

# **ASPT-ASTI Surface Panel**

## **Operation Manual**

**E511.ASPT-ASTI.00 RE**

**(rus. Э511.АСИТ-АСТИ.00 РЭ)**

Total pages: 40





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This operation manual provides information on the autonomous downhole sensor data read-out unit E511.ASPT-ASTI.00 (*rus. Э511.АСПТ-АСТИ.00*) (hereinafter referred to as ASPT-ASTI or surface panel) necessary to ensure correct and safe operation of the unit. Only technical personnel who has studied this manual and has electrical safety qualification group no lower than 3<sup>rd</sup> (to work with voltages up to 1000 V) can be allowed to work with ASPT-ASTI.

**ATTENTION:**

- ASPT-ASTI has a voltage up to 480V, which is dangerous for life
- in case of a fault in the step-up transformer, a dangerous voltage of more than 1000 V may occur at the "Transformer Y" terminal of the ASPT-ASTI.

**IF ASPT-ASTI IS CONNECTED TO THE 220 V, 50 Hz POWER NETWORK OR "TRANSFORMER Y" OUTPUT OF THE STEP-UP TRANSFORMER, DO NOT TOUCH INTERNAL ELEMENTS, CONNECTORS' CONTACTS, OR OPEN LIVE PARTS OF THE SYSTEM.**

## 1 Description of the product and its operation

### 1.1 Purpose of the product

1.1.1 The ASPT-ASTI system is designed to receive, store, display and transfer downhole data (incl. data of geophysical equipment) coming from the downhole sensor of BP-103, BP-95 and BP-117 series (*rus. БП-103, БП-95, БП-117*).

1.1.2 The ASPT-ASTI system ensures:

- monitoring insulation resistance of the "Step-up transformer – cable – motor" system
- receiving, storing and displaying downhole data, incl. data of geophysical equipment, coming from the downhole sensor
- transferring downhole data and real-time insulation resistance values to the control station (drive) or computer via the RS485 interface using the MODBUS RTU protocol [1]
- copying the archive of downhole sensor and geophysical information to a flash drive via the USB interface

1.1.3 ASPT-ASTI is manufactured in the UHL climatic version (*rus. УХЛ*), category 1.1, according to GOST 15150. ASPT-ASTI is designed for operation at ambient temperature from - 60 to +60 ° C.

1.1.4 ASPT-ASTI has IP43 enclosure class in accordance with GOST 14254.

## 1.2 Technical specifications

1.2.1 The main technical specifications of ASPT-ASTI are given in Table 1.1.

Table 1.1 – Technical specifications of ASPT-ASTI

Name of parameter	Parameter value
Rated supply voltage, V	220, 380, 480
Supply frequency, Hz	50 ±1
Consumption current, A, not more than	4
Power consumption, W, not more than	400
Monitored insulation resistance range, kOhm	1-9999
Insulation resistance monitoring error, %, not more than	
in the range from 0 to 999 kOhm,	5
in the range from 999 to 9, 999 kOhm	10
Period of update of downhole sensor and geophysical information, sec, not more than	60 (80 sec at first start)
Operation mode	continuous
Time of filling in the archive, days	25
Exchange rate with control station via RS485 interface, bps	2400 – 115200
Communication protocol with the control station	IRZ-TMS1 IRZ-TMS2 Elekton-TMSN1 Elekton-TMSN2 Borets

1.2.2 The exchange protocols IRZ-TMS1, IRZ-TMS2, ELEKTON-TMSN1, ELEKTON-TMSN2, and Borets are described in the related drive operation manuals.



1.2.3 External view and overall dimensions of ASPT-ASTI are shown in Figure A.1 of Appendix A and in Figures B.1, B.2 of Appendix B. Weight of ASPT-ASTI is not more than 50 kg.

1.2.4. Power to ASPT-ASTI is supplied from a single-phase alternating current network with frequency  $(50 \pm 1)$  Hz. Rated supply voltage is 220V.

### 1.3 Components of ASPT-ASTI

1.3.1 Positional designations of components of ASPT-ASTI are provided in Table 1.2.

Table 1.2 – ASPT-ASTI components

Name, designation	Positional designation
Modem GSM TU42-232 IRZ	A7
Power source DRC-100B MEANWELL	A2, A3
Interface board TMS-Э5-01 CVIA.468156.117-01 (rus. TMC-Э5-01 ЦВИЯ.468156.117-01)	A3
Voltage converter IS2-24-300 TU3415-003-86803794-2012 (rus. ИС2-24-300 ТУ3415-003-86803794-2012)	A13

Name, designation	Positional designation
Heater VNU200-A1 TU4330-002-54797851-2003 <i>(rus. BHY200-A1 TY4330-002-54797851-2003)</i>	A6
Controller IRZ500 CVIA.468332.221 <i>(rus. ИР3500 ЦВИЯ.468332.221)</i>	A1
Power source E511.IP25.00-02 <i>(rus. Э511.ИИ25.00-02)</i>	A12

1.3.2 ASPT-ASTI components are as follows:

- protection unit – serves to protect against increased input voltage;
- DRC-100B MEANWELL power supply unit – provides 24V for powering the KSU IRZ500 controller;
- TMS-E5-01 interface board – protects against overvoltage in the "Motor-Step-up transformer" line;
- KSU IRZ500 controller – serves to indicate information windows, configure and display information of ASPT-ASTI;

1.3.3 The ASPT-ASTI delivery set also includes a set of installation parts (installation kit) ref. CVIA305651.253 *(rus. ЦВИЯ305651.253)*. Contents of the installation set is described in Appendix B.

## **1.4 Design and operation**

1.4.1 Structurally, ASPT-ASTI is designed as a metal double-sided cabinet. The front panel of the system (Fig. A.1, annex A) provides access to the operator's panel of ASPT-ASTI (Figure B.1, Appendix B).

1.4.2 After power-up, ASPT-ASTI starts receiving frames from the downhole sensor, measuring insulation resistance and voltage in the step-up transformer Y-point.

1.4.3 ASPT-ASTI is ready to transmit information to the control station (drive) 10 seconds after power is turned on. Before first frames from the downhole sensor come to ASPT-ASTI, ASPT-ASTI will transmit default values to the drive (pressure of 650 Atm, insulation resistance of 1 MOhm, other parameters - zeros).

### **1.4.4 Archives of the ASPT-ASTI System**

1.4.4.1 The ASPT-ASTI system maintains an archive of downhole sensor & geophysical information, insulation resistance and step-up transformer Y-point voltage.

1.4.4.2 When a flash-drive is installed in the connector on the front panel of ASPT-ASTI, the archive is copied to the flash-drive.

1.4.5 The user interface is described in clause 2.5.

## **1.5 Marking and sealing**

1.5.1 ASPT-ASTI has a nameplate on the side wall with the following information:

- manufacturer trademark;
- product name;
- current consumption, voltage and frequency of supply network;
- degree of enclosure protection in accordance with GOST 14254;
- product weight;
- manufacturer name;
- serial number;

- date of manufacture.

1.5.2 All components of ASPT-ASTI are marked with their position designations in accordance with the electrical connection scheme.

1.5.3 Marking of the transport package contains manipulation signs No. 1, 3, 11, as well as main, supplementary, and information notes in accordance with GOST 14192.

## 1.6 Packing

1.6.1 Package of ASPT-ASTI complies with requirements of manufacturer drawings; package option is VU-0 (*rus. BV-0*) according to GOST 9.014, package category is KU-1 (*rus. KV-1*) according to GOST 23170.

1.6.2 The package ensures safety of ASPT-ASTI during storage and transportation in accordance with sections 4 and 5 of this operation manual.

1.6.3 Operational documentation and packing list are packed in individual sealed bags of polyethylene film in accordance with GOST 10354.

1.6.4 Packing list for ASPT-ASTI contains the following information:

- name and designation of ASPT-ASTI and its components;
- date of packing;
- signature and stamp of the responsible for packing and stamp of technical control department of the manufacturer.

1.6.5 ASPT-ASTI prepared to packing, documentation, and package pass through acceptance by the technical control department of the manufacturer.

## **2 Intended use**

### **2.1 Operational limitations**

2.1.1 DO NOT CONNECT OR DISCONNECT CONNECTORS "RS-232", "RS-485" AND THE GROUND TERMINAL WHEN ASPT-ASTI IS CONNECTED TO THE 220V, 50Hz NETWORK.

2.1.2 At temperature -30 °C and lower inside the cabinet, functioning of ASPT-ASTI is impossible. To restore functionality, it is necessary to hold ASPT-ASTI in the working state (all switches are in the left position). ASPT-ASTI shall be connected to the 220V, 50Hz network, the cover of ASPT-ASTI shall be closed. After 30-90 minutes, ASPT-ASTI should automatically turn on. The message "DHS NORMAL" shall appear in the main menu on the KSU IRZ500 controller screen.

### **2.2 Safety measures**

2.2.1 When working with ASPT-ASTI, it is necessary to observe the "Rules for technical operation of user electrical installations" and "Safety rules for operation of user electrical installations".

2.2.2 Before switching on to the 220V, 50Hz network, it is necessary to ground ASPT-ASTI through the GROUND terminal.

2.2.3 Installation, operation and maintenance of ASPT-ASTI must be carried out by specially trained personnel.

### **2.3 Preparation of the product for use**

2.3.1. Study this operation manual and prepare the necessary equipment in accordance with the list given in Table D.1 of Appendix D.

2.3.2 Unpack ASPT-ASTI and check completeness of delivery in accordance with section 2 of Technical Certificate ref. E511. ASPT-ASTI.00 PS (*rus. Э511.АСПТ-АСТИ.00 ПС*).

2.3.3 Check ASPT-ASTI for no mechanical damage.

2.3.4 Configure installation parameters and addresses of the Internet servers in accordance with clause 2.5.4.

2.3.5 Set the current time according to clause 2.5.4.

2.3.6 Format the archive according to clause 2.5.4.

## 2.4 Installation

2.4.1. Install ASPT-ASTI according to figure D.1, annex D.

2.4.2 Fix ASPT by means of the installation kit in such a way that it is possible to see the screen of the KSU IRZ500 controller and it is easy to access the USB connector and there is free space on the connectors side of at least 30 cm for connecting external cables.

2.4.3 Connect the GROUND terminal.

2.4.4 Attaching the "Transformer Y" wire to the "Transformer Y" terminal

2.4.4.1 Loosen the control screw on the "Transformer Y" terminal with a hexagonal wrench from the installation kit.

2.4.4.2 Insert the "Transformer Y" wire into the terminal hole.

2.4.4.3 Tighten the control screw of the "Transformer Y" terminal with the hexagonal wrench from the installation kit.

2.4.5 Attaching 220 V, 50 Hz power conductors and RS485 interface for connecting the control station (contacts "RS485 to VSD") to terminals of ASPT-ASTI.

2.4.5.1. To fasten the conductor, insert an awl or a thin screwdriver from the installation kit (hereinafter – the tool) into the hole to open the spring contact until the stop (figure 2.2), at that the tool will be slightly inclined to the bottom cover of the ASPT-ASTI cabinet.

2.4.5.2. Deflect the tool in the direction of the ASPT-ASTI top cover simultaneously shaking it and pushing it deeper into the contact socket (shown by the arrow in the figure). At the same time, the spring contact must open and the opening toll must lock in the contact socket.

2.4.5.3 Insert the required wire into the conductor socket (ends of the conductors must be stripped to a length equal to (5-8) mm).

2.4.5.4 Remove the tool used to open the spring contact from the socket, make sure that the conductor is firmly clamped.

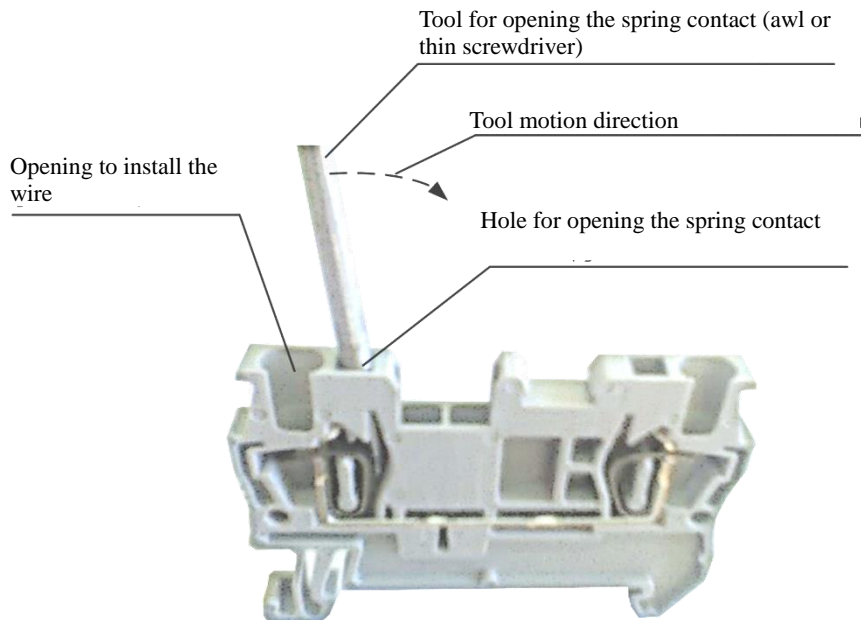


Figure 2.2 – Contact for control station interface



## 2.5 User Interface

2.5.1. Work with the ASPT-ASTI system is carried out through the terminal device module of the KSU IRZ500 controller. Appearance of the keyboard and indicator is shown in Figure B.1, Appendix B.

2.5.2 A security password is required to make or change settings of the ASPT-ASTI system. By default, the factory presets the security password to be 159.

2.5.3 The ASPT-ASTI system menu allows:

- displaying downhole data of the motor;
- displaying data coming from geophysical instruments;
- displaying information on the state of the system;
- displaying information on problems in the system;
- configuring the interface with the control station;
- setting information on ASPT-ASTI installation (field, pad, well);
- setting real time clock of the system;
- setting system security password;
- formatting the archive of the system.

### 2.5.4 Working with the ASPT-ASTI menu

2.5.4.1 The ASPT-ASTI menu is implemented as a hierarchical structure. Pressing the ENTER key on the menu item navigates down the hierarchy, pressing the CANCEL key returns to the previous level.

2.5.4.2 Press the "▲" and "▼" buttons to select the menu item. Enter the selected menu item by pressing the "ENTER" key, exit the item by pressing the «ESCAPE» key.

2.5.4.3 Entering the parameter editing mode is carried out by pressing the "ENTER" key on the corresponding menu item. After the system security password is requested (§ 2.5.4.5), the terminal will enter the editing mode.

2.5.4.4 Move to adjacent characters by using the "◀" and "▶" keys. Pressing the "ENTER" key will save the changes, and pressing the «ESCAPE» key will cancel the changes.

2.5.4.5 A security password is required in case of an attempt to change a particular system setting. A symbol is set by pressing the "▲" and "▼" keys. Move to the adjacent password symbols with the "◀" and "▶" keys. Pressing the "ENTER" key will result in password verification, in case of password matching the system will enter the editing mode of the corresponding parameter. Pressing the «ESCAPE» key will return to the previous menu.

### 2.5.5 Main menu items of ASPT-ASTI

2.5.5.1 Structure of the ASPT-ASTI menu is given in Appendix E.

2.5.5.2 When power is applied to ASPT-ASTI, the real-time parameters are displayed on the KSU IRZ500 controller screen, pressing the «ESCAPE» key displays the main menu of the system consisting of the following elements:

- Real-time settings
- Settings
- Diagnostics

2.5.5.3 The "Real-time Settings" menu item provides access to parameters obtained from the downhole sensor and geophysical instrument.

2.5.5.4 The "Settings" menu item provides access to the settings of the entire system.

2.5.5.5 The "Diagnostics" menu item displays the state of ASPT-ASTI and statistics of communication with the downhole sensor.

2.5.5.6 Pressing the F1 key provides access to contextual help, pressing the F2 key displays real-time parameters, pressing the F3 key allows you to change access passwords.

## 2.6 Diagnostics and troubleshooting

2.6.1 Possible messages on problems displayed on the KSU IRZ500 screen are shown in Table 2.1.

Table 2.1 – Possible error messages

Malfunction	Probable cause	Methods of elimination
<b>Window “Diagnostics”</b>		
<b>Status of DH sensor:</b> NO CONNECTION	Power to TMS-E5-01 is missing	Check integrity of the TMS-E5-01 ( <i>rus.TMC-Э5-01</i> ) power supply circuit and eliminate possible cable cuts
	RS-485 cable is disconnected	Check integrity of the RS-485 cable in the ASPT-ASTI cabinet
<b>Window “Real-time settings”</b>		
The frame counter in the “Frame” string does not change	The downhole sensor is not working properly	Replace the downhole sensor
	ASPT-ASTI failure	Replace ASPT-ASTI
	The cable connecting to the Transformer Y-point is cut	Restore connection with the Transformer Y-point

2.6.3 If the methods of troubleshooting indicated in the table do not give results or external failure manifestations of ASPT-ASTI do not correspond to those listed in the table, contact the service department of the manufacturer at the address specified in the first section of the ASPT-ASTI Technical Certificate ref. E511. ASPT-ASTI.00 PS.

**24-hour technical support tel.: +7-800-100-63 (in Russia).**

### 3 Maintenance

#### 3.1 General instructions

3.1.1 Maintenance is carried out by personnel who has been specially instructed and allowed to work.

3.1.2 Maintenance should be carried out at least once a year.

3.1.3 Major repairs are carried out by the manufacturer after 3 years of operation with subsequent verification within the scope of acceptance tests.

#### 3.2 Procedure of product maintenance

3.2.1. Perform visual inspection of ASPT-ASTI to ensure absence of mechanical damage.

3.2.2. Checking ASPT-ASTI functioning

3.2.2.1 Assemble the workplace in accordance with Figure G.1 of Annex G.

3.2.2.2. Turn on (switch to the left position) circuit breakers QF1 "Power network", QF2 "Socket", QF3 "~220V power", QF5 "Fan", and QF6 "Heating".

3.2.2.3 Make sure that TMS-E5-01 (*rus. TMC-Э5-01*) is turned On: the "Power" indicator and the "Rxd1", "Txd1" LEDs on the front panel of TMS-E5-01 must be blinking.

3.2.2.4 Check that there is indication on the modem (LED is flashing).

3.2.2.5 After 5-10 seconds, the screen of the KSU IRZ500 controller will turn on and the real-time parameters will be displayed on it.

3.2.2.6 (40-60) seconds after ASPT-ASTI is turned on, the frame counter in the "Frame" string shall begin changing.

3.2.2.7 It is allowed that the first 5-7 frames from the downhole sensor simulator are missing.

3.2.3 If a malfunction is detected in the course of work in accordance with clause 3.2.1 and clause 3.2.2, ASPT-ASTI shall be sent for repair to the manufacturer facility.

## **4 Storage**

4.1 Storage of ASPT-ASTI in the original package should comply with storage conditions 2 as per GOST 15150.

## 5 Transportation

5.1 The product in the original package can be transported by road, rail (in covered wagons or containers), or by air transport (in sealed compartments) at any distance and at any speed.

5.2 During loading and unloading operations and transportation, the boxes must not be subjected to sharp impacts and atmospheric precipitation.

5.3. Transport conditions:

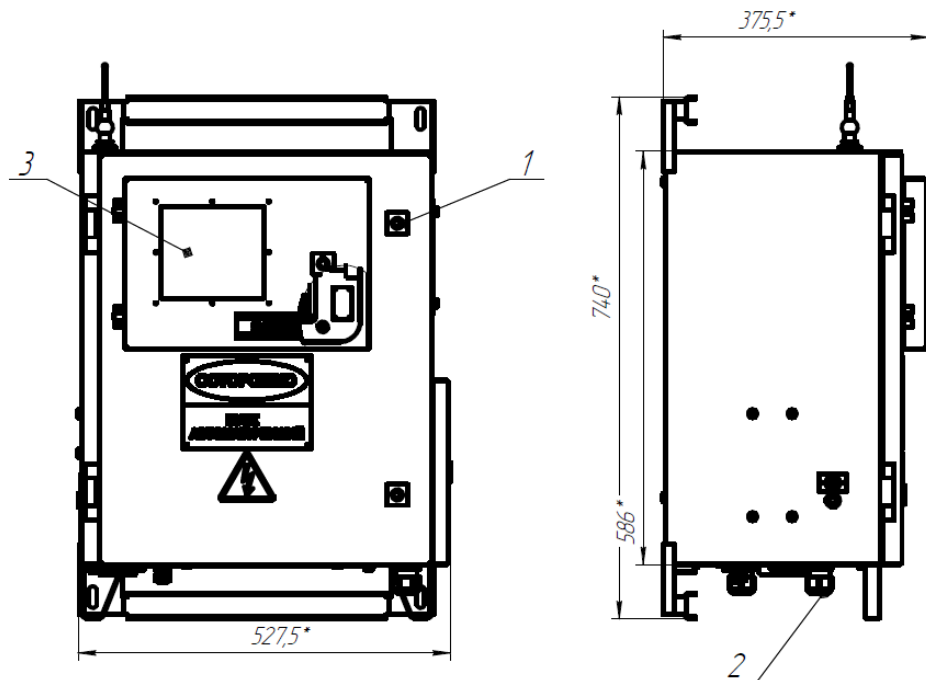
- ambient temperature from - 60 to +50 ° C;
- relative humidity up to 98% at a temperature of +25 ° C;
- atmospheric pressure from 84 to 107 kPa (from 630 to 800 mm

Hg).

5.4. The transport packages with the products shall be secured in vehicles so that to ensure their stable position and avoiding loose movement during transport.

5.5 When handling and transporting, the requirements of the warning labels on the package must be strictly observed.

### Annex A (informative) - Overall dimensions of ASPT-ASTI



1 – Cabinet lock; 2 – Cable gland; 3 –KSU IRZ500 controller terminal.

Figure A.1 – Overall dimensions of ASPT-ASTI



## Annex B (informative) - External view of ASPT-ASTI



Figure B.1 – External view of ASPT-ASTI

### Annex C (informative) - Content of the installation kit

Table C.1

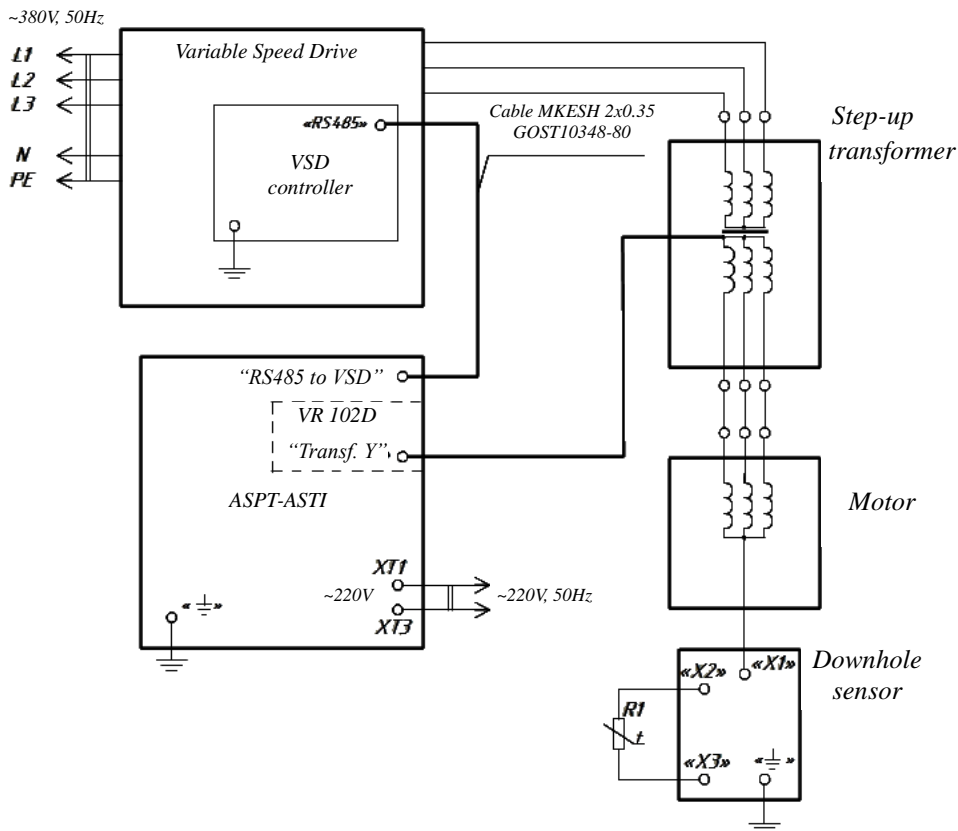
Name	Quantity	UM
Fuse strip VP1-1-0,5A AG0.481.303TU (rus. ВПП-1-0,5А АГО.481.303ТУ)	2	pcs
Zinc-plated hook 50X5 DIN 5299	4	pcs
Hex wrench 8 mm	1	pc
Flash drive USB2.0 2GB DTI/2GB King- ston	1	pc
Welded short-link chain D4 DIN766 L=0,5 m	2	pcs
Wire PuGV 0,5 GOST6323-79 (rus. ПыГВ 0,5 ГОСТ6323-79)	80	m
Wire PuGV 1,0 Z-Zh GOST6323-79 (rus. ПыГВ 1,0 З-Ж ГОСТ6323-79)	15	m
Cable MKESH 2x0,35 GOST10348-80 (rus. МКЭШ 2x0,35 ГОСТ10348-80)	15	m
Hose R3-C-12 U3 TU4833-008-00239971- 2001 (rus. P3-Ц-12 У3 ТУ4833-008- 00239971-2001)	15	m
Screw driver 210-719 WAGO	1	pc

**Annex D (obligatory) - List of control equipment, materials,  
and purchased products**

Table D.1

Name	Designation	Quantity	Note
Simulator of downhole sensor (IMBP)	E511.IMBP.00 ( <i>rus.</i> <i>Э511.ИМБП.00</i> )	1	Year of manufacture 2013 or later
Multimeter M890G	MASTECH	1	Replacement for similar in parameters is allowed
Wire PV3 1,0	GOST6323-79	4m	From the installation kit

### Annex E (informative) - Wiring diagram



R1-thermocouple CVIA.405219.002 (rus. ЦВИЯ.405219.002)

Figure E.1 – ASPT-ASTI wiring diagram

## Annex F (informative) - Structure of ASPT-ASTI menu

### 1 Actual settings

- ❖ **DHS:** (NORMAL, NO CONNECTION)
- ❖ **Actual time:** (current time)
- ❖ **Pin:** (ESP intake pressure)
- ❖ **Pd:** (ESP discharge pressure)
- ❖ **Tin:** (ESP intake temperature)
- ❖ **Td:** (ESP discharge temperature)
- ❖ **Tmot oil:** (Motor oil temperature)
- ❖ **XY Vibration (0...5g)**
- ❖ **Rinsul:** (insulation resistance of the “motor-transformer Y” system)
- ❖ **Frame No.:** (current frame number)
- ❖ **Frame Type:** (current frame type)
- ❖ **Receipt:** (time of the last frame reception)
- ❖ **DHS:** (NORMAL, NO CONNECTION)
- ❖ **Flow rate**
- ❖ **An. Output 1**
- ❖ **An. Output 2**
- ❖ **An. Output 3**
- ❖ **An. Output 4**
- ❖ **An. Output 5**
- ❖ **An. Output 6**
- ❖ **An. Output 7**
- ❖ **An. Output 8**

## 2 Settings

- ❖ **DHS settings**
  - *DHS type*
  - *Pressure measure*
  - *Temperature measure*
  - *Vibration measure*
  - *GEO coefficients:* (parameters of geophysical device are displayed)
    - Multiplier Q1
    - Summand Q1
    - Multiplier Q2
    - Summand Q2
    - Multiplier Q3
    - Summand Q3
    - Multiplier Q4
    - Summand Q4
    - Multiplier Q5
    - Summand Q5
    - Multiplier Q6
    - Summand Q6
- ❖ **Analog outputs**
  - *Analog output 1*
    - Operating parameter
    - Min parameter value
    - Max parameter value
  - *Analog output 2*
    - Operating parameter
    - Min parameter value
    - Max parameter value
  - *Analog output 3*
    - Operating parameter
    - Min parameter value
    - Max parameter value
  - *Analog output 4*
    - Operating parameter

- Min parameter value
- Max parameter value
- *Analog output 5*
  - Operating parameter
  - Min parameter value
  - Max parameter value
- *Analog output 6*
  - Operating parameter
  - Min parameter value
  - Max parameter value
- *Analog output 7*
  - Operating parameter
  - Min parameter value
  - Max parameter value
- *Analog output 8*
  - Operating parameter
  - Min parameter value
  - Max parameter value
- ❖ **Network settings**
  - *RS485 interface*
    - RS485 network address: (1...247)
    - RS485 nit rate: (No, 2400, 4800, 9600, 14400, 19200, 28800, 38400, 57600, 76800, 115200)
    - RS485 protocol type: (IRZ, Region-2, Region-3, Rosneft')
    - RS485 response timeout: (0...59999 ms)
    - DHS repeater address: (1...247)
    - RS485 parity
  - *RS232 interface*
    - RS232 Network address: (1...247)
    - RS232 bit rate: (No, 2400, 4800, 9600, 14400, 19200, 28800, 38400, 57600, 76800, 115200)
    - RS232 protocol type: (IRZ, Region-2, Region-3, Rosneft')
    - RS232 response timeout :( 0...59999 ms)
    - DHS repeater address: (1...247)
    - RS232 parity

- *Internet*
  - Update data
  - Well:(field for entering the folder name on the server, uppercase, English letters, 8 symbols)
- ❖ **Notepad**
  - *Oilfield No.*
  - *Well pad No.*
  - *Well No.*
  - *Rated motor power*
  - *ESP production ratio*
  - *ESP head*
  - *ESP depth*
  - *Fluid density*
  - *VSD info*
    - Controller serial number
    - Contr. prod. date
    - Controller F/W version
    - F/W release date
    - DHS controller F/W version
    - DHS serial No.
    - ASPT serial number
    - ASPT prod. date
    - ASPT install date
    - Loader version
- ❖ **Log settings**
  - *Normal writing period*
  - *In/out add. log writing period*
  - *Clear history*
- ❖ **Date and time**

### 3 Diagnostics

- ❖ **Controller temp.:** (temperature inside the controller)
- ❖ **Ext. equipment**
  - *DHS\_TX*



- *DHS\_RX\_OK*
- *DHS\_RX\_ERROR*
- *NL\_TX*
- *NL\_RX\_OK*
- *NL\_RX\_ERROR*
- *MH\_NL4A01\_RX\_BAD*
- *MH\_NL4A01\_RX\_80*
- *MH\_NL4A01\_STAT*
- *MH\_NL4A02\_RX\_BAD*
- *MH\_NL4A02\_RX\_80*
- *MH\_NL4A02\_STAT*
- *MH\_DHS\_RX\_BAD*
- *MH\_DHS\_RX\_80*
- *MH\_DHS\_STAT*
- *SC485\_TX*
- *SC485\_RX\_OK*
- *SC485\_RX\_BAD*
- *SC232\_TX*
- *SC232\_RX\_OK*
- *SC232\_RX\_BAD*

❖ **DHS statistics:** (NORMAL, NO CONNECTION )

- *Status of DH sensor*
- *Missed frames:*(number of missed frames)
- *Received frames:*(number of received frames)

## **Actions on:**

**Pressing F1** (help menu)

**Pressing F2** (go to actual settings)

### **Pressing F3**

C01 Password (enter a password to change the current profile)

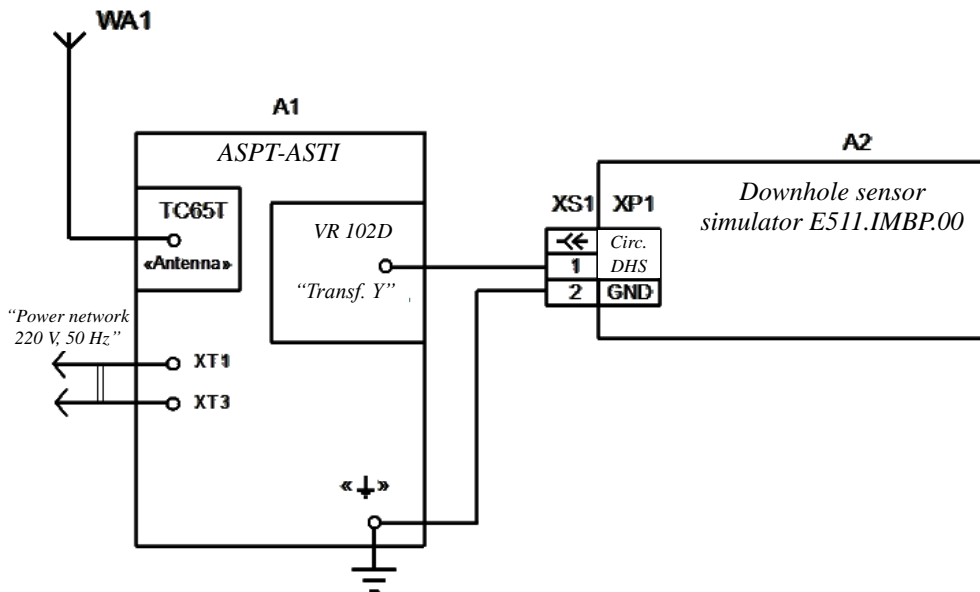
C02 Current profile (user, administrator )

C03 Change password (password setup)

C04 Default profile (user, administrator )

**Note:** In brackets, a range or possible values are indicated for a displayed parameter, or a list of selectable values is displayed for a configurable parameter.

### Annex G (obligatory) – Test workstation layout



XS1 is the power socket MSTB 2.5/2-5T being part of the IMBP delivery set.

Figure G.1 – Scheme of work station for ASPT-ASTI functional check

## List of used acronyms

DHS – downhole sensor  
ESP – electric submersible pump  
F/W - firmware  
S/W – software  
VSD – variable speed drive

## List of terms

Flash-drive = Flash-Memory. A solid state semiconductor non-volatile rewritable memory.

USB = Universal Serial Bus. Serial data interface for medium-speed and low-speed peripherals in computer technology.

RS-485 and RS-485 interface (Recommended Standard 485). Standard data transmission over a two-wire serial communication channel.

### Reference normative documents

Designation of reference document	Number of the section, subsection, paragraph, subparagraph, listing, or annex containing the reference
GOST 9.014	1.6.1
GOST 10354-82	1.6.3
GOST 14192-96	1.5.3
GOST 14254-96	1.1.4, 1.5.1
GOST 15150-69	1.1.3, 4.1
GOST 23170-78	1.6.1

## **Bibliography**

- [1] MODBUS Application Protocol Specification v1.

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