



Industrial-frequency current
test generator
IGP 2.1

TECHNICAL PASSPORT

№

INDUSTRIAL-FREQUENCY CURRENT TEST GENERATOR IGP 2.1

MANUAL
EQUIPMENT QUALIFICATION PROCEDURE



CONTENTS.

P.

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



1. Product features.

1.1. Industrial-frequency current test generator (hereinafter – test generator IGP 2.1) is manufactured by "PRORYV" Research and development enterprise.

1.2 . Test generator IGP 2.1 is designed to generate rated pulsed magnet field of industrial frequency (with spark inductor IK 1.1) when making tests of the technical equipment (hereinafter – TE), which may be exposed by noise in accordance with GOST R 50648-94, IEC 1000-4-8-93, GOST 30804.6.1-2013 item 8, GOST 30804.6.2-2013 item 8.

2. Technical specifications.

• Density of field at the coil center of spark inductor IK 1.1	1, 3, 10, 30, 40, 100 A/m
• Output current harmonic distortion factor	8% max
• Magnetic-field generation time (at a pitch of 1 min)	1 ÷ 10min
• Import power	100W max
• Dimensions	450×434×214mm
• Device mass	15 max
• Service life	10 years

Spark inductor IK 1.1 parameters:

• Number of turns	3
• Coil coefficient (the ration between the density of field in the coil center to its current)	2.65m ⁻¹ ±1%
• Operation volume	0.6×0.6×0.5m

3. Packing contents.

• test generator IGP 2.1	1 unit
• mains cable	1 unit
• 1A fuse	2 units
• 15A fuse	2 units
• spark inductor IK 1.1 with a set of mounting elements	1 unit
• 4m cable for connecting to the spark inductor	2 units
• technical passport	1 unit



4. Feature and operation concept.

4.1 The functional chart of the test generator IGP 2.1 is shown in **Figure 1**.

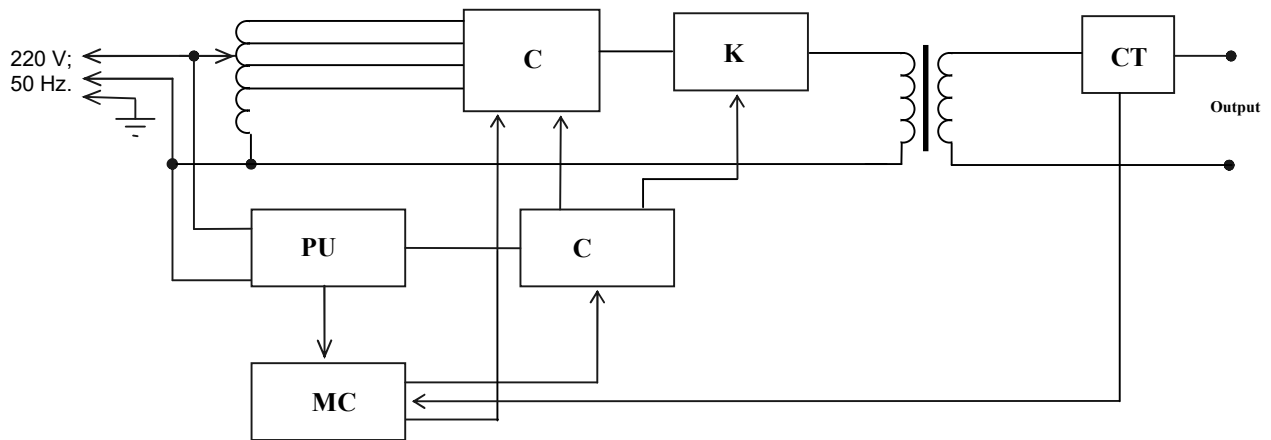


Fig. 1 The functional chart of the test generator IGP 2.1

1. Power Unit (PU)
2. Microprocessor Controller (MC)
3. Control Means (CM)
4. Central Control Unit (CCU)
5. Key (K)
6. Current transducer (CT)

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) produces control signals for the key (K) and the central control unit (CCU), and generates sync pulses when network voltage crosses the zero for MC.

4.5. The central control unit (CCU) switches the winding ends of the autotransformer in relation to generator operation mode and sets internal resistance that is necessary for the required output current value.

4.6. The current transducer (CT) generates voltage which is in proportion to the output current value for the analog-digital converter incorporated in the MC.

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.*

5.5. *When the output cables are connected to the generator, spark inductor and tested TE, the test generator shall be disconnected from the power network.*

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 15A fuses are inserted in the rear panel holders.

6.3. Connect the protective ground to the connecting device  on the rear panel by a wire sections of 1.5 mm² min.

6.4. Depending on the type of testing, connect the intertwined cables of the spark inductor or cables intended for connecting to the ground circuit of the TE, to the output connectors.

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 (СЕТЬ)" switch. The message shown in Figure 2 should be displayed. 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.

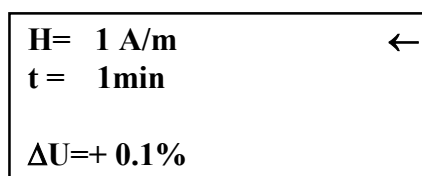


Figure 2

7. Working sequence.

7.1. After the generator is turned on by "**POWER (СЕТЬ)**" switch, text and an arrow cursor appear in the top line (ref. Figure 2). The cursor is moved by "↓" and "↑" keys.

7.2. Density of field is set by "+" and "-" keys. The cursor shall be located in "**H= ___A/m**" position. The values **1, 3, 10, 30, 40, 100A/m** can be chosen.

7.3. Test exposure time, which equals 1 minute as a default, is set when the cursor is put in «**t = ___min(мин)**» position ranging from 1 to 10 minutes by «+» and «-» buttons.

7.4. The bottom line of the display reflects voltage deviation on the primary winding of the output transformer from the rated value caused by the voltage deviation of the power network. Before starting the generator, set the minimum voltage deviation value using the "**RATED VOLTAGE (НОМИНАЛЬНОЕ НАПРЯЖЕНИЕ)**" slider on the front panel of the generator.

7.5. The generator is started by pushing "**START/STOP (ПУСК/СТОП)**" button. When the output current is generated, the "**START (ПУСК)**" LED shows red.

7.6. The generator operation can be interrupted by second clicking the "**START/STOP (ПУСК/СТОП)**" button. The generator does not react on commands from other buttons during an operation cycle.

7.7. The output current value is measured and displayed in the bottom line of the display, and a value for the density of field is shown, taking into account the IK 1.1 coil coefficient ($K=2.65m^{-1}$). The density of field value should be checked (or set) when there is no TE in the spark inductor work area.

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.

8.1. 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 1.

Table 1.

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 "MISCONNECTION! (НЕПРАВИЛЬНОЕ ПОДКЛЮЧЕНИЕ!)" message is shown on the display.	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. Displayed value of the current or density of field is significantly different from the set one. *	Poor contacts in power connectors or in places where test ground circuits are connected.	Make good contacts in the output circuits.
	The voltage deviation from the rated value is too high.	Set minimum deviation using the "RATED VOLTAGE (НОМИНАЛЬНОЕ НАПРЯЖЕНИЕ)" slider
	15A fuse is missing or blown-out.	Change 15A fuse in the rear-panel holder.

- The displayed value of density of field can be significantly different when a tested TE is set in the coil work area.

9.2. Otherwise, contact the manufacturer.



10. Acceptance information

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.

10.2. The list of standardized accuracy characteristics of the test generator.

10.2.1. The list of standardized accuracy characteristics of the test generator is shown in Table 2.

Table 2.

Density of field, A/m	1	3	10	30	40	100
Output current, A $\pm 20\%$ *	0.377	1.13	3.77	11.3	15.1	37.7
Output current harmonics coefficient, max, %	8	8	8	8	8	8

***Note:** intensity of magnetic field at the coil center equals $H = K * I$, where I is the inductor current value, K is the inductor coefficient, for the spark inductor IK 1.1 it equals $K=2.65 \text{ m}^{-1} \pm 1\%$.

10.3. The recommended measurement tools for testing the generator are shown in Table 3.

Table 3.

Measurement tools	Technical specifications	Type
Multimeter	Measurement limit (0.1 - 300) V at frequency of 50 Hz	LR 34401A
Distortion meter	Frequency range 20 Hz-199.9 kHz Minimal measured harmonics coefficient 0.1%	S6-11
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.

10.4.2. The current at the test generator output when working with the spark inductor is measured by the AC voltmeter, connected to the current transformer that is crossed by one of the cables linking the generator with the inductor. The value of output current is calculated using a formula (10.1).

$$I_{\text{exit}} = \frac{U_{\text{изм}} \times K_{\text{мп}}}{R} \quad (10.1),$$

where $U_{\text{msr(изм)}}$ - measured voltage; $C_{\text{tr(тр)}}$ - current transformer transformation ratio; R - resistance of the auxiliary resistor, connected to current transformer output.

The results of the measurements for all set values are recorded in the protocol (ref. Passport, Table 4, 5). The deviation of measured values from the rated ones is calculated using a formula (10.2):

$$\Delta I = \frac{I_{\text{изм}} - I_{\text{НОМ}}}{I_{\text{НОМ}}} \times 100\%. \quad (10.2)$$

The results of the measurements are recorded in the protocol (ref. Passport, table 4).



10.4.3. Output current harmonic coefficient is measured at the current transformer output by the distortion meter. The results of the measurements are recorded in the protocol (ref. Passport, table 4). Output current harmonics coefficient depends mostly on power supply harmonics coefficient in the connection point and as a rule does not exceed $3 \div 5\%$.

Table 4.

Density of field, A/m	1	3	10	30	40	100
Output current, A						
Deviation, %						
Output current harmonic coefficient, %						

11. Maintenance conditions

Climate conditions

The generator shall be operated under normal climate conditions

- surrounding air temperature $(25 \pm 10)^\circ \text{C}$;
- relative air humidity $45 - 80\%$;
- atmospheric pressure $84.0 - 106.7 \text{ kPa}$ ($630-800 \text{ mm Hg}$).

General requirements of electric power.

The generator is powered by a single-phase AC network with a frequency of 50 Hz, nominal voltage of $220 \text{ V} \pm 10\%$. The sections of the wires should correspond to the maximum loads of the test 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 minimum.

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 carbodies used for shipment shall not have cement, coal, chemicals, etc.

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

relative air humidity 80% at 298 K (25 °C) air temperature;

There shall be no dust, acid vapor, grease alkali and corroding gases in the storage space;

do not store unpacked devices on the top of one another.

The storage of the packed device is acceptable.

14. Certificate of acceptance.

Test generator IGP 2.1, manufacturing number _____, meets the technical requirements and is approved as ready for service.

