



Tomsk Scientific Industrial Introduction Company "SIAM" LLC

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# **AUTOMATIC WELL SOUNDER**

**«DUA-1»**

**OPERATING MANUAL**

Russia



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The certificate applies to “DU-1” well sounders (hereinafter referred to as the device) designed for operation at the wellhead in oil and gas fields.

The device is explosion-proof designed (intrinsically safe circuit type of protection) in accordance with the requirements of GOST 31610.0-2014 (IEC 60079-0:2011), GOST 31610.11-2014 (IEC 60079-11.), GOST 31610:2011), and have **1Ex ib IIB T3 Gb X** explosion proof mark. “DUA-1” automatic well sounder is designed for indoor and outdoor installation in hazardous areas where atmospheric explosives of IIA, IIB categories and T1, T2, T3 groups can form according to GOST R IEC 60079-20-1-2011 in the operating temperature range from -40 °C to +50 °C. The device design is comply with the assigned explosion proof mark, with the requirements of GOST IEC 60079-14-2013 and other regulatory documents governing the use of electrical equipment in hazardous areas.

The operating manual contains information about the design, principle of operation and specifications of the device as well as instructions necessary for proper operation, maintenance, transportation and storage of the device.

Observe the requirements of the Federal norms and regulations in the field of industrial safety "Safety rules in oil and gas industry" as well as this manual, when operating, maintaining and repairing the device.

The device may only be operated by specially trained personnel who have studied the operating documentation for the device, received the relevant safety instructions and permission to work.

## 1. GENERAL PRODUCT INFORMATION

### 1.1. Designation

1.1.1 The automatic well sounder “DUA-1” is designed for operation at the wellhead in oil and gas fields

1.1.2 The device is explosion-proof designed (intrinsically safe circuit type of protection) in accordance with the requirements of GOST 31610.0-2014 (IEC 60079-0:2011), GOST 31610.11-2014 (IEC 60079-11.), GOST 31610:2011), and have **1Ex ib IIB T3 Gb X** explosion proof mark. “DUA-1” automatic well sounder is designed for indoor and outdoor installation in hazardous areas where atmospheric explosives of IIA, IIB categories and T1, T2, T3 groups can form according to GOST R IEC 60079-20-1-2011 in the operating temperature range from -40 °C to +50 °C. The device design is comply with the assigned explosion proof mark, with the requirements of GOST IEC 60079-14-2013 and other regulatory documents governing the use of electrical equipment in hazardous areas.

1.1.3 Automatic well sounder provides static and dynamic level control, automatic registration of drop and recovery curves, automatic registration of gas pressure in annular space at wellhead.

1.1.4 The automatic well sounder can be used for automatic fluid level control (without operator's participation, if the level value is more than 20 m) during well operation, as well as during well start-up after repair or downtime.

## 1.2. Basic specifications

1.2.1 The automatic well sounder “DUA-1” meets the requirements of technical specifications TU 4273-101-20690774-2018.

1.2.2 The basic specifications are given in Table 1.

Table 1

<b>Parameter name</b>	<b>Norms on specifications</b>
Explosion proof mark	1Ex ib IIB T3 Gb X
Climatic modification	tropical climate
Level control range, m	от 20 до 3000 (6000)
Resolution capacity of the level control, m, max	1
Pressure measurement range, kgf/cm <sup>2</sup>	from 0 to 150
Resolution capacity of pressure control, kgf/sm <sup>2</sup> , max	0,1
Maximum magnetic valve actuation pressure, kgf/cm <sup>2</sup> , max.	50
non-volatile memory capacity	
- for symbolic reports	3008
- for graphics	310
Number of measurements with magnetic valve after the full charge of the battery under normal climatic conditions	400
Charging time of a discharged battery, h, no more	10
Operating temperature range, °C	From - 40 to + 50
Approved battery type	Boston Swing 5300
Battery voltage rating, V	3,65
Minimum Battery Voltage, V	2,7
Service life, years, min	5
Weight, kg, max.	8

### 1.3. Design and operation of the product

#### 1.3.1 Product design

The product has a single block and consists of the following main parts:

- 1) swivel removable manual valve;
- 2) well sounder housing;
- 3) "Power supply" LED;
- 4) "Charging" LED;
- 5) power on/off button;
- 6) plug for connecting the mains adapter from 220 V or the car's on-board network adapter to charge the built-in lithium battery;
- 7) solenoid valve nozzle;
- 8) electromagnet;
- 9) solenoid valve control unit;
- 10) swivel nozzle lock screw;
- 11) electromagnet screw;
- 12) electromagnet housing;
- 13) mounting clamp;
- 14) threaded connection coupling.

#### 1.3.2 Product operation principle

The device is installed directly on the measuring branch pipe of wellhead fittings and does not require measuring cables. The product performs acoustic pulse generation in annular space, reception, transformation and analysis of acoustic response (echo signal), fluid level determination, pressure control at wellhead. The product operates under the internal program under the control of the built-in microcontroller, which processes information from primary sensors, performs level calculation, records the values of controlled parameters (pressure and level) in its long-term memory, and provides communication with external devices (PC).

The level sensor is automatically supplied by the built-in lithium-ion battery. For its charging the product has a built-in charger with software control, allowing you to properly maintain the battery. The lithium-ion battery does not need to be discharged before it can be recharged, so once the battery is powered up, the product will start to charge immediately.

## **1.4. Safety and environmental instructions**

1.4.1 The product meets the safety requirements of CUTR 012/2011, GOST 31610.0-2014, GOST 31610.11-2014, GOST 12.1.019 79, GOST 12.2.003 91, GOST 12.2.007.0 75.

1.4.2 The product does not create any harmful or hazardous factors, does not require special means of protection of service personnel.

1.4.3 The Product does not have any harmful impact on the environment during transportation, storage and operation.

1.4.4 The Product does not contain any fire and explosion hazard elements.

1.4.5 The product does not use voltage exceeding the safe level (AC voltage 42 V, DC voltage 110 V).

## **1.5. Marking**

1.5.1 The main marking is located on the product body and contains:

- trade mark or the name of the manufacturing company;
- name of the product;
- the serial number of the product according to the numbering system of the manufacturing company;
- year of manufacture;
- special explosion-proof mark "Ex", according to Annex 2 CUTR 012/2011;
- number of the certificate of conformity with the requirements of the Technical Regulations of the Customs Union of the CUTR 012/2011;
- explosion-proof marking;
- name or mark of the certifying authority;
- special application conditions.

1.5.2 The transport container is marked with manipulation marks "UP", "WARNING! CAPABLE OF BEING BROKEN" and "PROTECT FROM MOISTURE" in accordance with GOST 14192 96.

## **1.6. Package**

1.6.1 Device, network adapter, car adapter, USB cable, ball-type nozzle head, rotating nozzle, exhaust receiver with rubber ring, flash drive with software "Siam Service 2", set of ZIP, certificate, operating manual



and user's guide "Siam Service" v.2.10" are packed in separate plastic bags.

Units and documents are packed inside the bag for carrying the product. The bags with the devices are stacked inside the transport container manufactured according to the drawings of the manufacturer.

1.6.2 A packing list containing the following information is enclosed in the transport container:

- name, address and country of the manufacturer;
- name and serial number of the product;
- name and number of component parts to the product;
- date of packing;
- the signature of the packer and the seal of the manufacturer.

## **2. INTENDED USE OF THE PRODUCT**

### **2.1. Operational limitations**

2.1.1 The following persons are allowed to work with the product: oil and gas production operators of not lower than the fifth category; well research operators of not lower than the fourth category. Personnel must be trained to operate the product. Training is carried out by the employees of the manufacturer directly at the workplace.

2.1.2 During the operation of the product use this operation manual, "Safety rules for exploration work", Federal norms and rules in the field of industrial safety "Safety rules in oil and gas industry", as well as approved by the head of the company instructions for maintenance and research of wells, taking into account the specifics of the object of study and technology of work.

2.1.3 Preventive maintenance and repair of the product shall be performed outside the explosion hazard zones. Comply with fire safety regulations, work in the open air or in a well-ventilated room when using highly flammable liquids to clean the product.

Observe the requirements of the "Maintenance" section of this document when operating the product. Do not allow severe contamination of the internal parts of the product, especially the acoustic sensor, valve, and taper connection threads, resulting in poor product performance and reduced service life.

2.1.4 The product must not be used in excess of the operating conditions specified in this manual.

#### **2.1.5 Requirements to the object of investigation**

Well arrangement and operation shall be performed in accordance with the "Safety Regulations for Oil and Gas Industry".

The investigated well, regardless of its purpose and method of operation, shall have a technological branch with a gate valve and a branch pipe for connecting a volumetric device. Determination of the fluid level is possible only in the well space (tubular, inter-tube, annular, bent), which connects to the technological branch used. While making measurements, the technological branch should not have sharp contractions (fittings, pipettes and similar devices). Pipe branch should have a pipe cone thread 60 in accordance with GOST 633 80, should be located at a height of 0.2 to 1.8 m above the ground. If the height is more than 1.8 m, use stationary or portable sites provided that they meet the requirements of the "Safety

Rules in the oil and gas industry". Unused pipe branch shall be closed with a process plug.

No more than two bends of the pipeline at an angle of 90 at a distance of up to 20 m from the pipe branch are allowed on the way of sound pulse.

## **2.2. Ensuring explosion-proofness of the product.**

2.2.1. Explosion-proofness of the device is provided by the type of protection "intrinsically safe electric circuit" "ib" level, according to the requirements of GOST 31610.11-2014 (IEC 60079-11:2011), which is achieved by the following:

- Basic circuit diagram includes the protective component "Fib". The protective component "Fib" is an intact spark protection unit with the short-circuit current limitation at 2.25 A (maximum), using current limiting resistors and semiconductor fuses in series. Double redundancy is used in the "Fib" protective component to ensure greater reliability. The "Fib" component is integrated into the battery compartment of the device. The design of the protective component "Fib" is met with the requirements of GOST 31610.11-2014 (IEC 60079-11:2011), including leakages and clearances. The minimum width of conductors on the PCB is 0.2 mm, copper thickness is not less than 18  $\mu\text{m}$ . Thus, the electrical circuit coming out of the battery compartment of the device is intrinsically safe.

- The electrical circuit principal and applied third party components provide maximum power consumption not more than 0.45 W from the internal battery with maximum possible voltage on it 4 V. The total maximum capacity of the electrical circuit is 330  $\mu\text{F}$ , maximum inductance is not more than 20  $\mu\text{Gn}$ . The maximum current in the circuit during normal operation is not more than 100 m.

- The well sounder uses Boston Swing 5300 battery cell. The battery has special made contacts which exclude the possibility of its incorrect switching on (polarity reversal) and is located in the internal battery compartment of the device. The design of the battery compartment ensures that the battery does not fall out of the device. Do not replace the battery and do not charge it in the hazardous area. For this reason, in order to inform the user about special conditions of use of the device, the identification plate of the device is marked with an

"X" sign indicating special conditions of safe operation.

- The maximum temperature of overheating of components and connections in the circuit diagram during normal operation is 15 °C max. Thus, the surface temperature of conductors and elements during operation and at maximum operating temperature plus 50 ° C is not more than 65 ° C. Device enclosures are made with the degree of protection against external influences not lower than IP54 according to GOST 14254-2015.

### **2.3. Measures to ensure and keep the device explosion-proofness during the assembly, disassembly and repair of the device.**

2.3.1. Measures to ensure explosion-proofness before the production process:

- The elements used in the protective component of "Fib" are subjected to an acceptance test:

- resistors are tested for their nominal resistance;

- the fuses are checked against the short-circuit current limit;

- Materials used for casting the protective component "Fib" are subjected to an acceptance test according to the certificates presented.

2.3.2. Measures to ensure explosion-proofness during production:

- The protective component "Fib" with the installed battery is subjected to an outgoing inspection:

- the short-circuit current and open circuit voltage at the output of the protective component are checked;

- visual inspection of the filling location is carried out in order to confirm the absence of any foreign inclusions, bubbles, cracks or stratification.

2.3.3. Measures to ensure explosion-proofness during operation:

- Check that the cover of the battery compartment and the compartment itself (including the threaded connection) are free from mechanical damage and corrosion. In case of corrosion or mechanical damage, do not operate the device;

- meet the requirements specified by the "X" sign in the explosion proof mark.

2.3.4. The "X" symbol in the explosion proof marking indicates special conditions for safe operation:

- 1) Do not open the instrument cover and therefore the battery compartment cover in hazardous areas;
- 2) Do not replace the battery and operate the computer in hazardous areas;
- 3) Do not charge the battery in explosion hazard area;
- 4) Only the types of batteries specified in the manufacturer's technical documentation may be used as power sources;
- 5) Constituents and circuits ensuring intrinsically safe design shall not be repaired and in case of failure shall be replaced by new ones supplied by the manufacturer;
- 6) The device's operability is maintained at ambient temperature from minus 40 to plus 50°C.

#### 2.4.4. Measures to ensure explosion-proofness during repair:

- the device must be repaired only by the employees of the manufacturer.

Repair by third parties or individuals is prohibited.

- the protective component "Fib" is not to be repaired. It is made intact and must be replaced in case of failure. Repair of the "Fib" component is not permitted.

- after repair, the device must be tested according to the test procedure, with the "Fib" component tested for short-circuit current and open-circuit voltage (together with the battery installed).

## **2.4. Preparation for use**

Unpack the product (remove it from the transport container, remove the packing bags), check the completeness of the product in accordance with the "Completeness" section of the certificate IZM 5.173.024 PS.

If the product has been previously used, clean it from contamination and check the threaded part of the connecting coupling of the product. In case of severe wear, corrosion or damage to the threaded part, installation of the product is not allowed.

## **2.5. Use of the product**

### **2.5.1. Switching the product on and off**

The level sensor automatically switches on with a short press on the power button. The "Power" LED starts to glow green.

Automatic well sounder switches off by pressing the power button for a long time (more than one second). The "Power" LED flashes red twice and goes out.

In addition, the product is automatically switched off:

- if the power button was not pressed for more than 100 seconds or there was no exchange with the secondary device during the same time;
- if the battery voltage drops below 2.5V.

In the latter case, all information in the product is stored, but the battery must be recharged to prevent deep discharge (see 2.3.6).

### **2.5.2. Fluid level control**

To control the level, the product should be installed on the measuring pipe branch of the wellhead valve. Turn on the power to the product.

Start the "DB SIAM" program on your notebook. Select the "Settings" tab. Press the "ZigBee" button. Select the "Add Sensor" mode. After connecting the sensor, select the mode "Work with sensor". Click the upper right icon "Device Management". Then you may choose the modes: "Information", "Projections", "Start".

Further you can connect to the sensor by choosing from the list your type and number of the device, and the mode "Work with device". If the sensor has not been connected for a long time, the connection may take place within one minute.

In the "Information" mode the overpressure value, voltage and battery capacity of the product are displayed.

In the "Start" mode you have to choose the valve (automatic or manual) from which the survey will be carried out. Start the fluid level

control test. For the automatic valve the countdown to burst will start and then the automatic valve will trigger.

For manual valve, the "Power" LED will start blinking once every half second. After a second, generate an acoustic impulse by pressing the manual valve knob of the product until it stops. The "Power" LED will light up red.

Within 20 seconds, the product will record acoustic information from the well, than determine the well fluid level and the "Power" LED will turn green. The inscription "Survey is complete" will appear.

In order to import information to the "DB SIAM", enter the import mode (tab "Devices") and press the "Import" button. If there is a large amount of data, the "Instrument does not respond" message may appear. To resume import from the interrupted place, press the "Import" button.

### **2.5.3. Automatic removal of level recovery or drop curve**

Mount the product to the wellbore branch pipe.

For automatic removal of the recovery curve or level drop, set the type of investigation LRC (level recovery curve) or LDC (level drop curve). Set the acoustic pulse generation by solenoid valve. Set the period of activation of the well sounder and the number of measurements in the first interval. If one interval is not enough, set the necessary activation periods and number of measurements in all necessary intervals. To start the automatic mode, press the "Start" button on the "Start" tab.

In 5 seconds, on the "Information" tab, you will be able to observe the current interval and the time before measurement. Then you can turn off the product. The product will be switched on automatically with the period specified in the first interval. After the number of measurements in the first interval, the product will turn on with the period set in the second interval, and so on until the fifth interval is completed or the next interval is zero.

In automatic mode, the device records an echo together with a symbolic report in a memory area designed to record 310 echoes. In this case, the symbolic report is duplicated in the memory area designed to

record 3008 symbolic reports. Even after the memory area for recording 310 echoes has been used up, the symbolic report will remain in the memory for 3008 symbolic reports.

To save memory and battery consumption, set the switch-on period from 30 to 90 minutes, number of measurements 9, 15.

To save battery and valve life, to remove LRC or LDC it is recommended to set interval mode as follows:

- first interval - period of switching on 5 minutes, number of measurements - 10;
- second interval - period of switching on 10 minutes, number of measurements - 20;
- the third interval - period of switching on 30 minutes, number of measurements - 20;
- the fourth interval - the period of inclusion 60 minutes, the number of measurements - 20;
- the fifth interval - the period of inclusion 180 minutes, the number of measurements - 7.

With the enabled resolution of the transition from the LRC, LDC in the mode of automatic pressure recording, if the fluid level falls below 50 m and the number of reflections greater than eight, the transition to the mode of automatic pressure recording will occur.

At deep discharge of the accumulator there is an automatic switchover to the mode of automatic pressure registration.

For the mode of automatic pressure recording, the switch-on period and the number of measurements are set separately.

#### **2.5.4. Automatic recording of gas pressure in annular space at wellhead**

Mount the product to the wellbore branch pipe.

On the "Start" tab set the type of LRC investigation, the frequency of switching on and the number of measurements. Click the "Start" button.

In 5 seconds on the "Information" tab you will be able to observe the current interval and the time to measure. Then you can turn off the product.



The product will automatically switch on after a specified period of time, work about 0.2 seconds (measure pressure, record the measurement in memory), automatically switch off and so on.

It is recommended to choose the measurement period so that no more than 3008 measurements were made during the total planned operation time.

### **2.5.5. Cancel the automatic mode of HLC, CPU, KVD**

In the modes of LRC, LDC, LRP you can turn on the product, view modes, perform data transfer to your computer.

To cancel the automatic mode, set the examination type DYN or STAT.

### **2.5.6. Battery charge**

Do not charge the battery at temperatures below 0C.

To charge the battery, connect the mains adapter to the 220 V / 50 Hz network or the car adapter to the cigar lighter socket from the car's on-board 12 V network. Connect the USB cable to the automatic well sounder. The "Charge" LED will light up red. Charging a discharged battery takes on average 10 hours. After the battery is charged, the "Charging" LED will glow green as long as the adapter is connected to the power supply.

### **2.5.7. Connecting to another grid**

To reconnect to another grid of the radio channel, briefly press the power on button seven times. The "Power" LED will light up red for 4 seconds. After that, turn off and on the product.

### **2.5.8. Testing the product**

When the power is turned on, the product performs a self-diagnosis and may detect malfunctions. At the same time, the "Power" LED starts flashing red (if no malfunction is detected, the LED lights up green). The number of flashes per second equals the fault number. After ten seconds, the flashing cycle is repeated.

1 - loss of setting factors. At short pressing of the power button, the setting factors (sensitivity of the pressure sensor, etc.) are filled with the initial values. Usually this malfunction is displayed at the factory when the product is put into operation for the first time;

2 - ferromagnetic memory malfunction;

3 - analog-to-digital converter malfunction;

4 - no response from the radio channel module;

5 - clock fault;

6 - clock malfunction;

7 - flash memory malfunction.

When highlighting faults 2, 3, 4, 6, 7, send the product for repair.

### **2.6. Well sounder disassembly**

Turn off the device.

Close the gate valve of the technological branch.

Open the device outlet valve and bleed excess pressure from the working volume.

Unscrew the product and remove it from the branch pipe. Drain the condensate from the working volume, clean the threaded part and put the product in a regular bag.

Close the branch pipe with the technological plug.

### 3. MAINTENANCE

#### 3.1. Order of Well sounder Maintenance

Provide the maintenance of the device according to the Table 2.

Table 2

Type of works	Period	Personnel
Cleaning of the tapered connecting thread, the acoustic sensor, the well sounder and the case (see p. 3.2)	every week	Operating personnel
Maintenance of the exhaust valve (see p. 3.3)	every month	Operating personnel
Cleaning of accumulator charging socket (see p. 3.4)	every month	Operating personnel
Performance monitoring (see p. 3.5)	every 6 months	Service center or “TSIIC SIAM” LLC certified specialists
Pressure tests (see p. 3.6)	every 6 months	Service center or “TSIIC SIAM” LLC certified specialists
Replacement of the valve sealing ring * (see p. 3.7)	every 12 months	Service center or “TSIIC SIAM” LLC certified specialists

\* The valve sealing rubber ring ( p.5 figure 1) is possible to be replaced by operating personnel

### **3.2. Cleaning Tapered Connecting Thread, Acoustic Sensor, Well sounder and Sensor Case**

Cleaning is done using pure gasoline, a brush and a cleaning rag. It is allowed to pour a small amount (50...100ml) of gasoline inside the threaded coupling cavity while cleaning. However, do not immerge the well sounder housing in the cleaning liquid, and do not let its ingress in the connector. When cleaning a very dirty thread, application of metal tools (an awl, a screwdriver, etc.) is allowed, but do not apply an excessive force not to damage the thread.

It is strictly forbidden to use a metal tool for cleaning the acoustic and pressure sensors. Moreover, be careful not to apply much force during cleaning. Acoustic sensor housing is covered with a protective varnish, do not damage it! It is forbidden to insert foreign objects in the pressure sensor hole!

Wipe the surfaces with a rag after washing. Cleaning should result in a metallic lustre on the coupling surfaces, connecting thread, acoustic sensor, and clean holes of pressure sensor and fitting.

The outer surfaces of pressure sensor are wiped with a clean rag, wetted in a small amount of gasoline, and then wiped dry.

### 3.3. Exhaust Valve Maintenance

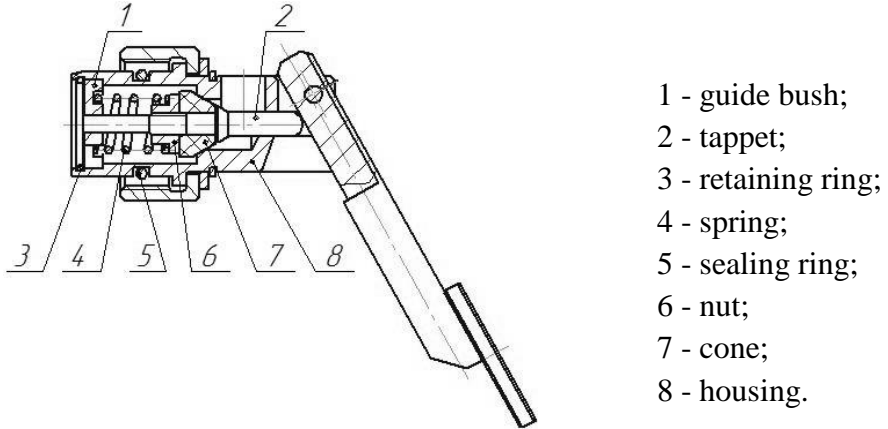


Figure 1 – Exhaust Valve

Washing is done with diesel fuel or kerosene, using a brush and a rag. Before washing, remove the valve from well sounder, put it into a clean container and pour a small amount of washing liquid. Press the handle several times without taking the valve out of a container. Clean the outer surfaces with a brush. Do not leave the valve in the washing liquid for a long time. After washing you should wipe the valve dry with a clean rag. Before installing it back in the well sounder, apply a small amount of lubricant, according to standard CIATIM GOST 6267-80, on the rubber sealing ring surface (5).

After mounting the valve on the well sounder, install the latter on the Inspection bench for well sounders SKU-1 IZM 4.137.003 (SIAM Company) and purge the valve at pressure of 5...8 atm, using clean air. Test for pressure integrity with a soap solution. A slight “seepage” is allowed with small bubbles in the discharge hole area. In case of a high “seepage”, repeat the valve washing process.

If high “seepage” continues, then replace the cone (7) of ball seats. In order to do that, press the retaining ring (3) and pull it out of valve housing. Take out the guide bush (1), spring (4), tappet (2) in combination with cone (7) and nut (6) from valve housing (8). Then, replace the cone

(7) by unscrewing the nut (6). When necessary, clean the contact chamfer of the valve ball-and-seat in the housing (8) with a rag.

Assemble it in the reverse sequence.

### **3.4. Cleaning of Accumulator Charging Socket**

Cleaning is done with a pure ethyl alcohol or alcohol-gasoline blend (1 part of ethyl alcohol, 1 part of rubber solvent or oil solvent gasoline, the other kind of gasoline is not allowed), using a brush. Alcohol consumption – 30g per month of operation. Apply a small amount of CIATIM GOST 6267-80 lubricant on the connector surface after cleanup.

### **3.5. Performance Monitoring**

The procedure of well sounder performance control:

- 1) Check the setting of setup and display modes;
- 2) Check the modes "Level control" and "Pressure control";
- 3) Check of sensitivity and noise level of the acoustic path;
- 4) Check the "Automatic pressure recording" mode;
- 5) Check of the maximum working pressure (not more than 100 atm.);
- 6) Check in the mode "Battery capacity control".

The methods of monitoring are given in the "Manual on conducting inspection tests of devices and complexes manufactured by TSIIC "SIAM" in operation". The checks 2) and 3) are carried out on the Stand of control of level gauges SCU-1 IZM 4.137.003 (produced by TNPVO "SIAM"). 5) is carried out at the Hydraulic Testing Stand SGI-1 IZM 4.137.002 (produced by TSIIC SIAM LLC).

Well sounder performance control is done at the SIAM service center or by SIAM certified specialists, according to design documentation under the testing program.

### **3.6. Pressure Testing**

Well sounder pressure testing is done at the SIAM service center or by SIAM certified specialists on the Hydraulic testing bench SGI-1 IZM 4.137.002, using oil, at the excessive pressure of 150 atm during 10 minutes. Oil leakage from well sounder is not acceptable during testing.

### **3.7. Replacement of the Valve Sealing Ring**

The outlet valve O-ring (rubber ring on the valve body) is replaced.

In order to replace the sealing ring, the latter should be demounted from the well sounder with a sharp tool. Take the ring out of the groove, clean the groove from dirt with a rag, wetted in gasoline, then wipe the groove dry and insert a new ring in the groove. Before installation the ring should be lubricated with CIATIM GOST 6267-80 lubricant. Then the valve should be put in place.

After a final assembly of the well sounder, it is necessary to carry out the integrity and strength tests. First, install the well sounder on the Inspection bench SKU-1 IZM 4.137.003 and test for pressure integrity with a soap solution at the pressure of 5...8 atm. A slight "seepage" is allowed with small bubbles in the discharge hole area. "Seepage" in the area of flexible joint coupling-body is not allowed. Then carry out the pressure testing of the well sounder, according to Clause 3.6. hereof. The device is permitted for operation if integrity requirements are met. If not, the sensor shall be sent to manufacturer for defects elimination.

The addresses of service centers can be found in the product certificate.

#### **4. DEVICE REPAIR**

Only qualified personnel of the manufacturer or its official representatives may repair the product.

#### **5. DEVICE STORAGE**

Before putting into operation the product should be stored in a regular bag in dry heated rooms at ambient air temperature from minus 10 to + 40 C and relative humidity not exceeding 80% at 35 C.

Storage rooms should be free from dust, acid and alkali vapors, corrosive gases and other harmful impurities causing corrosion.

Battery should be stored separately. To ensure long storage of the battery you should recharge it to the level of 70% of its capacity once every six to nine months.

**Attention! Charge the battery only at positive temperatures!**

#### **6. DEVICE TRANSPORTATION**

The device should be stored in a standard bag in dry heated premises, at the temperatures from -40 to +50 °C.

Severe shock and vibration are to be avoided during transportation.



## REVISION RECORD SHEET

Revision	Numbers of sheets (pages)				Total sheets (pages) of document	Ref # of document.	Incoming # of supporting document	Signature	Date
	Revised	Replaced	New	Annulled					