



UNDER-REAMERS RR

Different Under reamer designs and types are manufactured with-in "**BURINTEKH**", Ltd, these designs and types design to match each specific application with wide range of blades opening sizes.



FEATURES:

- Hydraulic activation.
- Changeable blades.
- Reaming coefficient up to 2,8.
- Changeable sleeves for various flushing fluids flow rates and densities
- Wide range of reamers.



Expansion of blades equipped with high quality PDC cutters into operating position is provided by the effect of differential pressure in the reamer body.

Delivery set of all types of underreamers includes back valve which prevents tool from sludge during round-trip operations.







RL TYPE HOLE OPENERS

RL type hole openers are designed for drilling wells with pilot bit or enlarging previously drilled intervals. Service life of reamers is equal to service life of PDC bits in same conditions; herewith enlarging is carried out at high ROP.

Reamer blades, equipped with PDC cutting structure, have back reaming cutters and reinforced gage protection. For enlarging previously drilled intervals reamer can be completed with extending sub and PZU (special tool preventing from accidental sidetracking) equipped with jet nozzles.



CASING SECTION MILLING TOOLS

Expandable mill FKR is designed for continuous casing section milling throughout the diameter in any interval of wellbore. Expansion of blades, reinforced with high quality composite material, into operating position is provided by the effect of differential pressure in mill body. FKR delivery set includes back valve, which prevents tool from sludging

Wear pads preventing loss of diameter during roundtrip operations.



FEATURES

- Hydraulic activation.
- Changeable blades.
- Capability of using both for cutting-off and for full milling of casing.
- Changeable sleeves for different flow rates.



DUMP SUB

Dump sub is installed above motor and is designed for communicating drill pipes shank bore with annular space during tripping operations.

BURINTEKH PRODUCTS LINES DOWNHOLE HYDROMECHANICAL TOOLS

JARS AND BHA COMPONENTS RENTING

«BURINTEKH», Ltd leases out own manufactured products, such as axial and torsional jars for drilling and workover operations, BHA components (stabilizers, centralizers, dampers, bit protectors, string reciprocators).

ABOUT PRODUCTION

A highly qualified team of design-engineers has vast experience in designing complex downhole equipment, the use of high-pressure sealing equipment in developed products up to 2000 atm. The equipment we develop is protected by patents of the Russian Federation, Eurasian patents, US and Canadian patents.

Over 20 years of experience in the design and manufacture of axial impact jars. The design of the jars is the proprietary design of **"BURINTEKH"**, Ltd. The trademarks "JGR", "JGB" are protected by Russian law.

"BURINTEKH", Ltd is the only manufacturer of torsional jars SHOCK TURN in the world. The unique design made it possible to create a fundamentally new breakthrough technology for the retrieving stuck equipment, which allows applying to the stuck object not only axial impacts, but also torsional impacts in combination with axial impacts: – power ratio of torsional jars in comparison with conventional is much higher due to the use of an additional energy source - elastic torsional deformation.

- Allows combining axial impacts with torsional, which increases the likelihood of retrieving stuck object.
- Left version allows retrieving stuck equipment in parts. SHOCK TURN trademark is protected by Russian law and is registered in the United States.

Modern innovative equipment for damping torsional and axial vibrations during drilling is proposed - downhole protectors. They are used as part of bottomhole assembly and provide feedback between the axial load and the torque on the bit, which increases the efficiency of drilling.

Based on theoretical studies a unique design of downhole equipment has been developed and proposed – supply correctors-dampers KPD allowing ensuring that the load on the bottom while drilling under conditions of increased friction is brought. As an energy source a generalized force is used, due to the pressure drop between the tube side and annular spaces.

All manufactured equipment is tested at the factory stands; continuous quality control of manufactured products is carried out











HYDRAULIC DRILLING JARS

Jars designs are own proprietary design of "BURINTEKH", Ltd and are protected by the Russian Federation patents, EA, USA and Canada patents. Trademarks "JGR", "JGB" are protected by Russian and International legislation.

SINGLE-ACTION HYDRAULIC JAR

DESIGNATION:

Hydraulic jar is designed for releasing stuck downhole tools by means of impacts directed upward together with static axial tensile load and torsion torque.

APPLICATION:

Drilling and workover operations.

ADVANTAGES:

- Hydraulic cylinder is located inside the body and is unloaded from the action of extreme loads arising during the operation of jar; Reduced number of body thread joints which are under extreme loads.
- Low weight and overall dimensions are an advantage during transportation.
- Possibility of rapid repair by replacing the hydraulic cylinder.

NOTE:

- It is possible to produce left hand jar.
- Can be packaged with elevator sub.
- It is possible to produce tool joint at customer's option and can be packaged with elevator subs.

DOUBLE-ACTION HYDRAULIC JARS

DESIGNATION:

Double-action hydraulic drilling jars are designed for releasing struck downhole tools by means of impacts directed up and down together with static axial load and torsion torque.

APPLICATION

Well drilling operations.







TORSIONAL JARS "SHOCK TURN"

Design of torsional jar is own "BURINTEKH", Ltd. development protected by Russian and foreign patents.

DESIGNATION:

Designed for releasing stuck tools by torsional-axial impacts.

APPLICATION:

Workover operations.

ADVANTAGES:

- Power capacity of torsional jars in comparison with conventional jars is much higher by means of using additional power supply elastic torsion strain.
- Allows combining axial loads with torsional which increases the probability of retrieving stuck object.
- Left design allows retrieving stuck tools by parts.
- Torsion torque is transferred through string with fewer losses for friction than axial load. That is why torsional jar performance effectiveness in curved and horizontal bores is higher.
- · Packaged design simplifying transportation to hard-to-reach areas

MECHANICAL DRILLING JARS

DESIGNATION:

Mechanical drilling jars (JMB) are designed for releasing struck downhole tools by means of impacts directed down together with static axial tensile load.

APPLICATION:

Well drilling and workover

IMPACT ASSEMBLIES

Impact assembly is **two-section jar** made as separate sections: top hydraulic jar (top section) and mechanical jar (bottom section).

ADVANTAGES:

- Ability of use jars as in assembly so as separately.
- Transportation is simplified because of compactness.
- Ability of separation jars lengthwise in assembly (installing pipes of necessary length between jars







Muited States of America







MECHANICAL STRING RECIPROCATOR

DESIGNATION:

Reciprocator is designed for releasing stuck downhole toll by impacts directed up and down in turns together with static axial load and torque.

Reciprocator is used as a bottom section of impact assembly together with hydraulic jars JGB or JGR.

APPLICATION:

Well drilling mainly horizontal and sidetracks.

ADVANTAGES:

- Increasing effectiveness of breaking off stuck BHA in horizontal section or sidetrack by means of combined action with hydraulic jars JGB or JGR.
- Due to small release strain, it allows quickly in automatic mode react on possible BHA sticking.

RKM RELEASE MECHANISM ANALYSIS

The objective of calculating release unit is to determine the preload force of the disc spring package in order to obtain the specified release effort of reciprocator. The specified release force is applied to the taper crown and is decomposed into a "triangle of forces" at three points of contact of the ball/roller in the release unit.

After constructing all the projections of the reactions on the thrust surfaces normal and the addition-subtraction of the force vectors, the final force acting on the taper thrust ring and compressing the package of disc springs is determined. Additionally, the calculation is carried out in dynamics as the ball/roller deepens into the separator opening in the process of releasing.

This kinematic calculation allows determining the nature of the loading unit and identify the maximum contact stresses acting on the parts at the points of contact of the ball/roller.







F_{release}=18 tons – unit release force;

F₁- the projection of the effort of release on the normal of the crown's lifting surface;

F_{preload} – preload force of springs.





DESIGNATION:

Supply corrector - damper is designed for providing optimal uniform loading of rock destruction tool with axial load when drill string movement is carried out non-uniformly by snaps due to friction, as well as for damping axial and torsional loads acting on the bit and BHA during drilling

APPLICATION:

Drilling vertical, directional, and horizontal wells.

ADVANTAGES:

- KPD does not create additional pressure drop because it has straight internal channel, and therefore does not load pumps with excessive pressure during operation.
- KPD provides bringing axial load to the bit, ensures smooth loading of the bit, while vibration from the bit is extinguished in the hydraulic chamber of the tool, which increases the life of the bit, PDM, MWD and BHA as a whole.
- **KPD** in the process of circulation does not create pressure pulsations, thus does not reduce the signal quality of the mud pulse MWD.

CALCULATION OF AXIAL LOAD CREATED BY KPD

Axial feed force of the device depends on the following parameters:

- Pressure losses in BHA elements located below KPD.
- Generalized area of the piston of KPD (table attached). •

Pressure losses in the BHA elements located below **KPD** are determined by:

- pressure losses during the passage of fluid through MWD (if MWD is included in BHA).
- pressure losses during the passage of fluid through the motor.
- pressure losses in nozzles of the bit. Axial load developed by KPD is calculated according to $\mathbf{F} = \Delta \mathbf{P} \cdot \mathbf{S}$. **WHERE**
 - ΔP is pressure drop in BHA elements below the device, atm. 0
 - S is generalized area of KPD piston, m2

An example of calculating axial feed force KPD-172-300 (a similar calculation is used for the rest of the standard sizes of KPD, values according to table 1): suppose that pressure drop in the BHA below the device is 100 atm. (10 MPa). Then the feed force of the device will be $17.2 \times 10-3 \times 107 = 172 \text{ kN}$ (17,2 tons).

The force developed by the device is spent on overcoming friction force of BHA and creating optimal bit loading. Obviously during drilling the pressure drop across motor will be determined by drag torque on bit, which is a variable, therefore, the axial feed force of the device will also change.

Size	Piston area, m ²	Bore ID, mm		
KPD-172-300	17,2 × 10 ⁻³	76,2		
KPD-124-300	8,82 x 10 ⁻³	50,8		
KPD-108-300	6,4 x 10 ⁻¹	50		





BOTTOMHOLE PROTECTOR



DESIGNATION:

Bit protector (PZ) is designed for damping of torsional and axial vibrations, single torsional and axial impacts acting on BHA elements while drilling

Drilling hazards:

- Vibrations while drilling.
- Stick-slip effects, torsional vibrations due to BHA twisting during reactive torque jumps.
- Excessive cutters penetration to rocks up to short term bit rotation stop due to reactive torque jumps.

APPLICATION:

PZ is used with PDC bits and installed directly above bit both while rotary drilling and drilling with downhole motors.

ADVANTAGES:

- The device organizes the feedback between the axial load and the torque on the bit, and therefore allows for the automatic control of axial load on bit depending on the torque on it.
- Allows reducing jumps of torque on bit, reducing the phenomenon of twisting of the string during jumps of the reactive torque ("Stick-slip" effect) due to damping of torsional vibrations. The creation of optimal axial loads on bit with damping of the longitudinal and torsional vibrations acting on the bottomhole assembly allows increasing bit life.
- Reducing torsional and axial vibration allows increasing life of the BHA elements, as well as the top drive.
- Reduction of torsional and axial vibration allows improving the working conditions of downhole electronics.
- The large spindle stroke allows compensating large single (peak) loads on bit which allows increasing its resource.
- Small dimensions allow installing the device under a downhole motor.
- Reducing the peak values of the torque acting on the downhole motor will avoid its work in the braking mode and thereby increase its resource.











WATER JET CLEANING TOOLS

DESIGNATION:

Water jet cleaning tool (**UGMO**) is designed for improving bit operating conditions by means of bottomhole zone water jet cleaning during drilling.

APPLICATION:

- Drilling in conditions of insufficient bit cleaning from cuttings.
- Drilling of wiper trip of drilled intervals represented by incompetent rocks.
- Drilling horizontal wells with large step out.
- Drilling in conditions of high differential pressure on the bottomhole.

PLACE OF INSTALLATION:

- UGMO is installed directly above the bit
- **UGMO** design is compatible with both PDC and roller-cone bits.

ADVANTAGES:

- Bit cutting structure wear reduction
- Reduction of differential pressure acting on bottomhole
- Wellbore quality increase
- Reduction of probability of bit sticking
- ROP increase

TECHNICAL SPECIFICATION

Product name	UGMO-205	UGMO-210	UGMO-210
Tool OD, in	8	K 1/4	B 3/N
Tool ID, in	2	2	2
Tool Joint Connection	4 1/2 REG	4 1/2 REG	4 1/2 REG
Tool Length, ft	1.6	1.7	1.6
Length without tool joint, ft	1.3	1.4	1.3
Tool Weight, Ibm	143	150	154

Different sizes can be manufactured upon client request.

HYDRODYNAMIC CALCULATION OF SYSTEM "BIT+UGMO"

When developing each design of the UGMO all major hydraulic parameters, tool operating conditions such as the total cross-sectional area of nozzles on the bit, flow rate of drilling fluid, density of drilling mud, etc. are taken into account. Based on the data received from the customer a preliminary calculation of nozzles TFA installed on the UGMO is made. Then a *3D* model of the "bit + UGMO" system is prepared and a CFD hydraulic calculation is performed to simulate the distribution of flushing fluid flow and pressure difference in the area of the bit operation and over the UGMO. The main criteria for design verification are the occurrence of a low-pressure area due to the high flow rate of flushing fluid at the inlet of the UGMO nozzles.







STRING DISCONNECTOR

DESIGNATION:

String disconnector (**RK**) allows if necessary disconnect string in specific place depending on its installation.

Device actuation is carried out by means of dropping ball to string where **RK** is installed and by creating specific pressure of flushing fluid

APPLICATION:

Drilling and workover operations.

TECHNICAL SPECIFICATION:

Product name	Tool OD, in	Tool ID, in	Tool Joint Connection	Tool Length, ft	Tensile Yield, Ibf	Torsional Yield, ft-lbf	Tool Weight, Ibm	Fishing joint per, box	•
RK-172GM	6 3/4	2 1/2	NC50	2.3	771000	40900	190	Upon customer request	

• RK-172GM

RK-string disconnector;

- 172 body diametr, mm;
- GM— hydromechanical working principle.

UPGRADED PIPE PUNCHER

DESIGNATION:

Upgraded pipe puncher (**PTM**) is designed for punching 8...25 mm holes in tubing and casings of domestic and foreign manufacturers to make a pass between the tube side and annular space.

This hole provides circulation restoring, prevents pulling pipes with fluid out of wellbore, increase performance.

APPLICATION:

Well workover operations.

ADVANTAGES:

- Puncher is supplied with a set of spare parts and accessories designed for five punches.
- The hole is made without using gunpowder and electrical cable.
- The tool is highly efficient, easy to manage and maintain, reliable and safe, can be used many times and does not require the use of special equipment.

FEATURES:

- During the assembly manufacturer uses and completes the supplied punchers with pins that provide punching in tubing 60x5,0, tubing 73x5,5, tubing 89x6,5, tubing 102x7,26, tubing 114x7,37 grade not lower than S75, and in tubing 146 ×10,7 and in tubing 168×12,1 all strength grades.
- For actuation of activation unit, shear pins are used in the punchers with a certain shearing pressure
- If necessary, actuation pressure of the puncher can be regulated by the customer.
- The use of all punchers in the well at a depth up to 3000 m.
- To ensure circulation during the TIH of the PTM-102T, the tool is used in conjunction with the circulation valve CVPTM-105. Also, to

avoid jamming of the tip during the process of punching the pipe, due to possible axial movement of the tool relative to the punched pipe the PTM-102T puncher should be used with an anchor.

Pin diameter, mm	Shear presseure, atm
3,0	about 120140
4,0	about 200220
5,0	about 290310



