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## EQUIPMENT AND MATERIALS FOR DRILLING WELLS BY ELECTRIC DRILLING

**Abstract:** The article considers the analysis of the selection, recommendations, as well as instructions for the use of equipment and materials for drilling wells by electric drilling in the Western part of the oil and gas fields of Turkmenistan for the purpose of trouble-free well drilling of vertical and directional wells. To analyze the selection of equipment and materials for well wiring, materials from previously drilled wells, operating instructions and a guidance document "Guidance document for the construction of wells by electric drilling" were used.

This paper presents a detailed analysis of the selection and recommendations for the use of equipment and materials for electric drilling, as well as recommendations for their operation of different types of downhole tools. The work can be used to fulfill the tasks set during the construction of oil and gas wells in areas with abnormally high reservoir pressures.

**Key words:** telemetry system, axial load, reactive torque, relative humidity, specific gravity, resistance, error, voltage, hydrocarbon, cable coupling.

**Language:** English

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### Introduction

The telemetry system - STE TP-190UHL5 is designed to measure the axial load of the bit, the reactive moment of the body of the deep device, the

pressure in the annular space, the pressure in drill pipes, the difference between the in-pipe and annular pressure during drilling of vertical and directional wells with electric drills [1, 2, 3, 4] (Figure 1).

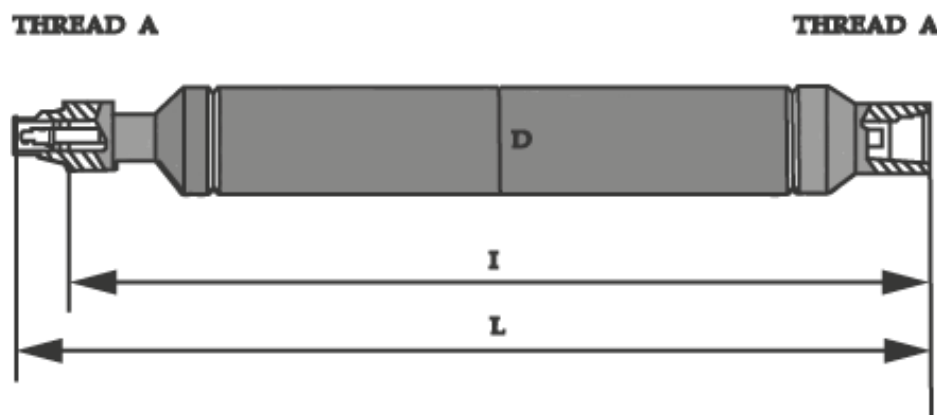


Figure 1. Telemetry system STE TP-190UHL5

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The technical data of the system correspond to those given in Table 1.  
The deep measuring device (DMD) is operated:

- when the temperature of the air or other agent is from 0 to 110 °C;  
- relative humidity up to 80 (at 20 °C). [5, 6, 7].

**Table 1. Technical data of the system**

Name of parameters	Measurement limits	The limit of the permissible value of the basic error	
		by digital output	by analog output
Axial load	from minus 50 to minus 10 from 10 to 350	+18	+0,25
Reactive torque of the DMD body, m	From 0 to 5000	+250	+0,25
Pressure in the annular space, MPa	from 20 to 110	+3,3	+0,15
Pressure in drill pipes, MPa	from 20 to 110	+3,3	+0,15
The difference between the in-pipe and annular pressure, MPa	- from minus 5 up to plus 15	+0,23	+0,75

The ground measuring device (GMD) is operated in an air environment at a temperature from 5 to 40 °C, relative humidity up to 80 (at 20 °C) and at

a supply voltage (220 + 40) V, frequency (50 + 2) Hz [8, 9, 10].

**Continuation of Table 1**

The limit of the permissible value of the basic error of the electrical resistivity of the drilling mud, Ohms.m	+0,015
The limit of the permissible value of the basic error of temperature, drilling mud, °C	+0,55
The limit of the permissible value of the basic error on the analog output, V	+0,55
Power consumption, max., no more, W	20

Notes:

1. Additional reduced error of ground control (GC) from changes in ambient temperature (for every 10 seconds) from the nominal value +0.2% [11, 12, 13].
2. Additional reduced error of GC when the supply voltage changes (by +40V from the nominal value of 220 V) +0,1% [14, 15, 16]. The design parameters of the system must meet the requirements of Table No. 2.

**Table 2. Design parameters of the system**

Name of parameters	Parameter value
Device for monitoring the isolation (DMI):	
Length, mm	4087+300
Diameter, mm	190 minus 10
Weight, kg	574+25
GC:	
Dimensions, mm no more, Weight, kg	500 x 490 x 178

The deep device is operated:  
- in the medium of drilling mud, which is an alkaline medium with a hydrogen index (pH) from 7 to 12 and containing hydrocarbons with a gas-liquid factor of 0.5 m<sup>3</sup>/m<sup>3</sup>;  
- at a hydraulic pressure of no more than 110 MPa;  
- at an upper environment temperature of 110 °C [17, 18, 19].

The ground-based device is operated in an air environment in accordance with the climatic design of the UHL and placement categories 3 according to GOST 15150-69 at a supply voltage (220 +40)V, 50 Hz.

The reverse resistance measured between the large ring of the cable coupling and the housing must be at a temperature of (20 +5) C - at least 10 ohms [20-23].

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The layout scheme of the bottom hole assembly (BHA) using these telesystems.

**Table 3. Characteristics of the layout of the bottom hole assembly (BHA)**

Name of parameters	Norms	
	DMD	GMD
Device layout of the telemetry system		
Length, mm	4779+400	
Diameter, mm	190 minutes 10	
Weight, kg	600+30	
Dimensions, mm, no more		500x490x178
Weight, kg no more		15
Connecting filter-2		
Dimensions, mm, no more		320x230x100
Weight, kg, no more		5

The telemetry system STE GP-190UHL5 is designed to measure the electrical resistivity and temperature of the drilling fluid in the annulus during the drilling of wells with electric drills, as well as the

insulation resistance and winding of the electric drill and power supply during the descent and lifting operations [24-28]. The technical data of the system must correspond to Table 4.

**Table 4. Technical data of the system**

Name of parameters	Norms
The operating current of the DMI, A	from 0 to 150
The measurement limit:	
Electrical resistivity of drilling mud in annular space annular space, Ohms.m	from 0.1 to 3.0 from
The temperature of the drilling fluid in the annular space, deg.C	20 to 110
The limit of the permissible value of the basic error:	
electrical resistivity of drilling mud, Ohms.m	+0,15 +2,8

A list of special structures for guidance in electric drilling, installation of electric drill relays, a list of fishing tools and technical data of the complete

device (UZEB-80U2) is given in Tables 5-8, as well as the set of the device (UZEB-80U2) is shown in Fig.2.

**Table 5. The list of special structures that should be guided by electric drilling**

No. n/a	Title	Designation year of manufacture	Organization who issued the instruction
1.	A complex method of classification of rocks of geological section, dividing them into characteristic bundles of rocks and selecting rational types and designs of ball bits for effective drilling of oil and gas fields	RD 39-2-52-78	VNIIBT
2.	Operating instructions for roller bits when drilling oil and gas wells	RD 39-2-51-78	VNIIBT
3.	Instructions for drilling oil and gas wells, diamond drilling tools	RD 39-2-77-78	VNIIBT
4.	Instructions for drilling directional wells	RD 39-2-810-83	VNIIBT
5.	Manual for the repair of electric drilling equipment	OTSCH.410.010. 1970 year	SKTBPE VNPO "Potential"
6.	Instructions for the preparation and operation of drill pipes and cable sections of the electric drill current supply	OTSCH.466.010.	The same

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7.	A device for monitoring the isolation and position of the diverter. Technical description and operating instructions	OTSCH.140.025TO. 1977 year	The same
8.	The device is a deep measuring telemetry system of the electric drill of the STE-185 UZ series. Technical descriptions and operating instructions	ZTSCH.789.030-02T0	SKTBPE VNPO "Potential"
9.	Instructions for the care and operation of the current collector of the TZ series	OTSCH 140.026, 1981 year	The same
10.	The mechanism of curvature of electric drills. Brief description and installation and operation instructions	OTSCH.466.039, OTSCH 466.036, 1975 year	-!-
11.	Technical description and operating instructions of the complete control and protection device for electric drills UZEB-65MU2 (UZEB80-39A2U2)	46x606.014T0, 1974 year.	-!-
12.	Technical description and operating instructions for gearboxes-inserts (GI)	OTSCH.466.063, 1978 year	
13.	Instructions for the device and operation of the grounding of the installation of an electric cord powered by the system "two wires-pipe"	IZ – 4 1981 year	SKTBPE VNIITB
14.	Electric drills. General technical conditions.	GOST 15880 – 76SKTBPE	
15.	Electric drills with a capacity of up to 210 kW. Technical conditions	GOST 17287 – 77	The same
16.	Rules of technical operation of electrical installations of consumers and safety rules for the operation of electrical installations of consumers	1971 year	Gosenergonadzor

**Table 6. Installation of electric drill relays**

Electric drill	Rated data of the electric drill			Drilling depth, m.	Types of protection, settings of the electric circuit protection relay		
	power kW	voltage	current strength		short circuit protection (instantaneous), Relay (1RM 2RZHRT40/20)		
					installation current A	connection of coils	cut-off current, A
E240 - 8	210			0-1000	6,6	parallel	530
E240 - 8	210	1700	144	1000-2000	6,0	parallel	530
E240 – 8R				2000-3000		parallel	480
E185 – 8 (E190) E185 – 8 s PB (E190 – 8R)				3000-4000	5,5	parallel	440
GI=2, GI=3)	125	1300	125	0-3000	4,7	series	380
(E 185 – 8P with a double GI =2x2)	125	1300	125	0-3000	3,1	series	250

**Continuation of table 6. Installation of electric drill relays**

Electric drill	Types of protection, settings of the electric circuit protection relay					
	from jamming (time exposure 2c) RMZ(RT 40/10)			overload protection (time delay-12 s>-Relay RMP (RT 40/6)		
	Installation current, A	connection of coils	cut-off current, A	Installation current, A	connection of coils	cut-off current, A
E240 - 8	3,2	parallel	252	2,2	parallel	174

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E240 - 8	3,16	parallel	252	2,2	parallel	174
E240 – 8R E185 – 8 (E190) E185 – 8 s PB (E190 – 8R)						
GI=2, GI=3)	2,5	series	200	1,8	series	150
(E 185 – 8P with a double GI =2x2)	1,7	series	240	1,7	series	140

**Table 7. List of fishing tools for electric drilling**

No n/a	Name	Appointment	Diameter of wells	Note
1.	Bell-cutter	To capture the body of the electric drill 3164, 3190, 3240, 3290	188;190,5 215,9 269,9; 295,3 394,3	
2.	Bell-gauge-milling machine	To capture the electric drill by the nipple of the upper and lower connecting housing and for catching an electric drill together with a spindle for diameters 3164, 3190, 3240, 3290	188;190,5 215,9 269,9; 295,3 394,3	
3.	Tap with centering devices	To capture the spindle shaft of electric drills 3164, 3190, 3240, 3290	188; 190,5 215,9 269,9; 295,3 394,3	The tap must have a set of heads, directions and funnels for the specified electric drills and wells
4.	Tap-gauge	To capture the body of the electric drill 3164, 3190, 3240, 3290	188;190,5 215,9 269,9; 295,3 394,3	Including the reducer-inserts in the presence of the remaining crown of the gear coupling RF 164, GI185, RF 190, GI 240, GI 290
5.	Bell-gauge-milling machine	To capture the bodies of the STE-164 telemetry system	188;190,5 215,9 269,9; 295,3 394,3	
6.	Tap-calibrator-milling machine	To capture the bodies of the STE-164 telemetry system	188;190,5 215,9 269,9; 295,3 394,3	
7.	Bell-gauge	To capture the pipes H140 annular thread	269,9;295,3	Connecting thread Z-161 nipple
8.	Bell-gauge	To capture the drill pipes H140 annular thread	269,9;295,3	Connecting thread Z-140
9.	Bell-gauge	To capture the HI40 drill pipes by the ZU-185 lock housing followed by a lapel	269,9;295,3	Connecting thread Z-161 nipple
10.	Tap-gauge with centering device	To capture drill pipes -N 140 annular thread of the lock coupling ZU-185 – N114, B127 - annular thread of the lock coupling ZU-155	243;269,9  190,5;215,9	Connecting thread 3-161 nipple  Z-133, nipples

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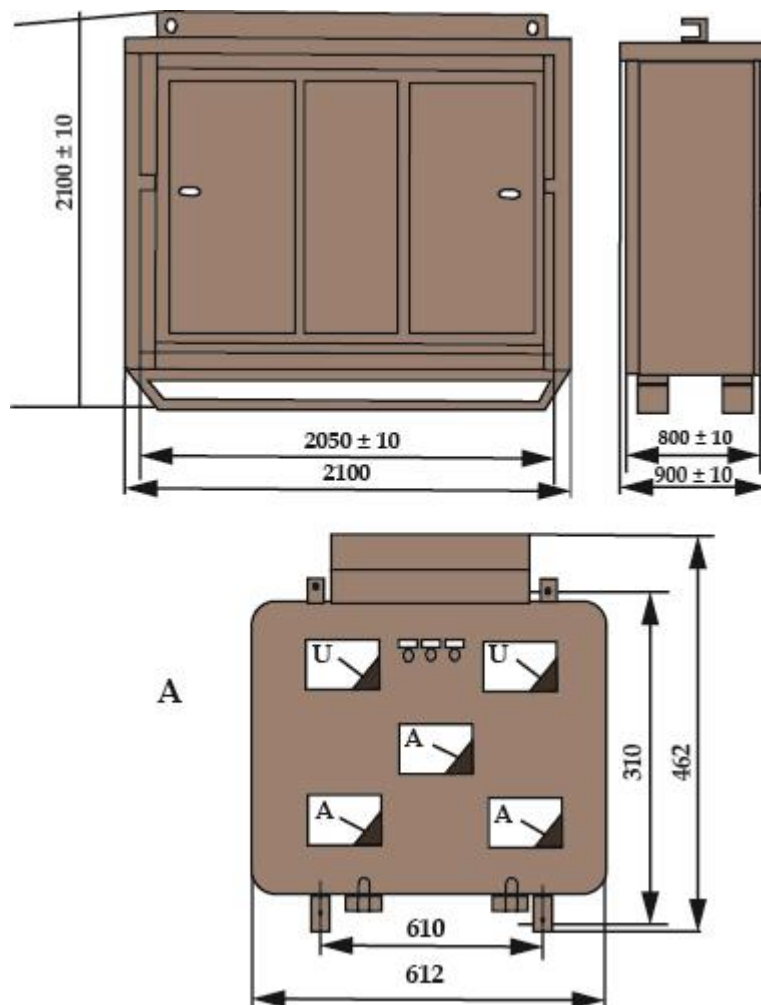


Figure 2. Complete device (UZEB-80 U2)

Table 8. Technical data of the complete device (UZEB-80 U2)

Designation	Name of the object	Main circuit		Control circuit	Overall dimensions, mm	Weight, kg
		UI	U			
A	Electric drill control and protection station	3000	200	330	2100x2050x800	1000
B	Control cabinet with measuring instruments	100	5	220	612x462x290	25

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