Research and Production Company
Sib Geofiz Pribor

SGD-EGC200 «SKAT II» GEOPHYSICAL MULTI-FUNCTION TRANSMITTER

Version V4.0
OPERATIONS MANUAL

2012

CONTENTS

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1.   PRODUCT OVERVIEW

1.1.   Introduction

1.1.1. The geoelectrical transmitter **SGD-ECG200 «SKAT II»** SGFP 220.00.00-03 (hereinafter transmitter)   is designed to create electromagnetic field during geophysical survey. It can produce a stabilized rectangular alternating currents with a duty cycle of 50 or 100% with a wide range of frequencies and current values.

1.1.2. Application area - geophysical exploration by methods of direct current, induced polarization, frequency sounding and other methods.

1.1.3. The geoelectrical transmitter SGD-EGC200 «SKAT II» ***should not be subjected obligatory certification***   according to Government Resolution of the Russian Federation dated December 1, 2009 N 982 "About approval of the single list of products subjected to obligatory certification, and a single list of products, which conformity assessment takes the form of acceptance of the declaration of conformity".
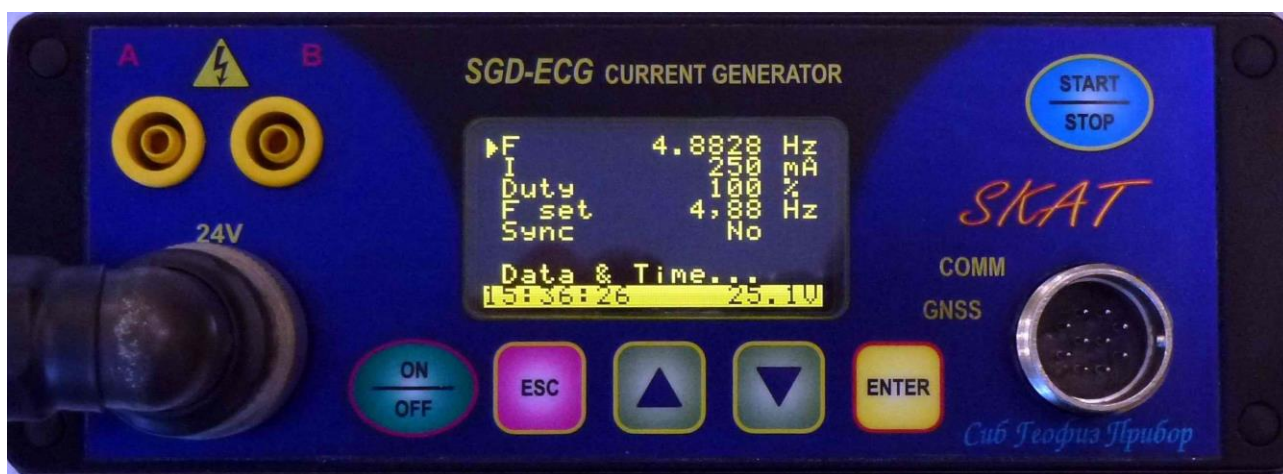
Picture 1. The geoelectrical transmitter **SGD-ECG200 «SKAT II»**

1.2. Design and operation

1.2.1. The transmitter is made in a metal case on the front panel of which are placed:
1) graphic display VFD or OLED type with a 128x64 pixel resolution;
2) controls;
3) connectors to input power, control the transmitter and output power to the soil.

1.2.2. Graphic display is designed to show the settings menu and operating parameters.

1.2.3. Controls of transmitter are presented by six button of membrane type:

ON/OFF - switch on/off the transmitter;
START/STOP - start / stop power transmission;
ENTER - enter to the submenu, enter to the parameter edit mode of the menu item, exits the parameter edit mode of menu item with saving of its new value;
ESC - exit out of the submenu, exit out of the parameter edit menu without saving its new value;
▲▼ - navigating a menu items, making changes in the menu item.

1.2.4. Connectors:

24V - connector for power input;
AB - terminals for power out;
COMM, GNSS,... - multipurpose connector for an external transmitter control, synchronization and signal from the current sensor. It is not installed in all versions of the transmitter.

1.2.4. Transmitter operates in two basic modes:
1) menu mode;
2) power transmission mode;

1.2.5. In menu mode, on the instrument display is shown the menu of settings. These settings can be changed using the control buttons.

1.2.6. In power transmission mode, the device generates alternating current with a stable amplitude through the terminals AB. In this mode, display will show the preset value of the current and the frequency, amplitude of the load voltage, and load resistance. If the load current corresponds to the set value, then in the top right corner of the display shows the "STAB", otherwise shows " - " and sounds a periodic beep.

1.2.7. The transmitter can synchronize switching current with the leading edge of the external differential signal at the pins 9, 10 of «COMM, GNSS» connector. Also, it can generate a synchronization signal on the same pins. The synchronization mode is defined in the menu item «Sync». All synchronization modes are shown in the following table.

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Item menu «Sync»	Direction for 9,10 pins	Moment synchronization of current		
		Pin 9, 10	**100% duty cicle**	**50% duty cicle**
«Input»	input	Transition from 9(-), 10(+) to 9(+), 10(-)	Transition from A(-), B(+) to A(+), B(-)	AB current on
		Transition from 9(+), 10(-) to 9(-), 10(+)	Transition from A(+), B(-) to A(-), B(+)	AB current off
«Output+»	output	Transition from 9(-), 10(+) to 9(+), 10(-)	Transition from A(-), B(+) to A(+), B(-)	AB current on
«Output-»	output	Transition from 9(-), 10(+) to 9(+), 10(-)	Transition from A(+), B(-) to A(-), B(+)	AB current off
«GNSS+»	output	Transition from 9(-), 10(+) to 9(+), 10(-)	Transition from A(-), B(+) to A(+), B(-)	AB current on
«GNSS-»	output	Transition from 9(-), 10(+) to 9(+), 10(-)	Transition from A(+), B(-) to A(-), B(+)	AB current off

In synchronization mode "GNSS", on the pin 6 of the «COMM, GNSS» connector is present voltage for supply navigation receiver.

1.3. Preparation for use.

1.3.1. Inspect the transmitter and make sure that there is no any mechanical damage.

1.3.2. Apply power to the connector "24V". The assignment of connector pins are shown below:

Description	Pin number
+ 20...30 V	2
Ground	3

1.3.3. Connect the feed line or a resistive load to the terminals «**A»** and **«B»**.

1.3.4. The pin assignment of "COMM, GNSS" connector are shown below:

Description	Pin number
RS232 Tx/RS485 A	1
RS232 Rx/RS485 B	2
Ground	3
Isolated current monitor«+»	4
Isolated current monitor«-»	5
Supply for GNSS receiver	6
External On/Off	7
Ground	8
Synchronization +	9
Synchronization -	10

Attention!!! Direct current power source with output voltage equal to 24 volts should provide sufficient power for the respective operating mode of the transmitter. So for the modes with the highest possible power, for example **750V @ 250 mA,** the current consumption can be up to **12A** at the minimum supply voltage.

Using a lead-acid batteries as a power supply, it is necessary to consider their ability to prolonged impact appropriate currents. This feature will directly depend on the rated capacity of the battery, the charging state, its residual resource and ambient temperature. For all modes of operation of the transmitter, the recommended nominal battery capacity should be at least several times more than the consumption in this mode current. So for operation with a maximum power the capacity of lead-acid batteries should be at least 24 A • h. Time of continuous work with such battery and positive ambient temperatures can be about 60 minutes. It`s also necessary to pay attention to the power leads. Wire cross-section and its length should have a minimum voltage drop to the requirable modes.

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1.4. Operating procedure

1.4.1. Power on/off the transmitter is made by briefly pressing on the button **«ON/OFF**. Within seconds after the transmitter was turn on, the display shows a welcome message with the name of the manufacturer, the product name, version of hardware implementation and software products, the serial number of the product. It is displayed for three seconds, and then the device enters the menu mode.

1.4.2. The menu consists of items of the two types. The first type includes an editable parameter, the second type contains a submenu. The first type is displayed as **«name of parameter»**+ **«value of parameter»**. The second type is displayed as **"name of submenu" + «...»**.

1.4.3. Navigating a menu items can be done by buttons **«▲» и «▼»**. Selected menu item is marked on the display by sign **«►»**. Navigating to submenu or enter to parameter edit mode of the menu item is called by pressing button **«ENTER»**. Exit of submenu is called by pressing button **«ESC».**

1.4.4. After enter the parameter edit mode of the menu item (by button **«ENTER»**), the choice of specified value of current, frequency, duty cicle, display brightness, date and time setting is made by buttons **«▲» и «▼»**. Exit of the edit mode with saved the selected value is called by pressing the button **«ENTER»**.

Exit out of edit mode of the menu without its change is called by pressing the button **«ESC».**

1.4.5. Settings menu includes following items:

F	**4.8828 Hz**	- frequency of current;
I	**100 mA**	- value of output current;
Duty	**50%**	- duty cycle of current;
		«50%»; «100%».
F set	**4,88Hz**	- set of frequencies: «4,88Гц»; «50/60Гц».
Sync	**Input**	- synchronization mode: «No»;
		«Input»; «Output+»; «Output-»; «GNSS+»; «GNSS».
Date and Time...		- submenu for date and time setting.

1.4.6. Transition to power transmission mode are called by pressing button **«START/STOP»**.

In this mode, the device generates alternating current with a stable amplitude through the terminals AB with the same parameters, which were specified in setup menu.

In this mode, current generator created current in AB line with the same parameters, which were specified in setup menu, and displays following lines constantly:

I =	**100 mA**	**STAB**	- selected value of current **is stabilized**;
or			
I =	**100 mA**	**━**	- selected value of current **is not stabilized**;

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U =   470 V   62%   - amplitude of voltage on the terminals AB and the percentage of the maximum possible value for this current;

R =   4.70   kOhm   - calculated value of the load resistance at the terminals AB.

In the case where the device fails to stabilize the current, it will emit short periodic beep.

1.4.7. In the bottom line of display, regardless of operation mode, current time and supply voltage are always shown. In the power transmission mode is also displays a flashing sign of lightning.

1.4.8. Recommended values for output current depending on AB line resistance are shown in table below:

Power , W	Output current, mA	Maximum output voltage, V	Resistance range of AB line, Ohm
200	1	750	1.000 … 750.000
	2		500 … 375.000
	5		200 … 150.000
	10		100 … 75.000
	20		50 … 37.500
	50		20 … 15.000
	100		10 … 7.500
	150		6,6 … 5.000
	200		5 … 3.750
	250		4 … 3.000
	300	650	3,3 … 2.200
	400	500	2,5 … 1.250
	500	400	2 … 800
	600	330	1,6 … 550
	700	280	1,4 … 400
	800	180	1,25 … 312
	900	180	1,1 … 245
	1000	180	1 … 200

2. TECHNICAL SPECIFICATIONS

2.1. Maximum output power - **200 W.**

2.2. Rated output current - **1, 2, 5, 10, 20, 50, 100, 150, 200, 250, 300, 400, 500, 600, 700, 800, 900 и 1000 mA.**

2.3. Leakage current in feed line in state of the current is switched off - no more than **0,01 mA.**

2.4. Maximum output voltage - **± 750 (1500 peak-to-peak) V.**

2.5. Relative error of current stabilization - no more than **0,5 %.**

2.6. Rise time and fall time (Rload = 1 kOhm) - no more than **1,5 microsecond.**

2.7. Setup time of current after pressing "start" - no more than **2 seconds.**

2.8. Shape of the output current - rectangular pulses of alternating polarity with a pause or no pause.

2.9. Available values of the duty cycle of current - 50%, 100%**.**

2.10. The number of available frequency sets is two.

2.11. Available frequency values of the first set - **0, 0.019, 0.038, 0.076, 0.152, 0.305, 0.61, 1.22, 2.44, 4.88, 9.76, 19.53, 39.06, 78.125, 156.25, 312.5, 625 Hz.**

2.12. Available frequency (period) values of the second set - 0.5, 1, 2, 4, 8, 16, 32 sec.

2.13. Absolute error of frequency current pulses without using a GNSS receiver - **± $1 \cdot 10^{-6}$**.

2.14. Relative frequency instability of current pulses without using a GNSS receiver - **± $1 \cdot 10^{-6}$**.

2.15. Internal or external synchronization.

2.16. Internal clock and calendar.

2.17. Continuous operation in the operating temperature range**.**

2.18. Reliability:

1) Mean time to failure, at least **2000 h;**

2) Mean life time, at least **6 years;**

3) Mean shelf life, at least **3 years.**

2.19. Supply voltage range - **20 to 28 V.**

2.20. Maximum power consumption in no-load mode - no more **5,5W.**

2.21. Maximum current consumption - no more **12 A.**

2.22. IP Code according to GOST14254-96 (MEK 529-89 CE I70-1 EN 60529) is **IP64.**

2.23. Operation temperature range - **-40 to +50°C.**

2.24. Dimensions - no more than **212•77•235 mm**.

2.25. Weight - no more than **2,8 kg.**

2.26. Weight of device and special vest with two sealed lead battery«12V, 8.5A•h» is not more than **9,5 kg.**

3. CONFIGURATION

3.1. Contents of delivery for current generator SGD-EGC200 «SKAT II» SGFP 220.00.00-03 is shown in Table 1.

Table 1.

Name	Item	Quality	Note
SGFP 220.00.00-03 RE	**DOCUMENTS** Transmitter **SGD-EGC200 «SKAT II»** Operations manual.	1	
	UNITS		
SGFP 220.00.00	Transmitter **SGD-EGC200 «SKAT II»**	1	**№ 036**
SGFP 220.51.00	Power cable **«SUPPLY 24V»**	1	1,2 m
	High-voltage terminal **LAS S W "HIRSCHMANN"**	4	**«YELLOW»**
GEO.364.126 ТУ	Connector 2RM22KNU4G3V1	1	
GEO.364.126 ТУ	Connector 2RM22KNU10G1V1	1	
SGFP 120.71.00	Special vest	1	
SGFP 120.72.00	Sealed lead battery**«12V, 8.5 A•h»**		
SGFP 443.00.00-01	Battery charger **SGD-BC3502**		**№**

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