ELEKTON

SMART TOOLS FOR THE OIL INDUSTRY
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Today the Closed Joint-Stock Company ELEKTON is one of leaders in the field of manufacturing of the surface electronic equipment for the oil industry in Russia. Company’s production space exceeds 10 000 m², the staff numbers about 500 employees.

Dynamic development of the company, aspiration to self-improvement, orientation toward the world quality standards - here only some of the reasons of stably increasing growth of production and sales volumes of output under the trade mark of ELEKTON.

Long-term operating experience of the ELEKTON’s equipment on oilfields of Russia has shown that for reliability and functionalities it does not concede, and on some parameters surpasses the best analogues of foreign manufacturers.

The leading Russian oil companies, such as TNK-BP, YUKOS, LUKoil, Bashneft, Rosneft, TNK, Sibneft, Surgutneftegaz, Slavneft, Surgutneftegaz, Bashneft, Rosneft, TNK, Sibneft, Surgutneftegaz, Slavneft, Surgutneftegaz, Bashneft, Rosneft are successfully running our equipment. CJSC ELEKT... (Iran), Tripoli (Libya), Alma-Ata (Kazakhstan), Delhi (India), Jakarta (Indonesia), Muscat (Oman) and Amman (Jordan).

The Company is the designer and manufacturer of Switchboards Elekt on-04 with direct start, Switchboards Elekt on-07 for starting currents limitation of... up to 1600А. Above 16000 Switchboards Elekton-04 and Elekton-07 are successfully running in the oil-production companies.

CJSC ELEKTON is the designer and manufacturer of Switchboards Elekton-05 with variable speed drive on rated current up to 1800 A and rated power up to 1100 kVA which allow to make soft start and regulation of frequency of rotation of ESP unit. More than 5000 wells are equipped by Switchboard Elekt on-05.

The Submersible Telemetry System Elekton-TMSR has been designed and manufactured for additional protection of ESP motor, for determination of a technical conditions and an overall performance of the rotary pump unit (ESP). The System allows data acquisition of the formation liquid's pressure and temperature on the pump unit’s suction and discharge, fluid flow (pump capacity), vibration speed-up of ESP motor in radial and axial direction and insulation of the system – Three-phase step-up oil transformer – Submersible cable – ESP motor.

All Switchboards have RS-485 interface and standard Modbus-RTU protocol for data communication which enable data acquisition via telemechanics system and automates the oil production process. It is possible to control the system and to receive the operating data by means of GSM networks of cellular communications. CJSC ELEKTON offers the program-technological interface of the Switchboard’s controller which, coupled with the Submersible Telemetry System Elekton-TMS-2, allows the well operating mode’s monitoring with expanded functions of on-line controlling.

Application of the VSD Switchboards together with Submersible Telemetry System and Telemechanics System makes possible according to the preset program to optimize and coordinate the downhole equipment’s operation with characteristics of the bottomhole formation zone. Also allows to diagnose, control and protect the downhole equipment that enables to improve essentially the oil production efficiency.

Recently along with manufacturing of microprocessor control drives, CJSC ELEKTON has developed and begun producing the downhole oil-field equipment – Inserted Progressing Cavity Pump (PCP) for high-viscosity oil production; Starting Clutch for the ESP unit’s start-up facilitation; and also heat-resistant (up to 230°С) Cable Extender with patented cable connector of original design.

CJSC ELEKTON has own bench testing unit where produced equipment is being checked-out under rated load up to 1,5 MW.

Service centers of our company for warranty and after-sales services have been opened in many regions of ELEKTON equipment’s intensive application: Nizhnevartovsk, Noyabrsk, and Otradny. We ensure installation supervision, after-sales and warranty service, technical staff training.

THE IDEOLOGY OF CJSC ELEKTON CONSISTS IN INTEGRATED APPROACH TOWARDS AUTOMATION AND OPTIMIZATION OF OIL PRODUCTION PROCESS, IN INTENTION TO PRODUCE OIL FIELD EQUIPMENT, WHICH IS COMPETITIVE TO THE BEST WORLD MARKETS SAMPLES.
**SMART TOOLS FOR THE OIL INDUSTRY**

**ELEKTON 04 Switchboards**

**ELEKTON-04-250 (400, 630, 800, 1000)**

Elekton-04 Switchboards are designed for control and protection of the ESP motors.

Current measurement in Elekton-04 Switchboards is carried out in step-up transformer primary circuit; results are being converted into motor operating current by controller with a special program. Due to such design the input of cables from secondary circuit of step-up transformer is eliminated, that enables to facilitate mounting noticeably and to increase operation safety.

Certificate of conformance P OCC RU.ME47.H00263.

**FEATURES OF ELEKTON-04 SWITCHBOARDS**

- Cables are connected in special section mounted on the cabinet’s back board upper part. Such design facilitates assembling of the switchboard on the multiple well platforms. This design is covered by several patents.
- 0.4 kV cable clamps provide connections up to 3 cables (with section 95 mm²) or up to 4 cables (with section 120 mm²) for each phase.
- Switchboard’s design is highly maintainable and has safe production service: system’s crucial components are easily substituted due to the plug-type connections application and engineering solution.
- Special sections for external devices connection unit are mounted on the cabinet’s back side of the switchboards as well as connection terminal of neutral point of the step-up transformer’s secondary coil. This design facilitates all external connections without opening the switchboard.
- There is a window on the switchboard cabinet’s front door, opposite the controller’s indicator lamps informing about switchboard’s status. Such design facilitates the control of the switchboard’s status without opening the door.

**VSD ELEKTON-05**

**VSD ELEKTON-05-32 (63, 75, 100, 160, 250, 400, 630, 800, 1000, 1200, 1600, 1800)**

Variable Speed Drive (VSD) Elekton-05 is designed to regulate speed rotation, optimize operation and protect the ESP motors.

Certificate of conformance POCC RU.ME47.H00265.

Electromagnetic Compatibility Test report №232-041/IC EMC-02 PI.

**AREA OF APPLICATION:**

- asynchronous electric motors of submersible pumps for oil recovery;
- ac converter-fed motors submersible pumps for oil recovery;
- asynchronous motors of common industrial modification – water intakes and water-supply, drives of Progressing Cavity Pumps, smoke sucker and industrial ventilation.

**MAIN TECHNICAL SPECIFICATIONS OF VSD ELEKTON-05-32 (63, 75, 100, 160, 250, 400, 630, 800, 1000, 1200, 1600, 1800)**

<table>
<thead>
<tr>
<th>SPECIFICATIONS</th>
<th>VALUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated supply voltage, V</td>
<td>380/415/435, (50/60 Hz)</td>
</tr>
<tr>
<td>Main supply voltage deviation, %</td>
<td>-25...+25</td>
</tr>
<tr>
<td>Rated current of the primary circuit, A</td>
<td>32...63...75...100...160...250...400...630...800...1000</td>
</tr>
<tr>
<td>Converter’s power rating, kVA</td>
<td>20...40...47...63...100...160...250...400...500...630...800...1000</td>
</tr>
<tr>
<td>Temperature range, °C</td>
<td>-40...+60</td>
</tr>
<tr>
<td>Protection rating</td>
<td>IP43</td>
</tr>
<tr>
<td>Control scheme</td>
<td>Controller Elekton-09</td>
</tr>
<tr>
<td>Frequency variation range, Hz</td>
<td>3.5...50x0,1%</td>
</tr>
<tr>
<td>Overall dimensions, mm</td>
<td>1920х880х560...1725х616х420...1910х1186х1035...2400х1820х1600</td>
</tr>
<tr>
<td>Weight, kg</td>
<td>155...170...170...180...900...330...350...750...780...800...850...1725...1725</td>
</tr>
</tbody>
</table>

**ELEKTON-04M-250 (400) Switchboard in contrast to Elekton-04-250 (400) Switchboard, the power circuit’s flexible contactor has been substituted for copper bus.**

Elekton-04-250 (400) Switchboard has been provided with a possibility of soft starter.

Certificate of conformance P OCC RU.ME47.H00315.

**VSD Elekton-05 enables starting of pumping unit according to the specified program both manual and automatic mode. Possibility of technological parameter maintenance (frequency, current, pressure) by means of built-in PID-regulator.**

**FEATURES OF VSD ELEKTON-05**

- Operation stability under power voltage jumping.
- Stabilization of output voltage in case of instability of mains supply.
- Built-in filter for decrease of the mains voltage Waveform Distortion Factor on VSD input.

**MAIN TECHNICAL SPECIFICATIONS OF THE ELEKTON-04-250 (400, 630, 800, 1000) SWITCHBOARDS**

<table>
<thead>
<tr>
<th>SPECIFICATIONS</th>
<th>VALUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating supply voltage, V</td>
<td>380/415/435, (50/60 Hz)</td>
</tr>
<tr>
<td>Supply voltage deviation from rated, %</td>
<td>-25...+25</td>
</tr>
<tr>
<td>Primary power circuit rated current, A, not more</td>
<td>250 (400, 630, 800, 1000)</td>
</tr>
<tr>
<td>Electric motor power, kW, not more</td>
<td>100 (160, 240, 320, 400)</td>
</tr>
<tr>
<td>Temperature range, °C</td>
<td>-40...+60</td>
</tr>
<tr>
<td>Protection rating</td>
<td>IP43</td>
</tr>
<tr>
<td>Switching unit</td>
<td>Contactor 250 A (400 A, 630 A, 800 A, 1000 A)</td>
</tr>
<tr>
<td>Switching unit control circuit</td>
<td>Controller Elekton-08</td>
</tr>
<tr>
<td>Overall dimensions, mm / weight, kg, not more</td>
<td>1735 х 700 х 520 / 110 (120)</td>
</tr>
<tr>
<td>Elekton-04M-250 (400)</td>
<td>1735 х 800 х 640 / 155 (170)</td>
</tr>
<tr>
<td>Elekton-04-630</td>
<td>1735 х 850 х 752 / 210</td>
</tr>
<tr>
<td>Elekton-04-800 (1000)</td>
<td>1860 х 950 х 1000 / 370 (380)</td>
</tr>
</tbody>
</table>
ELEKTON-09 Controller for VSD of ELEKTON-05 Series

Functionally and constructively the controller is divided into 2 blocks: frequency converter control unit Elekton-09.2 and interface module Elekton-09.1.

CONTROLLER PROVIDES THE FOLLOWING FUNCTIONS:
• regulation of the electric motor’s rotation speed from built-in control panel;
• switchboard’s autorestart after the shutdown troubleshooting service;
• smooth electric motor’s acceleration with preset rate;
• electric motor rotation direction reversal;
• programmable frequency correction bursts to provide automatic putting the well into operating duty;
• electric motor gradual braking when voltage limit value increasing in dc link.
• automatic maintenance of the technological parameter value (pressure, temperature, level and so on) from 1 of the 8 analog inputs;
• data communication via one port RS-232 and two ports RS-485, connection to the telemechanics system for remote control and on-line control – start-up, shutdown, setpoints change;
• operation under field decay conditions if speeds of rotation exceed rated;
• possibility to vary characteristic U/F (for different types of loading) without switchboard’s shutdown;
• record operating parameters of the switchboard (mains voltage, current, output frequency and so on) into controller memory and their fast view on the controller display directly;
• fixation in event log of the time of main supply switching off and on;
• setpoints changing registration in event log with indication of the data and time of the parameter’s value changing before and after, as well as the way of changing – remotely or by operator;
• recording in event log the course inhibiting the switchboard start;
• recording into event log the date and time of setpoints changing with indication of previous and new values;
• record into memory the meanings of the mains voltage values within adjustable periods, if it doesn’t allow the switchboard switching on;
• showing on controller display the protection name, which caused the switching off, with indication of remaining period of time (in minutes and seconds) before ESP motor switching off;
• automatic frequency changing up to preset value during preset period of time;
• 2 modes of wedging of ESP rotary unit:
  1. specified number of blows by increased voltage with specified output current frequency, in forward direction;
  2. specified number of blows by increased voltage with specified output current frequency, in different directions – swinging –
• programming of analog inputs in any of 3 standards: 0-4 V, 0-10 V, 4-20 mA;
• password setting for exception of an unauthorized access of the switchboard programming, 8 users password indentification;
• possibility of frequency convertor’s operation in modes of pulse-width and 6-pulse modulations.

CONTROLLER ENABLES PROGRAMMING THE FOLLOWING MAIN PARAMETERS:
• manual and automatic mode;
• electric motor’s acceleration time;
• electric motor’s braking time;
• braking mode (running-out or frequency dynamic speed-down);
• initial direction of rotation;
• time of switchboard’s autorestarting after main supply restoration;
• time and rate of «jogging» when drive start-up occurs with increased starting moment;
• turndown of the controlled parameter;
• proportional, integral and differential coefficients during operation with PID-regulator, or range of the controlled parameter corresponding to the frequency adjustment range during parametric control;
• parameters of the curve U/F (specified by 4 points) for drive control under different loading conditions;
• maximum phases output currents for current protection;
• phase output current at which the acceleration speed limit algorithm starts running;
• maximum admissible current in dc link;
• current time clock set up.

THE MAIN FOLLOWING TYPES OF PROTECTION ARE PROVIDED BY CONTROLLER:
• main supply temporary overvoltage protection;
• external and internal short circuit current protection;
• programmable operation threshold of circuit voltage rise protection;
• programmable operation threshold of circuit voltage reduction protection;
• ESP asynchronous electric motors’ insulance reduction protection;
• transistor overheating or cooling air flow disappearance protection;
• overload current time-current protection;
• underload protection.

CONTROLLER’S ADVANTAGES:
• reliable and steady to electric noises;
• up-to-date microprocessor is applied;
• reliable elemental base is applied;
• full galvanic isolation of power supply circuit;
• menu setpoints are grouped according to their functionalities;
• possibility to set up setpoints as default;
• informative enlargement of display by increasing displayed symbols – 4 lines of 20 symbols each;
• graphical display connection possibility;
• measuring of the mains voltage on the switchboard’s input allows to fix the reason of undervoltage in dc link (trouble of input rectifier or power circuit’s voltage derating);
• there is a possibility to create technologist’s individual menu;
• possible equipping of Elekton-08 (09) controllers with a function of information read-out to the USB Flash drive.
Output Filters for Frequency Converters to Rated Current from 160 up to 1200 A

Output Filter is intended for reduction of high-frequency harmonics of the carrier frequency of 3-phase output voltage of variable speed drive switchboards. Output filter is attached between VSD switchboard and step-up three-phase transformer. Filter’s rated current circuit should be corresponding with rated output current of the switchboard.

### MAIN TECHNICAL FEATURES

<table>
<thead>
<tr>
<th>Filter type</th>
<th>Rated operating current, A</th>
<th>Waveform Distortion Factor of output voltage &amp; current with Output Filter</th>
<th>Dimensions, mm</th>
<th>Weight, kg</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>$K_u$ output</td>
<td>$K_i$ output</td>
<td></td>
</tr>
<tr>
<td>Elekton-F-160</td>
<td>160</td>
<td>1588 x 804 x 925</td>
<td>210</td>
<td></td>
</tr>
<tr>
<td>Elekton-F-250</td>
<td>250</td>
<td>1588 x 804 x 925</td>
<td>210</td>
<td></td>
</tr>
<tr>
<td>Elekton-F-400</td>
<td>400</td>
<td>1588 x 804 x 925</td>
<td>230</td>
<td></td>
</tr>
<tr>
<td>Elekton-F-630</td>
<td>630</td>
<td>1835 x 1004 x 1105</td>
<td>380</td>
<td></td>
</tr>
<tr>
<td>Elekton-F-800</td>
<td>800</td>
<td>1835 x 1004 x 1105</td>
<td>420</td>
<td></td>
</tr>
<tr>
<td>Elekton-F-1000</td>
<td>1000</td>
<td>1094 x 1900 x 1235</td>
<td>430</td>
<td></td>
</tr>
<tr>
<td>Elekton-F-1200</td>
<td>1200</td>
<td>1094 x 1900 x 1235</td>
<td>490</td>
<td></td>
</tr>
</tbody>
</table>

**THE RESULTS OF MEASUREMENT OF WAVEFORM DISTORTION FACTOR OF OUTPUT VOLTAGE AND CURRENT OF FREQUENCY CONVERTER ELEKTON-05-400**

**Switchboard ELEKTON-05 without Output Filter**

Output voltage

Harmonic composition of output voltage

$K_u$ output = 43.73%

Output current

Harmonic composition of output current

$K_i$ output = 0.58%

**Switchboard ELEKTON-05 with Output Filter**

Output voltage

Harmonic composition of output voltage

$K_u$ output = 2.55%

Output current

Harmonic composition of output current

$K_i$ output = 0.58%
Submersible Telemetry System **ELEKTON-TMS-2/TMSP/TMSF**

The Submersible Telemetry System Elekton-TMS-2 for data logging. Current values are transmitted to the external devices.

### Main Technical Specifications

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Elekton-TMS-2</th>
<th>Elekton-TMSP</th>
<th>Elekton-TMSF</th>
<th>RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flowmeter, m³/d</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>15-150 (50-300, 100-750, 300-2000)</td>
</tr>
<tr>
<td>Discharge temperature, °C</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>0-200</td>
</tr>
<tr>
<td>Discharge pressure, bar</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>0-320 (0-600)</td>
</tr>
<tr>
<td>Intake temperature, °C</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>0-150</td>
</tr>
<tr>
<td>Intake pressure, bar</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>0-320 (0-600)</td>
</tr>
<tr>
<td>Motor oil/winding temperature, °C</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>0-200</td>
</tr>
<tr>
<td>Vibration radial, g</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>0-3</td>
</tr>
<tr>
<td>Vibration axial, g</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>0-3</td>
</tr>
<tr>
<td>Insulation, kΩ</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>0-9999</td>
</tr>
<tr>
<td>Y-point voltage, V (RMS)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>0-1000</td>
</tr>
</tbody>
</table>

### Overall Dimensions

- Downhole unit: Ø=114 mm, L=860 mm, weight 35 kg
- Surface unit: 245 x 200 x 160 mm, weight 6.5 kg
- Display/Control & Inductor Boxes: 1068 x 492 x 340 mm, weight 70 kg
- Display/Control Box: 377 x 492 x 284 mm, weight 20 kg
- Inductor Box: 507 x 492 x 284 mm, weight 42 kg

### Technical Specifications

- Discharge, m³/day: 800
- Pressure, bar: up to 400
- Temperature, °C: up to 250

### Dimensions

- Length, mm, not more: 1200
- Diameter, mm: 103
- Weight, kg: not exceeding 28

---

The flowmeter Elekton-TMSDF is intended for measurement of discharge, pressure and temperature at ESP discharge. The flowmeter operates in conjunction with submersible telemetry system.

Extra received parameters jointly with data on pressure and temperature at the pump suction allow to define technical condition and operating efficiency of the electric submersible rotary pump unit.
The equipment complex comprising a Variable Speed Drive Switchboard Elekton-05IT and Submersible Telemetry System Elekton-TMSR allows performing the following extra functions:

- autotuning of the well operating conditions to maximal stable oil production (well potential);
- monitoring of technical condition of the pumping unit during the process of well operation;
- monitoring of the well reservoir factors.

In order to work with the «Technologist’s Interface» there is no need to equip the wellhead with additional controlling and measuring equipment.
ELEKTON-06 Switchboards for Deep-well Working Rod Pump and Beam Pumping Units

ELEKTON-06-100

The Switchboard Elekton-06-100 is assigned for control and protection of deep-well working rod pump, beam pumping unit and its drive – three-phase asynchronous motor with rated voltage 380 V and frequency 50 Hz.

Built-in controller of the Switchboard Elekton-06 stores and represents on a liquid-crystalline display the information about rod pump and beam pumping units’ operation. Such information as: status of the unit; indication of the shutdown time and its cause; operating time from the moment of last start-up, or before start-up time in minutes and seconds; current parameters, setpoints and protections.

History. 10 dynamograms and wattmetergrams registered within time interval preset with setpoints are stored in the controller. There are input voltage, current and polish rod load protection sets. Bells rupture protection.

Elekton-06 Switchboard has 3 analog user configured outputs, to which the stationary dynamograph and well head pressure sensor and other devices can be attached.

Switchboard can be connected to telemechanics system on ModBus protocol via built-in RS-485 interface. Operation data can be read out into a notebook or a compact Data Input/Output Unit for further analysis of operation and diagnostics of pumping unit.

Certificate of conformance РОСС RU. МЕ47.Н00256.

ELEKTON-06 MAIN TECHNICAL SPECIFICATIONS OF ELEKTON-06-100 SWITCHBOARDS

<table>
<thead>
<tr>
<th>SPECIFICATIONS</th>
<th>VALUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating supply voltage, V</td>
<td>380/415/435, (50/60 Hz)</td>
</tr>
<tr>
<td>Supply voltage deviation from rated, %</td>
<td>-25 ... +25</td>
</tr>
<tr>
<td>Primary power circuit rated current, A, not more</td>
<td>100</td>
</tr>
<tr>
<td>Electric motor power, kW, not more</td>
<td>55</td>
</tr>
<tr>
<td>Temperature range, °C</td>
<td>-40 ... +60</td>
</tr>
<tr>
<td>Protection rating</td>
<td>IP43</td>
</tr>
<tr>
<td>Switching unit</td>
<td>Contactor 100 A</td>
</tr>
<tr>
<td>Switching unit control circuit</td>
<td>Controller Elekton-08</td>
</tr>
<tr>
<td>External sensors’ input signal standard</td>
<td>0-10 B; 4-20 mA</td>
</tr>
<tr>
<td>Interface</td>
<td>RS-485</td>
</tr>
<tr>
<td>Information changing</td>
<td>notebook, read-out unit BSL-04, telemechanics system, Modbus protocol</td>
</tr>
<tr>
<td>Overall dimensions, mm</td>
<td>584 x 367 x 660</td>
</tr>
<tr>
<td>Weight, kg</td>
<td>42</td>
</tr>
</tbody>
</table>

ELEKTON-07 Switchboards

ELEKTON-07-400 (630, 800, 1000, 1600)

Elekton-07 Switchboards are designed for control and protection of the ESP motors. The main difference of the Elekton-07 Switchboard is a thyristor soft starter.

Additionally to the standard algorithms (especially for large static moment cases) there have been added a quasi-frequency mode of motor launching to the soft starter of the Elekton-07. The soft starter enables to run the electric motor at low frequencies (12.5, 25 Hz discretely) within short period of time.

There is embedded interface RS-485 for connection with telemechanics system on Modbus protocol. Switchboard operating data are read out to the portable computer for further data processing and analysis.

Certificate of conformance РОСС RU. МЕ47.Н00263.

SOFT STARTER ADJUSTMENT IS CARRIED OUT:

with the help of two setpoints:

- Starting current – 100% ...500%
- Motor acceleration time – 0 ...10 sec.
- and starting mode selection:
  - Soft start (for normal motor switching on);
  - Jogging Start (for motor switching on, which requires increased starting moment, with further transition to the Soft Start Mode);
  - Quasi-frequency mode (for motor switching on, which requires increased starting moment, with further transition to the Soft Start Mode);
  - Full Start (for modes, which require direct motor switching on).

APPLICATION OF SOFT STARTER ALLOWS:

- to limit peak mechanical loads to the motor and mechanism;
- to limit start current;
- to exclude in some cases using the slip coupling and hydraulic clutch;
- to carry out contactor communication when there is no current.

MAIN TECHNICAL SPECIFICATIONS OF ELEKTON-07-400 SWITCHBOARDS

<table>
<thead>
<tr>
<th>SPECIFICATION</th>
<th>VALUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating supply voltage, V</td>
<td>380/415/435, (50/60 Hz)</td>
</tr>
<tr>
<td>Main supply voltage deviation, %</td>
<td>-25 ... +20</td>
</tr>
<tr>
<td>Rated current, A, not more</td>
<td>400 (630, 800, 1000, 1600)</td>
</tr>
<tr>
<td>Electric motor power, kW, not more</td>
<td>160 (240, 320, 400, 520)</td>
</tr>
<tr>
<td>Temperature range, °C</td>
<td>-40 ... +60</td>
</tr>
<tr>
<td>Protection rating</td>
<td>IP43</td>
</tr>
<tr>
<td>Overall dimensions, mm</td>
<td></td>
</tr>
<tr>
<td>• Elekton-07-400</td>
<td>1735 x 800 x 640</td>
</tr>
<tr>
<td>• Elekton-07-630</td>
<td>1735 x 850 x 725</td>
</tr>
<tr>
<td>• Elekton-07-800 (1000)</td>
<td>1860 x 950 x 1000</td>
</tr>
<tr>
<td>• Elekton-07-1600</td>
<td>1910 x 1186 x 1320</td>
</tr>
<tr>
<td>Weight, kg, not more</td>
<td>185 (335, 450, 460, 670)</td>
</tr>
</tbody>
</table>
ELEKTON-08 Switchboards

ELEKTON-08-250 (400)
Compact Elekton-08-250 (400) Switchboard is transformable, light weighted, easy-to-use and transportable.
High-performance processor of the controller, which in complex with advanced communication facilities, provides the effective use of it in present and future telemechanics systems.

FEATURES OF THE ELEKTON-08 SWITCHBOARDS:
• compact design;
• high-performance processor;
• easy reprogramming via card connector;
• 2 interface RS-485;
• inside controller temperature indication;
• luminosity adjustment of LED, operating modes and indicator highlight.

ELEKTON-08 Controller for Switchboards of ELEKTON-04 (07, 08) Series
The controller of Elekton-08 Switchboards enables to automate the operation of ESP unit to the maximum and optimize the oil production process.
The Controller is mounted on the front panel of the Switchboard and has embedded alphanumeric 2 line by 16-digit LCD display. Large quantity of symbols enables to indicate massages not in code mode, but by full name, that makes information comprehensible and accessible for perception.

FEATURES
• Membrane keyboard application for setpoints input and function selection.
• Nonvolatile memory for data storage for a long period in case of power supply lack.
• Embedded interface RS-485 for connection with telemechanics system by Modbus protocol.
• Current parameters logging with four adjustable intervals.
• Highlight liquid crystal display (LCD) application.
• Reliable internal heating system and additional LC indicator heating.
• Keys of the controller have backlight for enhanced viewing at night.
• User friendly software which runs on Windows OS for data read-out, information processing, setpoints changing, and database management that enables to display and plot various parameters in tables and graphs for statistics.
• Easy adaptable to additional devices, such as downhole telemetry system and contact manometer.
• Controller reprogramming is carrying out without pump unit shutdown.

MAIN TECHNICAL SPECIFICATIONS OF ELEKTON-08-250 (400) SWITCHBOARDS

<table>
<thead>
<tr>
<th>SPECIFICATION</th>
<th>VALUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated supply voltage, Volt</td>
<td>380/415/435, (50/60 Hz)</td>
</tr>
<tr>
<td>Rated current, A</td>
<td>250 (400)</td>
</tr>
<tr>
<td>Main supply voltage deviation, %</td>
<td>-25... +20</td>
</tr>
<tr>
<td>Electric motor power, kW</td>
<td>100 (160)</td>
</tr>
<tr>
<td>Temperature rate, °С</td>
<td>-40... +60</td>
</tr>
<tr>
<td>Protection rating</td>
<td>IP43</td>
</tr>
<tr>
<td>Switching unit</td>
<td>Contactor 250 A (400 A)</td>
</tr>
<tr>
<td>Control scheme of the switching unit</td>
<td>Controller Elekton-08</td>
</tr>
<tr>
<td>Dimensions, mm</td>
<td></td>
</tr>
<tr>
<td>• in transit condition</td>
<td>1103 x 930 x 570</td>
</tr>
<tr>
<td>• in operating position</td>
<td>1823 x 930 x 570</td>
</tr>
<tr>
<td>Weight, kg, not more</td>
<td>140 (215)</td>
</tr>
</tbody>
</table>
Progressing Cavity Pump VVN-54

Progressing Cavity Pump VVN-54 is intended for high viscous and high gas factor oil recovery in marginal wells with minimum internal diameter of casing 122 mm. Pumping Unit consists of inserted with oil-well tubing submersible fourpole ESP motor with borehole cable, starting clutch, seal section, base coupling and intake receptacle.

Progressing Cavity Pump (PCP) is inserted and hoisted through oil-well tubing with borehole cable of geodesic hoisting winch. The PCP consists of two working screw pairs (left and right), latching mechanism and spindle with axial and radial bearings. Rotation from spindle to screw pairs is transmitted via flexible shaft.

Switchboard the Elekton-05-63 with variable speed drive is used for ESP motor's protection and pump system's output adjustment.

### PUMPED-OUT FLUID PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viscosity, cSt, not more</td>
<td>1000</td>
</tr>
<tr>
<td>Maximum temperature, °C</td>
<td>90</td>
</tr>
<tr>
<td>Concentration of solid particles in reservoir fluid, г/l, not more</td>
<td>1,0</td>
</tr>
<tr>
<td>Gas factor, m3/m3, not more</td>
<td>0,5</td>
</tr>
<tr>
<td>Concentration of hydrogen sulphide, %, not more</td>
<td>5</td>
</tr>
</tbody>
</table>

### TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil-well tubing diameter, not less</td>
<td>73</td>
</tr>
<tr>
<td>Base coupling diameter, mm</td>
<td>93</td>
</tr>
<tr>
<td>Maximum diameter of inserted PSP, mm</td>
<td>54</td>
</tr>
<tr>
<td>Pump capacity, m³/day</td>
<td>5…30</td>
</tr>
<tr>
<td>Pressure, MPa</td>
<td>10…15</td>
</tr>
<tr>
<td>Electric motor shaft's rotating speed</td>
<td>800…1800</td>
</tr>
<tr>
<td>Electric motor power, kW</td>
<td>32</td>
</tr>
</tbody>
</table>

### MAIN TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum input shaft rotations, rpm</td>
<td>3000</td>
<td>1500</td>
</tr>
<tr>
<td>Transmission ratio at start-up moment</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Transmission capacity peak, kW</td>
<td>250</td>
<td>125</td>
</tr>
<tr>
<td>Clutch's type (model)</td>
<td>Inertial, reversible</td>
<td>Reducing</td>
</tr>
<tr>
<td>Volume of the filled oil, l</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Ambient temperature maximal, °C</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>Overall dimensions, mm</td>
<td>Ø=92, L=1614</td>
<td>Ø=92, L=1531</td>
</tr>
<tr>
<td>Weight, kg, not more</td>
<td>59,8</td>
<td>56,4</td>
</tr>
</tbody>
</table>

The Starting Clutch Elekton-MPC(V) is placed between seal and input module. Design of the Starting Clutch allows reducing the resistance moment on the motor’s shaft during its start-up to 10 times that reduces multiply the starting torque on electric submersible motor’s shaft (see fig.1) and inrush currents consequently. Design of the Starting Clutch allows to start ES motor while idle running and to couple it with ESP when maximal torque on the shaft.

The Starting Clutch Elekton-MPC(V) is intended for the ESP motor start’s simplification in drives of the Progressive Cavity Pumps (PCP) and Electric Submersible Pumps (ESP) as well as ESP’s backspin preventing.

1. \( M_n \): starting torque of ES motor’s direct start
2. \( M_a \): critical moment of ES motor
3. \( M_{n-a} \): ESP torque overcomed by the ES motor when direct start-up
4. \( M_{n+a} \): ESP torque overcomed by the ES motor with the Starting Clutch

\( \Delta M \): differential torque on ES motor’s shaft with the Starting Clutch

\( M : \) torque on ES motor’s shaft

\( n : \) rotation frequency of ES motor

\( t : \) time of ESP starting

\( I, A : \) starting currents without Clutch and starting currents with Clutch
Interface Unit ELEKTON-IU

Interface Unit ELEKTON-IU is mounted jointly with the surface unit of submersible telemetry system ELEKTON-TMS-2 into switchboards which are not equipped with its own controller or into switchboards which controllers couldn’t be connected directly to the surface unit of telemetry system.

Interface Unit ELEKTON-IU is intended for indication of telemetry information, its storage in nonvolatile memory; for ESP motor’s proofing on the basis of collected telemetry data and preset settings, and also for individual adjustment of the surface unit of telemetry system ELEKTON-TMS.

Interface Unit ELEKTON-IU is a controller with keyboard and 2 line by 16 character LCD display, which represents the current status of telemetry information.

Nonvolatile memory of the Interface Unit keeps the history which can be read out into PC via port RS-232 by means of universal communication program. There is possibility to read out information into the BSI-04 unit and Data I/O unit BSIVP-01, as well as from any controller of ELEKTON series.

There is a galvanic isolated port RS-485 for connection to telemechanics system.

Read-out Unit of ELEKTON-IU

For automatic reading is necessary to connect the Unit to port RS-232 of the controller. The light indication of the Unit, two highlight LED, informs of its condition:

- Read out / Done;
- Error / Overrun.

FAT file system of the Unit at reading automatically forms a folder with well cluster’s number in which the events log’s red file places. The file name is a cluster’s number and a serial number of event log, having read from the given well. 100 event logs can be generated on each well.

Nonvolatile memory – 32 Mb.

The Total number of event logs stored in the unit’s memory depends on read file’s volume which size varies from 32 Kbytes up to 328 Kbytes, depending on type of ELEKTON equipment from which reading was made.

At connection of ELEKTON-IU to USB-port of a computer with operational system Windows XP the Unit is automatically defined as a standard Flash disk.

Event log’s viewing is carried out by means of communication program ElektonUV.exe.

BSIVP-01 is power supplied through socket RS-232 of the controller or through USB-port in a mode of data transmission in a computer. An external power supplying is not required.

Dimensions: 34 x 17 x 70 mm, weight 25 g.

Certificate of conformance PCC RU.AR46.H47989.

DELIVERY KIT:
1. ELEKTON-IU unit;
2. Operating manual;
3. USB cable;
4. Communication program on CD

Data I/O-unit BSIVP-01

Data I/O-unit BSIVP-01 is intended for reading and storage of the data from all devices with integrated memory produced by CJSC ELEKTON: switchboards’ controllers, telemetry surface units, mains voltage recorder etc.

FUNCTIONAL CAPABILITIES
- Setpoints rewriting in case of controller’s changing (PC substitution).
- Communication control via RS-485.
- Indication of current parameters of telemetry surface unit.
- Viewing the stored event logs: switchboards type, cluster number, read-out date and so on.
- Graphical display with high resolution enables viewing the event logs and graphs without PC.

TECHNICAL SPECIFICATIONS
- Graphical LCD Display by 160 x 80 dots can show graphs plots and text information in 10 lines by 26 symbols each.
- Nonvolatile memory – 20 Mb.
- Quantity of events stored into history – 700.

FEATURES
- Built-in display heating.
- USB (mini B) socket for connection to computer.
- Program software through USB port.
- Power supplying via USB port in mode of data transfer to computer.
- RS-232 and RS-485 ports for connection to switchboards.

Data Transfer System Elekton-TS-3

The System is intended for reading event logs, setpoints, remote control and dispatching ELEKTON switchboards via GSM Cell Network as well as for immediate notice to the control point about the switchboard shutdown and its cause.

The System consists of dispatching GSM modem (cell communication block TCK-1), remote GSM modem – (cell communication block BCK-1) and program software ELEKTON for computer.

The transfer protocol is ModBus RTU which is standard one for all ELEKTON series Switchboard.

GSM modem – module Telit GM862-PCS. Data transfer rate – 9600 baud.

Time of full event log transfer from a switchboard to the control point – about 2 min.

Each GSM modem is to have Data Enabled SIM-card.

Certificate of conformance PCC RU.AR46.H47989.
**Test Bench IS-01**

Test Bench IS-01 is designed for examination of ESP motor’s operation in the following modes:
- under- (over-) voltage;
- voltage (current) unbalance;
- current over- (under-) voltage;

The device enables to adjust smoothly the voltage supplied to the switchboard from 0 up to 425 V (separately in each of three phases), has main supply with smooth current adjustment within the range of from 0 up to 400 A. Operating mode is long-term. Embedded resistance box allows to check-up the insulation control device operation. Overall dimensions of the unit 350 x 450 x 250 mm, weight 30 kg.

**Test Bench IS-03**

Test Bench IS-03 is designed for examination of operating efficiency of Elekton-08 switchboards’ controllers in laboratory and field conditions.

This device enables to control current parameters indications, restart delay count and controller’s protection response. Overall dimensions: 180 x 260 x 70 mm, weight 3,0 kg. Power supply: AC 220 V network.

**Extension Cable**

Extension cable with cable sleeve is intended for jointing of the mains supply power cable from surface equipment to ESP motor.

**SPECIFICATIONS**
- Length of cable extenders – 15, 20, 25, 30, 35, 40, 45, 50 m
- Type of cable – REDA LEAD
- Cable conductor section – 10, 13.3 and 16 mm²
- Rated operating voltage between phases – 4 kV
- Maximum admissible operating voltage – 4.8 kV
- Admissible temperature during trips – +40°C
- Maximum operating temperature – +220°C
- Formation liquid pressure – up to 35 MPa

**Contacts KEM**

Electromagnetic contactors KEM is intended for application in electric drive control circuit with voltage up to 690 V of AC, frequency 50/60 Hz, application category AC-3 for remote start and stop of three-phase asynchronous electric motor with short-circuited rotor. Climatic version – U3. Certificate of conformance POCC RU.AT46.B16590.

<table>
<thead>
<tr>
<th>MAIN TECHNICAL SPECIFICATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Catalogue Number</strong></td>
</tr>
<tr>
<td>------------------------</td>
</tr>
<tr>
<td>KEM-63</td>
</tr>
<tr>
<td>KEM-100</td>
</tr>
<tr>
<td>KEM-160</td>
</tr>
<tr>
<td>KEM-250</td>
</tr>
<tr>
<td>KEM-400</td>
</tr>
<tr>
<td>KEM-630</td>
</tr>
</tbody>
</table>

**Extension Cable**

Extension cable with cable sleeve is intended for jointing of the mains supply power cable from surface equipment to ESP motor.

**SPECIFICATIONS**
- Length of cable extenders – 15, 20, 25, 30, 35, 40, 45, 50 m
- Type of cable – REDA LEAD
- Cable conductor section – 10, 13.3 and 16 mm²
- Rated operating voltage between phases – 4 kV
- Maximum admissible operating voltage – 4.8 kV
- Admissible temperature during trips – +40°C
- Maximum operating temperature – +220°C
- Formation liquid pressure – up to 35 MPa
**Power Circuit Overvoltage Limiter ONS-1**

Power circuit overvoltage limiter ONS-1 is intended for protection of electronic devices (controller of the Switchboard and others), supplied from 220 V 50/60 Hz, from short-term spikes and long-term overvoltage of power supply.

The limiter provides the electronic devices’ efficiency without switching them off.

ONS-1 is performed in the plastic case mounted on TS 35 DIN rail. External connections are carried out through screw terminals.

The green color LED indicates a voltage on the screw terminals inputs; red color LED – transfer of ONS-1 to an input voltage limitation mode.

**Note!** The load of ONS-1 should not be connected to the neutral of a mains supply.

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**Power Circuit Overvoltage Limiter ONS-2**

Power circuit overvoltage limiter ONS-2 is intended for protection of the Switchboard’s electronic devices, supplied from 220 VAC, from short-term spikes and long-term over-voltage of power supply.

The limiter provides the electronic devices’ efficiency by means of their switching off at power supply’s long-term overvoltage according to the preset setting.

The device measures the mains voltage operating values and logs them with the specified period in nonvolatile memory with 2 Mb size, which allows to save 128896 loggings.

There are 3 logging modes:

- regularly logging with preset period;
- regularly logging with preset period, but in case of excess of min. and a max. preset thresholds of mains voltage the emergency mode of logging begins.
- regularly with preset period; preset changing of mains voltage in % (ΔU) occurs additional logging.

The preset period of loggings to the memory in all operating modes is adjusted independently within the limits of from 0,05 sec. up to 600 sec.

The software runs on Windows XP or older for PC and allows to read data from ONS-2 through built-in port RS-232. Data represents on PC display in time and voltage scaling graphs, allows to change the logging period, current time, date and also to export information to Microsoft Excel format.

ONS-2 has built-in 2 line by 16 character LCD display and sealed 6 buttons keypad.

---

**MAIN TECHNICAL CHARACTERISTICS**

<table>
<thead>
<tr>
<th>CHARACTERISTICS</th>
<th>ONS-1</th>
<th>ONS-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating time in voltage limitation mode at U_L, up to ~ 470 V, 50/60 Hz</td>
<td>no limitation</td>
<td>no limitation</td>
</tr>
<tr>
<td>Maximum permissible energy of voltage surges (600 – 2000 V), J, not more</td>
<td>175</td>
<td>175</td>
</tr>
<tr>
<td>Maximal amplitude of voltage output in a voltage limitation mode, V, not more</td>
<td>370</td>
<td>370</td>
</tr>
<tr>
<td>Load maximum power, W, not more</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>Interface</td>
<td>-</td>
<td>RS-232</td>
</tr>
<tr>
<td>Operating temperature, °C</td>
<td>-55 ... +85</td>
<td>-55 ... +60</td>
</tr>
<tr>
<td>Overall dimensions, mm</td>
<td>64 x 136 x 88</td>
<td>65 x 195 x 85</td>
</tr>
<tr>
<td>Weight, kg, not more</td>
<td>0,1</td>
<td>0,9</td>
</tr>
</tbody>
</table>
Multi-channel Audio Logger **DigioLog™**

Audio logger DigioLog™ is intended for long term recording of different signals: negotiations, communication sessions, audio signals, telephone speaking. Audio logger DigioLog™ is the device in strong metal case, off-line working ability, as well as remote control via net with user’s PC. The basic data carrier is the embedded hard disk. Logging and storage of such events as start recording time, duration, activation type, device’s switch on and switch off.

**PERFORMANCE CAPABILITIES AND ADVANTAGES**

- Round-the-clock operation without computer.
- Simplicity of installation and operation.
- The a wide range of power supplies, low consumption, operation from the accumulator.
- Silence in operation.
- Hard disk + Flash disk.
- Long-term audio-archive.
- DSP based professional audio logging device.
- Enhanced dynamic and frequency range, phantom supply.
- Volume leveling of remote and near users.
- Full electronic control.
- Fast access to the data – 100 Mbit/sec.
- Embedded FTP and WWW server.
- Remote access and real time monitoring.
- Authorized access to stored information.
- User firmware upgradeable possibilities.

**ADDITIONAL ACCESSORIES**

Tiny low-noise active microphones of Knowles type. Phantom power supplying 5...14 V. Unshielded cable (telephone wiring), more than 100 m removal, common and balanced output. Dimensions: 6 x 3 x 22 mm.

The field of application of audio logger – dispatching services in such spheres as power energy, transport, financing activity, medicine, protection, etc., where the voice data is important. Also application in commerce with the purpose of business’ efficiency increasing, documenting and the negotiations’ analysis, possibility of information’s leakage channels revealing.

**MDL-4NET-XX**

- **4 multipurpose channels**
  - Galvanic uncoupling
  - Modes: telephone/linear/balanced
  - Internal phantom 12 V
  - High-resistance input, more than 2 Mom

- **Indication**
  - Two-colored LED or LCD
  - Indication break and line voltage control

- **Quantization**
  - 8, 16, 32 Hz independently on channels

- **Logging codec**
  - PCM16, G.711, G.721(G.726), G.722, GSM 6.10

- **Logging format**
  - Standard WAV files

- **Content’s protection**
  - CryptoWav

- **Registration**
  - Outgoing/ingoing calls
  - Pulse/tone dialing
  - Automatic number identifier, all standards of Caller ID, fax

- **Additionally**
  - Ethernet 10/100 Mbit
  - Mains input rechargeable accumulator
  - Output on headphones
  - Activation sensor

**MDL-4A8TA**

- **12 independent channels**
  - 4 leading-in connections Hi-Fi
  - 8 multi-purpose with galvanic uncoupling, modes: telephone/linear

- **Indication**
  - LCD

- **Additionally**
  - Expansion slot PCMCIA
  - Wireless Ethernet
  - Interface USB 480 Mbit/sec for PC
  - IR remote control
  - Embedded speakers
  - Output on headphones
  - Activation sensor

**MDL-4A8TA Dimensions**

- 105 x 130 x 44 mm

**CAYMAN 4**

- **4 multipurpose channels**
  - eading-in connections
  - Inner switchable phantom 12 V
  - External adapter for telephone line

- **Indication**
  - LCD

- **ADC**
  - 16 and 24 bit

- **Logging codec**
  - ITU G.72x, SPEEX, MP3

- **Logging format**
  - Standard WAV files

- **Additionally**
  - Ethernet 10/100 Mbit
  - Interface USB host/device for PC, flash disc, external USB or other periphery
  - Output on headphones

**CAYMAN 4 Dimensions**

- 105 x 130 x 44 mm

**NEW MODEL OF A NEW SERIES, 2007**

**CAYMAN 4T**

- 4 telephone galvanic uncoupling channels (4xRJ11)

**CAYMAN 1E1**

- 30 duplex channel of data stream ISDN PRI

**CAYMAN 2E1**

- 60 duplex channel of data stream ISDN PRI

**CAYMAN 4T Dimensions**

- 105 x 130 x 44 mm

**ADDITIONAL ACCESSORIES**

Tiny low-noise active microphones of Knowles type. Phantom power supplying 5...14 V. Unshielded cable (telephone wiring), more than 100 m removal, common and balanced output. Dimensions: 6 x 3 x 22 mm.
WE INVITE DOMESTIC AND FOREIGN FIRMS, WHOSE BUSINESS IS THE OIL PRODUCTION, TO BUSINESS COOPERATION ON THE MUTUALLY-BENEFICIAL BASIS