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## GTEG-220A THERMOELECTRIC GENERATOR

### 1. Purpose

The GTEG-220A thermoelectric generator is a highly reliable autonomous power and heat source powered by natural gas or propane. GTEG-220A operates without maintenance for one year in various climatic zones at air temperatures from -60 to +40°C and relative humidity up to 98%. GTEG-220A generates electricity by converting heat flow energy into electricity (direct conversion). The generator does not contain moving parts, has a long service life and requires minimal maintenance.

The generator does not require the constant presence of personnel and can be controlled remotely via the RS-485 data exchange protocol. The operation of the generator does not depend on the time of year, time of day, weather conditions.

The built-in automated generator control system (AGCS) provides:

- automatic shutdown in the absence of gas, start-up and process control;
- remote on/off via RS-485 communication protocol;
- transmission of generator status data via RS-485 communication protocol;
- smooth transition to economy mode with reduced load;
- monitoring and control of the completeness of fuel combustion.

The generator is used as part of an autonomous power source (APS).

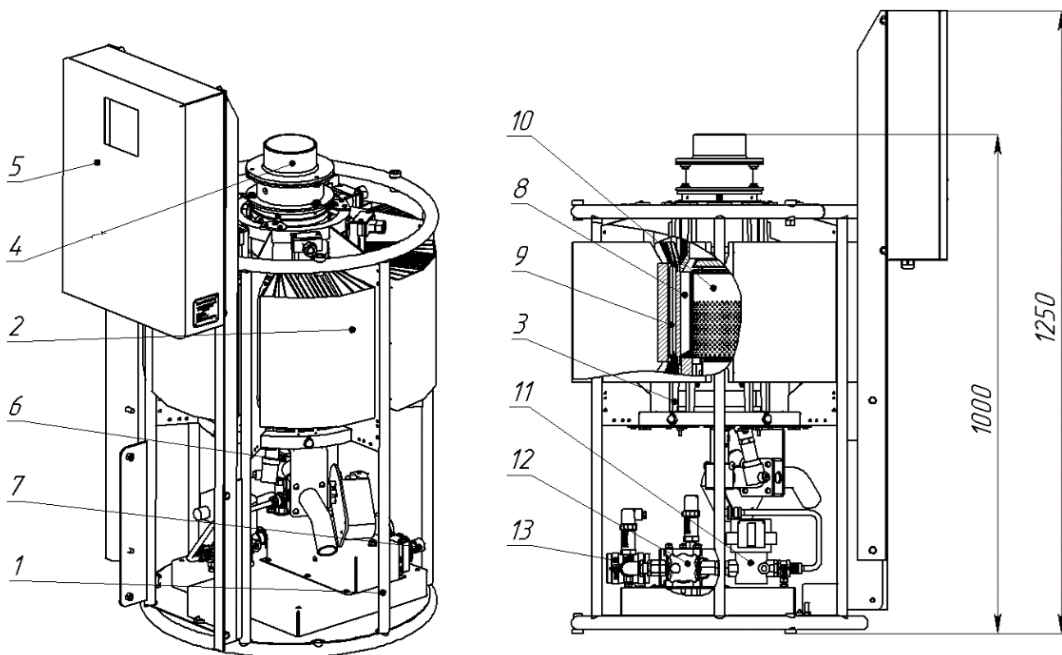
### 2. GTEG-220A main parameters

Parameter	Value
Nominal output voltage, V	12-18
Nominal output power (at +20°C), W	220±10%
Gas fuel type (factory preset)	Natural Gas

Parameter	Value
Range of operating gas pressure at the generator inlet, bar	From 0.4 to 1.0
Automatic shutdown when gas pressure drops below, bar	0.2
Working temperatures range, °C	from - 50 up to + 40
Life time, not less, years	25
Ramp-up time, hours, less than	1
Fuel pipe connection at generator	½"
Fuel consumption (natural gas), m <sup>3</sup> /h	0,77
Overall dimensions, mm	
- depth	754
- width	564
- height	1250
Weight, kg	190

### 3. GTEG-220A construction

The generator GTEG-220A consists of interconnected functional units (blocks, systems) mounted on a support frame:



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1 - support frame; 2 – air radiator; 3 – pressure spring 4 – combustion products outlet neck; 5 – electric cabinet; 6 – air damper with drive; 7 – gas inlet fitting 8 – heat receiver; 9 - TGM; 10 – air radiator base; 11 – burner device; 12 – gas filter; 13 - gas reducer with drive and pressure sensor.

The heat receiver is the central part of the structure to which the TGMs are attached. Six TGMs are installed between the sides of the heat receiver and the air radiators of the cooling system using a clamping system.

The heat from the “cold” joints of the TGM is discharged into the environment through the air heat exchangers of the cooling system.

The thermocouple is installed on the heat receiver and serves to measure its temperature. According to the signals from the thermocouple entering the AGCS, the combustion process is regulated.

The oxygen sensor is installed in the neck and serves to monitor the completeness of fuel combustion. According to the signals from the oxygen sensor entering the automated control system, the air supply to the burner device is regulated.

The upper part of the heat receiver is connected to the neck, to which a pipe for the removal of combustion products should be connected.

The electrical cabinet contains:

- the AGCS control unit, which launches the GTEG-220A, controls the processes of thermoelectric generation and controls the parameters of operation by means of an LED display with the transmission of information signals about the state of the GTEG-220A via the RS-485 interface.

- a voltage stabilization unit that stabilizes the supply voltage for the operation of AGCS, sensors, valves and other devices that are part of the GTEG-220A;

- cathodic protection unit and load connection terminals.

The operation of the GTEG-220A is based on the principle of direct conversion of thermal energy into electrical energy. For the operation of the thermoelectric generator, it is necessary to maintain the temperature difference on the TGM thermoelements, which causes the occurrence of electric current and voltage on the GTEG-220A output terminals. The heat required to heat the “hot” joints of

the TGM is released during the combustion of gas in a gas burner device, into which a gas mixture is supplied, ignited when voltage is applied to the ignition electrode from a high-voltage source. The gas supply is carried out from the AIP gas main.

Heat is removed from the “cold” junctions by air heat exchangers (radiators).

The amount of gas entering the burner device is regulated by a gas reducer, and the amount of ejected air is regulated by an air damper.

The launch of the GTEG-220A, the control of thermoelectric generation processes is carried out by the control unit of the AGCS. The control of the functioning parameters is carried out by the AGCS using a flame sensor, a thermocouple, an oxygen sensor and a pressure sensor.

When the controlled parameters exceed the set values, the AGCS generates an alarm signal, relieves the voltage from the safety valve, thereby stopping the gas supply to the burner device.

#### 4. Overall and connecting dimensions:

