BURINTEKH

CATALOGUE

DOWNHOLE HYDROMECHANICAL TOOLS

CONTENTS

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.


DOOSAN

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.

NOMENCLATURE

- **JGR–82**
  - *JGR – fishing jar;*
  - *82 – body diameter, mm.*
- **JGB–114P**
  - *JGB – hydraulic drilling jar;*
  - *114 – body diameter, mm;*
  - *P – type.*
- **JGB–172VD**
  - *JGB – hydraulic drilling jar;*
  - *172 – body diameter, mm;*
  - *VD – type (for operations in high pressure conditions).*

TECHNICAL SPECIFICATION

Product name	JGR-82	JGR-95	JGR-105	JGB-114P*	JGB-124VD*	JGB-172P*	JGB-172VD*	JGB-203VD**
Tool OD, in	3 1/4	3 3/4	4 1/8	4 1/2	5	7	7	8
Tool ID, in	5/8	7/8	1	2	2	3	3	3
Tool Joint Connection	NC23	2 7/8 REG	NC31	NC31	NC38	NC50	NC50	6 5/8 REG
Tool Length Fully closed, ft	6	6.7	8.25	8.33	8.5	8.8	8.8	9
Tool Length Fully extended, ft	6.9	7.7	9.25	9.31	9.5	9.8	9.8	10
Maximum Overpull Working Load, lbf	45000	55100	66100	66100	88200	132000	132000	220000
Total Stroke, in	11 3/4	11 3/4	11 3/4	11 3/4	11 3/4	11 3/4	11 3/4	11 3/4
Tensile Yield, lbf	305000	375000	441000	441000	606000	881000	881000	992000
Torsional Yield, ft·lbf	6200	10000	20300	20300	22100	40900	40900	56700
Tool Weight, lbm	130	200	320	340	400	730	680	1000

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.

HYDRAULIC DRILLING JARS

DOUBLE–ACTION HYDRAUILC JARS

DESGINATION:

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.

TECHNICAL SPECIFICATION

Product name	JGB-105-2	JGB-114-2	JGB-124-2VD	JGB-172-2VD	JGB-203-2VD*
Tool OD, in	4 1/4	4 1/2	5	7	8
Tool ID, in	2	2	2	3	3
Tool Joint Connection	NC31	NC31	NC38	NC50	6 5/8 REG
Tool Length Fully closed, ft	10.8	10.1	10	10.5	9.9
Tool Length Fully extended, ft	12.2	11.2	11.4	11.9	11.3
Maximum Overpull Working Load, lbf	66100	66100	88200	132000	220000
Total Stroke, in	16 1/2	16 1/2	16 1/2	16 1/2	16 1/2
Tensile Yield, lbf	516000	441000	606000	881000	992000
Torsional Yield, ft·lbf	17000	20000	22100	40900	56800
Tool Weight, lbm	350	400	500	850	1700

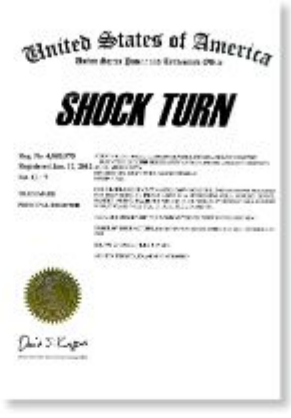
* It is possible to produce tool joint at the request of customer and can be packaged with elevator sub

NOMENCLATURE

- **JGB-172-2VD**
  - *JGB – hydraulic drilling jar;*
  - *172 – body diameter, mm;*
  - *2 – double-action;*
  - *VD – type (for operations in high pressure conditions).*

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.

TORSIONAL JARS

TECHNICAL SPECIFICATION

Product name	JGK-108R(O)	JGK-114P	JGK-124P	JGK-172P
Tool OD, in	4 1/8	4 1/2	5	7
Tool ID, in	7/8	2	2	3
Tool Joint Connection	NC31	NC31	NC38	NC50
Tool Length Fully closed, ft	8.4	8.4	8.4	8.8
Tool Length Fully extended, ft	9.4	9.4	9.4	9.8
Maximum Overpull Working Load, lbf	66100	66100	88200	132000
Total Stroke, in	11 3/4	11 3/4	11 3/4	11 3/4
Tensile Yield, lbf	516000	441000	606000	881000
Torsional Yield, ft·lbf	17000	20000	22100	40900
Tool Weight, lbm	340	340	420	730

It is possible to produce left hand jar.

*can be packaged with elevator sub.

NOMENCLATURE

JGK-172P

JGK – hydraulic torsional jar;

114 – body diameter, mm;

P – type.

"SHOCK TURN" POWER SUPPLY CAPACITY CALCULATION

In field practice accidents often occur when an extended section of a work string is stuck. In case of such accidents it is more expedient to try to retrieve stuck pipes in parts by unscrewing. As experience has shown it is inefficient to perform the process of unscrewing in the usual way- by static transfer of torque from the surface. It is much more efficient to unscrew them by applying shock torques with the help of jars "SHOCK TURN". Field operations with "SHOCK TURN" jars have shown their effectiveness in retrieving stuck equipment in parts by unscrewing them.

Torsional jars allow applying two types of impacts acting together and simultaneously on the bottomhole: torsional and axial impacts. "SHOCK TURN" jars are used along with the energy of the axial elastic deformation of the drill string and the torsion deflection. Due to the double energy source the impact force of such jars is much greater. Let us dwell in more detail on the advantages of torsional jars "SHOCK TURN" on a practical example.

EXAMPLE

Let jar installed at a depth of 3000 m on the work string 89x9 (pipe grade "E"), tensile load corresponding to

a yield strength of 124 tons, torque corresponding to the yield strength, M_{trq} = 2615 kg·m, the weight of the drill pipe string in air is 3000 m · 20,3 kg/m = 61000 kg (61 t), the weight of the pipe string in a liquid with a density of 1200 kg/m³: 61000 · (7850-1200) / 7850 = 51000 kg (51 t)). Let the permissible axial load be 60% of the yield strength of 124 · 0,60 = 74,4 tons. Thus for the operation of conventional jar string can be stretched with a force of 74,4-51 = 23,4 tons (234 kN).

Let's find axial tensional strain under the action of this force:

$$\Delta l = (3000 \text{ m} \cdot 234 \text{ kN}) / 210 \text{ hPa} \cdot 22{,}6 \cdot 10\text{-}4 \text{ m}^2 = 1{,}56 \text{ m},$$

where 3000 m is the length of the string, 210 hPa is the elasticity modulus of steel, 22,6 · 10-4 m2 is the annular section of the pipe body 89x9.

Thus the potential energy of the axial deformation of the work string when operating conventional jar will be:

$$E_{strain} = ½ \Delta l \cdot 234 \text{ kN} = ½ \cdot 1{,}56 \cdot 234 = 181{,}35 \text{ kN} \cdot \text{m}. \quad (1)$$

Now suppose that in order to eliminate the accident the torsional jar "SHOCK TURN" was tripped-in with a operating torque for impact of 1500 kg · m. Let determine the possible cumulative energy of twist for the above conditions of the work string.

String of length L = 3000 m under the action of a torsional torque of 1500 kg · m will rotate at an angle

$$\phi = M_{twist} \cdot L/G \cdot Jp,$$

where G is the shear modulus, 80 hPa; Jp- polar moment of inertia, 3,76 · 10^{-5} m^4.

Substituting the values, we get ϕ = ~ 150 rad or 23,9 revolutions.

Thus the potential energy of torsion of the work string will be:

$$E_{trq} = 2\pi \cdot 15 \text{ kN} \cdot \text{m} \cdot 23{,}9 \cdot ½ = 1125{,}69 \text{ kN} \cdot \text{m}. \quad (2)$$

Comparing the results (1) and (2), we see that the elastic torsion energy of the work string is 1125,69/181,35 = 6,2 times exceeds the potential energy of the axial deformation of the work string.

This example shows that the power supply capacity of torsional jars "SHOCK TURN" is much higher compared to conventional jars.

MECHANICAL DRILLING JARS

DESGINATION:

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.

TECHNICAL SPECIFICATION

Product name	JMB-108-22H	JMB-114H-01	JMB-124H-01	JMB-172H-01
Tool OD, in	4 3/8	4 1/2	5	7
Tool ID, in	7/8	2	2	3
Tool Joint Connection	NC31	NC31	NC38	NC50
Tool Length Fully closed, ft	6.1	6.4	6.4	7.8
Tool Length Fully extended, ft	6.5	6.8	6.8	8.3
Maximum Overpull Working Load, down, lbf	22000	26000	26000	48500
Maximum Overpull Working Load, up, lbf	6600	11000	11000	13000
Total Stroke, in	4	4	4	5 7/8
Tensile Yield, lbf	441000	441000	441000	771000
Torsional Yield, ft·lbf	17000	20000	22100	40900
Tool Weight, lbm	275	265	330	730

It is possible to produce left hand jar.

NOMENCLATURE

- **JMB-124H-01**
  - *JMB – Mechanical drilling jar;*
  - *124 – Body diameter, mm;*
  - *H – Jar for impact down (bottom section);*
  - *01 – Type.*

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

THE FOLLOWING IMPACTS ASEMBLIES ARE PRODUCED:

- JGR-105 and JMB-108-22H;
- JGB-114P and JMB-114H-01;
- JGB-124P (JGB-124VD) and JMB-124H-01;
- JGB-172P (JGB-172VD) and JMB-172H-01.

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 side tracks.

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.

TECHNICAL SPECIFICATION

Product name	RKM-108	RKM-114	RKM-124	RKM-172-01
Tool OD, in	4 3/8	4 1/2	5	7
Tool ID, in	1 1/2	2	2	3
Tool Joint Connection	NC31	NC31	NC38	NC50
Tool Length Fully closed, ft	7.4	7.1	6.7	8.7
Tool Length Fully extended, ft	8	7.6	7.2	9.4
Maximum Overpull Working Load, down, lbf	17500	17500	17500	26500
Maximum Overpull Working Load, up, lbf	26500	26500	26500	48500
Total Stroke, in	6	6	6	8 5/8
Tensile Yield, lbf	441000	441000	441000	771000
Torsional Yield, ft·lbf	20000	20000	22100	40900
Tool Weight, lbm	285	275	330	770

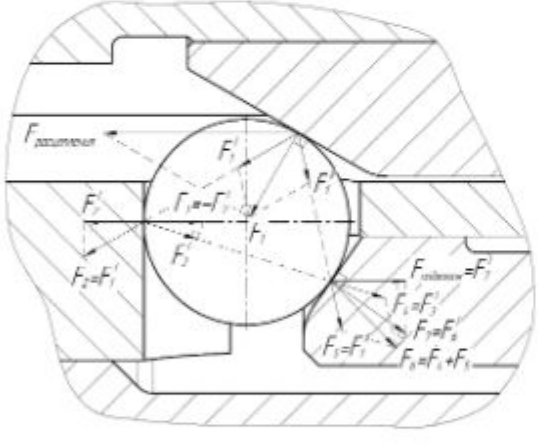
It is possible to produce other sizes at customer's option.

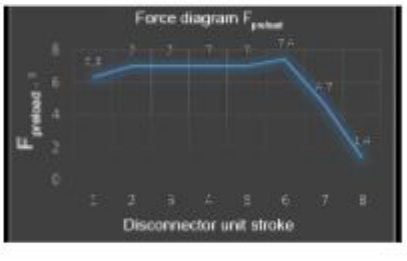
NOMENCLATURE

- **RKM-108**
  - *RKM – mechanical reciprocator;*
  - *108 – body diameter, mm.*

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 normals 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;

F_1 - the projection of the effort of release on the normal of the crown's lifting surface;

$F_{preload}$ – preload force of springs.

SUPPLY CORRECTOR – DAMPER

Damper is own original "BURINTEKH", Ltd. Development protected by patent.

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 nonuniformly 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.

TECHNICAL SPECIFICATION

Product name	KPD-108-300	KPD-124-300	KPD-172-300
Tool OD, in	4 3/8	5	7
Tool ID, in	2	2	3
Tool Joint Connection	NC31	NC38	NC50
Tool Length Fully closed, ft	5.8	6.7	6.8
Tool Length Fully extended, ft	6.8	7.7	7.8
Axial load, lbf	8800...14100	15500...19800	30800...37500
Total Stroke, in	11 7/8	11 7/8	11 7/8
Tensile Yield, lbf	300000	441000	771000

Product name	KPD-108-300	KPD-124-300	KPD-172-300
Torsional Yield, ft·lbf	13500	22100	40900
Tool Weight, lbm	220	350	600

It is possible to produce other sizes at customer's option.

NOMENCLATURE

KPD-108-300

KPD – supply corrector-damper;

108 – body diameter, mm;

300 – spindle stroke, mm.

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 below).

Size	Piston area, m^2	Bore ID, mm
KPD-172-300	$17,2 \times 10^{-3}$	76,2
KPD-124-300	$8,82 \times 10^{-3}$	50,8
KPD-108-300	$6,4 \times 10^{-3}$	50

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

$$F = \Delta P \cdot S,$$

where ΔP is pressure drop in BHA elements below the device, atm.;

S is generalized area of KPD piston, m^2.

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 $17,2 \times 10\text{-}3 \times 10^7 = 172$ 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.

BOTTOMHOLE PROTECTOR

Design is protected by the set of the Russian Federation patents, CU and USA patents.

DESIGNATION:

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

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.

TECHNICAL SPECIFICATION

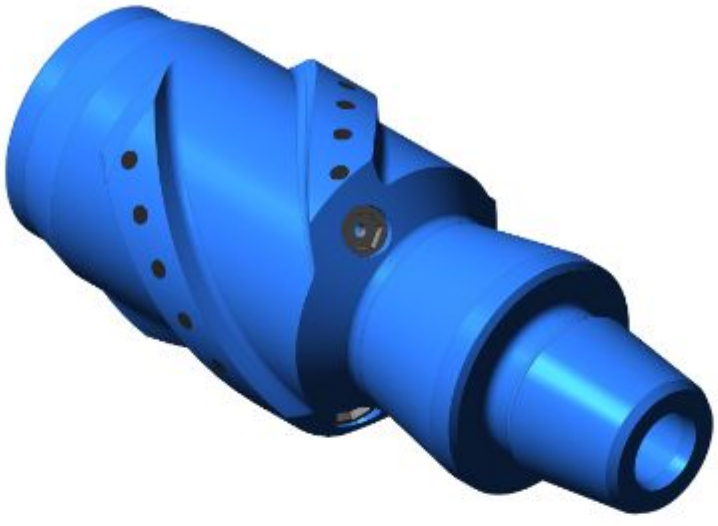
Product name	PZ-108-30	PZ-172M-40	PZ-215-50	PZP-172-80M	PZP-215-80M	PZP-295-80
Tool OD, in	4 1/4	7	8 5/8	7	8 5/8	11 5/8
Tool ID, in	7/8	2	3	2	2 7/8	3
Tool Joint Connection	2 7/8 REG	4 1/2 REG	6 5/8 REG	NC50	6 5/8 FH	7 5/8 REG
Tool Length Fully closed, ft	2	3	5.1	7.8	7.9	9
Tool Length Fully extended, ft	2.1	3.1	5.3	8.1	8.2	9.3
Damping Axial load, lbf	3300...30000	6400...30800	5500...99200	7700...28600	28600...99200	5500...99200
Total Stroke, in	1 1/8	1 1/2	2	3 1/8	3 1/8	3 1/8
Tensile Yield, lbf	441000	720000	1540000	830000	1630000	2860000
Torsional Yield, ft·lbf	40000	73000	143000	125000	130000	270000
Tool Weight, lbm	77	280	730	750	1340	2500

It is possible to produce other sizes at customer's option.

NOMENCLATURE

- **PZ-108-30**
  - *PZ – bottomhole protector (torsional splines);*
  - *108 – body diameter, mm, мм;*
  - *30 – spindle stroke, mm.*
- **PZP-172-80M**
  - *PZP – straight bottomhole protector (straight splines);*
  - *172 – body diameter, mm;*
  - *80 – spindle stroke, mm;*
  - *M – for installation above PDM.*

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

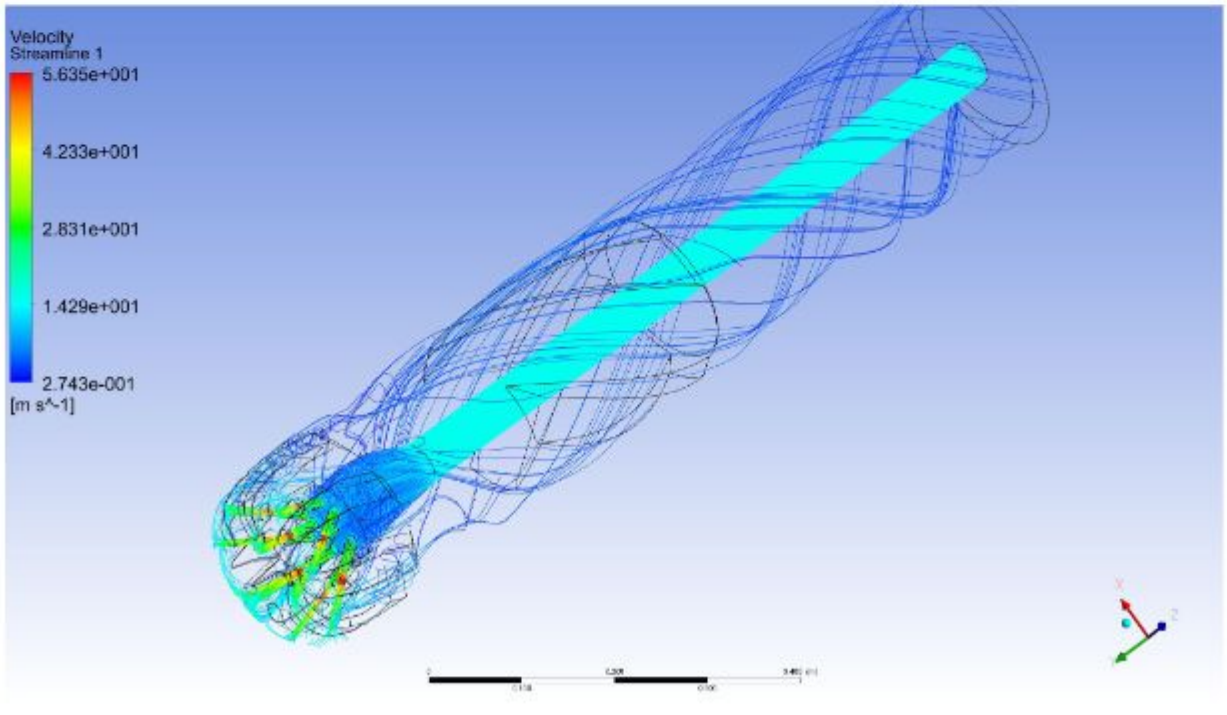
Product name	UGMO-205	UGMO-210	UGMO-210
Tool OD, in	8	8 1/4	8 3/8
Tool ID, in	2	2	2
Tool Joint Connection	4 1/2 REG	4 1/2 REG	4 1/2 REG
Tool Length, ft	1.6	1.7	1.6
Length without tool joint, ft	1.3	1.4	1.3
Tool Weight, lbm	143	150	154

It is possible to produce other sizes at customer's option.

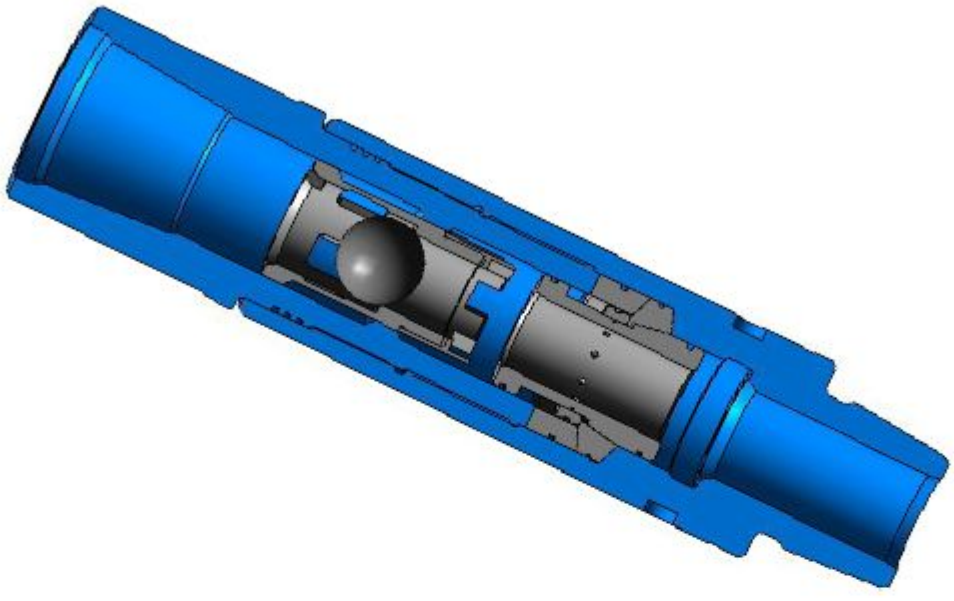
HYDRODYNAMIC CALCULATION OF SYSTEM "BIT+UGMO"

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



Own original "BURINTEKH", Ltd. Development.

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, lbf	Torsional Yield, ft·lbf	Tool Weight, lbm	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

Designs of all punchers are protected by patents

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.

UPGRADED PIPE PUNCHER

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:

Pin diameter, mm	Shear presseure, atm
3,0	about 120...140
4,0	about 200...220
5,0	about 290...310

- 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.

TECHNICAL SPECIFICATION

Product name	PTM-60KC	PTM-73KC	PTM-89KC	PTM-102KC	PTM-114KC	PTM-146	PTM-168
Tool OD, in	1 7/8	2 1/2	2 3/4	3 1/4	3 3/4	4 1/2	5 3/8
Tool Joint Connection	M33x1.5	M33x1.5	M39x1.5	M39x1.5	M39x1.5	Upon customer request	Upon customer request
Tool Length, ft	3.8	3.8	4.5	4.5	4.5	7	7
Punched pipe type (wall thickness), in	2 3/8 (0.197)	2 7/8 (0.216)	3 1/2 (0.289)	4 (0.256)	4 1/2 (0.290)	5 3/4 (0.421)	6 5/8 (0.476)
Punched hole diameter, in	0.315-0.394	0.394-0.472	0.551-0.630	0.512-0.590	0.512-0.590	0.787-1	0.787-1
Tool Weight, lbm	22	29	55	66	77	123	136

NOMENCLATURE

Punchers can be produced in several types:

K – conventional;

G – for operations in gaseous medium;

VD – for operations at depths 3000-6000m;

C – droppable type.

DESIGNATION:

Steerable rotary drilling of directional and horizontal sections during construction oil and gas wells of diameters from 220,7 to 222,3 mm.

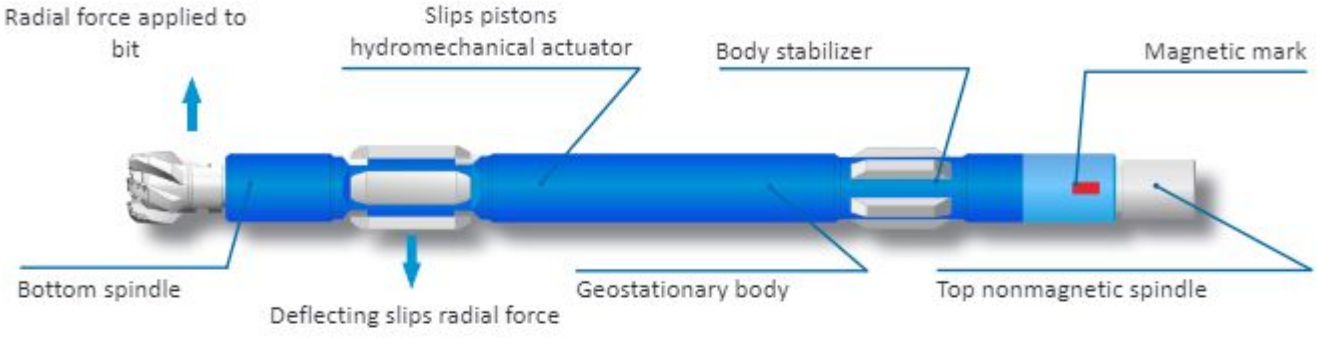
- **RSS-GM-195**
  - *RSS – rotary steerable system;*
  - *GM - hydromechanical;*
  - *195 – body OD in mm.*

TECHNICAL CHARACTERISTICS

Name, unit of measurement	Value
Main length body OD, mm (in)	195 (7¾)
Active slips OD at closing, mm (in)	220 (8¾)
Active slips OD at opening, mm (in)	238 (9¾)
Stabilizer OD, mm (in)	218 (8¾)
Max dogleg severity per 10m (100 ft) of drilling progress, deg.	9,0
Graded fluid density, kg/m³ (lb/ft³)	1200 (75)
Nominal TFA on bit, mm² (in²)	774 (1,2)
Max flow rate for switching off system and shifting to switch mode, l/sec	16 (253)
Nominal working flow rate, l/sec (gpm)	36 (570,5)
Max permissible flow rate, l/sec (gpm)	43 (681,5)
Nominal pressure drop at tool level in buildup hold mode, atm (psi)	47 (690)
Nominal pressure drop at tool level in buildup mode, atm (psi)	60 (882)
Max pressure drop at tool level, atm (psi)	90 (1320)
Max permissible torque, kN·m (ft·lbf)	20 (14750)
Tensile load dangerous for tool integrity, kN (lbf)	3400 (764355)
Max permissible working axial load, kN (lbf)	300 (67440)
Max permissible working temperature, °C (F)	150 (302)
Length, mm (ft)	4440 (14 9/16)
Total weight max, kg (lb)	850 (1875)
Bottom tool joint to bit per GOST 28487-90, box	3-117 (4 ½ Reg)
Top tool joint to tool per GOST 28487-90, box	3-133 (NC-56)
Recommended makeup torque Z-117, kN·m (ft·lbf)	15-20 (11050-14750)
Recommended makeup torque Z-133, kN·m (ft·lbf)	20-30 (14750-22120)

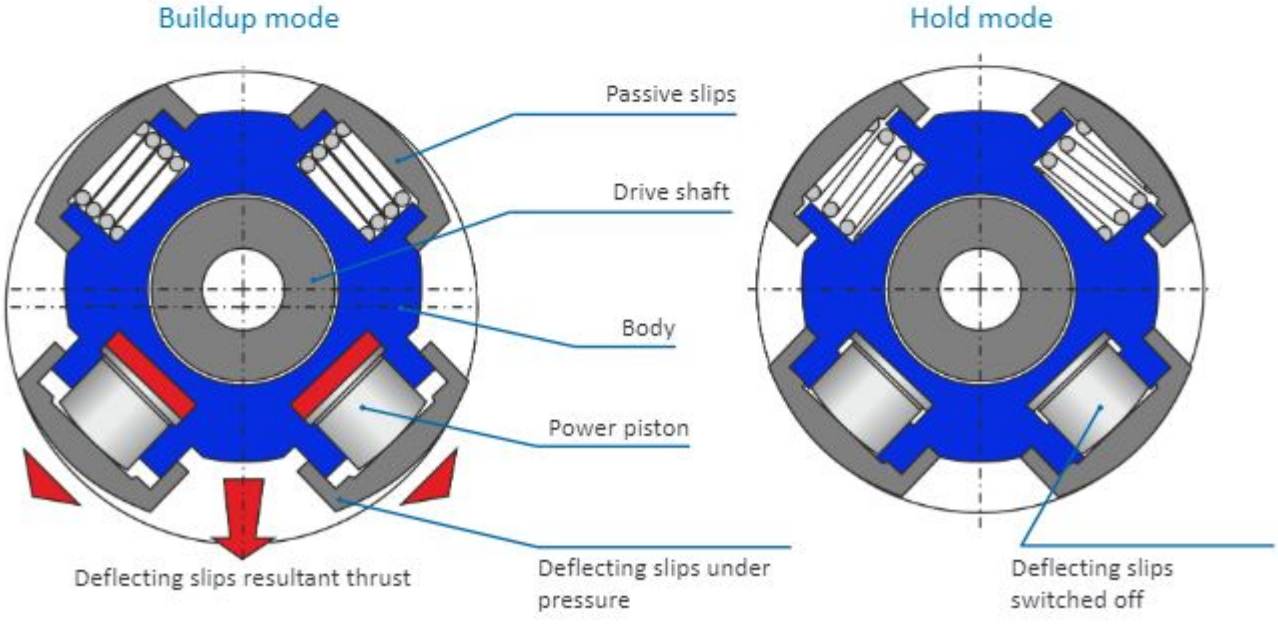
ROTARY STEERABLE SYSTEM

DESIGN AND FUNCTION RSS-GM-195



RUS-GM-195 contains a geostationary body (not rotated during directional drilling) with a stabilizer and bottom and top spindles mounted on bearings inside the body. Bit is connected to the bottom spindle by means of a tool joint and to the top non-magnetic spindle is connected NMDC with MWD. To transmit axial load and torque from the upper tool to the bit, the top spindle is connected to the bottom spindle through a shaft system passing through the body and having a through passage for supplying flushing fluid to the bit.

Also a switching mechanism is installed in the shaft system, which is responsible for alternately changing operation modes when the system is turned off and on. Two active slips and two passive slips are installed in the body. Thereat active slips have hydraulic drive activated in the process of directional drilling. Passive slips are spring-loaded and close when the active slips are extended. The operating mode of the equipment from the wellhead is determined by the increase in the pressure drop of flushing fluid by 10 ... 20 atm. when the tool switches to buildup mode and by decrease of pressure drop of flushing fluid by 10 ... 20 atm. when the tool switches to hold mode at a constant flow rate.



FOR NOTES

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