НАУЧНО-ПРОИЗВОДСТВЕННОЕ ПРЕДПРИЯТИЕ

Electrostatic discharge test generator IGE 20.1K

DATASHEET

№

ELECTROSTATIC DISCHARGE TEST GENERATOR

IGE 20.1K

MANUAL

2015

CONTENTS

1. Product features.

1.1. Test generator **IGE 20.1K** (hereinafter – the generator) is designed to generate rated test pulses simulating discharges over the surface of a spacecraft (SC) as a result of its interaction with Earth-orbit plasma, and to check the quality of the electromagnetic shielding of electronic blocks, the on-board wiring system, and the spacecraft itself from interference caused by electrostatic discharges.

2. Technical specifications.

- Charge capacity , pF, ±10% — 200
- rated output (test) voltage: kV, ±10% — 5, 10, 15, 20
- output pulse parameters — ref. Table 1
- discharge current pulse form — ref. Figure 1
- output voltage polarity — positive and negative
- operation mode — with a frequency of 1 Hz
- dimensions: generator, mm — 430 x 450 x 185
- mass of the generator, kg, max — 12
- import power, W, max — 10
- integrated battery runtime — up to 8 hours
- service life (does not apply to the battery) — 10 years

Table 1.

Output pulse parameters

Current amplitude, A, ± 10%	100	100	100	100
Current-rise time as of 0.1-0.9, nsec ±30%	5	5	5	5
Voltage level, kV, ±10%	5.0	10.0	15.0	20.0

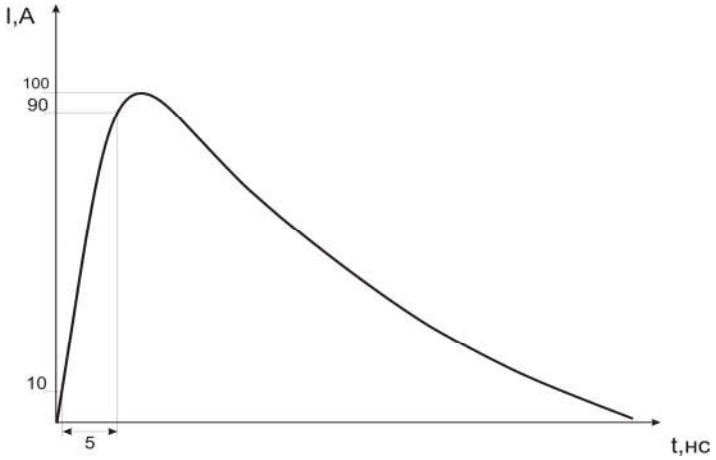

Fig.1 Discharge current pulse form.

3. Packing contents.

The package includes:

- test generator IGE 20.1K 1 unit
- charging unit 1 unit
- high-voltage cables 2 units
- datasheet 1 unit
- 3A Fuse 2 units

4. Feature and operation concept.

4.1 The functional chart of the test generator IGE 20.1K is shown in Figure 2.

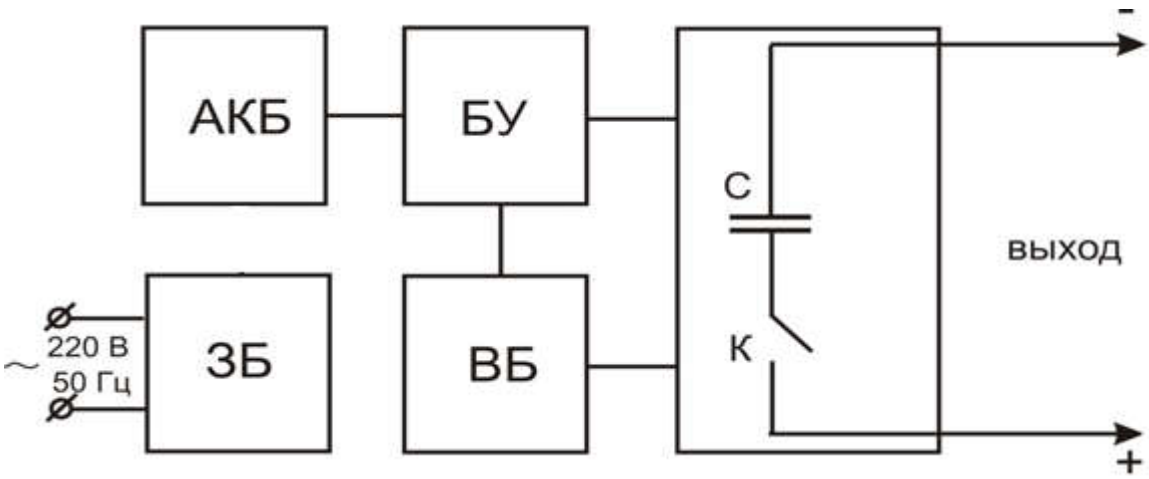

Fig. 2 The functional chart of the test generator IGE 20.1K

1. Charging Unit (CU on the scheme ЗБ)
2. Control Means (CM - БУ)
3. High-Voltage Unit (HVU - ВБ)
4. Battery Unit (BU - АКБ)
5. Discharge Key (DK - К)
6. Storage Capacitor (SC - С)

4.2. The charging unit provides the charging of the battery.

4.3. The control means sets the generator operation mode and controls the discharge key.

4.4. The high-voltage unit generates voltage for storage capacitor charging.

4.5. The battery unit (BU) ensures off-line operation of the generator.

4.6. The discharge key (DK) and the storage capacitor (SC) guarantee the formation of rated current pulses at the generator output.

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. ***Connect the high-voltage cables only when the test generator is turned off (*"on/off (вкл/выкл)"** *switch is put in "off" position).***

5.4. ***Do not touch the high-voltage cables and receptacle connectors when high-voltage pulses are formed.***

5.5. ***Do not use the test generator when the battery is charging.***

6. Preliminary starting procedure.

6.1. After transfers in winter or high humidity conditions, the product should be kept under normal conditions 8 hours minimum before using.

6.2. The battery shall be charged.

7. Working sequence.

7.1.1 The description of the generator front panel.

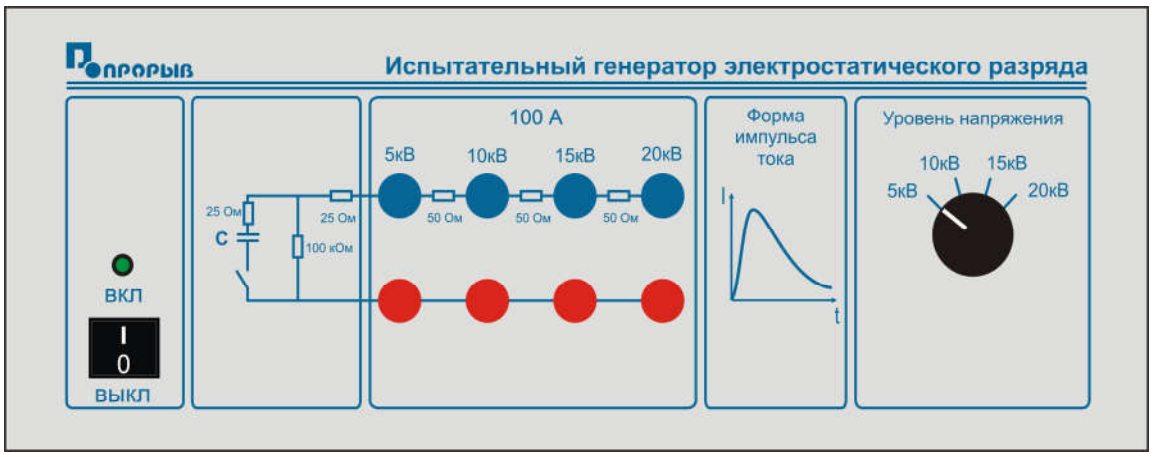

Fig. 3 The appearance of the generator front panel.

The front panel of the generator has:

"on/off (вкл/выкл)" switch turns the generator on and off.

Generator power-on indicator (индикатор включения генератора) is located above the switch. (When the generator is turned on, it shall show the green light.)
Attention! In case when you turn on the generator and the indicator shows orange light, do not use the generator and charge the battery.

Output high-voltage connectors (Выходные высоковольтные разъемы) are used to connect high-voltage cables.

Voltage level switch (Переключатель уровня напряжений) sets the value of output pulse voltage.

Pulse cycling indicator (Индикатор подачи импульсов) shows when the pulses are at the generator output and it is located above the voltage level switch.

When the generator power is turned on, the indicator shows a continuous green light. In one and a half minute it shows a pulsed green light, indicating that the generator is ready to operate. When rotating the voltage level switch clockwise from the leftmost position to any other, voltage pulses come to the output of the generator. It is recommended to preinstall the required voltage level before enabling the generator.

7.1.2 The description of the generator rear panel.

"Work/charge" switch (Выключатель «работа/зарядка») changes the modes of operation.

Battery charging connector (Разъем зарядка аккумулятора) is intended to connect the charging unit.

Fuse (Предохранитель) is put between the battery and the generator and is designed to protect the electrical circuitry on an emergency basis.

7.2. Operation mode.

7.2.1. Connect the high-voltage cables to a device under test.

7.2.2. Connect the high-voltage cables to the high-voltage sockets on the front panel, observing the necessary polarity.

7.2.3. Set the required output voltage level by the front panel switch.

The set level must match the connected output. For example, in order to get rated current pulses (100 A) and the voltage amplitude at no-load **10 kV**, connect the output connecting terminals marked on the front panel as **10 kV**, and set the voltage level switch to **10 kV**.

7.2.4. Turn the "work/charge" switch on the back panel to the "work" position.

7.2.5. Turn the "on/off" switch on the front panel to the "off" position.

7.2.6. In a minute and a half, high voltage pulses are brought to the generator output, and the Pulse cycling indicator is switched to the intermittent glow mode of green light with a frequency of 1 Hz.

7.2.7. The rated current 100± 10 (A) is provided **only when** charging voltage and output connectors are corresponding.

After the operation is complete, the generator is turned off in reverse order.

8. Charging the battery.

The test generator uses a maintenance-free 12V battery with the capacity of 12 Ah (Panasonic LC-RA1212PG).

Attention. Turn the "on/off" switch on the front panel to the "off" position. Turn the "work/charge" switch on the back panel to the "charge" position.

8.3.1. Connect the charging unit to the socket on the back of the generator.

8.3.2. The LED indicator of the charger shows red, reflecting that the charge has started.

8.3.3. When the charge is completed, the indicator shows green, reflecting that the charging is over. The average charging time is about 8 hours.

8.3.4. Disconnect the charging unit from the network outlet and the generator connector.

9. Maintenance.

9.1. The maintenance of the test generator after the end of the warranty period shall be performed by the manufacturer under a particular contract.
9.2. The manufacturer shall provide warranty service for the generator over 24 months after work acceptance is made in accordance with the contract.

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

10. Problems and solutions.

No.	Problem	Solution
1	When turning the generator on in operation mode, the indicator on the front panel does not show up	replace the fuse
2	Other faults	contact the manufacturer

11. Equipment qualification procedure.

11.1. The generator is qualified in accordance with the technical description of the test generator and the reference documentation (GOST 8.568-97, GOST R 50746-2000, IEC 1000-4-8-93).

11.2. The qualification frequency of the test generator IGE 20.1K 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.

11.3. The rated technical specifications to be determined and controlled.

11.3.1 Walk-around inspection.
11.3.2 The list of qualified characteristics of the test generator:
- Current amplitude = (100 ± 10) A,
- Current-rise time as of 0.1-0.9 level = (5±1,5) nsec,
- Test voltage = ((5; 10; 15; 20) ±0,1U) kV.

11.4. Conditions for the qualification:
-surrounding air temperature, K (^{0}C) 293±5 (20±5);
-relative air humidity, % 65±15;
-atmospheric pressure, kPa (mm Hg) 100±4 (750±30);

11.5. The recommended measurement tools for testing the generator are shown in Table 2.

Table 2.

Measurement tools	Technical specifications	Type
Oscilloscope	Pass-band 500 Mmhz (error ±3%)	LeCroy WaveJet 354
Multimeter	0 – 1000 O (error ±0.05%)	LR 34401A
Attenuator	Dividing ratio 1:20 (error ±1%) Input resistance 50 O Maximum voltage 5 kV min Pass-band 500 Mmhz min	IAN 3.1
Shielded chamber with current sensor	Faraday Shield in compliance with GOST R 51317.4.2-2010	
Attenuator	ρ =50 O, frequency attenuation 20 dB, error ±0.1 dB	D2-32

Notes:

1. The measurement devices specified in the table can be substituted with other equivalent ones providing adequate accuracy measuring of the corresponding parameters.
2. All measurement devices shall be in good operating conditions and accepted (calibrated) in due compliance.

11.6. Generator qualification and measurement of main metrological characteristics.

11.6.1. The preliminary starting procedure and walk-around inspection (the contents of delivery and the absence of damages, the availability of current documents, and testing equipment characteristics values recorded in the previous qualification procedure) of the generator are conducted in accordance with the product specification.

11.7. The measurement of the test generator main metrological characteristics.

11.7.1. Connect the generator to the instrument shunt (current sensor) on the Faraday Shield. Measure the value of output current and generator front pulse time at all output voltage values by the oscilloscope. The results of the measurements are recorded in the Table 3.

Table 3.

Set value of voltage amplitude, kV	5	10	15	20
Current amplitude I, A				
Current-rise time as of 0.1-0.9 level, nsec				

11.7.2. Connect attenuators IAN 3.1 and D2-32 to the "5 kV" generator terminals.
The "voltage level" switch on the front panel is set to 5 kV.
Measure the voltage of generator by the oscilloscope considering the attenuator ratio coefficient (1:200) and write the result into Table 4.

Table 4.

Generator voltage, U			Internal resistance, Rin	
Standard, kV	Measured, kV	Error E, %	Standard, O	Calculated, Rin =50*(1+E/100) O
2.5			50	

Measure the output resistance of the generator the multimeter Rn (depending on the output voltage) and record the results in Table 5.

Table 5.

Severity level	Rated value of output voltage, kV	Connection terminals	Rated value of discharge resistance Rdis, O	Measured value of discharge resistance Rdis, O
1	5	-	50	Rin (Table 4) =
2	10	5kV -10kV	50	
3	15	5kV -15kV	100	
4	20	5kV -20kV	150	

The measured values of Rn shall not differ from the rated by more than ±10 per cent.

11.7.3. The amplitude of the output voltage (at no-load mode) for severity levels 2, 3 and 4 is calculated by the formula (2):

$$U = I*(Rdis + Rin) \quad (2)$$

The results of the measurements are recorded in the Table 6.

Table 6.

Severity level	Rated value of output current, kV	Calculated value of output voltage U, U = I*(Rdis + Rin) kV
1	5	
2	10	
3	15	
4	20	

The measured values of U shall not differ from the rated by more than ±10 per cent.

12. Maintenance conditions.

12.1. Climate conditions.

The generator shall be operated under normal climate conditions

- surrounding air temperature ***(25 ± 10) ^{o} C;***
- relative air humidity ***45 - 80 %;***
- atmospheric pressure ***84.0 – 106.7 kPa (630-800 mm Hg).***

12.2. 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 ± 10***%***.

13. 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 generator shall be carried out at air temperature ranging from -25 °C to + 55 ° C, relative air humidity up to 95% at +55°C temperature.

14. 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 ºC) 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.

15. Certificate of acceptance.

Test generator IGE 20.1K, manufacturing number , meets the technical requirements and is approved as ready for service.

Production date

Head of Inspection Department