

Beam-balanced pumping units PNSh, PNShT



These types of pumping units are used as an individual mechanical drive for sucker rod pumps in oil production.

Pumping units PNSh 60 and PNSh 80 are developed on the base of SK-6 and SK-8 respectively. Their main units and components are interchangeable. Pumping units are equipped with double-stage gear reducers.

Pumping units PNShT are equipped with double- and three-stage gear reducers and engines differed by horsepower and rotation frequency. It allows choosing design of a pumping unit ensuring the best oil production conditions with minimum power consumption.

PNSh 60-2,1-25 for mounting on a low foundation in marsh land and soft ground



Parameters	Value
Maximum rod load, kN	60
Stroke length, m	2,1/1,8/1,5/1,2/0,9
Gear reducer	RP 450-28
Number of beam swings per minute	5,3-8,3
Pulley diameters, mm:	
- Gear reducer	710
- Engine	200; 250; 315
Brake	Drum-type
Overall dimensions, mm	8060x1770x5450
Weight, kg	5450

PNShT 60-3-31,5 for mounting on low foundation



Parameters	Value
Maximum rod load, kN	60
Stroke length, m	3,0/2,5/2,0/1,6/1,2
Gear reducer	RT28, three-stage, gear ratios 125, 90, 63
Pulley diameters, mm:	
- Gear reducer	900
- Engine	200; 280; 250
Brake	Drum-type
Overall dimensions, mm	6375x1880x6480
Weight, kg	8920

Designation	Range of beam swings per min.	Gear reducer	Engine	
			N, kW	n, rpm
PNShT 60-3-31,5-125	1.3...1.8	RT28-125	5,5	750
PNShT 60-3-31,5-125-01	1.7...2.4		1000	
PNShT 60-3-31,5-125-02	2,6...3,6		11	1500
PNShT 60-3-31,5-90	1,8..2,5	RT28-90	7,5	750
PNShT 60-3-31,5-90-01	2,4...3,4		11	1000
PNShT 60-3-31,5-90-02	3,6...5,0		15	1500
PNShT 60-3-31,5-63	2.6..3.6	RT28-63	11	750
PNShT 60-3-31,5-63-01	3,4...4,8		15	1000
PNShT 60-3-31,5-63-02	5,1...7,2		18,5	1500

PNSh 80-3-40 for mounting on a high foundation on rigid sand grounds


Parameters	Value
Maximum rod load, kN	80
Stroke length, m	3,0/2,5/2,0/1,6/1,2
Gear reducer	RP 450, double-stage, gear ratio 37
Pulley diameters, mm:	900 200; 280; 250
Brake	Drum-type
Overall dimensions, mm	7100x2250x5385
Weight, kg	12400

Designation	Range of beam swings per min.	Gear reducer	Engine	
			N, kW	n, rpm
PNSh 80-3-40	4,3...6,0	RP450	18,5	750
PNSh 80-3-40-01	5,8...8,1		22	1000
PNSh 80-3-40-02	8,6...12,0		30	1500

PNShT 80-3-40 for mounting on low foundation


Parameters	Value
Maximum rod load, kN	80
Stroke length	3,0/2,5/2,0/1,6/1,2
Gear reducer	Double- or three-stage
Pulley diameters, mm : - Gear reducer - Engine	900 200; 280; 250
Brake	Drum-type
Overall dimensions, mm	7100x2300x6750
Weight, kg	12600/13010

Designation	Range of beam swings per min.	Gear reducer	Engine	
			N, kW	n, rpm
PNShT 80-3-40-125	1,3...1,8	RT40-125	7,5	750
PNShT 80-3-40-125-01	1,7...2,4		11	1000
PNShT 80-3-40-125-02	2,5...3,6		15	1500
PNShT 80-3-40-90	1,9...2,6	RT40-90	11	750
PNShT 80-3-40-90-01	2,5...3,5		15	1000
PNShT 80-3-40-90-02	3,7...5,2		18,5	1500
PNShT 80-3-40-63	2,6...3,7	RT40-63	15	750
PNShT 80-3-40-63-01	3,5...4,9		18,5	1000
PNShT 80-3-40-63-02	5,3...7,4		22	1500
PNShT 80-3-40-37	4,3...6,0	RT450	18,5	750
PNShT 80-3-40-37-01	5,8...8,1		22	1000
PNShT 80-3-40-37-02	8,5...12		30	1500

PNSh- 3,5-4000-63 for mounting on a high or low foundation

These pumping units are analogs of SK8-3,5-4000 acc.to GOST 5866-76



Designation	Range of beam swings per min.	Gear reducer	Engine	
			N, kW	n, rpm
PNSh 80-3,5-40-40	3,1...6,0	RP 450-40-40	30	750

Single-arm pumping units OPNSh



As compared with conventional pumping unit, the single arm one has the following advantages:

- Slower ascent and accelerated descent of a rod, less acceleration at the start of moving upwards (maximum load) ensures decrease of peak loads and long service life of sucker rods;
- Due to decrease of peak loads, the less drive power is required which is followed by less power consumption.

As every type and version of a pumping unit is used together with gear reducers with various gear ratios and engines with various horsepower and rotation frequency, it ensures the best oil production conditions with minimum power consumption.

OPNSh 30-1,5-16

Design features of OPNSh 30-1,5-16:

- Walking beam assembled with Samson post, post back legs, cross-member and connection rods is hinged fold and makes compact package for easy shipment and mounting.
- Horsehead and balance beam are made integral. In order to free the space around a well-head during underground work in a well, walking beam can be taken away from a well at the distance about 1m with the help of manual drive in a back leg.
- To reset a stroke length without a mobile crane, a unit is equipped with quick-detachable manual screw jack which is placed between the lower end of a horsehead and a rest of a pedestal.
- Ends of gear reducer input and output shafts are tapered for quick tightening and dismantling of crankshafts, gear reducer pulley and brake drum. A unit is equipped with a kit of special tools and removers including remover for lower head of a connecting rod.
- Crankshafts are equipped with a screw unit to move counterbalances.
- A unit is equipped with cylindrical three-staged gear reducer with enhanced load capacity, gear ratio 90 or 45, with reinforced output shaft.
- Designs of a pumping unit and its gear reducer are protected with patents Pat2308614RF, Pat2191937RF, Pat51147RF.



Parameters	Value
Maximum rod load, kN	30
Stroke length	1,5/1,95/1,0/0,75
Gear reducer	T315M, three-stage, gear ratios 90,50
Output torque, kN*m	16
Pulley diameters, mm:	
- Gear reducer	500
- Engine	125; 150; 175; 200
Brake	Drum-type
Overall dimension, mm	4210x1570x4300
Weight, kg	3900

Designation	Range of beam swings per min.	Gear reducer	Engine	
			N, kW	n, rpm
ОПНШ 30-1,5-16-90	2,3...3,2	T315M-90-16	3	750
ОПНШ 30-1,5-16-90-01	2,6..4,2		4	1000
ОПНШ 30-1,5-16-90-02	4,0..6,3		5,5	1500
ОПНШ 30-1,5-16-45	4,0...6,4	T315M-45-16	4	750
ОПНШ 30-1,5-16-45-01	5,4..8,6		5,5	1000
ОПНШ 30-1,5-16-45-02	8,0...12,8		7,5	1500



Parameters	Value
Maximum rod load, kN	80
Stroke length	3,0/2,5/2,0
Gear reducer	T500M, three-stage, gear ratio 125, 90, 50
Pulley diameters, mm: - Gear reducer - Engine	900 200; 250; 280
Brake	Drum-type
Overall dimension, mm	7230x2135x6620
Weight, kg	12100

Designation	Range of beam swings per min.	Gear reducer	Engine	
			N, kW	n, rpm
OPNSh 80-3-40-125	1,2...1,7	T500M-125	5,5	750
OPNSh 80-3-40-125-01	1,7...2,3		7,5	1000
OPNSh 80-3-40-125-02	2,5...3,5		11	1500
OPNSh 80-3-40-90	1,8..2,7	T500M-90	7,5	750
OPNSh 80-3-40-90-01	2,5...3,6		11	1000
OPNSh 80-3-40-90-02	3,7...5,4		15	1500
OPNSh 80-3-40-50	3,2...4,7	T500M-50	15	750
OPNSh 80-3-40-50-01	4,3..6,2		18,5	1000
OPNSh 80-3-40-50-02	6,5...9,3		22	1500

Pumping units OPNSh 80-3-40 with electric engine and gas engine are available. Gas engine ensures autonomous operation of a unit due to oil gas without electric power consumption. There is a successful experience of using OPNSh 80 with gas engine in conditions of the Far North on the island of Kolguev.

OPNSh-80 with gas engine made by OAO "Izhneftemash", Kolguev island, "Arktik-neft"



Long-stroke chain pumping unit PC



This is a highly efficient power saving equipment for oil production. It is intended for operation of high-output wells (up to 100 t per day) and production of high-viscosity products and crosswell pumping of water to maintain borehole pressure.

Advantages::

- Quiet long-stroke pumping conditions increase reliability, service life of all pumping unit components, increase wear resistance of sucker rods and tubes, increase a unit efficiency;
- Using of long-stroke sucker rod pumps allows operating of pumping units efficiently both on high-output and low-output wells.
- Specific power consumption is 2 and more times less as compared with electrical centrifugal pumps ECN.
- Pumping unit can operated under climatic conditions of U and UHL1 types.
- Reliability of chain operation is increased due to drop lubrication.

Design features:

- Open construction of a pumping unit provides easy access to main components during their control, maintenance and repair.
- A unit is equipped with automatic emergency brake, which prevents counterweight from falling when sucker rod or rope break.
- Rope sheave unit is equipped with limiter to prevent rope slipping-off when rods hang up.
- A unit is equipped with electrical interlocking system, ensuring safe operation conditions.
- A unit is equipped with mechanical device for carrying out an operating control of chain tension.
- Design of a pumping unit and its gear reducers are protected with patents Пат230135PФ, Пат2191937PФ, Пат51147PФ.

Technical data

Parameters		Value
Maximum rod load, kN no more than		80
Stroke length, m		6+0,1
Three-stage gear reducer with Novikov gearing		T315Ц-45 -16
- output torque, kN*m		16
- gear ration		45
Removable pulley diameters, mm:		
- Gear reducer		315, 500
- Engine		142; 175; 205; 230
Version of a unit:	Engines:	Number of double strokes per minute:
PTs 80-6	1 5 kW, 1000 rpm	1-2,7
PTs 80-6-01	18, 5 kW, 1500 rpm	1,5-3,54
PTs 80-6-02	22 kW, 1 500 rpm	4
Rotary chain 1TP-63.5, number of chain links		201
Rope 18,5-Г-В-Л-Н-1670 GOST 3066-80 , length, m		46,4
Column haulage (well workover, servicing), m		1,5
Counterbalance weight, min/max, kg		1800/6000
Unit weight, kg:		
- without balancing weights, kg		12 500
- with balancing weights, kg		16 700
Overall dimensions		4370x2390x10250

- Insert pumps with 32, 38, 44 mm diameter with top and bottom seating arrangement;
- Tubing pumps with 44, 57, 69 mm diameter.
- Design of a pumping unit and its gear reducers are protected with patents Пат230135PФ, Пат2191937PФ, Пат51147PФ.

Pump versions:

- Barrel is compound, consisting of 2 parts, nitride-plated;
- Plunger is sprayed with chrome-nickel powder.
- Valves are made of cobalt alloy and stainless steel.

Mobile pumping unit with electric drive PNShME 91-2,5-40/116-2,5-40)

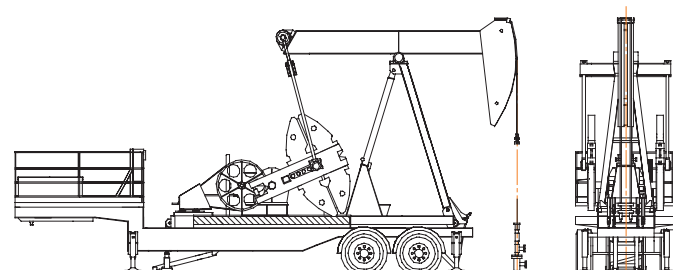
Mobile Pumping Unit is intended for test short-term service of reactivated or new wells to determine their productivity and other characteristics which help to choose a size and version of a stationary pumping unit for well operation.

If required, Mobile Pumping Unit may be used for continued well operation.

Transport position



Working position



Mobile Pumping Unit produced by OAO Izhneftemash has several advantages over American analogue (Lufkin):

- Hinge-jointed unit consisting of a walking beam, a Samson post and a frame is very easy in design, that's why Mobile Pumping Unit may be quickly transformed from transport to working position and conversely with any crane truck.
- A commercial semi-trailer and a beam-balanced pumping unit involving unified components are included in Mobile Pumping Unit. This significantly reduces cost of a unit, increases its reliability and serviceability.
- Automatic descending and lifting of base plates when transforming Mobile Pumping Unit from transport to working position and conversely with a general-purpose crane truck having load capacity 10 tons and more.

Parameters			Value	
Type and version			PNShME 91-2,5-40	PNShME 116-2,5-40
Load on wellhead rod, kN (ton), no more than			91 (9,1)	116 (11,6)
Nominal stroke of wellhead rod, m			2,5; 2,0; 1,8; 1,4; 1,2	
Gear reducer			Double-stage RP-450 (C2NSh-750B)	
Gear reducer rated output torque, kN*m			40	
Gear reducer rated ratio			37	
V-belt drive	V-belt type		Single 5-V belt	
	Quantity, pcs.		1	
	Pulleys diameters	Gear reducer Engine	1250 200; 250; 315; 380	
Beam swings per min			3,1; 3,9; 4,9; 6,0	
Engine speed of rotation, rpm			750	
Engine rated horsepower, kWt			30	
Overall dimensions (without tractor truck), mm, no more than:				
- width			2500	
- length	in working position		12500	
	in transport position		11530	
- height	in working position		6450	
	in transport position		3960	
Unit weight, kg, no more than			13200	
Unit weight with semi-trailer, kg, no mort than			21600	
Max. speed on highway, km/hour			60	

Gear reducers for PNSh, PNShT, OPNSh, PC Pumping units

Two-stage gear reducers

RP type



High-speed and low-speed stages are herringbone gear with thermally improved Novikov gearing.

Parameter /type	RP 450-28	RP 450
Maximum gear reducer output torque, kN*m	28	40
Rated gear ratio	40	37
Lubrication volume in crankcase, dm ³	90	82
Overall dimensions, mm		
- length	1450	1483
- width	1542	1930
- height	958	968
Weight, kg	2105	2720

Three-stage gear reducers

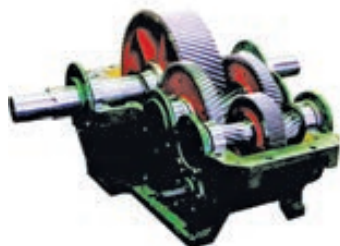
RT type



Equipped with herringbone gear with thermally improved Novikov gearing.

Parameters	RT 28	RT 40
Maximum gear reducer output torque, kN*m	28	40
Rated gear ratio	63; 90; 125	63; 90; 125
Lubrication volume in crankcase, dm ³	110	96
Overall dimensions, mm		
- length	1450	1520
- width	1542	1915
- height	958	970
Weight, kg	2210	2810

T type



Equipped with large module transmission with thermally improved Novikov gearing:

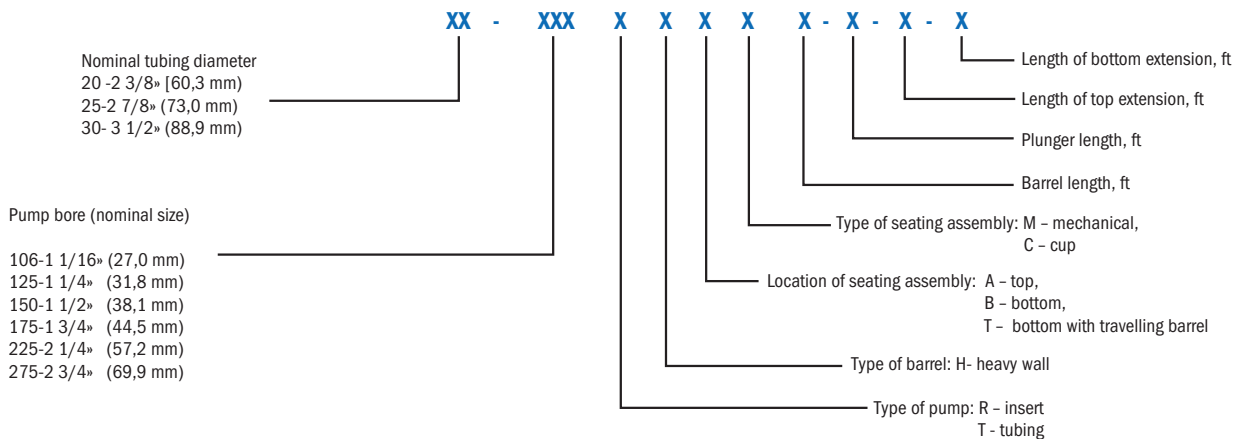
- Low speed stage is cylindrical gear with thrust rings;
- Intermediate stage is herringbone gear;
- High speed stage is cylindrical helical gear.

Parameter/type	T 250	T 315Ц	T 315M	T 450	T 500M
Maximum gear reducer output torque, kN*m	7,1	16		31,5	40
Rated gear ratio	125; 100; 50; 71; 90	45	90;45	125; 90; 63	125; 90; 63
Lubrication volume in crankcase, dm ³	21	40		108	
Overall dimensions, mm					
- length	830	1018	1018	1470	1630
- width	665	806	1244	1540	1734
- height	509	625	625	862	930
Weight, kg	350	634	670	1810	2260

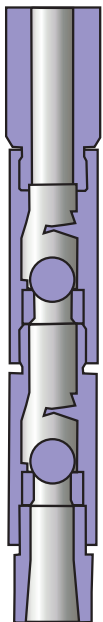
Gear reducers of T type are provided with:

- Quick detachable chute cover for visual examination and adding of oil;
- Special plug preventing from unauthorized oil drain out of gear reducer;
- Forced lubrication of bearing supports and gears;
- Design of gear reducers is protected with patents Пат2191937РФ, Пат51147РФ.

Full API pump designation:



Duplex valve



All the manufactured pumps are modified for Russian downhole equipment for installing in straight NUE tubing string (with non-upset ends) as per GOST 633-80 and connecting with sucker rod string as per GOST 13877-96. For connecting of filters or other safety devices to bottom of a pump - LP internal thread (pipeline thread) - 1:16 taper; 11,5 threads per inch. Thread diameter: 1», 1 1/4», 1 1/2», 2» (depending on pump type and diameter).

Versions of pump components:

Barrel:

- Alloy steel, nitride-plated (HN);
- Carbon steel, chrome-plated (CR);
- Length of barrel - up to 14 feet, nitride-plated - up to 14 feet, chrome-plated - up to 16 feet, compound barrels (for long-stroke pumps) - up to 28 feet.

Plunger (nipple type):

- Carbon steel, chromium-nickel hard ally powder sprayed (T);
- Grooved, smooth;
- Length - up to 5 feet, compound - up to 10 feet.

Valves:

- Standard and special designs, including double travelling and standing valves.

Valve cage:

- Alloy steel;
- Stainless steel.

Ball and seat:

- Stainless steel (SS);
- Cobalt alloy (ST);
- Tungsten carbide (TC1).

Plunger clearance is defined as a difference between nominal diameters of a plunger and a barrel plus sum of tolerances for plunger and barrel diameters.

Plunger clearance (range):

- Fit-1 - 0,025 ... 0,088 mm
- Fit-2 - 0,050 ... 0,113 mm
- Fit-3 - 0,075 ... 0,138 mm
- Fit-4 - 0,100 ... 0,163 mm

When making a request/order for pumps Customer should specify:

- denomination, full designation of a pump including tubing diameter; diameter and type of a pump; length of a barrel, plunger and extensions (or required plunger stroke);
- type of top seating arrangement of insert pumps: standard (according to API), in OM anchor (according to Industry standard OST) or special "taper-in-taper" type;
- Type of seating arrangement of standing valve of tubing pumps: standard (according to API), non-removalbe;
- plunger clearance (Fit 1,2,3,...);
- depth of pump installation (discharge);
- material of barrel, plunger, valves, valve cages;
- additional requirements to pump versions.

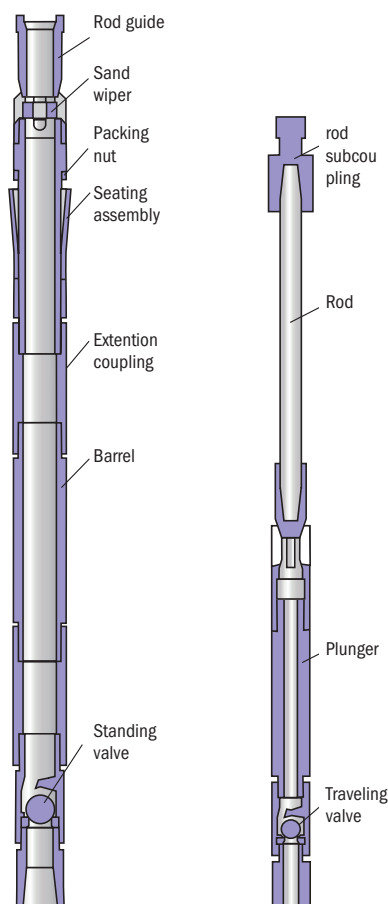
If no any requirements to material, clearance and discharge of pumps are specified, then pumps are delivered in the following type and version: barrel HN, plunger T, valves SS, alloy steel valve cages, Fit2, discharge up to 1500 m.

Seating nipples (anchors) of insert pumps, as well as filters, overflow valves, automatic tractive connections and other tools for SRP are not included in delivery set and should be ordered optionally.

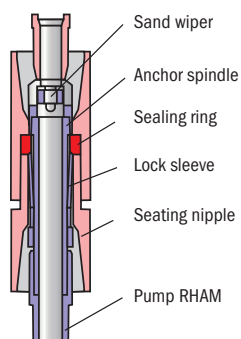
Rod (Insert) pumps

Rod (insert) pumps are delivered with sand wiper (sand valve). It is installed in rod guide to prevent sanding up of a pump during its idle time. To provide better sealing of pump anchoring unit in corrosion environment, an anchor spindle of top mechanical seating arrangement as per API assembled with stainless steel packing nut is available.

Scheme of top (mechanical) anchored rod pump acc. to API



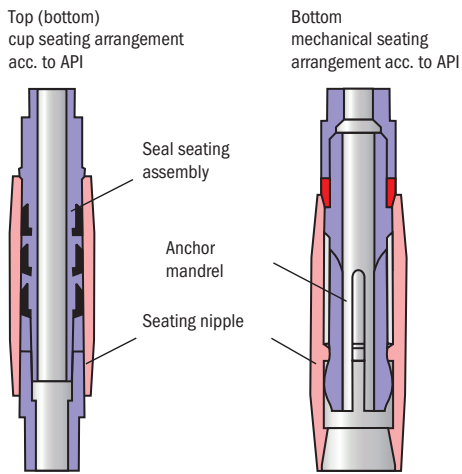
Scheme of seating arrangement



*Pump designation is given without lengths of a barrel, a plunger and extensions, which are selected for each pump type and version according to required plunger stroke.

Versions of rod pumps:

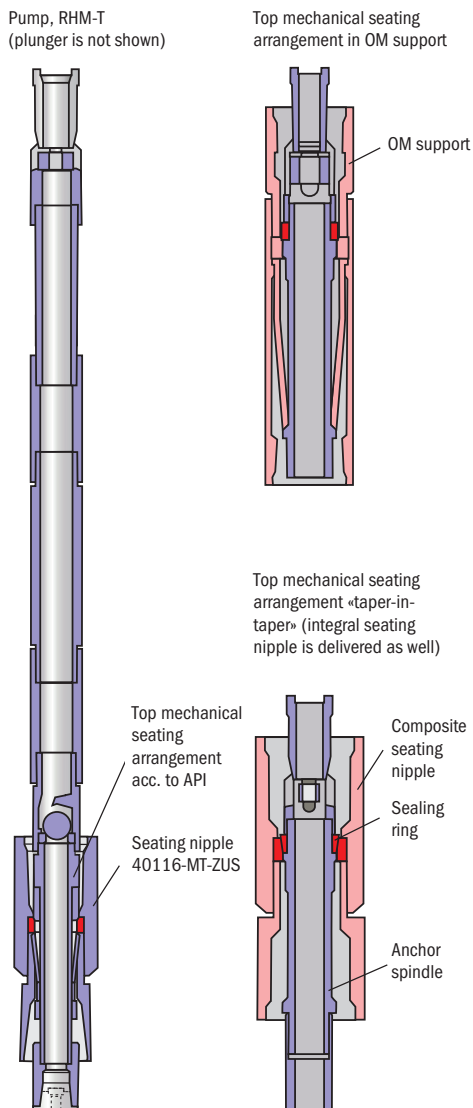
Seating arrangement	Pump bore, mm	Tubing size, mm	Pump designation*	Designation of seating nipple (anchor)
Top mechanical acc. to API	27,0	60,3	20-106 RHAM	40116-ZUS
		73,0		40116-M-ZUS
	31,8	60,3	20-125 RHAM	40116-ZUS
		73,0		40116-M-ZUS
	38,1	73,0	25-150 RHAM	40117-ZUS
			25-175 RHAM	
Top mechanical in OM support, acc. to OCT 26.16.06-86	27,0	60,3	20-106 RHAM	OM-60
	31,8		20-125 RHAM	
	38,1	73,0	25-150 RHAM	OM-73
	44,5		25-175 RHAM	
Top special (taper-in-taper)	27,0	73,0	25-106 RHAM	32001-M, 32001-KM, 40116-KM-ZUS
	31,8		25-125 RHAM	
	38,1		25-150 RHAM	32002-M, 32002-KM, 40117-KM-ZUS
	44,5		25-175 RHAM	
Top cup acc. to API	27,0	60,3	20-106 RHAC	32521
		73,0	25-106 RHAC	32522
	31,8	60,3	20-125 RHAC	32521
			25-125 RHAC	32522
	38,1	73,0	25-150 RHAC	
44,5	73,0	25-175 RHAC		
Bottom mechanical acc. to API	27,0	60,3	20-106 RHBM	32756
		73,0	25-106 RHBM	32757
	31,8	60,3	20-125 RHBM	32756
			25-125 RHBM	32757
	38,1	73,0	25-150 RHBM	
	44,5	73,0	25-175 RHBM	
57,2	88,9	30-225 RHBM	32758	
Bottom mechanical, double-stage pump	57,2/38,1	88,9	30-225/150 RHBM 12-4-2-2	32758
Bottom cup acc. to API	27,0	60,3	20-106 RHBC	32521
			20-125 RHBC	
	31,8	73,0	25-125 RHBC	32522
			25-150 RHBC	
38,1	73,0	25-175 RHBC		
Bottom mechanical acc. to API, set in pump bottom	27,0	73,0/60,3	25/20-106 RHM-T	40116-MT-ZUS
	31,8		25/20-125 RHM-T	
	38,1		25/20-150 RHM-T	
	44,5		25/20-175 RHM-T	
Travelling barrel, bottom mechanical acc. to OST	44,5	73,0	25-175RHTM	OM-73



Anchor (seating nipple) of rod (insert) pumps

Seating arrangement		Designation	Connecting thread, mm
Top mechanical	Acc. to API	40116-ZUS	60
		40116-M- ZUS 40117- ZUS	73
		40116-MT-ZUS	73/60
	Taper-in-taper	32001-M, 40-116-KM-ZUS	73
		32002-M, 40117-KM-ZUS	73
	Acc. to OST	OM-60	60
Top and bottom cup	Acc. to API	32521	60
		32522	73
Bottom mechanical	Acc. to API	32756	60
		32757	73
		32758	89

Rod (insert) pumps of special design:



Исполнения:

- RHAM pumps with anchor at the top end of a pump for setting in OM support according to OCT 26.16.06-86;
- RHAM pumps with anchor at the top end of a pump for setting in seating nipple of “taper-in-taper” seating arrangement;
- RHM-T pumps with diameters 27, 32, 38 and 44 mm, at the bottom end of which top mechanical seating assembly acc. to API from pumps with diameter from 27 mm to 32 mm. Pumps are installed in 40116-MT-ZUS seating nipple with connecting thread of tubing 73 mm on the top and tubing 60 mm on the bottom. Such design of pumps allows to install RHAM pumps with diameters 27 mm and 32 mm and RHM-T pumps of all diameters (25/20-106 RHM-T, 25/20-125 RHM-T, 25/20-150 RHM-T, 25/20-175 RHM-T) in a well with 40116-MT-ZUS seating nipple.
- Double-stage pumps;

On customer's request standard pumps can be equipped with doubled standing and travelling valves.

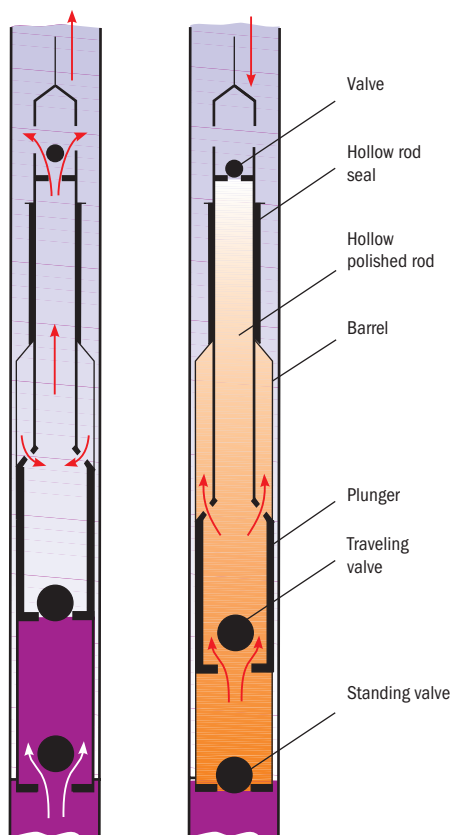
Example of insert pump designation

Diameter 32 mm with bottom mechanical seating arrangement acc. to API, length of barrel – 12 feet, length of plunger – 4 feet, extensions – 2 feet each, for installation in tubing 73 mm:

25-125 RHBM 12-4-2-2

Double-stage (differential) pump 30-225/150 RHBM 12-4-2-2

Double-stage pump operation, schematically



Consists of:

- Barrel with standing valve. There is a hollow rod guide on the top of barrel for sealing upper chamber (high-pressure stage)
- Plunger with travelling valve and hollow polished rod with additional valve on the top of a rod. Rod is connected with plunger with the help of adapter with side holes connecting internal hollow of a plunger and a rod with upper chamber which is the space between rod and barrel.
- Inner hollows of a plunger with travelling valve, rod with valve and upper chamber create high pressure stage. Under-plunger space (lower chamber) is a low pressure stage.

Pump operation:

- When plunger moves upwards, both plunger valves are closed; standing valve is opened, and well fluid flows in a lower chamber (low pressure stage);
- When plunger moves downwards, upper plunger valve remains closed and standing valve is closing. Fluid flows in upper chamber through open lower plunger valve;
- With following upstroke, lower plunger valve is closed by fluid pressure, which is achieved by diminishing upper chamber space;
- When pressure in upper chamber equals to fluid column pressure in tubing string, upper plunger valve opens and fluid flows in tubing string. At the same time fluid flows through opened standing valve into lower chamber.

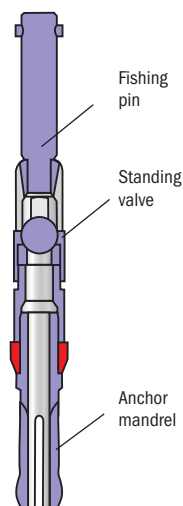
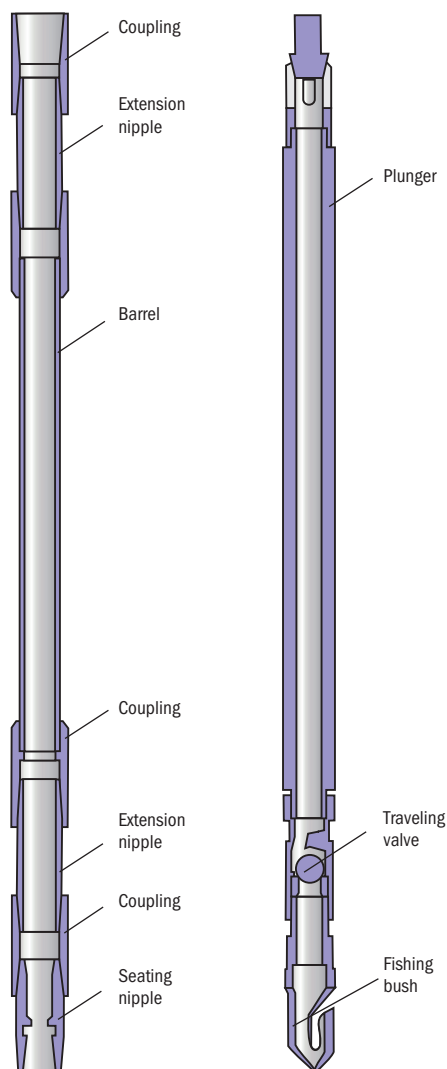
Thus, lower chamber is filled and released without fluid column pressure in tubing. It creates favorable conditions for pumping gassed well fluid.

Approximate stroke length of rod pump plunger depending on combination of barrel-plunger-extension lengths

Combination of barrel-plunger-extension lengths	Maximum length of plunger stroke (from end to end), m
7-4-1,5-1,5	1,4
9-4-1,5-1,5	2,0
10-4-1,5-1,5	2,3
12-4-1,5-1,5	2,9
12-4-2-2	3,2
14-4-1,5-1,5	3,5
14-4-2-2	3,8
14-5-1,5-1,5	3,2
22-4-2-2	6,2

Tubing pumps

THM tubing pump with mechanical seating arrangement acc. to API, schematically



Tubing pump versions

Seating arrangement of standing valve	Pump bore, mm	Tubing size, mm	Pump designation
Acc. to API Spec. 11AX with bayonet fishing tool (THM) or with cup seating arrangement (THC)	31,8	60,3	20-125 THM
		73,0	25-125 THM
	44,5	60,3	20-175 THM (THC)
		73,0	25-175 THM (THC)
	57,2	73,0	25-225 THM (THC)
69,9	88,9	30-275 THM	
Special (taper)	31,8	73,0	25-125 THM-K
	44,5	73,0	25-175 THM-K
	57,2	73,0	25-225 THM-K
Non-removable valve (additional drain valve of SKOK type is used)	31,8	73,0	25-125 THM-T
	44,5	73,0	25-175 THM-T
	57,2	73,0	25-225 THM-T
	69,9	88,9	30-275 THM-T
Non-removable valve, long plunger (10 feet), barrel with side hole	31,8	73,0	25-125 THM-T 11-10-2-2
	44,5	73,0	25-175 THM-T 11-10-2-2
	57,2	73,0	25-225 THM-T 11-10-2-2
	69,9	88,9	30-275 THM-T 11-10-2-2
Non-removable single (C) or doubled (CC) valve with built-in drain beating device	31,8	73,0	25-125 THM-C(CC)
	38,1	73,0	25-150 THM-C(CC)
	44,5	73,0	25-175 THM-C(CC)
	57,2	73,0	25-225 THM-C(CC)
	69,9	88,9	30-275 THM-C

Designation of pumps (except THM-T 11-10-2-2) is given without lengths of barrel, plunger and extensions which shall be selected for each size of pump, depending on required plunger stroke.

Plunger stroke of standard tubing pumps (THM) depending on combination of barrel-plunger-extension lengths

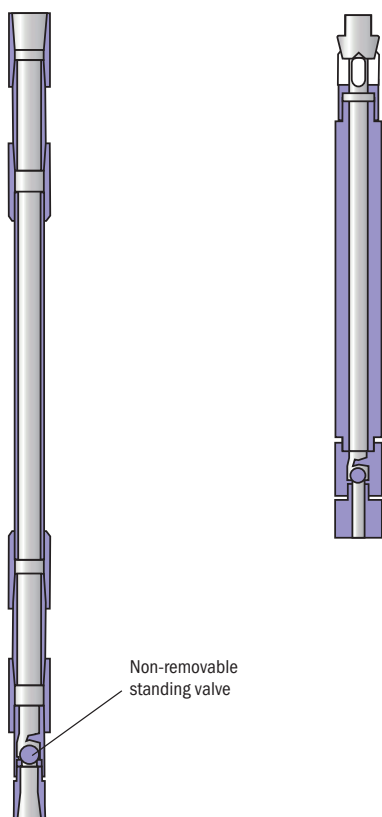
Combination of barrel-plunger-extension lengths	Max length of plunger stroke (from end to end), m
7-4-2-2	1,5
9-4-2-2	2,1
11-4-2-2	2,7
11-4-2-3	3,0
14-4-2-2	3,6
11-10-2-2	3,0
22-4-2-2	6,0
14-5-1,5-1,5	3,2
22-4-2-2	6,2

Example of tubing pump designation

Diameter 44,5 mm, standard seating arrangement of standing valve (acc. to API), length of barrel – 11 feet, length of plunger – 4 feet, length of extensions – 2 feet each, for installation in tubing with diameter 73 mm: 25-175 THM 11-4-2-2.

Tubing pumps of special design

Pump with non-removable standing valve of THN-T type



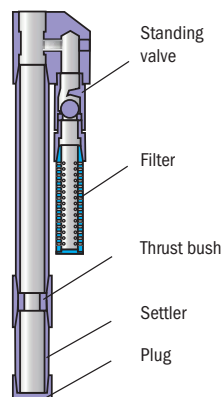
Pumps THM-T with diameters 32, 44, 57 and 70 mm with non-removable standing valve.

Standing valve is set in the bottom of pump instead of seating nipple; fishing tool is not available. Diameter of standing valve (seat and ball) for pumps with diameters 32,44,57 mm is oversized, providing more stable pump operation (free of valve sticking, occurred because of paraffin deposits). Pumps are used together with drain valve (CKOK type or other) placed above pump to drain fluid from tubing when pump is pulled out.

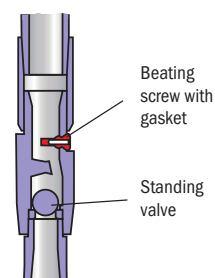
The following versions are developed on the base of THM-T pumps:

- Pumps with non-removable standing valve, barrel with side drain hole and long plunger (10 feet) (THM - T 11-10-2-2). Plunger is fitted so that side hole of barrel is constantly covered by plunger; plunger stroke is 3 m. When plunger is in its lower position (at its stop) and when it is pulled out from barrel, drain hole is opened to ensure drain of fluid from tubing both when plunger is pulled out on rods and when rods and plunger components are parted or unscrewed; direct flushing at well completion is provided as well.
- Pumps with side standing valve (BVK). The plant produces BVK valves for THM-T tubing pumps with diameters of 32 and 44 mm. BVK valve is delivered optionally and set under barrel instead of bottom part of a pump. In pumps equipped with BVK valves dead space is almost zero in a barrel, when a plunger is in its lower position. This allows to operate wells with insignificant pump working submergence without risk of failure of fluid feed due to pump blocking by gas.
- pumps with non-removable single (THM-C) or doubled (THM-CC) standing valve and built-in drain beating device. Diameter of standing valve (seat and ball) in pumps of diameters 32, 44, 57 mm is oversized. Fishing tool is not available. Fluid is drained from tubing through a hole in beating screw which is broken with beating tool thrown into well.

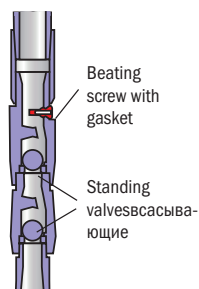
Side standing valve, model BVK



Pump THM-S



Pump THM-CC



Sucker rods



Sucker rods are intended for transmission of movement from pumping unit to sucker rod pump plunger. They are connected to form a string of sucker rods. Sucker rods are produced from précised hot rolled products made of steel containing no less than 2% of alloy elements. By mechanical properties and corrosion resistance sucker rods correspond to "D" and "D spec." grades. Sucker rods are equipped with connecting coupling screwed on one end of a rod, packed by 40 pcs. in transportation packages unless otherwise specified in an order. Thread of sucker rods and couplings is protected with safety cups and plugs. On agreement with customer sucker rods may be equipped with armamide centralizer.

Sucker rods and couplings are produced according to TU 3665-059-05785537-2003.

Nomenclature and characteristics of sucker rods

Nominal diameter of sucker rods	Length, mm		Ultimate tensile strength, N/mm ²	Yield point, N/mm ²
	Standard	Pony		
ShN 19	7620, 8000, 9140	From 610 to 3660	793-965	586 min
ShN 22				
ShN 25				
ShN 19.SP			820-990	630 min
ShN 22.SP				
ShN 25.SP				

Sucker rod couplings

Two types of sucker rod coupling MSh (without wrench flats) are produced:

- connecting coupling, intended for connection of sucker rods with the same notional dimensions;
- bushings, intended for connection of sucker rods with different notional dimensions.

Nomenclature and characteristics of couplings

Nominal dimension of coupling	Diameter, mm	Length, mm	Weight, kg
MSh 19	41,3	102	0,7
MSh 22	46,0	102	0,85
MSh 25	55,6	102	1,1
MSh 16x19	41,3	102	0,72
MSh 19x22	46	102	0,86
MSh 22x25	55,6	115	1,3
MSh 19x25	55,6	115	1,4

Versions of couplings

Class	Material	Heat treatment or coating	Hardness, HRC
T	steel 40, steel 45	normalization	-
S	steel 40, steel 45, steel 20ChN2N, steel 20N2M	High frequency current	43-51
SM	steel 20ChN2N, steel 20N2M	Chrome-nickel powder spraying with melting	55 min

Equipment for dual completion of several operational objects with subsurface sucker rod pumps (ORE)

The equipment is intended for simultaneous operation of two or more productive formations in one well. It is used for oil (gas) production, water injection during water flooding of oil formations, injection of chemical reagents to increase oil and condensate recovery, injection of gas when constructing underground gas storages, etc.

Main capabilities of the equipment:

- Pumps may be changed without packer failure and retrieval of tubing string;
- Produced oil or gas may be accounted separately;
- Field developments may be held;
- Deposits of asphalt, resin and paraffin may be prevented and removed;
- Gas may be removed from the suction of a lower pump;
- Equipment may be repaired in field conditions;
- Range of theoretical capacity (N=6, L=2.5):
 - Lower pump: 12.4 ... 24.5 m³ per day;
 - Upper pump: 20.5 ... 42.8 m³ per day;
- Theoretical capacities ratio (Q_{upper}/Q_{lower}): 0.34 ... 3.46

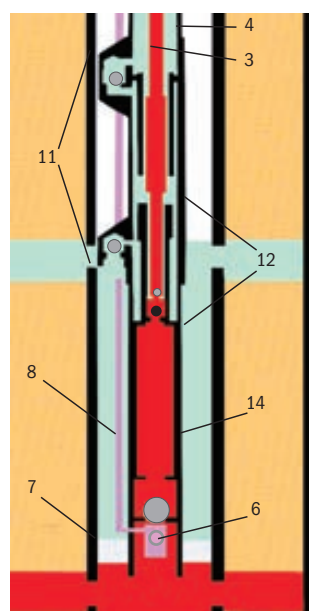
Technical specifications:

Parameters of equipment	Value
Casing diameter (nominal), mm	146, 158
Tubing diameter (nominal), mm	73; 89
Tubing length, m, no more than	1500
Type of sucker rod string	Tubing sucker rod
Length of pumping unit stroke, m, no more than	2,5

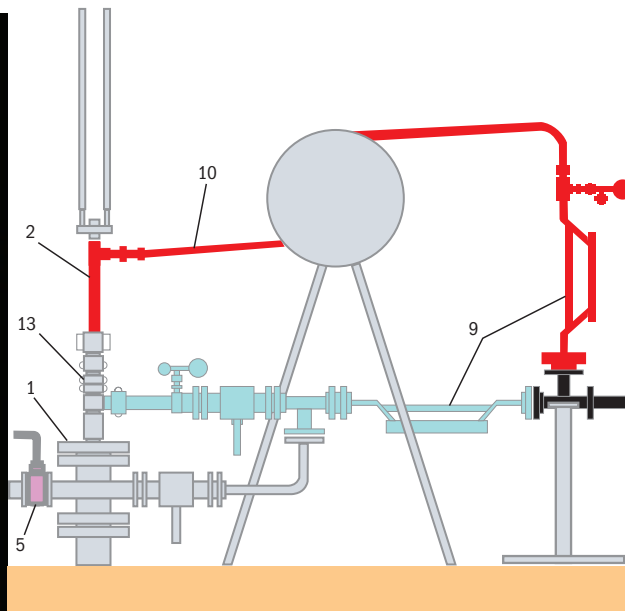
Equipment configuration:

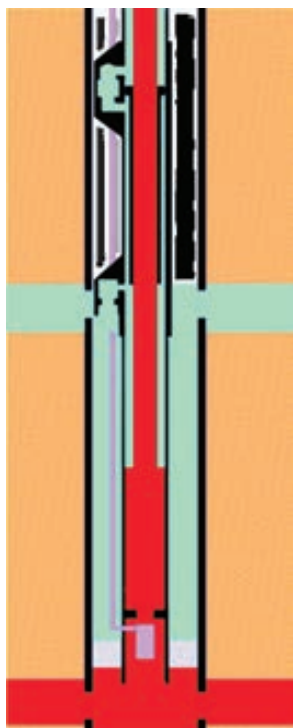
1. Modernized Christmas tree.
2. Hollow polished rod
3. Hollow rod string.
4. Tubing string.
5. Reagent feeding equipment or heating cable line.
6. Subsurface pressure gage
7. Packer.
8. Logging cable.
9. Flowgages.
10. High-pressure hose.
11. Upper sucker rod pump with by-pass valve.
12. Lower sucker rod pump.
13. Modernized casing-head stuffing box.
14. Plunger - packer

Schematic diagram of downhole pumping equipment



Schematic diagram of above-ground equipment





Theoretical capacity of subsurface sucker rod pumps during well dual completion, m³ per day:

(Counting data: plunger's stroke - 2.5 m, number of double strokes - 6).

	Upper pump	44	57
	Lower pump		
27		<u>20,48</u> 12,37	<u>42,75</u> 12,37
32		<u>15,17</u> 17,37	<u>37,75</u> 17,37
38		<u>8,34</u> 24,50	<u>30,62</u> 24,50

Theoretical capacity ratio of subsurface sucker rod pumps during well dual completion, m³ per day:

(Counting data: plunger's stroke - 2.5 m, number of double strokes - 6).

	Upper pump	44	57
	Lower pump		
27		1,66	3,46
32		0,87	2,17
38		0,34	1,25

Tubing sucker rods



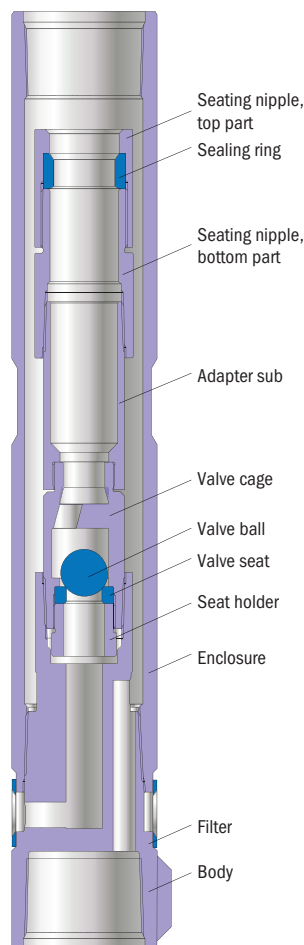
Sucker rods are intended for:

- Transmission of reciprocating motion being a part of rod string from pumping unit to subsurface sucker rod pump;
- Supply of pumped out fluid from a pump to well head through the bore;
- Injection of different chemical reagents in tubing string to remove deposits of asphalt, resins and paraffin and to increase oil recovery of oil formation.

Tubing sucker rod with a coupling (BTP-28.29.00.000, BTP-28.30.00.000)				
Designation	External diameter of coupling, mm	Bore diameter, mm	Area of rod body, mm ²	Weight of 1 LM, kg
ShNT 32x4,5M	48,3	23,0	388,6	3,1
ShNT 36x5,5	52,2	25,0	526,7	4,1

Downhole equipment

Well mixer SS-89



Well mixer design allows:

- To mix fluids from two formations divided by a packer during their one lift dual completion with electrical submersible pumping system (ESP) for the lower formation and with subsurface sucker rod pump of RHM-T type for the upper formation;
- To install RHM-T pump.

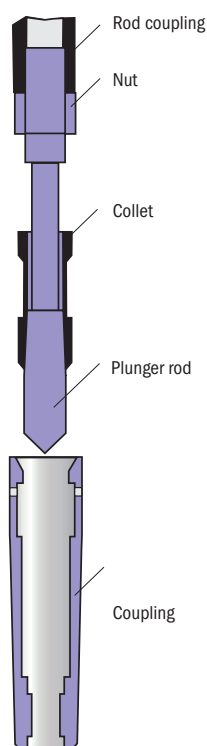
Advantages:

- Safety filter protects from mechanical impurities during SRP suction;
- Valve and seat has an increased flow area compared with analogs.

Technical characteristics

Parameters	Value
Connecting thread acc. to GOST 633-80	89
Overall dimensions, mm, no more than	
- Diameter of circumscribing circle	123,5
- Length	700
Diameter of axial channels (for ESP), mm	17 (6 holes)
Diameter of side channels (for SRP), mm	19 (2 holes)
Dimensions of filter grooves, mm (for SRP), mm	3×25 (36 grooves)
Ball and seat (V11-225 valve):	
- material	Stainless steel 95Ch18
- ball diameter, mm	34,925
- seat internal diameter, mm	26,57
Weight, kg, no more than	6,0
Operation conditions:	
- working environment	Oil, gas, water
- temperature of working environment, °C, no more than	100
- discharge head, m, no more than	1500

Automatic tractive connections



This device is intended for connecting sucker rod string with a pump installed in a well.

Automatic tractive connection allows:

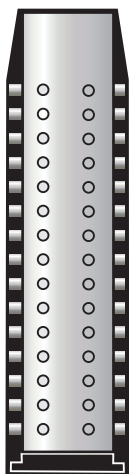
- To run insert pumps installed in seating nipple with tubing string;
- To run tubing pumps with plunger installed in barrel.

Before running of a pump, the lower part of tractive connection is screwed to plunger or plunger rod, while the upper part is fixed to bottom of sucker rod string. When running of sucker rod string, the upper part enters into the lower part, collet is locked in coupling ensuring a reliable connection between sucker rod string and pump plunger.

Size and versions, technical characteristics

Parameter / type	AS-19/60	AS - 19/73	AS-22/89
Connecting thread acc. to GOST 13877-96	Sh19	Sh19	Sh22
Tubing size, mm	60,3	73	73; 89
Connecting force, kN	75	100	100
Overall dimensions (when engaged), mm:			
- length	477	473	473
- diameter	42	50	50
Weight, kg, no more than	3,3	4,3	4,5

Safety filters



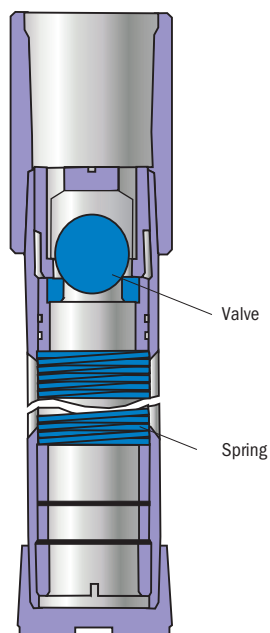
Well strainers are intended for protection of a pump from foreign particles of more than 3 mm.

Filter is a tube with welded plug and holes of diameter 3 mm. Top end of a tube has LP connecting thread (line pipe, tapered), which matches internal thread in the lower part of a pump, or that of RHBM seating nipple.

Technical characteristics

Parameter/type	Filter 1"	Filter 1 1/4"	Filter 1 1/2"	Filter 2"
Size of LP thread	1"	1 1/4"	1 1/2"	2"
External diameter, mm	34	42,5	48,3	60,3
Internal diameter, mm	24	32	40,3	50,3
Length, mm	210			
Total square of holes \varnothing 3, mm	720 (102 holes)	1080 (153 holes)	440 (204 holes)	
Weight, kg, no more than	0,75	1,0	0,85	1,5

Spring well strainer FSP-73/89



Filter element in a strainer is a spring.

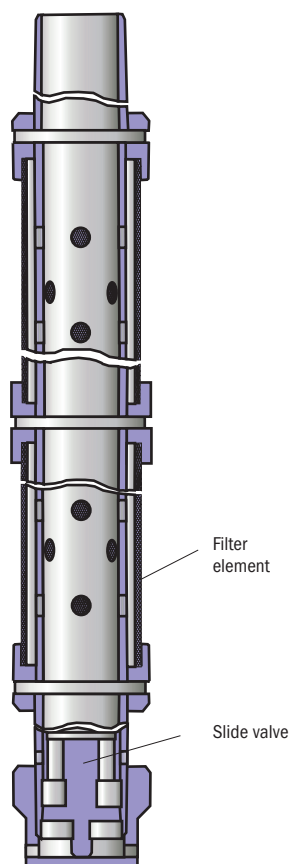
Φ FSP filter is set under sucker rod pump in NKT-73 tubing string. It is intended for preventing pumps from mechanical particles of size more than 0,2... 0,8 mm. Clearance between spring coils is adjusted to control particles size.

Filter is self-cleaning; spring filter element is cleaned out when valve (ball-seat) moves axially during sucker rod pump operation.

Technical characteristics

Parameters	Value
Connecting thread	NKT-73
Overall dimensions, mm, no more than:	
- length	900
- diameter	89
Weight, kg, no more than	15

Well strainer FS-60/92



Screen well strainer (FS) is set under oilwell sucker rod pump in NKT-60 tubing string and intended for preventing pumps from mechanical particles of size more than 1 mm.

Screen with meshes of size 1x1 is used as a filter element.

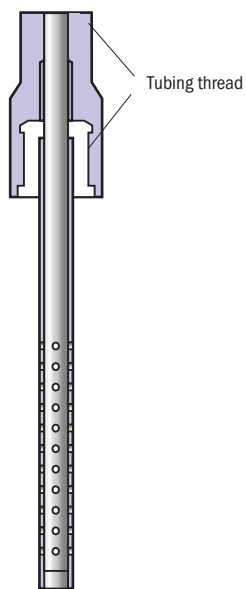
Fluid flows into suction pipe through screen and holes in strainer casing.

If a strainer becomes clogged, slide valve reacts and fluid flows without cleaning into suction pipe through slide valve passages.

Technical characteristics

Parameters	Value
Connecting thread	NKT-60
Overall dimensions, mm, no more than:	
- length	880
- diameter	92
Weight, kg, no more than	11

Sludge Trap AFNI. 631632.001

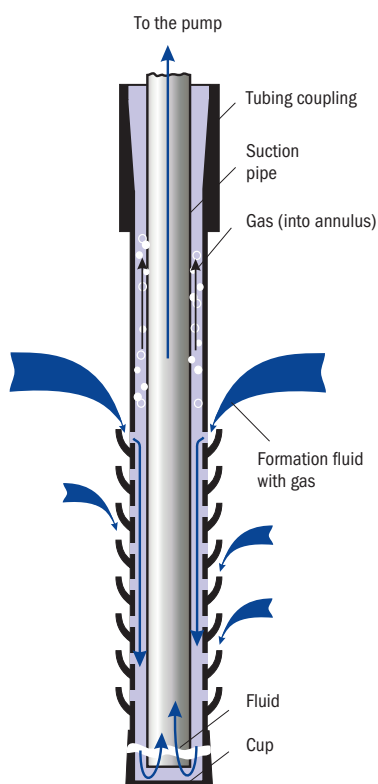


Sludge trap is installed under a pump and is intended for desludging of produced fluid from foreign impurities (sludge).

Technical characteristics

Parameters	Value
Connecting thread acc. to GOST 633-80	NKT-73
Filtering ports:	
- Diameter, mm	5
- quantity	44
- total area, mm ²	860
Overall dimensions, mm, no more than:	
- length	90
- diameter	1346
Weight, kg, no more than	7

Gas Anchor



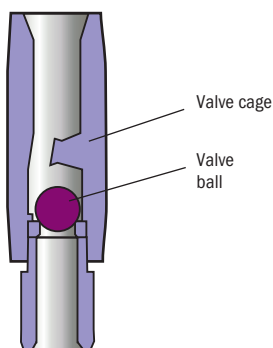
Gas anchor is intended for gas separation from oil pumped by sucker rod pumps.

As a rule, up to three gas anchors connected to each other are used. They are screwed on a tubing string under a pump and they serve as an outer suction pipe. Tubing pipe plugged with a cup is connected to a bottom anchor. Internal suction tube, entering into the bottom (plugged) tubing pipe is screwed on into pump inlet.

Internal suction pipe is not included in delivery set of a gas anchor.

Parameter/type	Gas Anchor 2 3/8" (60)	Gas Anchor 2 7/8" (73)	Gas Anchor 3 1/2" (89)
Connecting thread acc. to GOST 633-80	NKT-60	NKT-73	NKT-89
Diameter of anchor tube, mm		73	88,9
Diameter of anchor cups, mm		94	109
Anchor length, mm		1020	1030
Number of holes Ø 8 mm	96	120	144
Weight, kg, no more than	8	12	16

Pressure valve KO-73

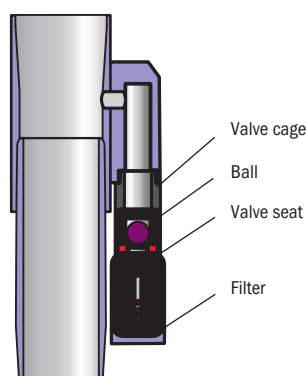


Pressure valve KO-73 is intended for interval pressure testing of tubing string when running down centrifugal pump. As well as for shutting off fluid flow when pump stops.

It is used during well operation without sucker rods and is installed in tubing string above a pump.

Parameters	Value
Tubing size, mm	73
Pressure, MPa	15
Overall dimension, mm, no more than:	
- External diameter	73
- Height	264
Weight, kg, no more than	5,5

Backflush valve KP 73-15



It is intended for fluid delivery through the string downhole annulus inside tubing when carrying out process operations.

It is installed in a tubing string at the required depth.

Parameters	Value
Tubing size, mm	73
Pressure, MPa	15
Overall dimensions, mm, no more than:	
- Diameter of circumscribing circle	120
- Height	405
Weight, kg, no more than	7,3

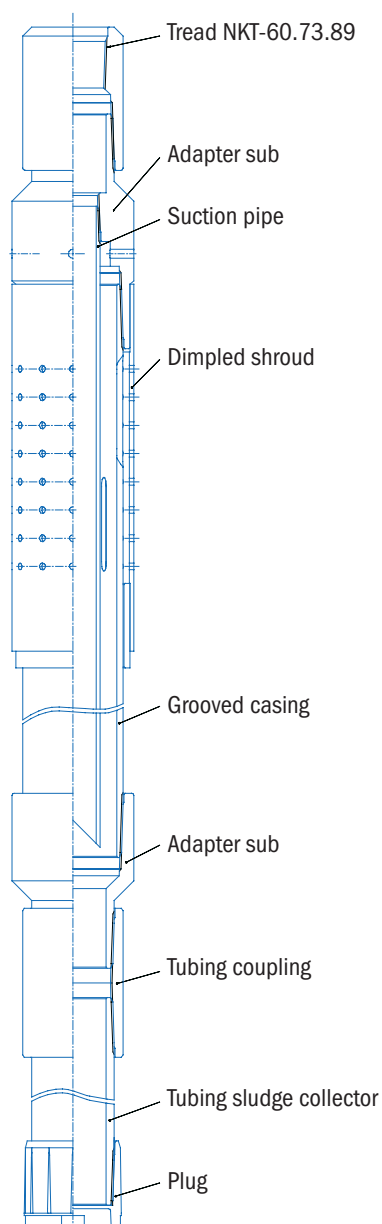
Gas-sand anchor

Gas-sand anchor is intended for separation of gas dissolved in oil and mechanical impurities from well fluid. Gas-sand anchor is installed on pump suction. It is recommended to install a tubing sludge collector under a gas-sand anchor for collection of mechanical impurities.

Gas-sand anchor allows to:

- Avoid sloughing of sand;
- Increase pump volumetric efficiency;
- Avoid pump clogging;
- Increase workover interval of a well.

Scheme of gas-sand anchor operation



Well strainer FSP-73

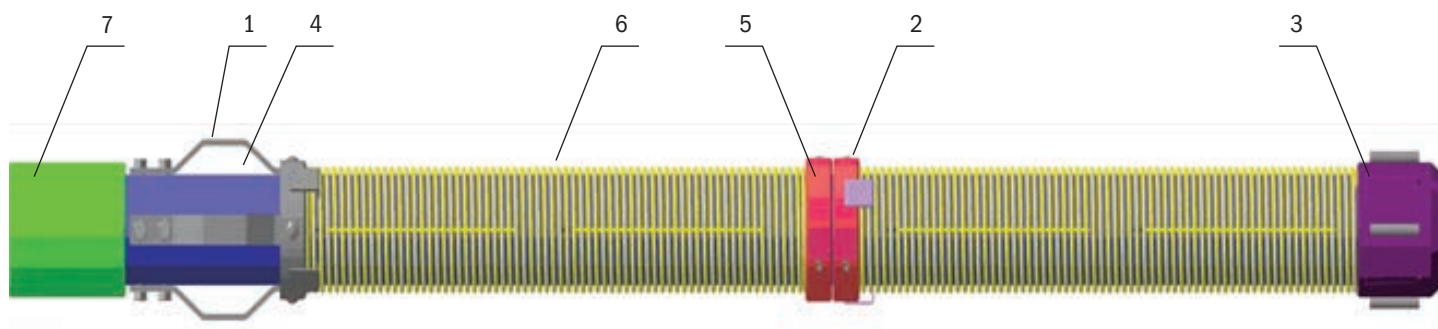
A strainer is intended for filtering of lifted fluids from foreign impurities, sand and other mechanical particles from a well.

A well strainer may be used as a part of downhole pumping equipment.

A well strainer may be operated in moderate and cold microclimatic conditions.

It consists of:

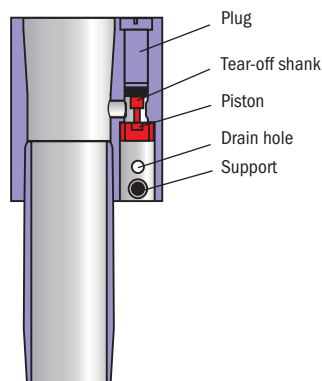
- Centralizer (pos.1)
- Fixing device (pos.2)
- Plug (pos.3)
- Pipe (pos.4)
- Adjustment ring (pos.5)
- Filter element (pos.6)
- Coupling (pos.7)



Technical characteristics of FSP-73/105

Parameters	Value
Nominal size of tubing string	NKT-73
Dimensions of filter grooves, mm	3x250 (16 grooves)
Flow area, mm ²	7128
Flow area inside the pipe, mm ²	3017
Overall dimensions, mm, no more than:	
- length	1670
- diameter	120
Weight, kg, no more than	26

Drain valve SKOK



Detachable drain valve is intended for fluid drain out of tubing string.

When used in combination with tubing pump and non-removable standing valve (THM-T), drain valve is installed on upper coupling of a pump or in tubing string above a pump.

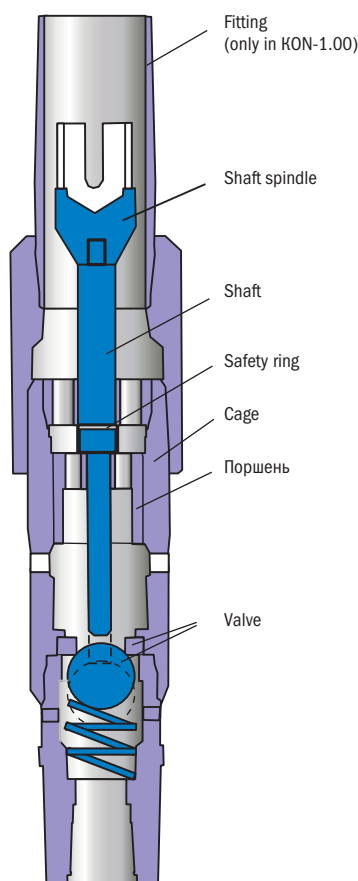
In order to reuse a valve, it is necessary to install a new tear-off shank. Shanks are included in spare parts delivery set.

To drain fluid out of tubing string when running a pump, pressure required for valve operation is produced in string. At the same time, neck of tear-off shank breaks. After that, valve piston comes out of a barrel and lets drain fluid pass through holes of valve cage into annulus.

Parameters	SKOK-50-N	SKOK-70-N
Connecting thread of tubing	2 7/8" (73 mm)	3 1/2" (88,9 mm)
Diameter of drain holes, mm	10 (2 holes)	
Diameter of circumscribing circle, mm	124	143
Valve length, mm	330	
Operating pressure, MPa	from 10,0 to 20,0 by customer's request	
Weight, kg, no more than	7,2	9,2

When ordering specify valve designation and operating pressure (if not specified, valves are delivered with operating pressure 20 MPa).

Shutdown valve KON



Shutdown valve is intended for well overhaul without their killing if pumps are changed without tubing pull-out. It is installed under seating nipple of insert pump.

Before first running of a pump, under the action of formation pressure and a spring a valve (seat-ball) is closed, side holes in valve cage are opened, through which fluid flows in tubing.

When setting a pump in seating nipple, it pushes a shaft spindle. A spindle moves piston and a ball, a piston closes side holes, valve is opened, providing suction of fluid during pump operation.

When pulling a pump, a piston stays in the same position (side holes are closed), ball affected by formation pressure and spring, closes valve, preventing fluid flow into tubing, at the same time shaft easily moves upwards. At the next running of a pump a valve is opened again with the help of a shaft.

Types and versions and technical characteristics of valves

Valve version	Pump type	Type of seating nipple	Connecting thread	Length, mm	Diameter, mm	Weight, kg
KON-1.00	25/20- ... RHM-T	4011 6-MT-ZUS	NKT 2 3/8" (60)	472	89	10,4
KON-2.00	20-... RHBM	32756	NKT 2 3/8" (60)	392	89	9
KON-3.00	25-... RHBM	32757	NKT 2 7/8" (73)	386	89	9