.3. After the generator is turned on, text and an arrow cursor appear in the top line of the screen (see Figure 2).

7.4. The cursor is moved over lines by "↓" and "↑" keys. The menu item can be selected by "+" or "-" keys. The start is launched by "**ПУСК / СТОП (START/STOP)**".

### 7.5. Tests in compliance with GOST 30804.4.11-2013,

After selecting the test mode according to GOST 30804.4.11-2013 from the main menu, a menu with three upper lines as shown in Figure 3 is displayed.

<p><b>GOST 30804.4.11-2013</b>  <b>80%U<sub>rated</sub> 5000ms</b>  <b>φ= 0° N= 3</b>  <b>220.0 V 0.00 A</b></p>	←
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**Figure 3**

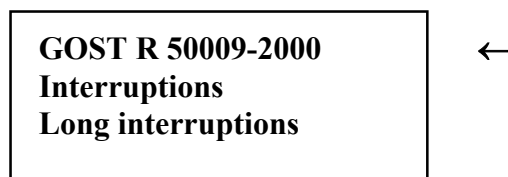
The first line returns to the main menu, and the second one selects the test mode (the test voltage level as a percentage of the rated voltage and the corresponding length of a failure or interruption). The possible values for the test voltage level and the length of the voltage dynamic change are shown in Table 1. The brought period of voltage dynamic change is 15 sec. The third row selects the initial and end phases of the interruptions from 0° to 315° at a pitch of 45° and the number of voltage dynamic changes from 1 to 100 (in default – 3), and the fourth line initiates the measured effective output voltage and current values of the tested equipment.

**Table 1**

No.	Test Voltage Level	Length of periods
1	80% U <sub>rated</sub>	250 (5000 ms)
2	70% U <sub>rated</sub>	25 (500 ms)
3	40% U <sub>rated</sub>	10 (200 ms)
4	0% U <sub>rated</sub>	0.5 (10 ms)
5	0% U <sub>rated</sub>	1 (20 ms)
6	0% U <sub>rated</sub>	250 (5000 ms)

## 7.6. Tests in compliance with GOST R 50009-2000.

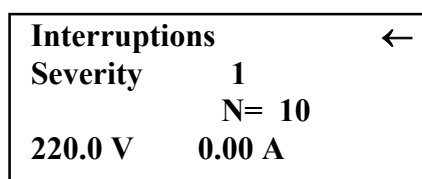
7.6.1. After selecting the test mode according to GOST R 50009-2000 from the main menu, a menu as shown in Figure 4 is displayed.



**Figure 4**

Clicking the "+" or "-" buttons in the top row returns to the main menu. The selection in the other lines refers to the Test Mode submenu according to GOST R 50009-2000.

7.6.2. Interruptions mode according to GOST R 50009-2000 UK 3 requirement



**Figure 5**

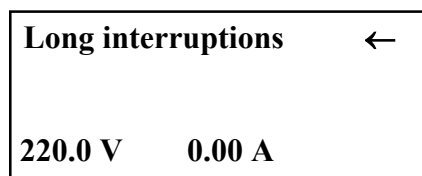
A menu as shown in Figure 5 is displayed, where the top two lines are available. The first line returns to the previous menu, and the second one selects the test severity level. The third line indicates the number of interruptions corresponding to the selected level of stiffness, and the fourth row reflects the measured output voltage and current value drawn by the tested TE.

The compliance between the test severity, length, period and the number of interruptions is shown in Table 2.

**Table 2**

Severity	Length of half-wavelengths	Period, sec	Quantity
1	2	10	10
2	4	10	20
3	6	10	50
4	8	10	100

7.6.3. Long interruptions mode according to GOST R 50009-2000 UK 4 requirement

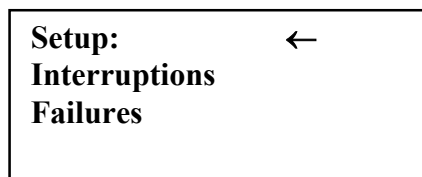


**Figure 6**

A menu as shown in Figure 6 is displayed, where the top line is available. It returns to the previous menu, or starts with one long interruption cycle according to GOST R 50009-2000 UK 4 requirement.

## 7.7. Test in "Setup (Установка)" mode.

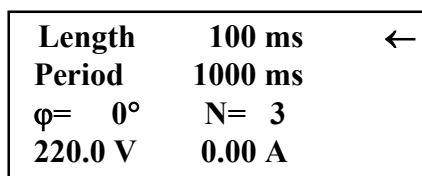
7.7.1. The operation in "Setup (Установка)" allows changing the test settings in wide range. After selecting the "Setup (Установка)" test mode from the main menu, a menu as shown in Figure 7 is displayed.



**Figure 7**

Clicking the "+" or "-" buttons in the top row returns to the main menu. The selection in the other lines refers to the Test Mode submenu.

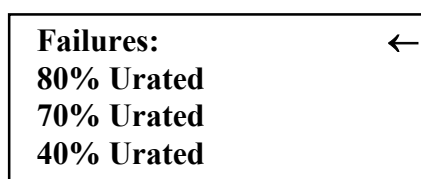
### 7.7.2. Interruptions mode.



**Figure 8**

The menu as shown in Figure 8 is displayed. After moving the cursor to the appropriate position using the "+" and "-" buttons the following parameters can be set: the length of interruptions from 10 and 99000 ms at a pitch of 10 ms, the period of interruption from 20 and 99980 ms at a pitch of 20 ms, a phase shift of the start and end of the interruption to the supply network voltage from 0 and 315 ° at a pitch of 45° and the number of interruptions from 1 to 100 (by default – 3). Holding the buttons in a pressed state automatically changes the parameter, with the rate of changes multiplying over time. The bottom line returns to the previous menu.

7.7.3. The failure mode differs because the menu as shown in Figure 9 is displayed, which allows to choose the test voltage level. Then the operation is equal to the interruptions mode indicated in item 7.7.2.



**Figure 9**



## 7.8. Test procedure.

7.8.1. In all test modes before the start of the test cycle, it is necessary to set the rated value of the output voltage  $220 \pm 2$  V by using "**RATED VOLTAGE (НОМИНАЛЬНОЕ НАПРЯЖЕНИЕ)**" regulator, taking lead from the bottom line of the display.

7.8.2. The test cycle is started by pushing "**START/STOP (ПУСК/СТОП)**" button. During voltage dynamic changes operation, the LED shows red. At the same time brought voltage dynamic changes are counted. When the specified number of voltage dynamic changes has been brought, the test cycle ceases. It can be also stopped by re-clicking "**START/STOP (ПУСК / СТОП)**" at the interval between voltage dynamic changes.

7.8.3. A sync pulse of positive polarity with a 10 V amplitude and length of 10  $\mu$ s is formed at "**TRIGGERING (СИНХРОНИЗАЦИЯ)**" output during the launch and the end of each voltage dynamic change.

7.8.4. If the effective value of the current drawn by the TE, averaged over 16 network voltage periods, exceeds the threshold value, the protection activates and the output voltage is turned off. "**OVERLOAD (ПЕРЕГРУЗКА)**" sign appears on the display, and the LED starts flashing red. In this case disable the load and restart the generator by clicking «**START / STOP (ПУСК / СТОП)**» button.

The value of threshold triggering depends on a mode of the generator. In most regimes it is about 10.5 A. At the time of voltage dynamic changes operation in "Failures (Провалы) 70%" mode it is about 12 A, and in "Failures (Провалы) 40%" – about 22 A.

## 8. Maintenance.

8.1. The maintenance of the test generator after the end of the warranty period shall be performed by the manufacturer under a particular contract.

8.2. The manufacturer shall provide warranty service for the generator over 24 months after work acceptance is made in accordance with the contract.

8.3. The warranty obligations shall not apply to equipment with clear mechanical or other damage caused by malfunctioning, mistreatment or accidents.

8.4. The warranty period is terminated if the repair is to be completed by the Customer or any third party.

8.5. Biennially at a minimum, the test generator shall be checked in accordance with periodical qualification procedure.

## 9. Problems and solutions.

9.1. Possible problems and solutions of fixing them are indicated in Table 3.

**Table 3**

Kind of malfunction	Probable cause	Solutions
1. When "POWER (СЕТЬ)" switch is turned, LCD backlight does not work.	1A fuse is missing or blown-out.	Change 1A fuse in the rear-panel holder.
2. The message "MISCONNECTION (НЕПРАВИЛЬНОЕ ПОДКЛЮЧЕНИЕ)" is displayed.	Phase and zero wires of the supply outlet and generator are mismatched.	Upturn the plug in the outlet.
	Protective ground does not connected or damaged	Connect the ground connector to ground bus of a room.
3. There is no voltage in the output receptacle.	10 A fuse is missing or blown-out in the supply network of the tested TE.	Change 10 A fuse in the rear-panel holder.

9.2. Otherwise, contact the manufacturer.

## 10. Equipment qualification procedure.

10.1 The test generator shall be qualified according to the methodology described below. The qualification frequency of the test generator during its operation and storage process is to be defined by an enterprise using the equipment in accordance with the conditions and intensity of its operation. It is recommended to conduct it biennially.

10.2. The list of standardized accuracy characteristics of the test generator is shown in Table 4.

**Table 4**

Characteristic	Severity	Rated value
The change of $U_{\text{output}}$ when the load current is changed from 0 to 8 A when the output voltage is 220 V, %, maximum	-	5
The value of $U_{\text{output}}$ in interruptions, V, maximum	-	20
The value of $U_{\text{output}}$ in failures $80\%U_{\text{rated}}$ ( $I_{\text{rated}}=0\div 10\text{A}$ ), $\%U_{\text{rated}}$ , maximum	-	5
The value of $U_{\text{output}}$ in failures $70\%U_{\text{rated}}$ ( $I_{\text{rated}}=0\div 11.5\text{A}$ ), $\%U_{\text{rated}}$ , maximum	-	5
The value of $U_{\text{output}}$ in failures $40\%U_{\text{rated}}$ ( $I_{\text{rated}}=0\div 20\text{A}$ ), $\%U_{\text{rated}}$ , maximum	-	5
Error of the step change voltage phase to the network voltage phase, degrees, maximum	-	10
The amount of surges in step change of the output voltage from 0 to $100\%U_{\text{rated}}$ and from $100\%U_{\text{rated}}$ to 0 at $R_{\text{rated}}=100\ \Omega$ , V, maximum	-	11
Output voltage rise and fall time during its step change ( $R_{\text{rated}}=100\ \Omega$ ), $\mu\text{s}$	-	from 1 to 5
Peak loading current when the output voltage is 220 V, A, minimum		500
Interruptions length in compliance with GOST R 50009-2000 UK 3 requirement, half-wavelengths	1	2
	2	4
	3	6
	4	8
Interruptions length in compliance with GOST 30804.4.11-2013, periods	-	0.5
	-	1
	-	250
Failures length in compliance with GOST 30804.4.11-2013, periods	$80\%U_{\text{rated}}$	250
	$70\%U_{\text{rated}}$	25
	$40\%U_{\text{rated}}$	10
For long interruptions mode according to GOST R 50009-2000 UK 4 requirement		
1st interruption length, half-wavelengths	-	10
1st pause length, half-wavelengths	-	30
2nd interruption length, half-wavelengths	-	10
2nd pause length, half-wavelengths	-	30
3rd interruption length, half-wavelengths	-	50

10.3. The recommended measurement tools for testing the generator are shown in Table 5.

**Table 5**

Measurement tools	Technical specifications	Type
Memory oscilloscope	Pass-band 10 Mmhz min	TDS 2022
Pulse voltage divider	Ratio 1:10 Maximum voltage 500 V	kit TDS 2022
Multimeter	Measurement limit (0.1 - 300) V at frequency of 50 Hz	NR 34401A
Load resistors	1. Resistance 27.5 Ohm $\pm 5\%$ , power 2 kW minimum 2. Resistance 17.6 Ohm $\pm 5\%$ , power 2 kW minimum 3. Resistance 100 Ohm $\pm 5\%$ , power 0.5 kW minimum 4. Resistance 13.4 Ohm $\pm 5\%$ , power 2 kW minimum 5. Resistance 4.4 Ohm $\pm 5\%$ , power 2 kW minimum	wire
Rectifier with a capacitor filter	In compliance with GOST 30804.4.11-2013,	
Current transformer	Maximum primary current 600 A Secondary current 5 A Class 0.2	UTT-5M

#### 10.4. Generator qualification and measurement of main metrological characteristics.

10.4.1. The pre-starting procedure of the test generator shall be conducted in accordance with item 6 of the present passport. Connect digital voltmeter and oscilloscope to IGD 8.1m generator output through the voltage divider. **When connecting them, the ground contact of the divider shall be connected to the N(O) of "OUTPUT (ВЫХОД)" socket, and the instrumentation prod – to Ph(Φ) slot.** The external trigger shall be connected to "TRIGGERING (СИНХРОНИЗАЦИЯ)" output of the test generator IGD 8.1m located on the back panel. Sync pulses have positive polarity, 10  $\mu$ s length, and around 10V amplitude. Set the waiting mode of the memory oscilloscope.

10.4.2. Set the nominal voltage (220 V) at the generator output, controlling it using the digital voltmeter. Connect a load resistor with resistance 27.5 O and power 2 kW ( $I_{rated} \approx 8$  A) to the generator output. Measure the output voltage and calculate the change of the output voltage when the load current is changed from zero to the maximum value according to the formula (10.1). The results of the measurements are recorded in the protocol (ref. Passport, Table 7).

$$\Delta U_{\text{ВЫХ}} = \frac{U_{\text{вых2}} - U_{\text{вых1}}}{U_{\text{вых1}}} \times 100\%, \quad (10.1)$$

where  $U(\text{ВЫХ1})_{\text{output1}}$  – output voltage at no-load;  $U(\text{ВЫХ2})_{\text{output2}}$  – load output voltage.

**Note:** there shall be an opportunity to measure the generator output voltage directly from "OUTPUT (ВЫХОД)" outlet of the IGD 8.1m.

10.4.3. Disable the load from the generator output. Set "Setup (Установка)/Interruptions (Прерывания)/Length (Длительность) – 20000 ms / Period (Период) – 20020 ms / Phase - 0°" operating mode of the generator (ref. Passport, item 7.7.2). Run the generator by pressing "START/STOP (ПУСК / СТОП)" button and measure the output voltage during the generation of interruption. The results of the measurements are recorded in the protocol (ref. Passport, Table 6).

10.4.4. Set "Setup (Установка) / Failures (Провалы) / 80%  $U_{rated}$  / Length (Длительность) – 20000 ms / Period (Период) – 20020 ms / Phase - 0°" operating mode of the generator (ref. Passport, item 7.7.3). Measure the output voltage during the generation of failure when  $I_{rated}=0$  A ( $U_{xx}$ ).

10.4.5. Run the generator in the same mode. Then connect a load resistor having 17.6  $\Omega$  resistance and 2 kW minimum power ( $I_{rated}\approx 10$ A) to the generator output for 5 sec maximum and measure the output voltage during the generation of failure. The change of the output voltage at 10 A current load for failures 80%  $U_{rated}$  ( $U_H$ ) are calculated according to the formula (10.2) and are recorded in the protocol.

$$\Delta U_{вых} = \frac{U_H - U_{xx}}{220} \times 100\% . \quad (10.2)$$

10.4.6. Set "Setup (Установка) / Failures (Провалы) / 70%  $U_{rated}$  / Length (Длительность) – 20000 ms / Period (Период) – 20020 ms / Phase - 0°" operating mode of the generator (ref. Passport, item 7.7.3). Repeat the actions according to item 10.4.4-10.4.5 for failures 70%  $U_{rated}$ . The load resistor shall be used with resistance 13.4  $\Omega$  and power 2 kW minimum ( $I_{rated}\approx 11.5$  A).

10.4.7. Set "Setup (Установка) / Failures (Провалы) / 40%  $U_{rated}$  / Length (Длительность) – 20000 ms / Period (Период) – 20020 ms / Phase - 0°" operating mode of the generator (ref. Passport, item 7.7.3). Repeat the actions according to item 10.4.4-10.4.5 for failures 40%  $U_{rated}$ . The load resistor shall be used with resistance 4.4  $\Omega$  and power 2 kW minimum ( $I_{rated}\approx 20$  A).

10.4.8. Set "Setup (Установка)/Interruptions (Прерывания)/Length (Длительность) – 20 ms / Period (Период) – 1000 ms / Phase - 90°" operating mode of the generator. Connect a load resistor with resistance 100  $\Omega$  and power 0.5 kW minimum to the generator output. By means of the memory oscilloscope measure the rise and fall time of the output voltage in the step change, as well as the value of output voltage surges. Then set the value "Phase (Фаза) - 270°" and repeat the measurements. Record the results of the measurements in the protocol (ref. Passport, Table 6).

10.4.9. Set "Setup (Установка)/Interruptions (Прерывания)/Length (Длительность) – 20 ms / Period (Период) – 1000 ms / Phase - 0°" operating mode of the generator. By means of oscilloscope measure the delay of the start and end of the interruptions to the time of transition through neutral to the positive half-wavelength and the network voltage period. The phase shift is calculated according to the formula (10.3). Record the results of the measurements in the protocol (ref. Passport, Table 6).

$$\Delta\varphi = \frac{t_z}{T} \times 360^\circ - \varphi_0, \quad (10.3)$$

where  $t_{delay}$  – the delay length to the time of voltage transition through neutral,  
T – network voltage period,  
 $\varphi_0$  – the set phase value,  
 $\Delta\varphi$  - phase shift.

10.4.10. Repeat the steps as indicated in item 10.4.9 for the remaining phase shift values. The maximum phase shift value is recorded into the protocol.

10.4.11. Set "Setup (Установка)/Interruptions (Прерывания)/Length (Длительность) – 19990 ms / Period (Период) – 20000 ms / Phase - 90°" operating mode of the generator. Run the generator and connect it to the biphaser rectifier with a 1700  $\mu$ fd $\times$ 400V capacitor filter, resistive load with 100  $\Omega$  resistance and 0.5 kW load, and the current sensor. The current sensor shall be connected to the memory oscilloscope output in waiting mode with internal triggering. After the current pulse is recorded, the rectifier shall be disconnected from the generator output.



Then set the value "Phase ( $\Phi$ аза) - 270°" and repeat the measurements. The minimum value of the peak current over measurements shall be recorded in the protocol (ref. Passport, Table 6).

10.4.12. By means of the memory oscilloscope measure the length of interruptions and failures in "GOST 30804.4.11-2013" mode at the test voltage levels, interruptions in "GOST-50009-2000" mode at all degrees of severity, and the temporary parameters of long interruptions in "GOST R 50009-2000" mode. The results of the measurements are recorded in the protocol (ref. Passport, Table 7).

**Table 6**

Item	Rated value	Measured value
Change of the output voltage when the load current is changed from 0 to 8 A when the output voltage is 220 V, %, maximum	5	
Output voltage in interruptions ( $R_{\text{rated}}=\infty$ ), V, maximum	20	
Change of the output voltage in failures $80\% U_{\text{rated}}$ ( $I_{\text{rated}} = 0\div 10$ A), $\%U_{\text{rated}}$ , maximum	5	
The value of the output voltage in failures $70\%U_{\text{rated}}$ ( $I_{\text{rated}}=0\div 11.5$ A), $\%U_{\text{rated}}$ , maximum	5	
Change of the output voltage in failures $40\% U_{\text{rated}}$ ( $I_{\text{rated}}= 0\div 20$ A), $\%U_{\text{rated}}$ , maximum	5	
The amount of surges in step change of the output voltage from 0 to $100\%U_{\text{rated}}$ at $R_{\text{rated}}= 100$ O, V, maximum	15	
The amount of surges in step change of the output voltage from 0 to $100\%U_{\text{rated}}$ to 0 at $R_{\text{rated}}= 100$ O, V, maximum	15	
Output voltage rise time during its step change at $R_{\text{rated}}= 100$ Ohm, $\mu$ s	from 1 to 5	
Output voltage fall time during its step change at $R_{\text{rated}}= 100$ Ohm, $\mu$ s	from 1 to 5	
Peak loading current when the output voltage is 220 V, A, minimum	500	
Error of the step change voltage phase to the network voltage phase, degrees, maximum	10	

Table 7

Item	Severity	Rated value	Measured value
The interruptions length in GOST R 50009-2000 UK 3 requirement mode, half-wavelengths	1	2	
	2	4	
	3	6	
	4	8	
The interruptions length in GOST 30804.4.11-2013, periods	-	0.5	
	-	1	
	-	250	
The failures length in GOST 30804.4.11-2013, periods	80%U <sub>rated</sub>	250	
	70%U <sub>rated</sub>	25	
	40%U <sub>rated</sub>	10	
For long interruptions mode according to GOST R 50009-2000 UK 4 requirement			
1st interruption length, half-wavelengths	-	10	
1st pause length, half-wavelengths	-	30	
2nd interruption length, half-wavelengths	-	10	
2nd pause length, half-wavelengths	-	30	
3rd interruption length, half-wavelengths	-	50	

## 11. Maintenance conditions.

### Climate conditions

The generator shall be operated under normal climate conditions

- surrounding air temperature  $(20 \pm 10) ^\circ C$ ;
- relative air humidity **45 - 80 %**;
- atmospheric pressure **84.0 – 106.0 kPa (630 – 800 mm Hg)**.

General requirements of electric power.

The generator is powered by a single-phase AC network with a frequency of 50 Hz, nominal voltage of  $220 V \pm 10\%$ . The sections of the wires should correspond to the maximum loads of the tested equipment. The workplaces shall have euro sockets with the connected grounding pins. The sockets and protective ground connected devices shall be located in close proximity to the generator. The connection of the protective ground to the "ground" connecting device located on the rear panel of the generator require a flexible wire having sections of 1,5 mm.

Do not use dividing transformers to power the generator.

## 12. Shipment.

The packed device is transported by all kinds of transport, provided that it is protected against precipitation.

When the device is transported by an air plane, it shall be placed in a heated sealed compartment.

The holds of ships and carboodies used for shipment shall not have cement, coal, chemicals, etc.

The shipment of the generator shall be carried out at air temperature ranging from  $-25\text{ }^{\circ}\text{C}$  to  $+55\text{ }^{\circ}\text{C}$ , relative air humidity up to 95% at  $+55\text{ }^{\circ}\text{C}$  temperature.

## 13. Storage precautions.

The device shall be stored in heated space under the following conditions:

- air temperature from 283 to 308 K (from 10 to 35  $^{\circ}\text{C}$ );
- relative air humidity 80% at 298 K (25  $^{\circ}\text{C}$ ) air temperature;
- there shall be no dust, acid vapor, grease alkali and corroding gases in the storage space;
- do not store unpacked generators on the top of one another;
- the storage of the packed generator is acceptable.

## 14. Certificate of acceptance.

Test generator IGD 8.1m, manufacturing number \_\_\_\_\_, meets the technical requirements and is approved as ready for service.