

TAGRAS OILFIELD SERVICE HOLDING



GROUP OF COMPANIES
SYSTEM • SERVICE

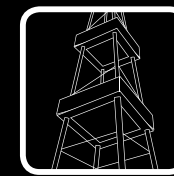


CATALOGUE

CONSTRUCTION OF WELL SITES

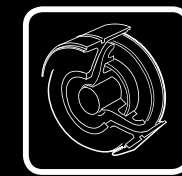
LLC SYSTEM-SERVICE MC

*Reliable partner
for your business!!*



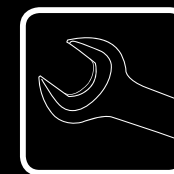
LLC PEREKRYVATEL

CONSTRUCTION
of well sites



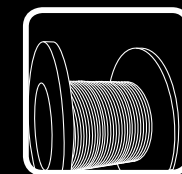
LLC RINPO

MANUFACTURE AND REPAIR
of oilfield equipment



LLC SERVIS NPO

SERVICING
of oilfield equipment



LLC TATNEFT-KABEL

MANUFACTURE
of cabling and wiring products



Dear partners!

Today, the System-Service Group of Companies is developing dynamically, expanding the horizons of its production activities.

The company includes LLC System-Service Management Company, LLC Perekryvatel, LLC RINPO, LLC Servis NPO, and LLC Tatneft-Kabel.

The success of enterprises involved in the extraction of the "black gold" consists of many components. One of them is high-quality high-tech equipment. The System-Service Group of Companies is responsible for this aspect of oil producers' work, providing them with modern special equipment that meets all modern standards, as well as providing service at the highest level.

We invite partners to cooperate for the implementation of joint projects.

Best regards,
Director of LLC System-Service MC
Ildar Mukhamadeyev



TaGRAS
oilfield services
company



TNG-GROUP

geophysical survey
and seismic acquisition



SYSTEM-SERVICE

manufacture, rental, repair, servicing
of oil submersible and drilling equipment



TAGRAS-TRANSSERVICE

cargo and passenger transportation
and logistics, specialized transport services



TAGRAS-ENERGOSERVICE

construction and repair work in the energy
industry and industrial construction



TAGRAS-RS

wellwork, construction and repair work
for hydraulic fracturing and EOR



TMS GROUP

manufacture and servicing
of oilfield and drilling equipment



TATNEFTEDOR

construction and maintenance
of roads



TAGRAS-BUSINESSSERVICE

complex IT-service, adaptation
and maintenance of 1C,
multifunctional service centre

OUR ACTIVITIES:

- Search and exploration of oilfields using modern methods of land and marine seismic acquisition; oilfield geophysics and geoinformation systems; interpretation of data obtained as a result of seismic acquisition and downhole logging; development and manufacture of innovative geophysical equipment
- Drilling directional and horizontal wells for oil and gas production. Technological operations for sidetracking and horizontal sidetracking.
- Manufacture of pipes and fittings in anticorrosion and heat-insulated versions for oil and gas pipelines, petroleum product pipelines, and heat supply systems (external, internal anticorrosion coating of pipes, fittings)
- Hydraulic fracturing
- Wide range of high-tech integrated services in well construction; drill bit and motor service, mud and backfilling service, geosteering for wellbore placement, drilling supervising, troubleshooting using local borehole wall lining equipment
- Repair, maintenance, and rental of equipment for oil production (surface and subsurface), Manufacture and repair of equipment for drilling and workover
- Manufacture of pumping units of various capacities
- Maintenance of electric submersible pumps, reservoir pressure system equipment, production of submersible cables for electric submersible pumps
- Workover and maintenance of wells
- Manufacture of equipment for well construction: PDC drill bits, local borehole wall lining equipment, sidetracking equipment
- Electricity and heat supply of oil production facilities, service of power facilities
- Infrastructure of oil and gas fields, construction of main oil and petroleum product pipelines, construction of field facilities
- Specialized technological transport services
- Cargo and passenger transportation, including tilt-covered vehicles all across Russia. Crew change transportation services, including vehicles of improved cross-country performance
- Construction, reconstruction, repair, and maintenance of roads, provision of field facilities with access roads, site development
- Comprehensive accounting outsourcing
- Payroll outsourcing
- HR records management and administration
- Maintenance of IT-infrastructure
- Maintenance of 1C software products
- Building and maintenance of an integrated information security system for enterprises or groups of companies
- Industrial automation
- Accompanying clients on business trips in Russia and around the world

MULTIFUNCTIONAL HOLDING,

technological leader in the oil and gas service market of the Russian Federation, which unites enterprises with more than half a century of history in the oil and gas service market.

WE ARE PROUD OF OUR EXPERIENCE

and competencies of our specialists, our own modern production facilities, innovative equipment, and digital products.

WE SYSTEMATICALLY STRENGTHEN

our production potential, increase the use of cutting-edge high-tech equipment, digital solutions, and innovative technologies.

OUR MISSION:

At the nexus of technology and experience, we find effective solutions to provide a full range of services for oil and gas and other sectors of the economy.

OUR VALUES:

- Team
- Responsibility
- Safety
- Innovation
- Efficiency

OUR PRINCIPLES:

- We do not violate laws and rules and stop the violations of others
- We study the needs of customers and offer best solutions
- We protect the resources of the company, the country, and the planet
- We welcome new ideas and initiatives
- We work towards a result



CONSTRUCTION OF WELL SITES



LLC Perekryvatel
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per@sistemaservis.ru



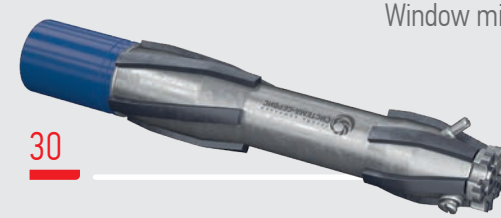
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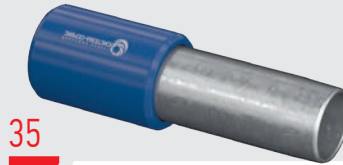
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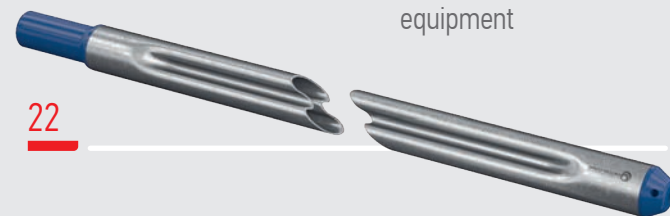
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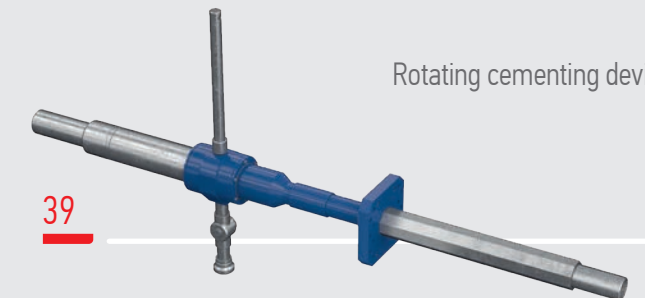
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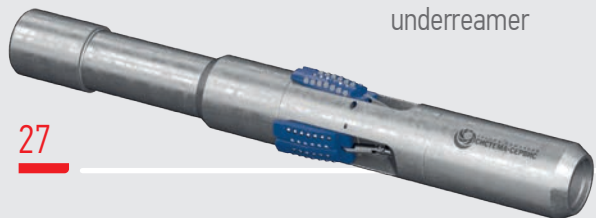
Reaming casing shoe

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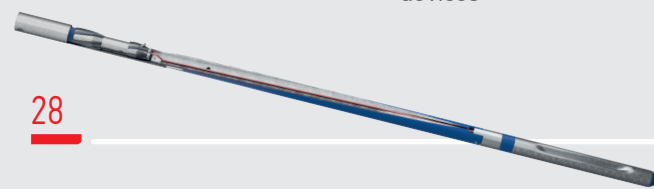
Rotating cementing device

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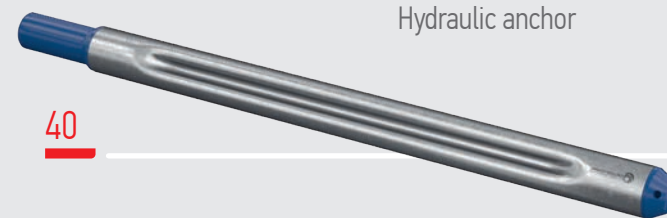
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Manufacture of PDC drill bits



Purpose:

Designed for full-hole drilling of oil and gas wells

Construction:

Drill bits with a steel body with a fixed cutting structure equipped with polycrystalline diamond cutters (PDC).

Application:

Drill bits for drilling vertical, horizontal, and directional wells.

Work principle:

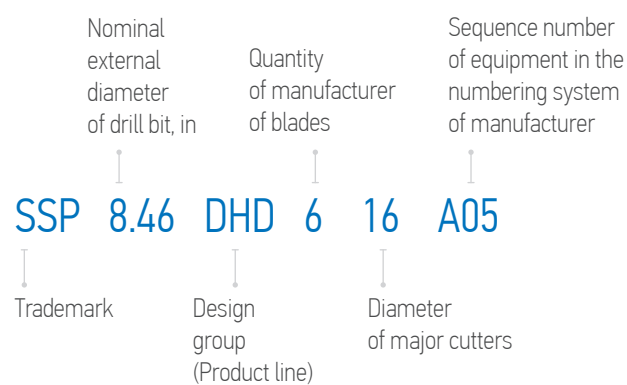
The reliable attachment system of the cutter in combination with the hardening of the surface by building up with tungsten carbide allows you to perform a high-quality cut of rock by rotating the tool around its axis with simultaneous loading of the tool.

Additional information:

Design and manufacture of PDC drill bits as per Customer's specific technical requirements

Advantages:

1. High milling speed.
2. Wear resistance.



Technical specifications:

Drill bit name	External diameter		Quantity of blades	Maximum size of cutters	Coupling thread		IADC Code	Quantity and type of jet nozzles/ ports
	mm	in			GOST	API		
SSP 120.6 DHD 513 G01	120.6	4 3/4	5	13	3-76	2 7/8	S321	5 x ports
SSP 123.8 DHD 513 G01	123.8	4 7/8	5	13	3-76	2 7/8	S322	5 x ports
SSP 123.8 DHD 613 B01	123.8	4 7/8	6	13	3-76	2 7/8	S322	6 x ports
SSP 142.9 DHD 513 B01	142.9	5 5/8	5	13	3-88	3 1/2	S422	7 x ports
SSP 142.9 DHD 613 G01	142.9	5 5/8	6	13	3-88	3 1/2	S422	6 x ports
SSP 155.6 DHD 613 A01	155.6	6 1/8	6	13	3-88	3 1/2	S133	TC22 x 2; 4 x ports
SSP 155.6 DHD 613 D01	155.6	6 1/8	6	13	3-88	3 1/2	S332	6 x ports
SSP 212.7 DHD 613 F01	212.7	8 3/8	6	13	3-117	4 1/2	S333	TC22 x 6
SSP 215.9 DHD 419 G01	215.9	8 1/2	4	19	3-117	4 1/2	S332	TC27 x 4, 4 x ports
SSP 215.9 DHD 516 G01	215.9	8 1/2	5	16	3-117	4 1/2	S422	TC22 x 8
SSP 215.9 DHD 613 G01	215.9	8 1/2	6	13	3-117	4 1/2	S422	TC22 x 6
SSP 215.9 DHD 616 E01	215.9	8 1/2	6	16	3-117	4 1/2	S422	TC22 x 9
SSP 215.9 DHD 716 D01	215.9	8 1/2	7	16	3-117	4 1/2	S423	TC22 x 4; 7 x ports
SSP 295.3 DHD 619 G01	295.3	11 5/8	6	19	3-152	6 5/8	S322	TC39 x 6
SSP 393.7 DHD 519 F01	393.7	15 1/2	5	19	3-177	7 5/8	S423	TC39 x 7

Sidetracking PDC drill bit



Purpose:

Designed for sidetracking in oil and gas wells

Construction:

Drill bits for sidetracking with a steel body with a fixed cutting structure.

Application:

Design group KD (KickOffDrill) — sidetracking bits for sidetracking in an open hole.

Work principle:

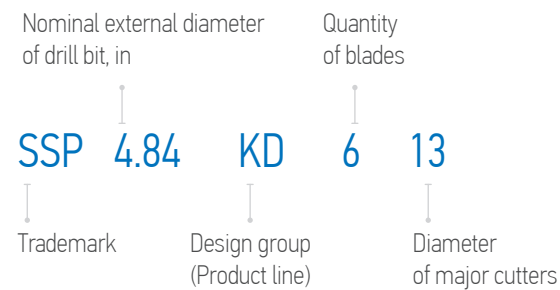
The reliable attachment system of the cutter in combination with the hardening of the surface by building up with tungsten carbide allows you to perform a high-quality cut of rock by rotating the tool around its axis with simultaneous loading of the tool.

Additional information:

Design and manufacture of PDC drill bits as per Customer's specific technical requirements

Advantages:

1. High milling speed.
2. Wear resistance.



Technical specifications:

Drill bit name	External diameter		Quantity of blades	Maximum size of cutters	Coupling thread		IADC Code	Quantity and type of jet nozzles/ ports
	mm	in			GOST	API		
SSP 123.8 KD 613	123.8	4 7/8	6	13	3-76	2 7/8	S231	3 x ports
SSP 142.9 KD 613	142.9	5 5/8	6	13	3-88	3 1/2	S231	3 x ports
SSP 155.6 KD 613	155.6	6 1/8	6	13	3-88	3 1/2	S231	3 x ports
SSP 215.9 KD 613	215.9	8 1/2	9	13	3-117	4 1/2	S431	6 x ports

Reaming and gauging PDC drill bit



Purpose:

Designed to clean out drilled boreholes.

Construction:

Drill bits for cleaning out boreholes with a steel body with a fixed cutting structure.

Application:

Cleaning out boreholes in oil and gas wells

Work principle:

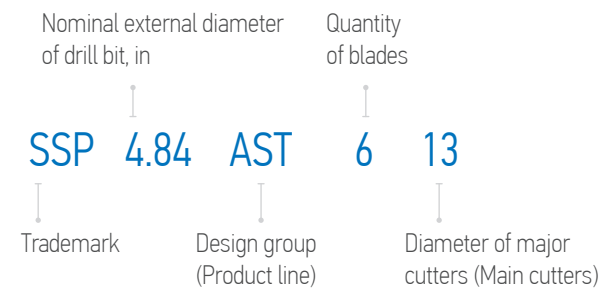
The reliable attachment system of the cutter in combination with the hardening of the surface by building up with tungsten carbide allows you to perform a high-quality cut of rock by rotating the tool around its axis with simultaneous loading of the tool. The cone-shaped design of the drill bit is intended to eliminate the risk of spudding an additional borehole while cleaning the borehole from drill cuttings.

Additional information:

Design and manufacture of PDC drill bits as per Customer's specific technical requirements

Advantages:

1. Eliminates the possibility of deviation from the planned trajectories of the existing well profile.



Technical specifications:

Drill bit name	External diameter		Quantity of blades	Basic size of cutters	Coupling thread		Quantity and type of jet nozzles/ ports
	mm	in			GOST	API	
SSP 123.8 AST 613	123.8	4 7/8	6	13	3-76	2 7/8	3 x ports
SSP 142.9 AST 613	142.9	5 5/8	6	13	3-88	3 1/2	3 x ports
SSP 155.6 AST 613	155.6	6 1/8	6	13	3-88	3 1/2	3 x ports
SSP 215.9 AST 613	215.9	8 1/2	6	13	3-117	4 1/2	6 x ports
SSP 220.7 AST 613	220.7	8 2/3	6	13	3-117	4 1/2	6 x ports
SSP 295.3 AST 613	295.3	11 7/8	6	13	3-152	6 5/8	9 x ports

PDC drill bit with an extended gauge to prevent the formation of ledges



Purpose:

Designed for full hole drilling of oil and gas wells with the simultaneous cleaning out of the drilled borehole.

Construction:

Drill bits are made of extra hard steel and reinforced with polycrystalline diamond cutters.

Application:

Cleaning out boreholes in oil and gas wells while drilling

Work principle:

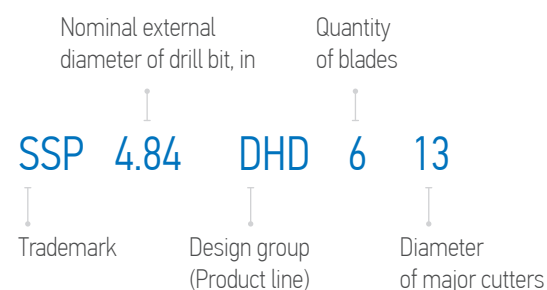
The extended gauge eliminates the possibility of the formation of ledges while drilling

Additional information:

Design and manufacture of PDC drill bits as per Customer's specific technical requirements

Advantages:

- 1. Enlarged gauge



Technical specifications:

Drill bit name	External diameter		Quantity of blades	Basic size of cutters	Coupling thread		Quantity and type of jet nozzles/ ports
	mm	in			GOST	API	
SSP 123.8 DHD 513 L	123.8	4 7/8	5	13	3-76	2 7/8	3 x ports
SSP 142.9 DHD 513 L	142.9	5 5/8	5	13	3-88	3 1/2	3 x ports
SSP 155.6 DHD 513 L	155.6	6 1/8	5	13	3-88	3 1/2	3 x ports
SSP 215.9 DHD 513 L	215.9	8 1/2	5	13	3-117	4 1/2	6 x ports
SSP 220.7 DHD 513 L	220.7	8 2/3	5	13	3-117	4 1/2	6 x ports
SSP 295.3 DHD 516 L	295.3	11 7/8	5	16	3-152	6 5/8	9 x ports

PDC drill bit with short gauge for "control"



Purpose:

Designed for full hole drilling of oil and gas wells with high dogleg severity.

Construction:

Drill bits are made of extra hard steel and reinforced with polycrystalline diamond cutters.

Application:

Side wells and horizontal sidetracks with a high dogleg severity index

Work principle:

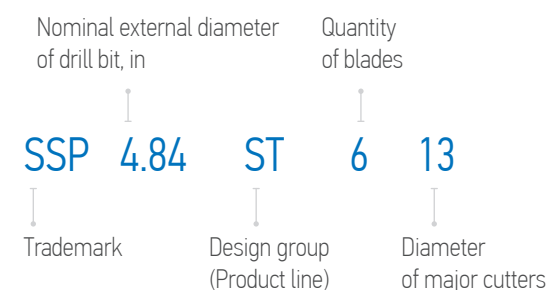
The shortened gauge allows you to build a well profile over 3.5° by 32.81 f while drilling

Additional information:

Design and manufacture of PDC drill bits as per Customer's specific technical requirements

Advantages:

- 1. Shortened gauge



Technical specifications:

Drill bit name	External diameter		Quantity of blades	Basic size of cutters	Coupling thread		Quantity and type of jet nozzles/ ports
	mm	in			GOST	API	
SSP 123.8 ST 613	123.8	4 7/8	5	13	3-76	2 7/8	3 x ports
SSP 142.9 ST 613	142.9	5 5/8	5	13	3-88	3 1/2	3 x ports
SSP 155.6 ST 613	155.6	6 1/8	5	13	3-88	3 1/2	3 x ports
SSP 215.9 ST 613	215.9	8 1/2	5	13	3-117	4 1/2	6 x ports
SSP 220.7 ST 613	220.7	8 2/3	5	13	3-117	4 1/2	6 x ports
SSP 295.3 ST 616	295.3	11 7/8	5	16	3-152	6 5/8	9 x ports

Bicentric PDC drill bits



Drift diameter / reaming diameter, in

SSP 4.47/5.74 BCB

Trademark Design group (Product line)

Purpose:

Designed for drilling boreholes with simultaneous reaming.

Construction:

Drill bits are made of extra hard steel and reinforced with polycrystalline diamond cutters.

Application:

Full hole drilling of oil and gas wells with simultaneous reaming.

Work principle:

The drill bit consists of a pilot bit and a reaming bit. During full hole drilling, the pilot bit forms the centre and at this moment, the second radius of the bit begins to work, which increases the final diameter of the borehole

Additional information:

Diameters are individually selected as per Customer's needs

Design and manufacture of PDC drill bits as per Customer's specific technical requirements

Advantages:

1. Increasing the diameter of the well without the use of additional tools and extra work.

Full drill bit



Drift diameter / reaming diameter, in

SSP 8.46 DS

Trademark Design group (Product line)

Purpose:

Designed for casing drilling. After casing cementing, the drill bit is drilled with a PDC drill bit.

Construction:

Drill bits are made of a special alloy and reinforced with polycrystalline diamond cutters.

Application:

Casing full hole drilling.

Work principle:

By rotating the casing string and an easily drilled bit, the well is drilled. Subsequently, the drill bit is cemented with a casing string annulus. Due to a certain alloy, the drill bit is drilled with the next assembly

Additional information:

Diameters are individually selected as per Customer's needs

Design and manufacture of PDC drill bits as per Customer's specific technical requirements

Advantages:

1. The technology allows drilling with simultaneous lowering of the casing string.



Local borehole wall lining equipment

Purpose:

Designed to cover the intervals of disastrous loss of circulation in an open hole during drilling.

Construction:

1. Profile liner (longitudinally corrugated pipes)
2. Tool for its installation in the well (reamer, underreamer, etc.).

Application:

1. Vertical wells
2. Directional wells
3. Horizontal wells.

Technologies:

Depending on the functional application of the equipment, various modifications of local borehole wall lining equipment are provided (see the table) for:

- sequential local overlapping of trouble zones;
- adding length of casing strings from below with pipes with a diameter of 8.63, 9.65 in without reducing the internal diameter of the well;
- water shut-off before lowering the production casing string;
- separation of individual sections in horizontal wells.

The technology and equipment for local borehole wall lining have more than 40 patents in the Russian Federation and 53 patents in other countries, including the USA, Canada, Australia, China, India, Norway, Japan, Germany, Great Britain, Mexico, Italy, France, etc.

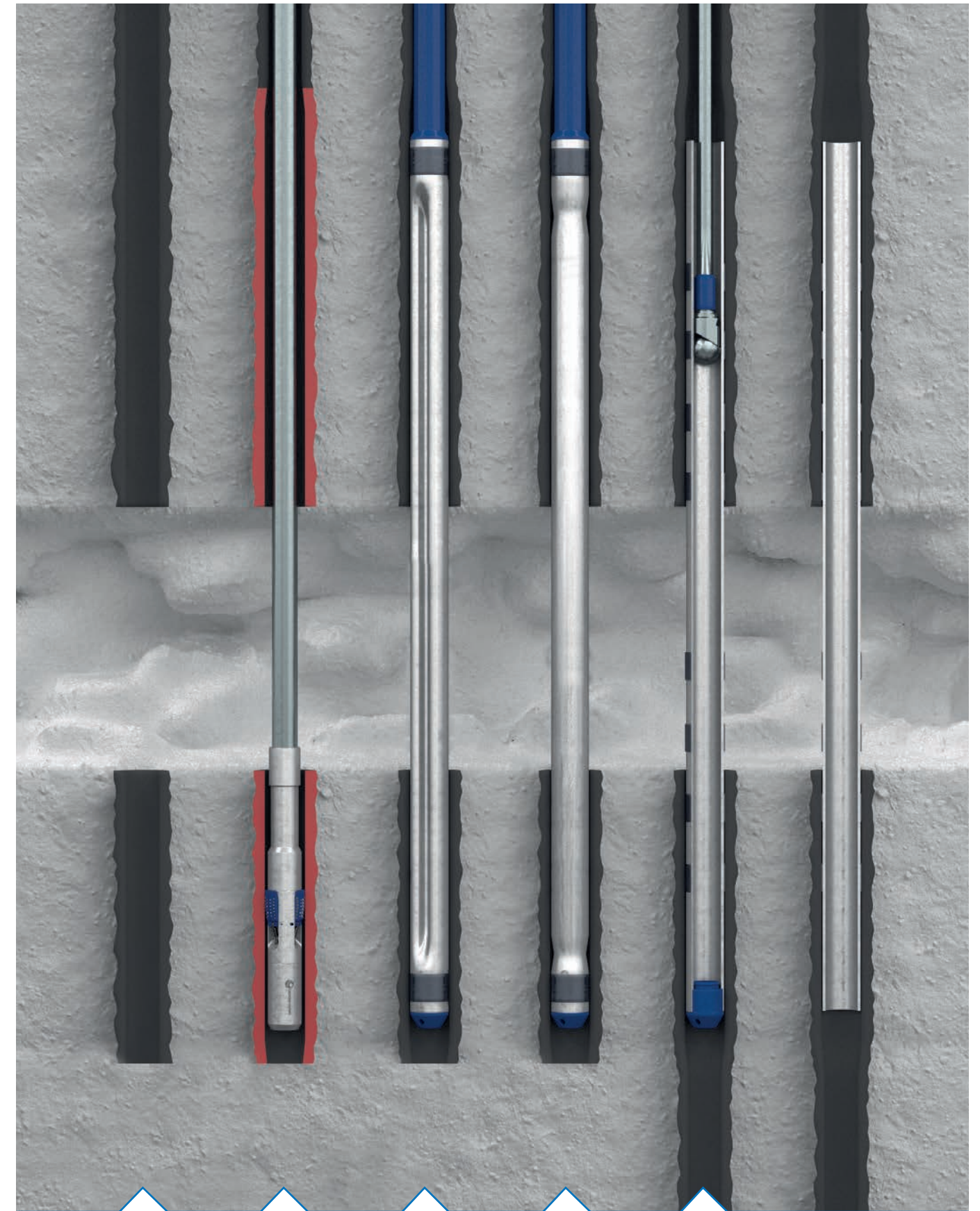
Work principle:

During the local borehole wall lining, casings with diameter larger than the diameter of the well are profiled along the entire length and decreased in cross-section so that they can be lowered freely into the well, and increase the diameter of a borehole with expanding reamer up to a diameter of starting (plain) casings in the problem interval.

After the profile tie-back casing is lowered into the well on drill pipes, due to the pressure created by drill fluid pumping, profile pipes shall be swedged out to the original size and tightly pressed against the wall of the expanded well section.

Advantages:

1. Solves the problem of sealing the difficult lost circulation zones.
2. Excludes the use of intermediate casing and tie-back casing.
3. Allows to reduce the energy intensity, material consumption, and time for well construction.



Borehole with a trouble zone

Borehole reaming

Lowering of profile liner

Swedging out profile liner by pressure

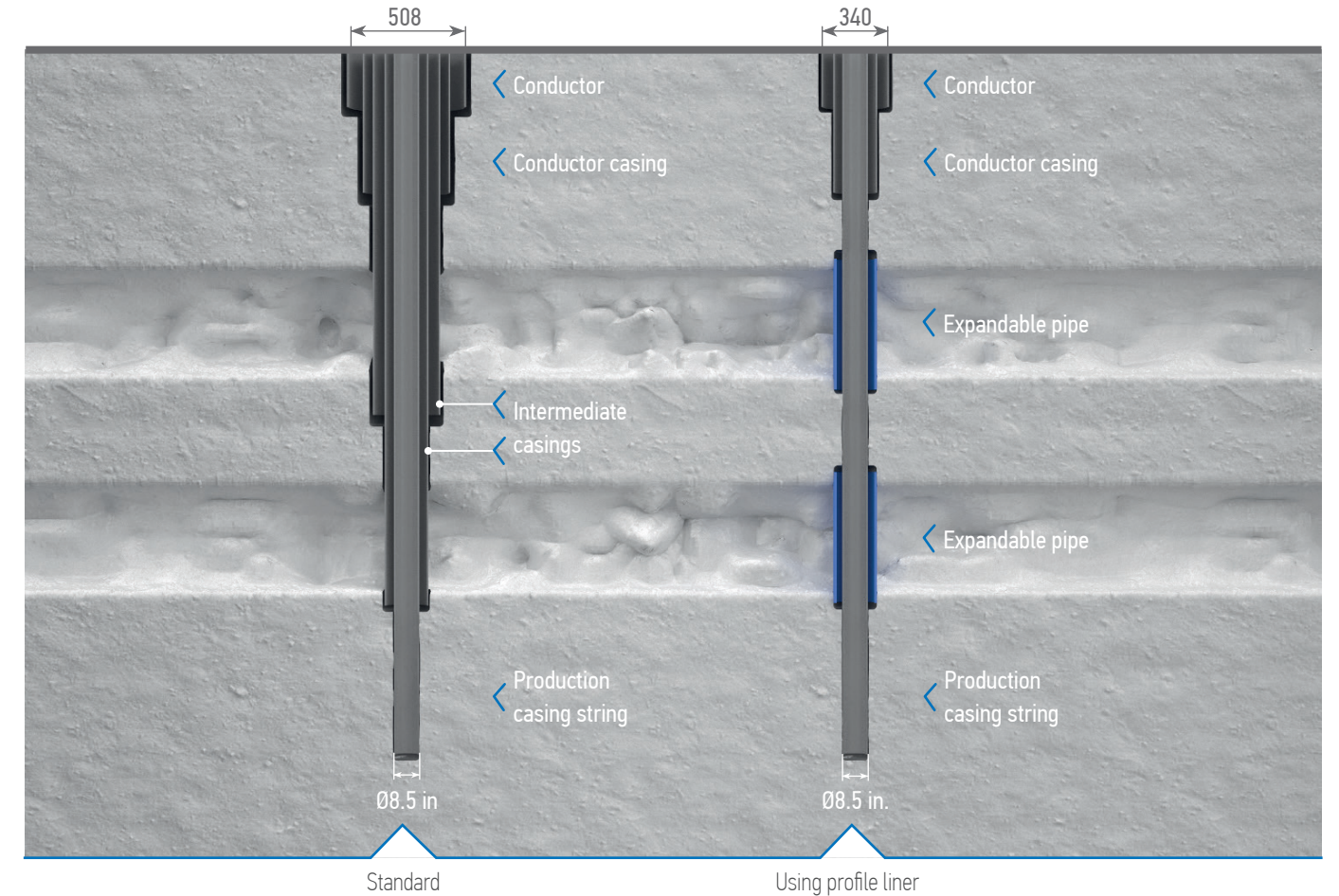
Milling

**Technical specifications:
of profile liner for open boreholes of an open well:**

Local borehole wall lining equipment version	Profile liner size, in.			Well diameter, in.			Pressure difference, ksi	
	D	D1	s	d	d1	d2	P	P1
OLKS-124	4.646	4.567	0.196	4.882	5.039	4.882	2.321	3.191
OLKS-144	5.354	5.276	0.196	5.665	5.827	5.665	2.031	2.466
OLKS-144U	5.354	5.276	0.196	5.665	5.276	4.882	2.031	2.466
OLKS-156	5.512	5.63	0.2362	6.142	6.299	6.142	2.031	2.466
OLKS-156U	5.354	5.354	0.196	6.142	5.669	5.665	2.031	2.466
OLKS-216S	7.874	7.677	0.315	8.5	8.504	8.5	2.176	2.611
OLKS-216U	7.874	7.677	0.315	8.5	7.717	7.5	2.176	2.843
OLKS-222S	8.11	7.874	0.315	8.752	8.819	8.752	2.176	2.611
OLKS-295	10.75	10.63	0.315	11.63	11.81	11.63	1.74	1.944

- D – profile liner diameter in cylindrical parts;
- D1 – circumscribing circle diameter in the profile part;
- s – wall thickness;
- d – well diameter before the installation of the profile liner;
- d1 – internal diameter of the profile liner after installation;
- d2 – drill bit diameter for drilling the well after profile liner installation;
- P – profile liner expansion pressure;
- P1 – permissible internal pressure on the profile liner;
- S – welded joint of profile pipes;
- M – upgraded equipment;
- RS – weld-threaded joint of profile pipes;
- U – with reduced diameter.

Cost comparison during well construction with the use of a profile liner at a well depth of 11 483 ft (3,500 m)



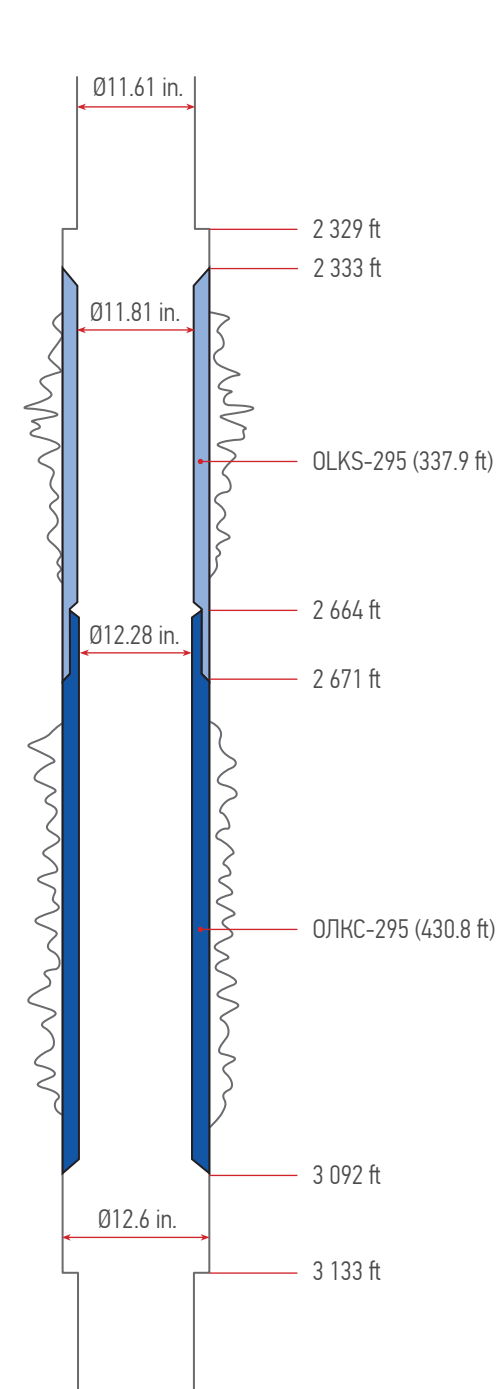
Technical specifications:

Parameters	Technology used:		Amount saved
	Standard	Using profile liner	
Conductor casing diameter, in.	20	13.39	
Subsurface casing, in.	16	9.598	
Intermediate casing, in.	12.8	9.299	
Tie-back casing diameter, in.	9.598	9.299	
Production casing string diameter, in.	6.614	6.614	
Borehole diameter at the bottom hole	8.5	8.5	
Total weight of the string, klbs	1 321	395.7	925.1
Total weight of cement, klbs	1 074	215.2	858.9
Total volume of cement, qt	407 366	130 492	276 875
Max. weight on the hook, klbs	436.1	292.6	143.5
The total construction time is reduced by 50%			

Track record

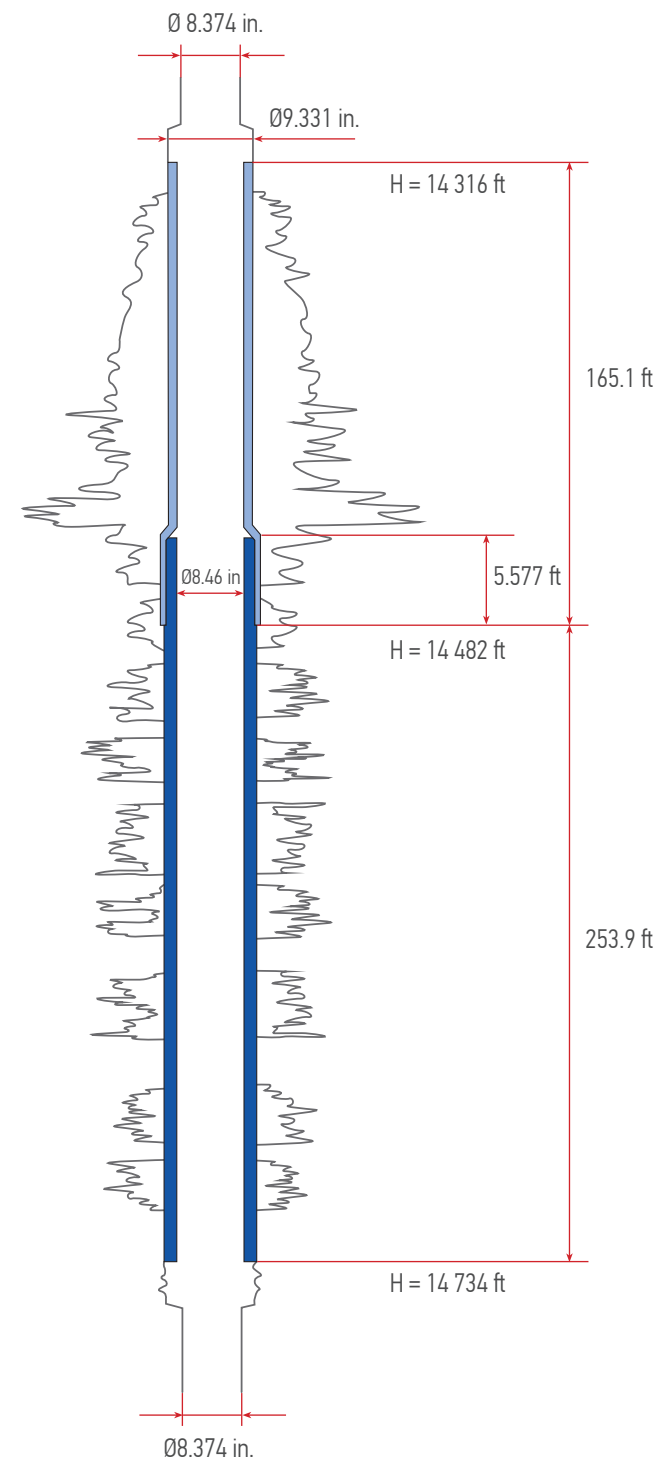
Well No. 71
Kovykta field, PJSC Gazprom, Irkutsk Oblast

Phased isolation of the loss zone with OLKS-29 equipment



Well No. 2sk
The Karpovskiy Severniy block in West Kazakhstan Region, Republic of Kazakhstan

Local Borehole Wall Lining Equipment Unit



Hydromechanical underreamer

Purpose:

Equipment for increasing the borehole diameter.

Application:

Vertical, directional, and horizontal wells.

Work principle:

An underreamer is included in the layout of the bottom-hole assembly. With the help of extra pressure, the cylinders inside the equipment are activated and the pipe rams are switched into the working position. The target interval is expanded, after which, according to the reverse principle, the equipment state changes into the transport position and is removed from the well.

Advantages:

1. Simple design. PDC. High drilling progress durability.

Technical specifications:

Standard size	Transport diameter, in.	Functional diameter, in.	Length, ft	Coupling thread	
				GOST R 50864-96	API
RRM-124/140	4.646	5.512	4.396	3-86	NC 31
RRM-143/160	5.433	5.512	4.396	3-86	NC 31
RRM-140/170	4.646	5.512	4.396	3-86	NC 31
RRM-145/175	5.433	5.512	4.396	3-86	NC 31
RRM-178/210	4.646	5.512	4.396	3-86	NC 31
RRM-216/242	5.433	5.512	4.396	3-86	NC 31
RRM-295/320	4.646	5.512	4.396	3-86	NC 31



Sidetracking devices for side wells



Purpose:

Sidetracking devices for side wells are designed for cutting out a window in a casing string and sidetracking in an open hole during the construction of side tracks of oil and gas wells.

Construction:

It consists of a hydraulic anchor, whipstock with a hydraulic system, window mill, reamer mill, and auxiliary tools.

Application:

Vertical, directional, and horizontal wells.

Technologies:

- Sidetracking in production casing string;
- Sidetracking a bypass borehole in an open borehole;
- Extractable system for multilateral well construction

Work principle:

The equipment is lowered into the well to the target depth. The anchor is activated by hydraulic pressure. Next, a part of the production casing string is cut out by a window mill.

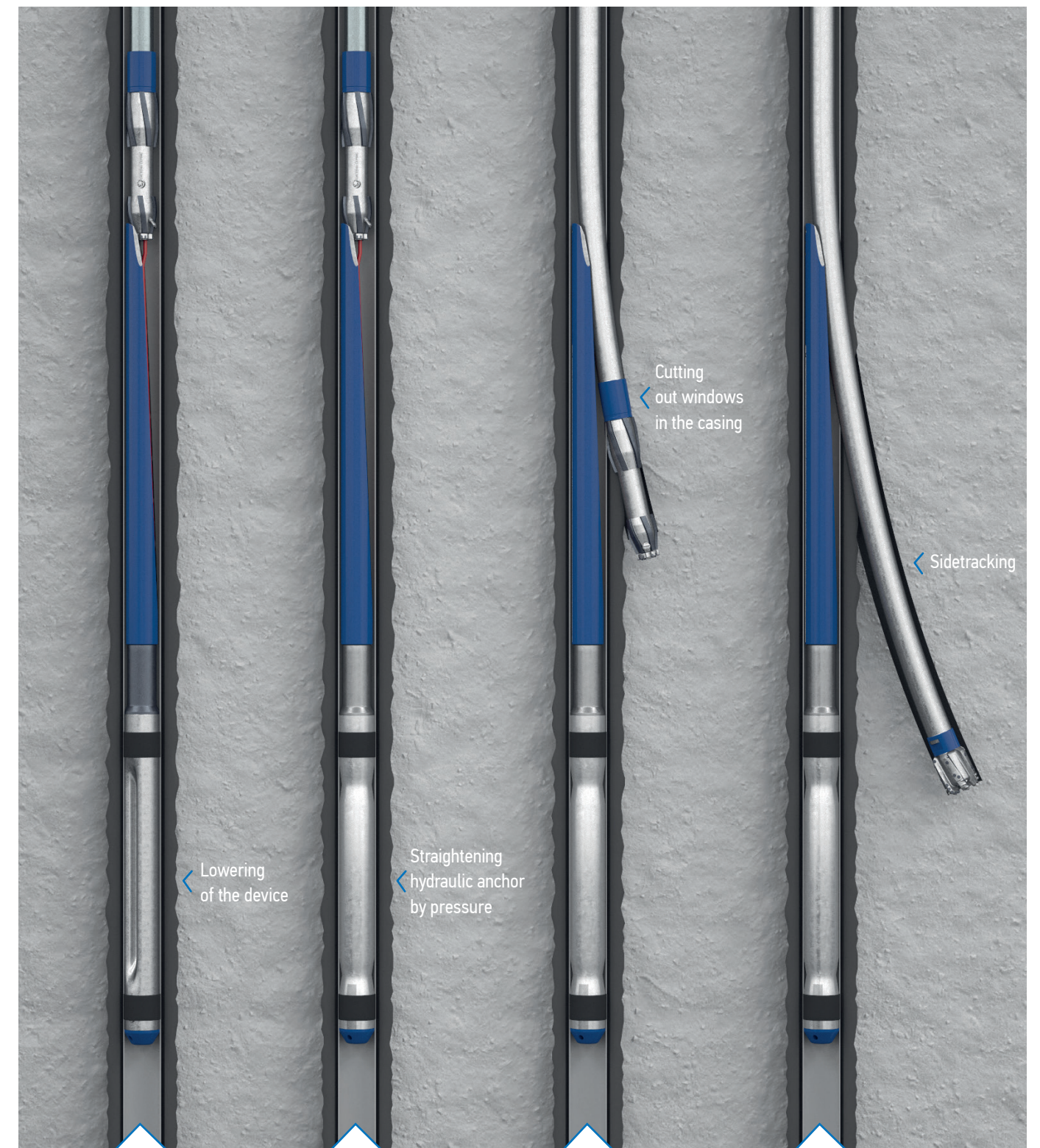
Advantages:

1. Sidetracking is performed without cementing and an artificial bottomhole;
2. The design of the mill allows it to be wear-resistant and operate on high milling speed;
3. Reliable and simple, the anchor can withstand more than 50 tons of axial load;

Technical specifications:

Parameters	BS-140	BS-146	BS 168	BS-178	BS-194	BS-219	BS-245
Casing string diameter, mm (in)	139.7 (5 1/2)	146.1 (5 3/4)	168.3 (6)	177.8 (7)	193.7 (7)	219.1 (8)	244.5 (9)
Whipstock length, in.	96.26	101.2	118.1	118.1	157.5	157.5	157.5
Hydraulic anchor length, in.	131.9	128	128	168.3	140.9	157.5	157.5
Hydraulic anchor diameter, in.	4.567	4.646	5.315	5.787	6.26	7.087	7.717
Mill diameter, in. (FD, FO/FR)	4.567	4.961	5.512/5.748	5.748/6.142	6.378/6.614	7.008/7.559	7.874/8.661
Whipstock chute pitch	2°-2°30'						
Weight of the whole set, max, lb	551.2	661.4	970	1 190	1 433	1 587	3 527

Process of sidetracking



The device assembled at the well collar is lowered into the gauged well to a target depth. The whipstock chute is oriented by geophysical equipment.

Pumping of the flush fluid opens the anchor that fixes the whipstock in the casing. The tension of the drilling tool cuts off the screw, which connects the mill with the whipstock.

By rotating the mill, a window is cut out in the casing.

Sidetracking up to the target depth is made with a drill bit.



Window milling tools

Purpose:

Effective solutions for milling "windows" in 5.51, 5.74, 6.61, 7.01, and 9.64 in casing strings and drilling the sidetracking borehole per one round trip, allowing the cutting out of the technological window both with tagging the bottom (cement bridging) and without tagging the bottom, which significantly reduces the time and cost for well site construction.

Construction:

The set consists of a window mill and a reamer mill. The window mill has a flat tip and pumpout plugs, which get sheared off during the mill rotation and open additional holes for the flush fluid.

The distance between the window mill and the reamer mill ensures optimal milling modes.

Application:

Vertical, directional, and horizontal wells.

Technologies:

The set consists of a double mill or a window mill and a reamer mill.

Work principle:

The equipment is lowered into the well to the target depth. The anchor is activated by a hydraulic pump. Next, a part of the production casing string is cut out by a window mill.

Advantages:

1. The mill is reinforced with a metal-ceramic composition and carbide blades on the end part, which allows it to operate on high milling speed.

Technical specifications:

Mill nominal size	Nominal external diameter, in.	Mill height, in.	Weight, lb	Coupling thread according to GOST 50864-96
Double mill				
FD-116	4.567	26.38	66.8	3-86
FD-126	4.961	27.95	75.84	3-86
Window mill				
FO-140	5.512	14.65	40.12	3-86
FO-150	5.906	14.02	54.9	3-86
FO-162	6.378	15.83	65.48	3-102
FO-200	7.874	20.87	137.8	3-133
Reamer mill				
FR-146	5.748	25.2	108.2	3-86
FR-156	6.142	24.61	109.3	3-86
FR-168	6.614	24.88	111.3	3-102
FR-220	8.661	26.93	231.5	3-133



Stage cementing collars

Purpose:

Stage cementing collars (SCC) are designed for cementing production casing strings in 2 (two) stages, which reduces the hydrostatic pressure on the lost circulation horizons and ensures the required annular cement top.

Construction:

SCC, stop ring, locking plug PSC, top cementing plug PPC. For cementing the production casing string with rotation, the SCC is made with buttress thread.

Application:

Vertical and directional boreholes and horizontal sidetracks.

Additional information:

Diameters are individually selected as per Customer's needs

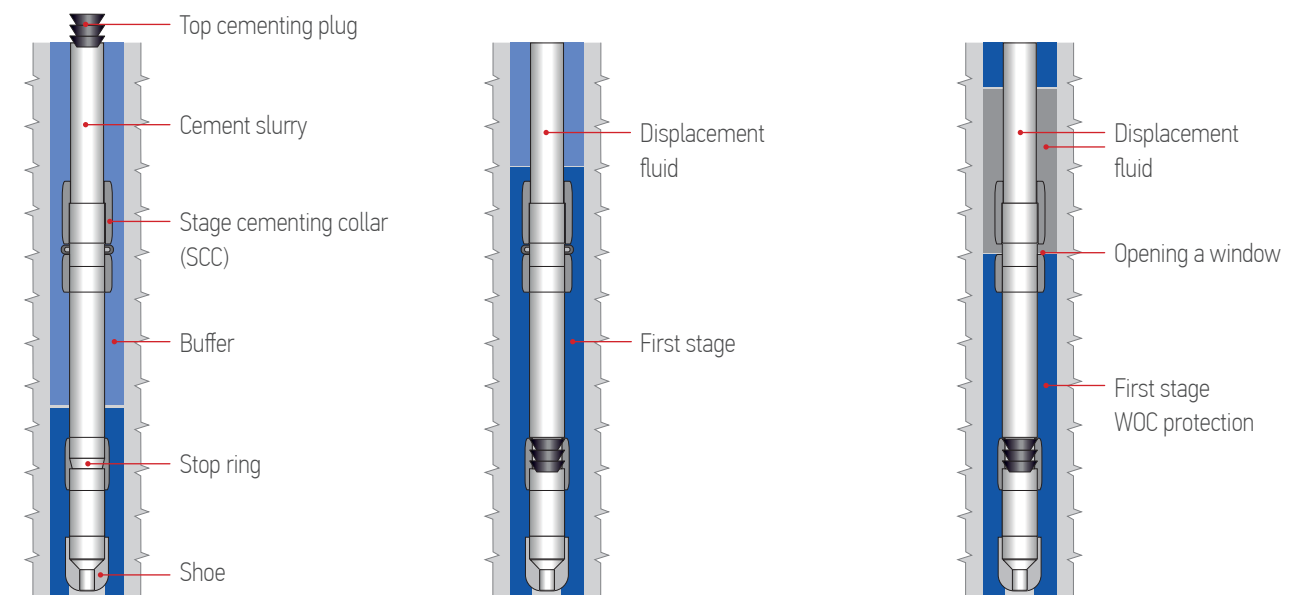
Advantages:

1. More advanced and reliable node for opening circulating ports is used compared to analogues;
2. The locking device of the closing sleeve ensures 100% tightness after drilling out of the locking plug and SCC;
3. It is possible to select the shear screws for different values of circulating port opening pressure;
4. Simple and reliable.

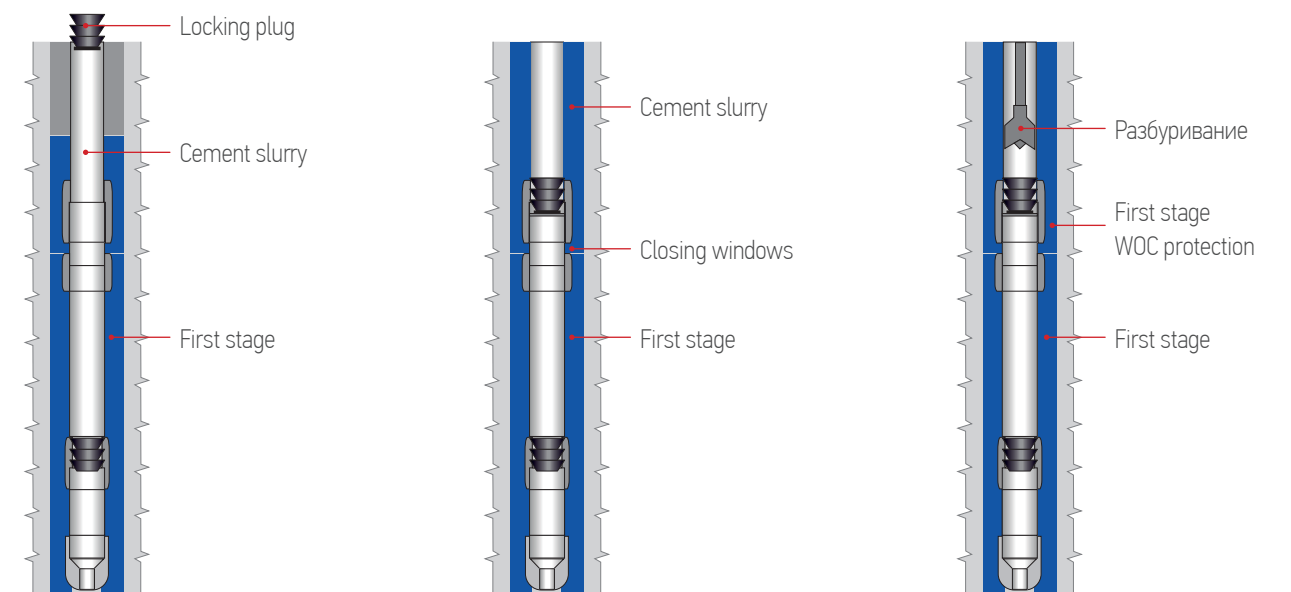
Technical specifications:

Main parameters of SCC	Values				
	SCC-102	SCC-114	SCC-146	SCC-168	SCC-178
OTTM coupling thread diameter, in.	4.016	4.488	5.748	6.614	7.008
External diameter of collars, max, in.	4.567	5.63	7.559	7.992	7.992
Internal diameter without drilled out seat, min, in.	3.386	3.917	5.118	5.906	6.26
Pressure difference for opening circulating ports, ksi	From 2.176 to 2.901				
Opening pressure increment, ksi	0.145				
Pressure difference for closing circulating ports, max, ksi	0.7252				
Length, max, in.	14.37	16.14	17.72	20.08	20.08
Weight, max, lb	28.66	44.09	88.18	99.21	99.21
Pressure difference for stop ring, min, ksi	0.4351				

Work principle:



1. **The collar is lowered into the well** as part of the casing string, the stop ring is installed on one or more pipes above the casing shoe. After pumping the calculated volume of cement slurry (with amount calculated for its rise to the height of the collar in the annulus), before pumping the displacement fluid, the top cementing plug is let in.
2. **The top cementing plug** reaches the stop-ring and is fixed in it, thereby ensuring the tightness of the casing closure.
3. **After checking the fixation of the top cementing plug**, radial holes are opened by increasing the pressure in the SCC, through which the excess cement is washed out in the annulus above the SCC. Waiting on cement (WOC) of the first stage.



4. **After pumping the cement slurry** (for the second stage of cementing, above the SCC) and before pumping the displacement fluid, a locking plug is installed.
5. **The locking plug** reaches the sleeve seat (inside the SCC), the sleeve pins are cut off by increasing pressure, the sleeve moves downward, thereby closing the radial holes of the SCC. Waiting on cement (WOC) of the second stage.
6. **After the WOC, the locking** and the top cementing plugs (made of rubber), as well as all internal parts of the SCC and the stop rings (made of aluminium) are drilled with a drill bit.



Liner hanger

Purpose:

Designed for lowering, installation, and fixation in the well sidetrack of cemented or non-cemented liners. The liner hanger is produced in two standard sizes PH-114 and PH-102 and two versions: the main one for the cemented liner and O1 for the non-cemented liner.

Construction:

- Liner setting tool with bottom plug;
- Stop rings;
- Valve unit;
- Shoe;
- Top plug.

The hanger is easy to use and reliable.

Application:

Vertical and directional boreholes and horizontal sidetracks.

Work principle:

The liner hanger is lowered into the well using drill pipes. In a given interval, the device seals the borehole (liner) and disconnects from the drill string.

Advantages:

1. Simple and reliable.
2. Does not require normalising after activation.

Technical specifications:

Main parameters of liner hanger	Values	
	Diameter of the casing string in which the liner hanger is installed, in	5.748
External diameter of the liner pipes, in	4.016	4.488
External diameter of the liner setting tool, in	4.724	5.512
Maximum external diameter (except liner), in	4.331	5.000
Total length of the parts except nipples, max, in	51.181	61.417
Upper coupling thread, according to GOST R 50864-96	Z-86	Z-102
Coupling thread of hanger parts	OTTM – 102 TU 14-161-163-96	OTTM – 114 GOST 632-80
Pin cutoff pressure for bottom plug, ksi	0.435-0.580	0.435-0.580
Internal diameter after installation, in.	3.465	3.917
Nominal internal diameter when cementing, in.	1.181	1.181
Set weight, max, lb	154.3	176.4



Pipe junctions (fitting)

Purpose:

Pipe junctions (fitting) are used for adding total length of the production casing string from above in order to "fit" the necessary equipment (filter, packer, etc.) to the productive formation of the well.

Construction:

- casing string
- coupling

Application:

Oil and gas wells.

Work principle:

Used as part of a casing string to regulate the overall length.

Advantages:

1. Quick production for equipment of any size as per Customer's needs.

Technical specifications:

Main parameters	Values
Pipe junction external diameter, in.	4.016–6.614
Pipe junction length, ft	1.64–18.04
Wall thickness, in.	0.2362–0.4134
Coupling thread	OTTM – 102 TU 14-161-163-96 OTTM – 114 ÷ 168 GOST 632-80



Cementing kit

Purpose:

Intended for separation of the displacement fluid and cement slurry. Prevents the cement slurry from escaping from the annulus into the casing

Construction:

Top cementing plug PPC:

- Nose piece;
- Pin;
- Rubber plug;
- Stopper ring;
- Rubber rings.

Stop ring:

- Pipe joint;
- Seat;
- Ring.

Application:

Oil and gas wells.

Work principle:

Used as part of a casing string during cementing.

Advantages:

1. Quick production for equipment of any size as per Customer's needs.

Technical specifications:

Parameters	Values		
	KC-114	KC-146	KC-168
External diameter, in.	5.000	6.535	7.390
Casing string diameter, in.	4.488	5.748	6.614
Run-in clearance, max, in.	2.441	3.622	4.094
Length, max, in.	29.843	22.835	22.992
Weight, max, lb	33.95	43.87	52.47



Casing shoe

Purpose:

Designed for equipping the bottom of casing strings with a diameter from 4.49 in to 16.77 in, in order to direct them along the borehole and protect them from damage when lowering.

Construction:

Consists of steel casing and an integral hemispherical concrete guide attached to it.

Application:

Vertical and directional boreholes and horizontal sidetracks.

Work principle:

Used as a guide device of the casing string during lowering into the well.

Advantages:

1. Eliminates the risk of landing the descending string on almost any ledges.

Technical specifications:

Shoe type, reference designation	Nominal diameter, in.	External diameter, in.	Centre bore diameter D1, in.	Height H, in.	Weight, lb, max
BKM-114	4.488	5.118	1.969+0.394	10.630	33.07
BKM-146	5.748	6.535	2.756+0.394	11.693	39.68
BKM-168	6.614	7.402	3.150+0.394	11.811	52.91
BKM-178	7.008	7.795	3.543+0.394	12.795	70.55
BKM-245	9.646	10.630	4.724+0.394	14.764	121.3
BKM-324	12.756	13.819	6.299+0.394	14.173...15.354	191.8
BKM-426	16.772	17.756	8.661+0.394	16.535	330.7



Reaming casing shoe

Purpose:

Intended for equipping the bottom of casing strings with a diameter from 4.02 in to 9.64 in, in order to direct them along the borehole while reaming the borehole.

Construction:

Consists of steel casing and an integral hemispherical easily drilled guide attached to it.

Application:

Oil and gas wells.

Work principle:

Used as a guide device of the casing string during lowering into the well.

Advantages:

1. Quick production.
2. Simple design.
3. The material used can be easily drilled with standard drill bits.

Technical specifications:

Shoe type, reference designation	Nominal diameter, in.	External diameter, in.	Height H, in.	Weight, lb, max
BKPVN-102	4.016	4.646	10.630	33.07
BKPVN-114	4.488	5.512/5.906	11.811	39.68
BKPVN-146	5.748	8.268	14.646	52.91
BKPVN-168	6.614	8.268	14.173	70.55
BKPVN-178	7.008	8.268	14.882	92.59
BKPVN-245	9.646	11.220	16.457	125.7



Rotating cementing device

Purpose:

Rotating cementing head is designed for uniform distribution of cement entering the casing string annulus during cementing of the production casing string.

Construction:

Rotating cementing head. Top cementing plug. KShZ valve.

Application:

Cementing of casing strings with rotation

Work principle:

After the casing string is lowered into the well, the top is tied with this device. With the help of the top drive (TDS or rotor), the entire string is rotated while cement slurry is pumped into the well.

Advantages:

1. Allows to improve the zonal isolation quality
2. Reduces the risks of unplanned products during well development.
3. Prevents the formation of longitudinal cracks and channels during cementing.

Technical specifications:

Type of rotating cementing head	Rotations per minute.	Cement slurry flow rate when pumping, max, bbl/min.	Admissible torque during rotation, max, lbf.ft	Threaded connections		Pressure of the cut-off pins of the top cementing plug, ksi	Top cementing plug diameter, in.
				Upper-coupling	Bottom-nipple		
GCV-102	20-40	5.661	3 835	Z-102	OTTM-102	1.015	3.622
GCV-114	20-40	5.661	5 310	Z-102	OTTM-114	1.015	4.134
GCV-146	15-30	5.661	7 671	Z-133	OTTM-146	1.015	5.315
GCV-168	15-30	5.661	9 441	Z-133	OTTM-168	1.015	6.102
GCV-245	15-30	5.661	10 326	Z-133	OTTM-245	1.015	9.252

Hydraulic anchor

Purpose:

Designed for fixing the whipstock in the casing string without tagging the bottom. The anchor is securely fixed, excluding both axial and tangential displacements due to high values of straining loads because of the large working surface.

Construction:

Consists of a shaped tube with a length of at least 9.85 ft. One meter of the open anchor can withstand 50 tons of axial load.

Application:

Vertical and directional boreholes and horizontal sidetracks.

Work principle:

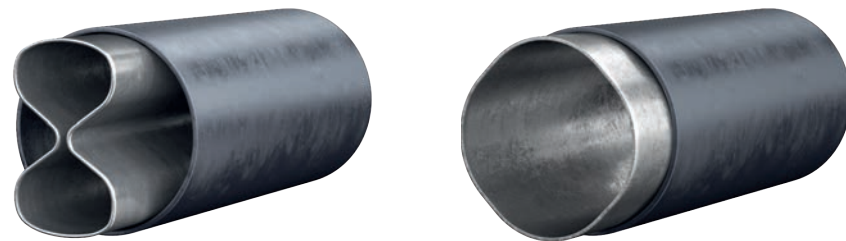
With the help of extra pressure, the shaped part is straightened while increasing in diameter.

Advantages:

Reliability
Wide range of applications

Technical specifications:

Standard size	External diameter, in.	Anchor length, ft	Coupling thread according to GOST 50864-96
YaGT-140	4.331	10.99	Z-86
YaGT-146	4.646	10.66	Z-86
YaGT-168	5.315	10.66	Z-102
YaGT-178	5.787	14.03	Z-102
YaGT-194	6.260	11.75	Z-133
YaGT-245	7.717	13.12	Z-147



Whipstock

Purpose:

Designed to provide the necessary deviation of cutting devices from the axis of the main borehole when cutting a "window" in the casing string.

Construction:

Produced in 2 versions:

- with a device pressing the whipstock to the casing string (used at small slope angles);
- without a pressing device.

Application:

Vertical and directional boreholes and horizontal sidetracks.

Work principle:

The whipstock chute pitch is 2°30', which ensures optimal sidetrack retraction.

Technical specifications:

Standard size	External diameter, in.	Whipstock length, ft	Coupling thread according to GOST 50864-96
BS-140	4.331	8.022	Z-86
BS-146	4.567	8.432	Z-86
BS-168	5.315	9.843	Z-102
BS-178	5.512	9.843	Z-102
BS-194	6.299	13.12	Z-133
BS-245	7.480	13.12	Z-147



Rental, repair of hydraulic downhole drilling motors



Purpose:

Downhole drilling motors are used for drilling vertical and directional oil and gas wells, as well as for well-workover operations, sidetracking, and drilling horizontal sidetracks. Upon a customer's request, downhole drilling motors are equipped with drill bits, near-bit scrapers, and back valves.

Construction:

Downhole drilling motors from 2.13 in to 9.45 in.

Application:

- Drilling of vertical, directional, and horizontal wells.
- Development and repair of wells.

Services:

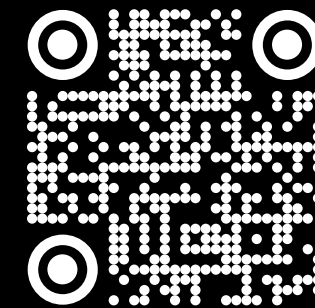
- Rental of equipment;

- Engineering and technological support of hydraulic downhole drilling motors, hydraulic downhole drilling motors + drill bit + telemetry;
- Bench testing;
- Repair of hydraulic downhole drilling motors, back valves and overflow valves, circulation subs;
- Repair and replacement of working tool sections;
- Inspection of the hydraulic downhole drilling motor parts and components;
- Repair of threaded joints.

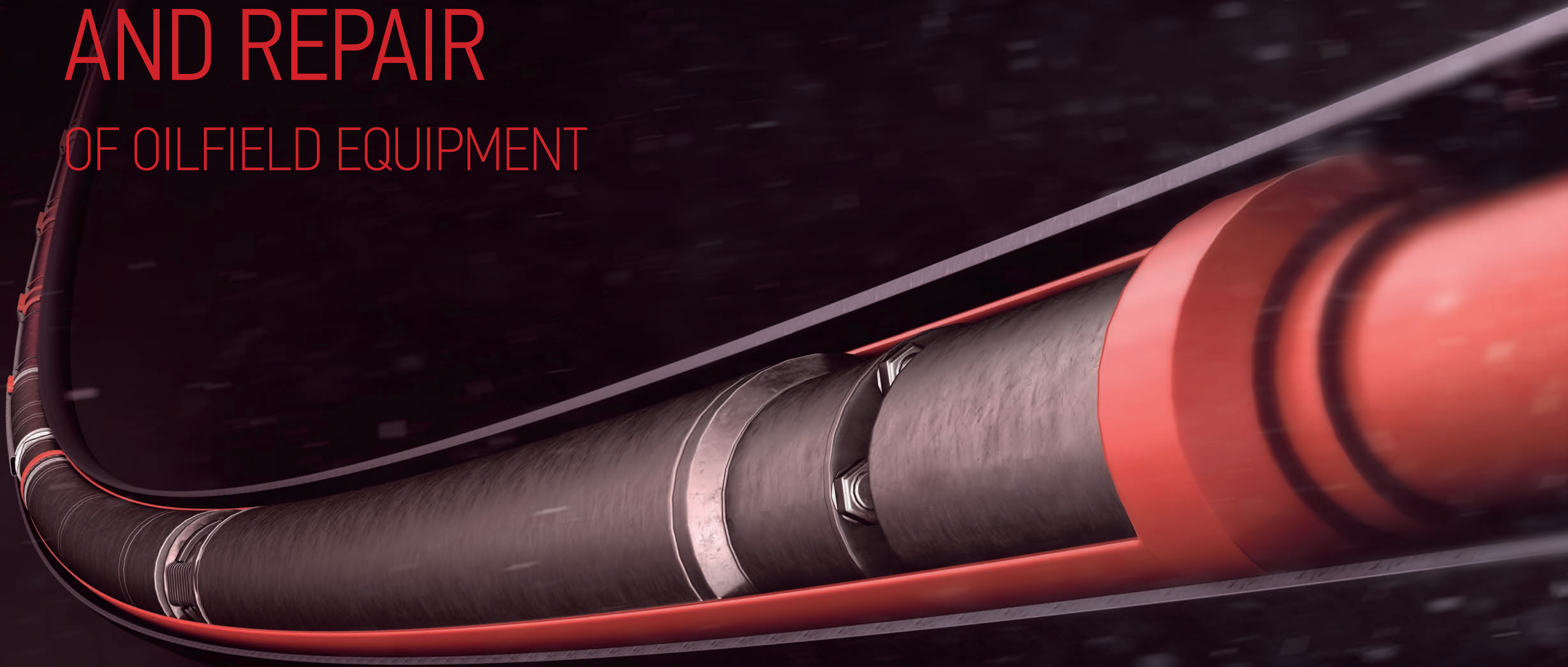
Advantages:

1. Own equipment.
2. Measurement of the approximation indicators for each motor before shipping to a Customer.

Questionnaire



MANUFACTURE AND REPAIR OF OILFIELD EQUIPMENT



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48	Electric submersible centrifugal pumps	51	Submersible electric motors	88	Field service of electric submersible pumping units	89	Field service of reservoir pressure maintenance system equipment
55	Submersible AC electric motors	56	Submersible low-speed motor EDSS (System-Service electric motor) for operation of progressive cavity pumps	90	Capillary systems for supplying chemicals to wells	92	Equipping wells with GSM modems
58	Protectors	60	Gas separators	93	"Service-Navigator" remote control system for oil production facilities	95	Heating cable to reduce the number of repairs due to paraffin blockage of tubing
62	Horizontal pumping units	65	Modular cluster pumping stations	97	Servis NPO services		
67	Repair of sectional centrifugal pumps	68	Control stations for ESP				
71	Control stations for sucker-rod pumping units	73	Control stations for pumping and reservoir pressure maintenance				
74	Installations for dual operation	86	Top-driven installation for the system of reservoir pressure maintenance of VCPU (vertical centrifugal pumping unit) type				



Electric submersible centrifugal pumps

Purpose:

used for lifting reservoir fluid, as well as in reservoir pressure maintenance systems. ESCPs allow pumping liquid with a capacity of 188.7 to 7 862 barrel/day with a flow of up.

Construction:

There are three groups: 5 – 4.87 in.; 5A – 5.118 in.; 6 – 5.839 in.. The pump case diameter is 3.622, 4.055, and 4.488 in. respectively.

The pumps consist of an top section (with a fishneck for attaching the pump to the tubing), middle sections, an input module, a check valve, and a bleed valve.

Application:

For oil well operation (high-rate, flooded, deep, and inclined wells).

Work principle:

The pump does the main work—lifting the liquid. The pump consists of sections, and sections consist of stages. The more stages, the greater the maximum pressure of the pump. The larger the stage, the greater the flow rate (the amount of fluid pumped per unit of time). The more flow rate and pressure it has, the more energy it consumes. Everything is connected. The pumps, in addition to flow rate and pressure, also differ in size and design—standard, wear-resistant, corrosion-resistant, wear-corrosion-resistant.

Reservoir fluid characteristics:

- Reservoir fluid is a mixture of oil, production water, and petroleum gas;
- Maximum fluid density – 87.4 lb/ft³;
- Maximum kinematic viscosity of a single-phase fluid, which provides operation of the pump without changing the pressure and efficiency – 0.01 Stoke.
- Hydrogen index of produced water pH – 6.0–8.5;
- Maximum solids mass concentration for pumps:
 - standard version – 0.09988 oz/ft³ (0.01%);
 - corrosion-resistant version – 0.1998 oz/ft³ (0.02%);
 - wear-resistant, wear-corrosion-resistant version – 0.4994 oz/ft³ (0.05%);
 - increased corrosion and wear-resistant version – 0.9988 oz/ft³ (0.10%);
- Microhardness of particles according to the Mohs scale, not more than:
 - conventional, corrosion-resistant, corrosion-wear-resistant version – 5;
 - increased corrosion and wear-resistant, wear-resistant version – 7;
- Maximum content of production water – 99%;
- Maximum content of free gas at the pump intake – 25%;
- By volume, with the use of a gas separator as part of the unit – 55%.
- Maximum hydrogen sulfide concentration for pumps:
 - standard, wear-resistant version – 0.009988 oz/ft³ (0.001%);
 - corrosion-resistant and wear- corrosion-resistant versions, increased corrosion and wear resistance – 1.249 oz/ft³ (0.125%);
- Temperature of the pumped liquid up to 302 °F
- Maximum hydrostatic pressure in the installation area – 5.802 ksi.

Advantages:

In high-flow areas (over 503.2 barrel/day), ESPs have the highest efficiency among all methods of artificial oil lift

Technical specifications:

Pumping unit	Injection rate in working zone, barrel/day	Fluid head max., ft	Max. cons. power, kW	Efficiency, %
0215ESPCW5-25I	113.2-201.3	11646.982	28,7	35
0215ESP5-25I	113.2-201.3	12139.108	30	35
0215ESPCW5-30I	113.2-239	11811.024	35,08	35
0215ESP5-30I	113.2-239	11646.982	34,8	35
0215ESPCW5-45I	220.1-345.9	12139.108	46,18	41,5
0215ESP5-45I	220.1-345.9	11811.024	45,15	41,5
0215ESPCW5-50IM1	188.7-440.3	11646.982	46,08	44
0215ESP5-50IM1	188.7-440.3	11811.024	46,44	44
0215ESPCW5-60I	251.6-471.7	11811.024	47	52
0215ESP5-60I	251.6-471.7	11811.024	47,29	52
0215ESPCW5-80I	377.4-629	11811.024	60,42	54,5
0215ESP5-80I	377.4-629	11811.024	60,5	54,5
0515ESPCW5-80I	377.4-629	11646.982	58,86	54,5
0215ESPCW5-125I	503.2-1 038	11811.024	95,91	53,5
0215ESP5-125I	503.2-1 038	11646.982	94,68	53,5
0215ESPCW5A-160M1	754.8-1 258	11811.024	111,15	59
0215ESP5A-160M1	754.8-1 258	11811.024	110,19	59
0515ESPCW5A-160M1	754.8-1 258	11811.024	111,04	59
0215ESPCW5-200M1	880.6-1 510	11646.982	148,99	54
0215ESP5-200M1	880.6-1 510	11811.024	151,5	54
0215ESPCW5A-250M1	1 132-1 887	11646.982	185,02	54
0215ESPCW5A-400	1 887-3 145	9350.394	210,9	61
0215ESPCW5A-500M1	2 359-4 088	8202.100	260,6	56
0115ESPCW5A-700M3	4 025-6 038	7874.016	305,53	64
0115ESPCW5A-800M3	4 025-6 038	7545.932	344,41	62

X X X G ESP XX XX XXXX I MX Tv XXXX E M/ KP
 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

- | | |
|--|---|
| <p>1 0 – no axial bearing unit;
 2 – axial bearing unit has washers made of wear-resistant material.</p> <p>2 0 – impellers of a single-support design with short hub, separate protective shaft sleeve; impeller material:</p> <ul style="list-style-type: none"> • grey cast iron for standard pumps (ESP); • cast iron GH190 for wear-resistant pumps (ESPW); • Niresist cast iron for corrosion-resistant pumps (ESPC) and corrosion-resistant and wear-resistant pumps (ESPCW); <p>1 – impellers of a single-support design with an elongated hub made of Niresist cast iron;</p> <p>2 – steps of a double-support design:</p> <ul style="list-style-type: none"> • Niresist cast iron for corrosion-resistant and wear-resistant pumps (ESPCW); • grey cast iron with a short hub, a separate protective shaft sleeve for standard pumps (ESP); <p>3 – carbon fiber impellers;</p> <p>5 – cluster scheme of assembly of working stages.</p> <p>3 Parts of the pump:</p> <p>1 – input module, flanged joint;</p> <p>2 – input module, "flange-body" joint;</p> <p>4 – bottom section, "flange-body" joint;</p> <p>15 – input module, "flange-body" joint with 6 screws M12x1.25, heads and bases of sections with built-in radial bearings of sections.</p> <p>4 As part of the top section, the head is modular (the letter "G" is not put in the absence of a modular head)</p> | <p>5 Electrically driven centrifugal pump.</p> <p>6 In standard version, no letters.
 W – wear-resistant version;
 C – corrosion-resistant version;
 CW – corrosion-wear-resistant version.</p> <p>7 Overall group (5, 5A, or 6).</p> <p>8 Rate capacity, bar/day</p> <p>9 Impellers with wheels (in the standard version of the wheels, the letter "I" is not put).</p> <p>10 Labelling of the modified pumps (letter "M" and the serial number of the pump version).</p> <p>11 Increased corrosion resistance (with working bodies made of Niresist cast iron with increased hardness), letters are not put for other versions.</p> <p>12 Nominal fluid head, ft</p> <p>13 Involute intersectional connection of shafts (in the straight-sided spline version, the letter "E" is not put).</p> <p>14 Nominal fluid head, ft</p> <p>15 M – shaft of the bottom section and the input module made from high alloys Inconel, Alloy. In the standard version, the letter "M" is not put.</p> <p>16 CP – corrosion-resistant coating of the body;
 KN – stainless steel body.
 In the standard version, the letters "CP" or "KN" are not put.</p> |
|--|---|

Submersible electric motors

Purpose:

Used as a motor for centrifugal and cavity pumps for pumping formation fluid from oil wells. We produce more than fifty standard sizes of SEMs with power ranging from 12 to 350 kW, which allows you to choose the most optimal combination of motor and pump to ensure the operation of the installation with the highest possible efficiency.

Construction:

Electric motors have the construction type of mounting 1M 3631 according to GOST 2479. Construction types – one-section, two-section, and three-section. The manufacturing technology with the use of special materials allows us to produce high-heat-resistant motors operating in reservoir fluid with temperatures up to 302°F (up to 338°F at the request of customer). Motors are tested on a special stand, with the possibility of creating shaft load and picking up all the necessary parameters.

Starting, control of the electric motor operation, and its protection in emergency conditions are carried out by control stations. Protection against reservoir fluid penetration into the internal cavity of electric motor, compensation for oil leakage and thermal changes in its volume during operation and stops, rotation torque transfer from the motor shaft to the pump shaft is performed by a protector with appropriate overall and connecting dimensions and specifications.

Application:

Used as part of an oil production unit and is a pump drive.

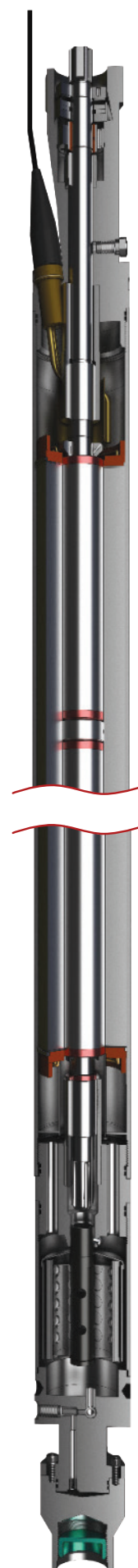
Work principle:

In the stator winding, when it is connected to a three-phase current, a rotating magnetic field arises, which crosses the rotor rods and induces an electromotive force in them. Since the rotor rods are closed, a current will appear in them under the action of this force. This current, interacting with the magnetic field, creates a torque, under the influence of which the rotor will begin to rotate. The direction of rotation will coincide with the direction of rotation of the stator field, however, in terms of rotation speed, the rotor will slightly lag behind the stator field; these motors are called asynchronous. The electrical energy supplied to the stator winding from the network is converted into mechanical energy of rotation of the motor shaft.

Package contents:

- Electric motor – 1 pc.
- Set of spare parts and tools for installation – by agreement
- Equipment certificate – 1 pc.
- Manual (AR 3174.000 RE) – by agreement

At customer's request, submersible motors can be equipped with a telemetry system, which allows to obtain real-time data on the operation and the well conditions in the motor mounting area and to promptly shut down the unit in case of overstress. Transmission of signals from the submersible unit of the telemetry system to the control station is carried out via a power cable of the electric motor.



Technical specifications of electric motors, size 103:

Motor type	Nominal power, kW	Nominal voltage, V	Nominal current, A	Efficiency, %	cos φ	Rated slip, %	Min. well diameter in.	Cooling liquid speed min, in./s	Cranking torque, lbf.ft	Stator winding insulation resistance at t=(239+59)°F, MOhm
1	2	3	4	5	6	7	8	9	10	11
ED(K)(T)(T1)16-103M1	16	530	25,6	81	0,84*	5,8*	4,791	2,756	1,085	100
ED(K)(T)(T1)22-103M1	22	700	27,5	81	0,83	5,5	4,791	3,937	1,808	100
ED(K)(T)(T1)28-103M1	28	900	27	81	0,82	5,8	4,791	3,937	2,17	100
ED(K)(T)(T1)32-103M1	32	1000	27,5	81	0,83	5,9	4,791	3,937	2,532	100
ED(K)(T)(T1)40-103M1	40	1200	30	81,5	0,84	5,8	4,791	5,906	2,893	100
ED(K)(T)(T1)45-103M	45	1400	28	81	0,83	5,4	4,791	5,906	3,255	100
ED(K)(T)(T1)50-103M1	50	1400	32	81	0,83*	6*	4,791	7,874	3,255	100
ED(K)(T)(T1)56-103M1	56	1600	32	81*	0,83*	6*	4,791	11,81	3,617	100
ED(K)(T)(T1)63-103M1	63	1750	32	81*	0,83*	6*	4,791	13,78	3,978	100
ED(K)(T)(T1)70-103M1	70	1900	30,2	82*	0,83*	6,5*	4,791	13,78	3,978	100
ED(K)(T)(T1)80-103M1	80	2050	36	80	0,83	7,2	4,791	11,81	5,425	100

The largest diameter of the motor – 3.937 in

Winding insulation resistance in the cold state, at t=(68±50)°F, at least 1000 MOhm.

Technical specifications of electric motors, size 103 with increased supply voltage:

Motor type	Nominal power, kW	Nominal voltage, V	Nominal current, A	Efficiency, %	cos φ	Rated slip, %	Min. well diameter, in.	Cooling liquid speed min, in./s	Cranking torque, lbf.ft	Stator winding insulation resistance at t=(239+59)°F, MOhm
1	2	3	4	5	6	7	8	9	10	11
Single-section electric motors										
ED(K)(T)(T1)28-103M1P	28	1950	14	82	0,83	6	4,791	3,937	2,17	100
ED(K)(T)(T1)32-103M1P	32	2150	13	82	0,83	6	4,791	3,937	2,532	100
ED(K)(T)(T1)45-103M1P	45	2200	18	82	0,83	6	4,791	5,906	3,255	100
ED(K)(T)(T1)56-103M1P	56	2550	20	82	0,83	6	4,791	11,81	3,617	100
ED(K)(T)(T1)63-103M1P	63	2270	24,5	82	0,83	6	4,791	13,78	3,978	100
ED(K)(T)(T1)70-103M1P	63	2450	24,8	82	0,83	6,5	4,791	13,78	3,978	100
ED(K)(T)(T1)80-103M1P	80	2800	26	81	0,83	6,5	4,791	11,81	4,34	100
ED(K)(T)(T1)90-103M1P	90	2950	27	81	0,83	6,5	4,791	11,81	4,34	100
Two-section electric motors										
EDS(K)(T)(T1)90-103M1P	90	2700	29	81	0,83	6,5	4,791	7,874	8,68	50

Technical specifications of electric motors, size 117:

Motor type	Nominal power, kW	Nominal voltage, V	Nominal current, A	Efficiency, %	cos φ	Rated slip, %	Min. well diameter, in.	Cooling liquid speed min, in./s	Cranking torque, lbf.ft	Stator winding insulation resistance at t=(239+59)°F, MOhm
1	2	3	4	5	6	7	8	9	10	11
Single-section electric motors										
ED(K)(T)(T1)12-117M	12	380	26	84,0	0,85	5,0	4,87	1,969	1,447	100
ED(K)(T)(T1)16-117M	16	750	18	84,0	0,85	5,0	4,87	1,969	1,447	100
ED(K)(T)(T1)22-117M	22	750	24	84,5	0,85	5,0	4,87	1,969	2,532	100
ED(K)(T)(T1)28-117M	28	900	26	84,5	0,84	5,0	4,87	3,15	2,893	100
ED(K)(T)(T1)32-117M	32	1000	26	85,0	0,86	5,0	4,87	3,15	3,255	100
ED(K)(T)(T1) 32-117M1	32	940	28,5	85,5	0,86	5,2	4,87	3,15	2,532	100
ED(K)(T)(T1)40-117M	40	1200	27	84,5	0,85	5,0	4,87	3,15	3,617	100
ED(K)(T)(T1)45-117M	45	1400	26	85,0	0,86	5,0	4,87	3,15	4,34	100
ED(K)(T)(T1)45-117M1	45	1280	29	85,5	0,86	5,2	4,87	4,724	4,34	100
ED(K)(T)(T1)50-117M	50	1400	28	84,5	0,86	5,2	4,87	4,724	4,34	100
ED(K)(T)(T1)56-117M	56	1400	32	84,5	0,86	5,2	4,87	4,724	5,063	100
ED(K)(T)(T1)63-117M	63	2000	25	5,0	0,85	5,2	4,87	11,81	5,786	100
ED(K)(T)(T1)63-117M1	63	1850	25	85,5	0,86	5,2	4,87	11,81	4,34	100
ED(K)(T)(T1)70-117M	70	2050	28	84,5	0,86	5,2	4,87	11,81	5,786	100
ED(K)(T)(T1)80-117M4	80	2000	35	85,0	0,83	6,2	4,87	11,81	5,786	100
ED(K)(T)(T1)90-117M4	90	2000	37	84,0	0,84	6,2	4,87	11,81	6,51	100
ED(K)(T)(T1)100-117M4	100	2150	38	84,0	0,85	6,2	4,87	11,81	6,51	100
ED(K)(T)(T1)110-117M4	110	2100	44	84,0	0,85	6,2	4,87	11,81	6,51	100
ED(K)(T)(T1)125-117M	125	2300	44	84,5	0,86	5,2	4,87	23,62	7,233	100
ED(K)(T)(T1)140-117M9	140	2350	49,0	84,5	0,86	5,2	4,87	23,62	7,233	100
Two-section electric motors										
EDS(T)(T1)80-117M	80	2000	34	84,5	0,83	5,2	5,118	11,81	7,233	50
EDS(T)(T1)90-117M	90	2000	40	85	0,83	5,2	5,118	11,81	8,68	50
EDS(T)(T1)100-117M	100	2000	41	85	0,85	5,2	5,118	11,81	9,403	50
EDS(T)(T1)125-117M	125	2000	51,5	85	0,85	5,2	5,118	11,81	11,57	50
EDS(T)(T1)140-117M	140	2000	56	84,5	0,85	5,2	5,118	19,69	13,02	50
EDS(T)(T1)160-117M4	160	2100	65	84	0,85	5,8	5,118	19,69	10,13	50
EDS(T)(T1)160-117M	160	2300	58	84	0,85	5,2	5,118	19,69	10,13	50
EDS(T)(T1)180-117M4	180	2400	63	84	0,85	5,2	5,118	19,69	13,02	50
EDS(T)(T1)200-117M	200	2500	65,5	84,5	0,86	5,2	5,118	19,69	13,02	50
EDS(T)(T1)220-117M	220	2700	67,5	84	0,84	5,5	5,118	19,69	13,02	50
EDS(T)(T1)250-117M4	250	3000	70	83	0,84	6,9	5,118	19,69	13,02	50
Three-section electric motors										
EDS(T)(T1)300-117M4	300	2880	90	83	0,83	5,8	5,118	43,31	17,36	50
EDS(T)(T1)350-117M4	350	3750	79	82,5	0,85	6,0	5,118	43,31	17,36	50

Parameters of electric motors of size 117 with increased supply voltage:

Motor type	Nominal power, kW	Nominal voltage, V	Nominal current, A	Efficiency, %	cos φ	Rated slip, %	Min. well diameter in.	Cooling liquid speed min, in./s	Cranking torque, lbf.ft	Stator winding insulation resistance at t=(239+59)°F, MOhm
1	2	3	4	5	6	7	8	9	10	11
Single-section electric motors										
ED22-117MP	22	2000	9,5	84,5	0,85	5,0	4,87	1,969	2,532	100
ED28-117MP	28	2100	12	84,0	0,86	5,0	4,87	3,15	2,893	100
ED28-117M5P	28	1920	13	84,5	0,86	5,2	4,87	5,118	2,893	100
ED32-117MP	32	1950	13,5	85,0	0,86	5,0	4,87	0,0	3,255	100
ED32-117M5P	32	2050	13,5	84,5	0,86	5,2	4,87	5,118	3,255	100
ED45-117MP	45	2350	17	84,5	0,86	5,2	4,87	4,724	4,34	100
ED45-117M5P	45	2250	17	84,5	0,86	5,2	4,87	4,724	4,34	100
ED56-17MP	56	2800	17	85,0	0,86	5,2	4,87	4,724	5,063	100
ED56-117M5P	56	2780	16,5	84,5	0,86	5,2	4,87	7,087	3,617	100
ED63-117MP	63	2750	19	85,0	0,86	5,2	4,87	4,724	5,786	100
ED63-117M5P	63	3200	17	84,5	0,86	5,2	4,87	13,78	7,233	100
ED70-117MP	70	2950	19	85,0	0,8	5,2	4,87	11,81	6,51	100
ED70-117M5P	70	2750	21,5	84,5	0,86	5,2	4,87	13,78	6,51	100
ED80-117MP	80	3100	21	85,0	0,83	5,8	4,87	11,81	5,786	100
ED80-117M5P	80	2870	24	84,5	0,86	5,2	4,87	13,78	5,786	100
ED90-117MP	90	2850	26	83,5	0,83	5,5	4,87	11,81	6,51	100
ED90-117M5P	90	3100	25	84,5	0,86	5,2	4,87	13,78	7,233	100
ED100-117MP	100	2700	31,0	84,5	0,86	5,2	4,87	11,81	6,51	100
ED110-117MP	110	2750	34,0	84,5	0,86	5,2	4,87	11,81	6,51	100

ED X X X XXX - XXX M X E P V5 with PX92XXX

1 2 3 4 5 6 7 8 9 10 11 12

<p>1 Submersible motor</p> <p>2 absence of a letter – single-section version S – Sectional version</p> <p>3 Resistance to the surrounding corrosive environment: no letter – basic version, standard K – corrosion-resistant;</p> <p>4 Heat resistance: no letter – basic version – for working in reservoir fluid with temperatures up to 194°F; T – heat-resistant – for reservoir fluid with temperatures up to 248°F; T1 – high heat-resistant – for reservoir fluid with temperatures up to 302°F (up to 338°F at special request).</p>	<p>5 Power, kW</p> <p>6 Case diameter, in.</p> <p>7 Version code</p> <p>8 Version number (may be missing)</p> <p>9 Shaft splines: E – involute, no letter – straight-sided</p> <p>10 P – motors with increased supply voltage</p> <p>11 Climatic version and placement category according to GOST 15150</p> <p>12 Protector type</p>
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Submersible AC electric motors

Purpose:

Submersible AC electric motors with a size of 4.61 in are used as a motor for cavity pumps at a rotation speed of up to 1500 rpm and centrifugal pumps at a rotation speed of up to 4200 rpm. Rotation speed control ranges from 500 to 4200 rpm.

AC electric motors represent a new generation of energy-efficient equipment. They are produced in three-phase, oil-filled, and single-section versions. The poles on the rotor are formed by permanent magnets made from alloys of rare earth elements.

Application:

Used as part of an oil production unit and is a pump drive.

Work principle:

The work principle of an AC motor is based on a clear positioning of permanent magnets on the rotor in relation to the formed peak of the electromagnetic pulse on phase electrical windings. When the magnets move, the sensors receive information about their position and change the capacity of the reactive valve converters, which allows the shaft to rotate further.

Package contents:

- Electric motor – 1 pc.
- Set of spare parts and tools for installation – by agreement
- Equipment certificate – 1 pc.
- Manual (AR 3174.000 RE) – by agreement

At customer's request, motors can be equipped with a telemetry system for submersible electric motors, which allows you to obtain real-time data on the operation and the well conditions in the motor mounting area and to promptly shut down the unit in case of overstress. Transmission of signals from the submersible unit of the telemetry system to the control station is carried out via a power cable of the electric motor.

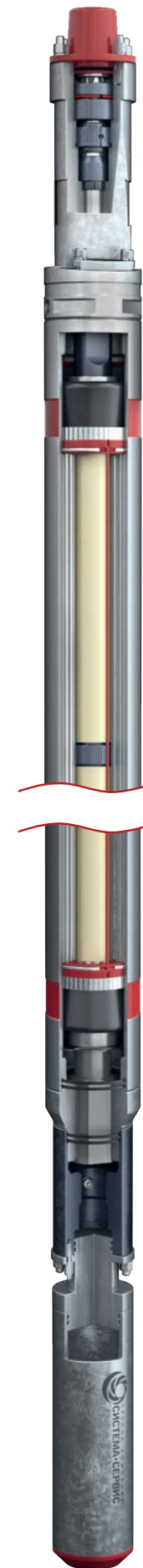
Advantages:

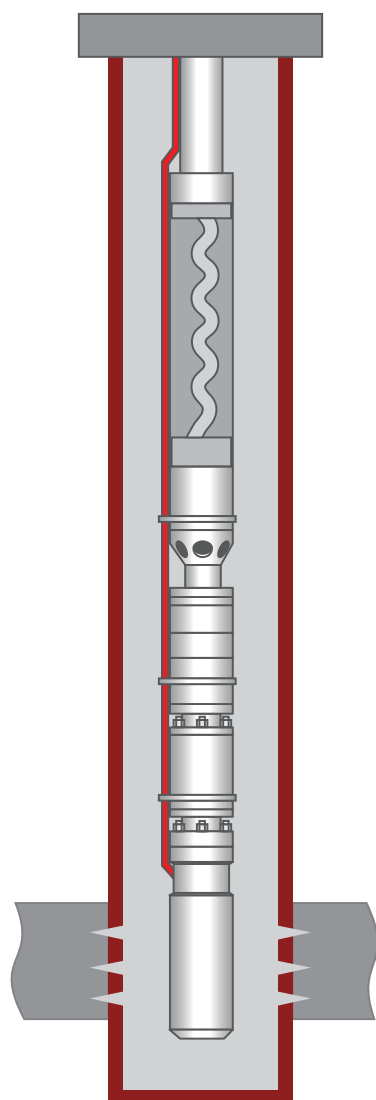
AC electric motors, compared to asynchronous motors:

- High efficiency and power factor,
- Overall length and weight less by 40% with the same power,
- Reduced heat generation,
- Because of reduced current – less power loss in the cable line, control unit, and three-phase transformer,
- Because of shorter length, the centrifugal electric pump can be operated in highly deviated and horizontal wells,
- Adjustable RPM range at constant torque,
- Significantly increased power in the single-section version,
- Reduced power consumption.

Technical specifications of the VED40-117-3.0 motor:

Nominal power, kW		Nominal voltage, V		Nominal current, A	Energy efficiency class	Efficiency, %	Cooling liquid speed min, in./s	Installed length, ft
150 Hz 3000 rpm	180 Hz 3600 rpm	150 Hz 3000 rpm	180 Hz 3600 rpm					
40	48	950	1140	21	e3	92,5	3.15	6 864





Submersible low-speed motor EDSS (System-Service electric motor) for operation of progressive cavity pumps

Purpose:

Designed for long-term 50 Hz AC line operation, as well as work with control stations with frequency converters in the range from 20 Hz to 80 Hz as a motor for submersible progressive cavity pumps for pumping reservoir fluid from oil wells.

Application:

Used as part of an oil production unit and is a pump motor. The greatest effect is achieved when used as part of installations:

- In low-rate and medium-rate well production;
- In complicated wells with high-viscosity oil and water-oil emulsion, contamination, etc.
- In wells with limitations for rod pumps due to well curvature and landing depth;
- In wells with no possibility of arranging the foundation for the sucker-rod pumping unit.

Work principle:

In the stator winding, when it is connected to a three-phase current, a rotating magnetic field arises, which crosses the rotor rods and induces an electromotive force in them. Since the rotor rods are closed, a current will appear in them under the action of this force. This current, interacting with the magnetic field, creates a torque, under the influence of which the rotor will begin to rotate. The direction of rotation will coincide with the direction of rotation of the stator field, however, in terms of rotation speed, the rotor will slightly lag behind the stator field, therefore these motors are called asynchronous. Thus, the electrical energy supplied to the stator winding from the network is converted into mechanical energy of rotation of the motor shaft.

Package contents:

- Electric motor – 1 piece.
- Set of spare parts and tools for installation – by agreement
- Equipment certificate – 1 pc.
- Operation manual (AR 3174.000 RE) – by agreement

At customer's request, motors can be equipped with a telemetry system for submersible electric motors, which allows you to obtain real-time data on the operation and the well conditions in the motor mounting area and to promptly shut down the unit in case of overstress. Transmission of signals from the submersible unit of the telemetry system to the control station is carried out via a power cable of the electric motor.

Purpose:

- Optimum frequency – from 50 to 480 rpm;
- Use of a standard control station for asynchronous motors;
- High adaptability of the installation to the well flow rate (accuracy in up to 0.43 rpm increments);
- Possibility of using progressive cavity pumps designed for top drive.

Technical specifications of low-speed electric motors when working via a control system with variable speed drive:

Motor type	Indicators at supply frequency of 50 Hz					Efficiency, %	Speed range, rpm	Length, ft
	M lbf.ft	P, kW	n, rpm	Un V	In A			
4EDSS130-117/300	95.88	4	300	260	24	62	65-500	10.43
4EDSS210-117/300	154.9	6,5	300	400	24	62	65-500	14.27
4EDSS280-117/300	206.5	9	300	560	24	62	65-500	17.96
4EDSS350-117/300	258.1	11	300	680	24	62	65-500	20.71
4EDSS460-117/300	339.3	14,5	300	880	24	62	65-500	25.27
4EDSS130-117/214	95.88	3	214	260	24	62	50-500	10.43
4EDSS210-117/214	154.9	5	214	400	24	62	50-500	14.27
4EDSS280-117/214	206.5	6,5	214	560	24	62	50-500	17.96
E4EDSS350-117/214	258.1	8	214	680	24	62	50-500	20.71
4EDSS460-117/214	339.3	10,5	214	880	24	62	50-500	25.27

M – torque rating; P – power; n – rotation speed; Un – nominal voltage; In – nominal current.

Parametric series for selection of EDSS for progressive cavity pumps:

Pump head, ft	Nominal productivity of pump at 100 rpm, barrel/day								
	10.06	25.16	44.03	62.9	88.06	100.6	125.8	157.2	201.3
	Performance control range when working with EDSS, barrel/day								
	5.032-50.32	12.58-125.8	22.01-220.1	31.45-314.5	44.03-440.3	50.32-503.2	62.9-629	78.62-786.2	100.6-1 006
9 843		○	○						
7 874	○	○	○	○					
7 218	○	○	○	○					
6 562	○	○	○	○	○				
5 906	○	○	○	○	○	○			
5 249	○	○	○	○	○	○			
4 593	○	○	○	○	○	○	○		
3 937	○	○	○	○	○	○	○	○	
3 281	○	○	○	○	○	○	○	○	○
2 133	○	○	○	○	○	○	○	○	○

Pump input torque, lbf.ft	up to 95.88	up to 154.9	up to 206.5	up to 258.1	up to 339.3
	○	○	○	EDSS460-	117/300(214)
	○	○	EDSS350-	117/300(214)	○
	○	EDSS280	-117/300(214)	○	○
Electric motor type*	EDSS210	-117/300(214)	○	○	○
	EDSS130-117/300				

EDSS210-117/300: EDSS – System-Service electric motor (three-phase, synchronous oil-filled);
 154.9 – torque rating, lbf.ft;
 4.606 – case diameter, in.;
 300 – nominal rotation speed, rpm at frequency supply of 50Hz.

Protectors

Purpose:

Protectors are designed to prevent formation fluid from entering the cavity of a submersible oil-filled electric motor, compensation for oil leakage and thermal changes during motor operation and stops. The protector is installed between the input module (or gas separator) and the submersible electric motor.

Application:

Designed to work in formation fluid (mixture of oil, production water, and associated gas), which has the following parameters:

- ambient temperature, max:
 - standard version – 248°F,
 - heat-resistant version – 302°F,
 - high-temperature-resistant version – 338°F
- contamination level of the pumped fluid
(with a maximum relative particle hardness of 7 on the Mohs scale), max – 0.4994 oz/ft³
- hydrogen sulfide content, max
 - standard version – 0.009988 oz/ft³
 - for corrosion-resistant version – 1.249 oz/ft³
- free gas (by volume), %, max – 54.937 oz/ft³
- hydrostatic pressure in the protection zone, max – 5.802 ksi

Work principle:

Protectors are used to transmit torque from the electric motor to the pump, protect the submersible oil-filled electric motor from the penetration of formation fluid into its internal cavity, compensate for oil leakage and thermal changes in its volume during operation of the electric motor and its stops, the reception of axial force from the pump.

Package contents:

- Protector – 1 pc.
- Set of spare parts and tools for installation – by agreement
- Equipment certificate – 1 pc.
- Manual (AR 3174.000 RE) – by agreement

Features:

- Can be made as a monoblock;
- Can be made corrosion-resistant (K);
- Can be made heat-resistant (T) and highly-heat-resistant (T1), operational at reservoir fluid temperatures up to 302°F and 338°F, respectively;
- Used in protectors of mechanical seals of leading Russian and foreign manufacturers;
- Equipping with bypass check valves that provide bleeding of excess internal pressure and removal of the free gas phase from the oil cavity of the SEM during the operation of the ESP in the well;
- Shafts from stainless steel to increase corrosion resistance or from "Alloy" monel alloy (at customer's request)

Advantages:

- Simple design;
- Interchangeable thrust bearings from 1763.7 lb to 2645.5 lb;
- Three degrees of protection with a small length of equipment;



Technical specifications:

Name	Power transmitted, kW	Case diameter, in.	Installation length, ft	Power consumed, kW			Thrust capacity, lb	Weight, lb
				without axial loads	at maximum axial load	Volume of oil, gal		
P(K,T)92-LD(E)	250	3.622	6.135	0,4	0,4	1.453	220.5	125.7
P(K,T)92M-LD(E)	250	3.622	6.148	0,4	0,9	1.453	1764-2 646	125.7
P(K,T)92M(E)	250	3.622	7.218	0,4	0,4	1.717	220.5	127.9
P(K,T)92(E)	250	3.622	8.048	0,5	1,2	1.849	2 646	149.9

P X x X X - X X X
1 2 3 4 5 6 7 8

- | | |
|--|---|
| <p>1 Protector</p> <p>2 Resistance to the corrosive environment:
No letter – standard version;
K – corrosion-resistant</p> <p>3 Heat resistance:
• no letter – standard version – for formation fluid temperature up to 248°F
• T – heat-resistant – for formation fluid temperature up to 302°F;
• For formation fluid temperatures up to 338°F at special request.</p> <p>4 Case diameter, in.</p> | <p>5 Version number</p> <p>6 L – labyrinth in the design</p> <p>7 D – rubber diaphragm is used as a phase separator.</p> <p>8 Shaft spline design:
E – involute, no letter – straight-sided.
Example designation for a corrosion-resistant protector with a case diameter of 3.622 in., heat-resistant, modified when ordered and in documents, with a labyrinth and a rubber diaphragm, with involute shaft splines:
PKT92M-LD Spec. TU 3381-014-87867182-2009</p> |
|--|---|



Gas separators

Purpose:

Designed to reduce the volumetric content of free gas in the formation fluid pumped out by ESP units to an acceptable value.

Application:

Installed instead of the pump inlet module, or after the inlet module when the gas separator is designed without a suction strainer and performs the function of separating most of the free gas from the gas-liquid mixture and directing it to the annulus.

Work principle:

The amount of free gas at the inlet to the pump is often more than 25%, which can lead to its failure. In this case, some kind of gas stabilizing device is used.

Package contents:

- Gas separator – 1 pc.
- Set of spare parts and tools for installation – by agreement
- Equipment certificate – 1 pc.
- Operation manual (AR 3174.000 RE) – by agreement

Features:

Gas separation in devices of this type is carried out by the vortex rotation of air in the chamber. Due to centrifugal forces, foreign particles stick to the traps and are removed from the working chamber.

Advantages:

The gas separator ensures operation of the pump with a free gas content in the reservoir fluid up to 75%, while products from other manufacturers only ensure operation of the pump with a free gas content in the reservoir fluid up to 70%.

Reservoir fluid parameters:

Indicator parameter	Value
Temperature of pumped liquid, °F	Up to 338
Hydrogen index, pH	6.0-8.5
Concentration of solid particles in reservoir fluid, oz/ft ³	0,9988
Microhardness of particles on the Mohs scale, max	7
Maximum concentration of hydrogen sulfide, oz/ft ³	1,248
Maximum content of produced water, %	99
Maximum liquid density, lb/ft ³	87.4
Maximum kinematic viscosity of a single-phase fluid, which ensures the operation of the gas separator (dispenser) without changing the pressure and efficiency, Stoke	0.01

Technical specifications:

Product designation	Design document	Injection range, barrel / day	Head, ft	Power consumed, kW.	Efficiency, %	Gas separation coefficient	Length, in.	Weight, lb
1	2	3	4	5	6	7	8	9
Single section electric motors								
GSVRN5-200E	AR.GS.49.00.000	157.2-1,258	14,57	0,54	6,94	0,7	27,48	42,44
GSVRN5-200	AR.GS.49.00.000-01	157.2-1,258	14,57	0,54	6,94	0,7	27,48	42,44
GSVRN5-200E-5A	AR.GS.49.00.000-02	157.2-1,258	14,57	0,54	6,94	0,7	27,48	42,44
GSVRN5-200-5A	AR.GS.49.00.000-03	157.2-1,258	14,57	0,54	6,94	0,7	27,48	42,44

2- GS(V)R (O,N) K X- X X E -X -X
1 2 3 4 5 6 7 8 9 10

- | | |
|--|---|
| <p>1 Doubled version consists of products that have two tubular cases connected through an intermediate case (if no code, the product is in one case);</p> <p>2 Gas separator manufactured by LLC RINPO V – vortex (with the standard design of the gas separator, the letter "V" is not put);</p> <p>3 As part of a gas separator-dispersant:
O – shaft axial bearing unit (if no shaft axial bearing, the letter "O" is not put);
N – base with inlet holes (if no inlet holes in the base, it is necessary to use a gas separator with an inlet module);</p> <p>4 Resistance of the case to a corrosive environment:
K – corrosion-resistant (with the standard design of the module, the letter "K" is not put);</p> | <p>5 Overall group 5, 5A, or 6;</p> <p>6 Maximum rated capacity of the joined pump, barrel/day;</p> <p>7 Labelling of the modernised gas separators (designation "M" and the serial number of the gas separator version);</p> <p>8 Involute intersectional connection of shafts (with a straight-sided splined connection, the letter "E" is not put);</p> <p>9 No letter – head for joining pump of size 5
5A – head for joining pump of size 5A</p> <p>10 Shaft material:
No letter – 05X16N4D2B or analogue
"M" – "Monel," "Alloy," or another alloy</p> |
|--|---|

Horizontal pumping units

Manufacture, repair, testing, and maintenance of HPU

Purpose:

Designed for injection of fresh, reservoir, and waste water into oil reservoirs in order to maintain reservoir pressure.

Application:

Capital and module cluster pumping stations of reservoir pressure maintenance systems in oil fields.

Work principle:

HPU is a power machine which converts mechanical energy into hydraulic energy of the pumped liquid. The injection unit is attached to the flange of the suction chamber, through which the liquid is pumped.

Construction:

Electric motor – to create torque; serves as a pump motor.

Intensifier – to increase the pump shaft speed and distribute torque between the pump sections when they work simultaneously.

Thrust chamber – for axial relief of the pumping unit from the pressure of the pumped liquid.

ESP centrifugal pump – a power machine which converts mechanical energy into hydraulic energy of the pumped liquid. The injection unit is attached to the flange of the thrust chamber, through which the liquid is pumped.

Advantages:

Cooling system – prevents heating and premature wear of bearing joints of the thrust chamber and intensifier.

Frame – made as a base on which there are places for attaching the components of the HPU and the protective-enclosing casings of the collars.

Requirements for the composition of the pumped liquid:

- Mineralisation – no more than 249.7 oz/ft³;
- Hydrogen index – 5.4–7.5 pH;
- Content of dissolved gases:
H₂S – no more than 0.2697 oz/ft³;
CO₂ – no more than 0.2997 oz/ft³;
Oil – no more than 0.1998 oz/ft³;
- Weight concentration of solids – up to 0.04994 oz/ft³ with a size up to 7 874 μm;
- Water density – from 0.9988 to 1.179 oz/ft³ with temperature from +41°F to +176°F.

HPU versions:

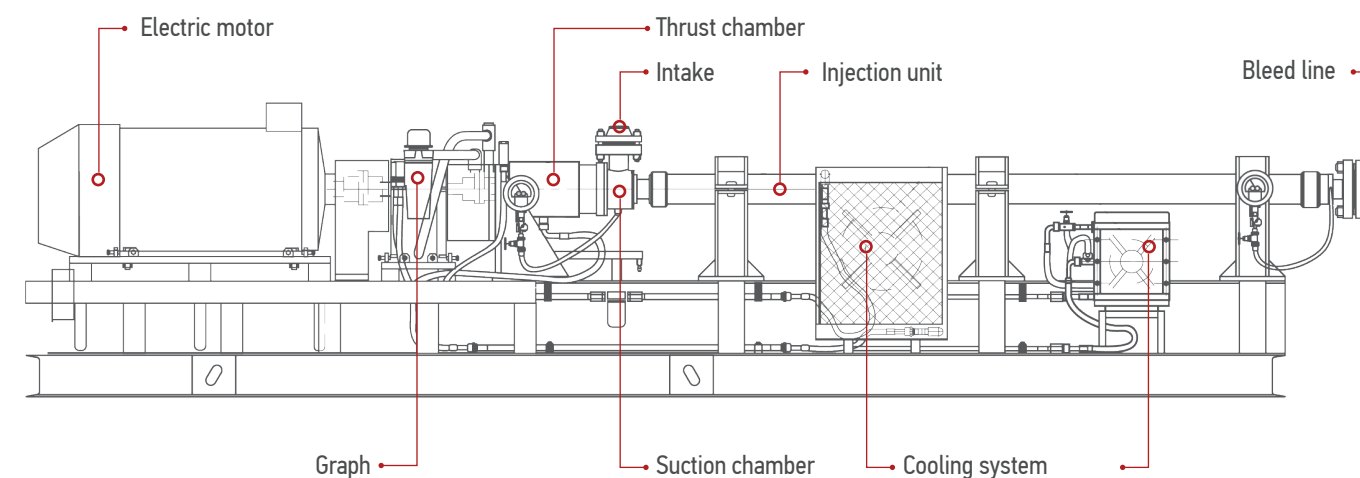
Due to the lack of intensifiers supply, only single-section versions without an intensifier in the table are highlighted in red color.

Horizontal pumping units (HPU) to provide the necessary required characteristics are made in several versions, each of which has different typical designs, differing in the number of stages in the section and the number of sections in the system.

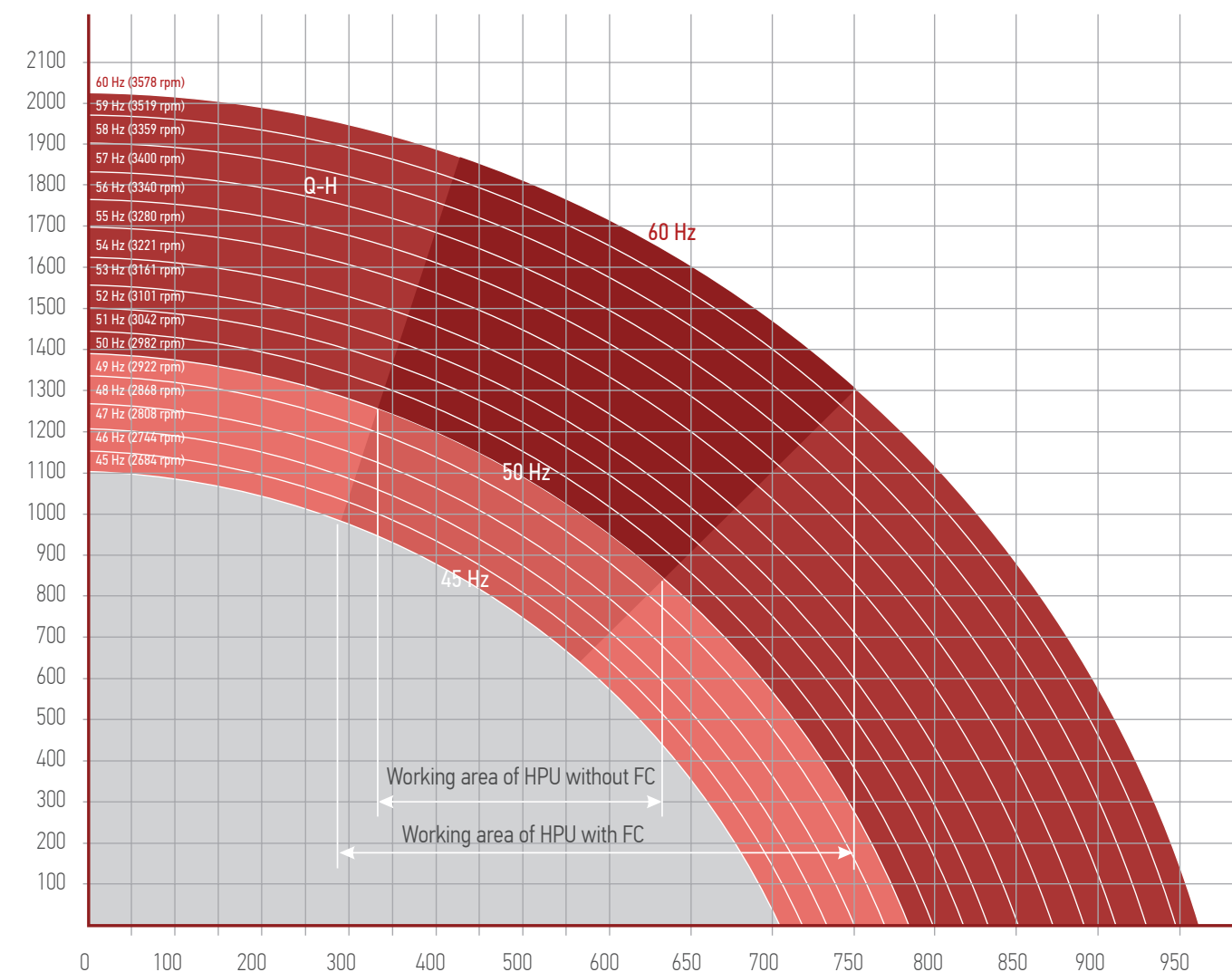
HPU types:

- Single-section with a frequency converter (hereinafter referred to as the "FC," which serves to expand the range of modes of operation and regulation of pressure-flow characteristics of HPU).
- The use of the frequency converter:**
- Allows to regulate pressure-flow characteristics (due to frequency correction);
 - Ensures smooth start and stop of the pumping unit;
 - Protects the electric motor from current overloads;
 - Allows to eliminate the possibility of sharp mechanical impact shock on the shaft and thrust chamber of the pump;
 - Mitigates the shortcomings of the mains power supply of process units;
 - Reduces energy costs by ensuring the operation of pumping units in the zone of maximum efficiency (due to the fact that the system itself selects the required speed of the electric motor of the pumping unit to provide a given outlet pressure).

Standard component layout of a horizontal pumping unit (HPU)



Graph



Technical specifications:

HPU type	Pressure, ksi at $p=68.67$ lb/ft ³	Qnom – H., at $p=62.43$ lb/ft ³	Performance, barrel/day min-max	Pressure head, in. min-max	NDV., kW/motor type	Overall dimensions: LxWxH, in.	Weight (design), lb
Single-section							
350-800	1.213	350-760	1 352-2 705	21.260-34.961	75/5AM250S	186.614x39.370x51.181	4850
350-1000	1.42	350-890	1 352-2 705	24.803-40.945	75/5AM250S	200.787x39.370x51.181	4960
350-1150	1.627	350-1020	1 352-2 705	28.346-46.850	90/5AM250M	220.472x39.370x51.181	5071
350-1400	2.026	350-1270	1 359-2 711	35.433-58.268	110/5AM280S	265.157x39.370	3144
350-1600	2.265	350-1420	1 359-2 711	39.764-65.748	110/5AM280S	273.622x39.370x51.181	6393
500-800	1.181	500-740	2 032-3 887	20.472-35.827	75/5AM250S	222.362x39.370x53.898	5952
500-100	1.508	500-945	2 032-3 893	25.591-45.669	110/5AM280S	257.480x39.370x51.181	6173
500-1100	1.668	500-1045	2 032-3 893	28.346-50.000	110/5AM280S	273.622x39.370x51.181	6173
Single-section with intensifier							
500-1300	1.891	500-1185	1 849-3 698	34.252-56.299	132/5AM280M	206.890x42.126x56.142	6724
500-1500	2.17	500-1360	1 849-3 692	39.764-64.961	160/5AM315S	222.047x42.126x53.937	6944
500-1600	2.313	500-1450	1 849-3 692	42.126-69.291	160/5AM315S	226.260x42.126x56.142	7165
500-1800	2.673	500-1675	1 874-3 749	47.638-78.740	200/5AM315MA	220.472x42.126x53.937	7275
500-2000	2.928	500-1835	1 849-3 692	53.150-87.402	200/5AM315MA	254.961x42.126x51.181	6834
750-800	1.213	750-760	2 774-5 315	23.622-41.535	132/5AM280M	204.567x42.126x51.181	6724
750-1100	1.675	750-1050	2 774-5 315	32.283-57.874	200/5AM315MA	237.795x42.126x53.937	7055
750-1350	2.042	750-1280	2 812-5 384	38.976-68.898	200/5AM315MA	254.961x42.126x57.913	7275
750-1500	2.25	750-1410	2 774-5 315	43.701-77.165	250/5AM315MV2	273.228x42.126x53.937	9149
Two-section with intensifier							
1000-800	1.165	1000-730	3 692-7 384	21.260-34.646	160/5AM315S	182.520x42.126x60.079	10119
1000-1000	1.516	1000-950	3 749-7 497	28.346-44.488	200/5AM315MA	188.780x42.126x61.693	10340
1000-1100	1.617	1000-1050	3 755-7 510	29.921-49.213	250/5AM315MV2	197.795x42.126x61.693	9921
1000-1300	1.899	1000-1190	3 698-7 397	34.252-56.299	315/AN355A	214.764x42.126x63.819	11133
1000-1500	2.281	1000-1430	3 755-7 510	40.945-67.126	315/AN355A	226.772x42.126x61.693	12015
1000-1620	2.377	1000-1490	3 805-7 617	42.126-68.898	315/AN355A	226.772x42.126x61.693	12015
1000-1800	2.68	1000-1680	3 755-7 510	48.031-78.740	400/AZO-450LB	248.819x42.126x61.693	11795
1500-800	1.213	1500-760	5 548-10 623	23.622-41.732	250/5AM315MV2	212.441x42.126x61.850	11354
1500-1100	1.668	1500-1045	5 548-10 623	32.283-57.480	400/AZO-450LB	246.811x42.126x68.937	11795
1500-1300	1.978	1500-1240	5 711-10 938	36.614-64.961	400/AZO-450LB	254.094x42.126x68.150	13558
1500-1500	2.242	1500-1405	5 548-10 623	43.701-77.559	500/AZO-560-500	305.984x42.126x68.150	17196
1500-1650	2.489	1500-1560	5 711-10 938	46.457-81.890	500/AZO-560-500	305.984x42.126x68.150	17196
1500-1750	2.608	1500-1635	5 629-10 787	48.819-87.402	500/AZO-560-500	300.000x42.126x61.693	17086

HPU are designed for specific gravity $p = 0.6358$ oz/in³, intake pressure from 0.07252 to 0.5802 ksi.

Modular cluster pumping stations



We offer a full range of works on manufacture of modular cluster pumping stations (MCPS): starting with the development of technical specifications and design documentation and finishing with commissioning works at Customer's site. Ready-made facility for the RPM system, which does not require capital construction and is a complete factory-made product equipped with process instruments, heating systems, ventilation, lighting

Purpose:

MCPS for water supply with the required parameters.

Application:

Used for pumping fresh and formation water and for supplying injection wells into the reservoir pressure maintenance system

Work principle:

The modular building is delivered and assembled on site by customer's contractor.

Design:

The MCPS building is a modular structure made of several separate container blocks, which are supplied complete with equipment inside. The walls of the block-container are sandwich panels with insulation made of non-combustible material. The building is equipped with artificial lighting, a telpher, automatic heating and ventilation systems interlocked with a

gas analyser, an automatic powder fire extinguishing system.

The modular building consists of:

1. BN1 (Pumping block): HPU; Piping.
2. BA (Apparatus block) - control cabinet; high-frequency variable speed drive

MCPS consists of two compartments: processing and apparatus.

- The processing compartment contains HPUs mounted on the rigid frame base of the container block and fitted with supply and pressure pipelines. The fittings of the supply pipeline consist of gate valve, flowmeter, transitions, laterals, flanges, and coarse and fine filters. The fittings of the injection pipeline include the check and gate valve (motor operated valve).
- The apparatus compartment contains the control stations with a frequency converter, or with a smooth starter.

Advantages:

- Possibility of reinstallation to other sites;
- Wide range of head and rate specifications;
- Maximum degree of compliance with individual requirements of the Customer and the applicable regulatory and technical documents;
- High level of reliability and maintainability.

Start-up and adjustment works:

- Hydraulic piping of MCPS;
- Electrical fitting of MCPS;
- Adjustment of control station;
- Adjustment of instrumentation and controls of MCPS;
- Start of HPU, process stabilization and control over the operation of HPU;

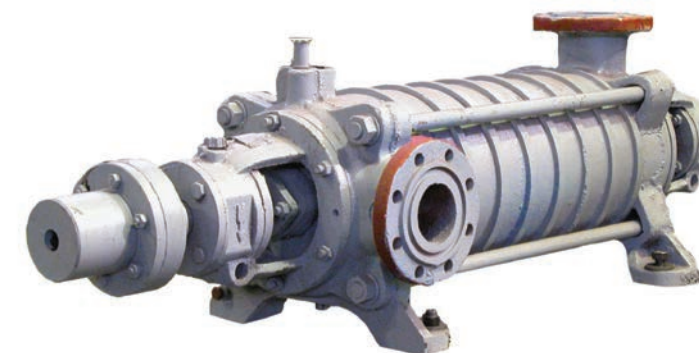
- Warranty maintenance of equipment;
- Training of personnel and consulting of specialty crewmen on equipment operation.

Technical specifications:

Technical specifications are selected as per customer's specific technical requirements



Repair of sectional centrifugal pumps

**Purpose:**

Sectional centrifugal pumps are designed for pumping out neutral water with a mechanical impurity content of not more than 0.1% by weight with a solid particle size of not more than 0.004 in.

Application:

cluster pumping stations (CPS) and modular cluster pumping stations (MCPS) of the reservoir pressure maintenance system of oil fields.

Work principle:

The work of the system is based on the principle of interaction between the blades of the disk, which rotates and pumps fluid. The rotating disk pushes the fluid towards the outlet.

The cavity is filled with fluid again. It enters the installation and suction pipes under pressure. After the liquid leaves the unit, it passes through the channels and gets under pressure on the wheels. After that, water enters the injection pipeline. The rotation of the rotor is carried out by an electric motor.

Services:

- Polymer coating of impellers and guiding devices;
- Manufacturing of all component parts and units of pumps;
- Hardening of parts of pump by gas-flame spray coating;
- Running-in of the pumps after a complete overhaul at the bench.

Technical specifications:

Pump version	Delivery, gal/h	Pressure head, ft	Rotation speed, rpm
SCP40	251.6	10 764, 15 069, 19 373, 20 453	3000
SCP63	396.3		
SCP80	503.2		
SCP180	1 132	10 226, 11 302, 12 756, 15 305, 20	

Control stations for ESP



Purpose:

Designed to control and protect submersible electric centrifugal pumps based on the RUMB microprocessor controller and a developed user interface.

Application:

Protection and control over parameters of work of pumping installations of submersible electric centrifugal pumps.

Work principle:

The controller measures, calculates, and saves parameters in memory and gives a signal to start the power section. If the set limits are exceeded, the controller stops the installation.

Состав:

- | | | |
|---------------|------------------|-------------------|
| 1. Cabinet | 1. Power section | 1. Other optional |
| 2. Controller | 1. Modem | parts |

Advantages:

- Own system for monitoring the operation of the control system;
- Support of mass meters
- Support of TMC, flow meters, etc. via a digital communication channel.

Technical specifications:

Parameter name	Parameter value		
	Direct start	Soft start	With frequency control
Mains voltage, V	380 +15%; -15%	380 +15%; -15%	380 +15%; -15%
Number of phases	3	3	3
Power supply frequency, Hz	50±1	50±1	50±1
Output voltage, V	380	0..380±2%	0..380±2%
Output frequency, Hz	50	50	1...70
Versions by rated output current, A	250; 400	100; 160; 250; 400; 630; 800; 1000	100; 160; 250; 400; 630; 800; 1000; 1200; 1400; 1600
Overload current in 60 s	–	–	120%
Efficiency, %	–	at least 98	at least 95
Phase-wise voltage measuring range, V	0 - 500	0 - 500	0 - 500
Voltage measurement error, %	no more than 5	no more than 5	no more than 5
Insulation resistance measuring range for the SPOT – power cable – SEM system, MOhm	0 - 10	0 - 10	0 - 10
Insulation resistance measurement error, %			
In the range from 0 to 0.5 MOhm	no more than 2.5	no more than 2.5	no more than 2.5
In the range from 0.5 MOhm to 10 MOhm	no more than 10	no more than 10	no more than 10
Case protection class	IP43 (or IP54)	IP43 (or IP54)	IP43 (or IP54)
Operating temperature, °F	-76..+ 122	-76..+ 122	-76..+ 122

Provides:

- Automatic and manual control of a submersible electric motor. The operator manually controls the station right from the remote controller. The automatic mode provides the option of the control station autoreclosing after a tripping event, if the protection is compatible with automatic recloser, and a timer mode (a set time program).
- Control and protection of SEM. The control station provides control over the mains voltage and the electric motor current, the insulation resistance of the SPOT – power cable – SEM system, and ensures motor cut-off in the case of intolerable changes in these parameters.

Functionality:

- ESP protection in case of emergency;
- Recording and storage of the operation history in non-volatile memory;
- Discontinuous operation with set periods of operation and idle time;
- Discontinuous operation with set absolute switch on/switch off time;
- Discontinuous operation based on the data from the TMS pressure sensor at the pump intake;
- Technical recording and display of the electricity consumed (for the current and past day, month, year)
- Based on instantaneous actual power or the sensor data;
- Recording of the volume of fluid pumped (for the current and past day, month, year);
- Differentiation of the staff access level using proximity access identifiers;
- Update of the microprocessors software in the field using RUMB UPI-06 data transfer device;
- Remote monitoring, control and configuration using Rumb 9 software tools.

Additional sensors connected:

- Deep thermal manometric systems from different manufacturers;
- Analogue or digital annulus pressure sensor;
- Analogue or digital buffer pressure sensor;
- Analogue or digital oil gathering pipeline pressure sensor;
- Stationary echosounder;
- Two pulse inputs for the fluid meter;
- Digital input to connect flow meters of different manufacturers;
- One - or two pin pressure gauge.

Types of control station configurations:

- Direct start;
- Soft start (smooth soft start);
- With frequency control.

Additional functions of the station with frequency control:

- Manual motor supply frequency control;
- Smooth SEM acceleration/deceleration;
- Rotation direction reversal;
- Wedging;
- Shaking to reduce deposits on pump surfaces;
- Automatic maintenance of parameters (dynamic level; flow rate, operating current) using the built-in PID controller.

Controlled parameters:

- Total power consumption;
- Active power component;
- Phase total current of the SPOT secondary circuit
- Active phase total current components of the SPOT secondary circuit;
- Average total current of the SPOT secondary circuit;
- Phase currents of the SPOT primary circuit;
- Phase voltages in the SPOT primary circuit;
- Linear voltages in the SPOT primary circuit;
- Average phase voltage in the SPOT primary circuit;
- SEM utilisation as percentage of the rated value;
- Power factor (cos φ);
- Insulation resistance of the cable-motor system;
- Phase voltage imbalance;
- Phase current imbalance;
- Turbine motor rotation frequency;
- Consumed electric power;
- Pressure at the pump intake;
- Fluid temperature at the pump intake;
- SEM winding temperature;
- SEM XYZ axis vibration;
- Annulus pressure;
- Buffer pressure;
- Line pressure;
- Fluid level in the annulus;
- Amount of fluid extracted.

SU "SKAD" UEPN X – X – XXXX – X – X – X – X – X
 1 2 3 4 5 6 7 8 9

- | | |
|--|--|
| <p>1 Brand name – SU "SKAD" UEPN electric submersible pump installation control station</p> <p>2 Availability and type of the control station controller installed (hereinafter referred to as the "CSC")
 0 – no controller
 1 – RUMB CSC-06
 2 – RUMB CSC-07
 3 – RUMB CSC-08</p> <p>3 Configuration by functionality:
 0 – direct start
 1 – frequency converter
 2 – soft starter</p> <p>4 Rated current of the main circuit, A (see the Technical Specifications Table for the configuration range)</p> <p>5 Type of transfer device:
 0 – no
 1 – 160 MHz
 2 – 433 MHz
 4 – GPRS modem
 5 – GPRS and 433 MHz
 6 – RUMB M-EDGE-01 (3G) modem</p> | <p>6 Availability and type of a ground submersible telemetry unit (hereafter referred to as the "TMS"):
 0 – no
 1 – ELEKTON-TMSN-3 ground unit
 2 – IRZ TMS-E5-01 ground unit</p> <p>7 3 – a ground unit from other manufacturers (the name must be specified when ordering)</p> <p>8 Availability of a VAR compensator:
 0 – no
 1 – available</p> <p>9 Availability of a bypass:
 0 – no
 1 – available</p> <p>10 Availability of a commercial electricity meter:
 0 – no
 1 – SET 4TM
 2 – Mercury
 3 – other manufacturers</p> |
|--|--|

Example of designation of the SU "SKAD" UEPN control station with a direct start, with RUMB CSC-06 controller, 250A rated current of the main circuit, equipped with a 160 MHz radio modem, without TMS, without VAR compensators, without a bypass, and without a commercial electricity meter:

SU "SKAD" UEPN 1 – 0 – 250 – 1 – 0 – 0 – 0 – 0

Control stations for sucker-rod pumping units



Purpose:

SRPU control stations are designed to manage, control, and protect submersible sucker-rod pumping units with 5 to 40 kW electric motors.

Application:

Management, protection, and control over parameters of operation of sucker-rod pumping units.

Work principle:

The controller measures, calculates, and saves parameters in memory and gives a signal to start the power section. If the set limits are exceeded, the controller stops the installation.

Composition:

- | | | |
|---------------|------------------|-------------------------|
| 1. Cabinet | 1. Power section | 1. Other optional parts |
| 2. Controller | 1. Modem | |

Advantages:

- Various designs for most complex tasks;
- In the intelligent-algorithm version, adaptive protection and maintenance of the filling of the pump are implemented;
- Remote monitoring system.

Functionality:

- Manual and automatic electric motor switch on/switch off with the capability to set operation and idle time;
- ESP protection in case of emergency;
- Recording and storage of the operation history in non-volatile memory;
- Automatic reclosing in case of power failures.

Technical specifications:

Parameter name	Parameter value
Mains voltage, V	380 +15%; - 30%
Number of phases	3
Power supply frequency, Hz	50 ±10%
Output voltage, V	
Direct start, soft starter	380
FC	0...380
Rated current, A	100
Overload current in 60 s	120%
Efficiency %	At least 95
Interface for integration with RUMB controller	RS-485
Case protection class	IP43
Operating temperature, °F	-76..+ 122

Types of control station configurations:

- Direct start;
- Soft start (smooth soft start);
- With frequency regulation.

- minimum/maximum load protection on the polished rod and the maintenance mode by adaptive frequency reduction;
- minimum pump fillage protection and its automatic maintenance at the set level.

Additional functions of the station with frequency control in the configuration with intelligent algorithms and protections:

- pumping speed adjustment with the ability to maintain parameters (dynamic level, flow, operating current, etc.) using the built-in PID controller;
- dynamometry (superficial, deep), wattmetering;

Types of control station configurations:

- Direct start;
- Soft start (smooth soft start);
- With frequency regulation.

SU "SKAD" SKN X – X – XXX – X – X – X – X – X – X

1 2 3 4 5 6 7 8 9 10

<p>1 Brand name – SU "SKAD" SKN oil pump control station</p> <p>2 Presence Availability and type of the control station controller installed (hereinafter referred to as the "CSC") 0 – no controller 1 – RUMB CSC-06 2 – RUMB CSC-07 3 – RUMB CSC-08</p> <p>3 Configuration by functionality: 0 – direct start 1 – frequency converter (hereinafter referred to as the "FC") 2 – soft starter (hereinafter referred to as the "SS")</p> <p>4 Rated current of the main circuit</p> <p>5 Type of transfer device: 0 – no 1 – 160 MHz 2 – 433 MHz 4 – GPRS modem 5 – GPRS and 433 MHz 6 – RUMB M-EDGE-01 modem</p>	<p>6 Availability of an additional protection device: 0 – no 1 – UZ-01 protection device 2 – UZDR-8 protection device 3 – KSKN-3 4 – Standard-08 UZEP 5 – KSKN-4</p> <p>7 Availability of a VAR compensator: 0 – no 1 – available</p> <p>8 Availability of a bypass: 0 – no 1 – available</p> <p>9 Availability of braking resistors: 0 – no 1 – available</p> <p>10 Availability of the DDS-04 system 0 – no 1 – available</p>
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Example of designation of the SU "SKAD" SKN control station with a direct start, without controller, 80A rated current of the main circuit, equipped with a 160 MHz radio modem, having an additional Standard-08 UZEP protection device, without VAR compensators, without a bypass, without a braking resistor, and without the DDS-04 system:

SU "SKAD" SKN 0 – 0 – 0 – 80 – 1 – 4 – 0 – 0 – 0 – 0



Control stations for pumping and reservoir pressure maintenance

Purpose:

Control stations are designed to control pumping units (centrifugal sectional pumps (CSP), horizontal pumping units (HPU), overhung pumps, etc.) with up to 1,600 kW and 0.4, 6 or 10 kV feed voltage electric motors used to pump fluid and maintain the formation pressure.

Application:

Control, monitoring, and protection of pumping units (CSP, HPU, overhung pumps, etc.) with up to 1,600 kW and 0.4, 6 or 10 kV feed voltage electric motors used to pump fluid and maintain the formation pressure.

Work principle:

The controller measures, calculates, and saves parameters in memory and gives a signal to start the power section. If the set limits are exceeded, the controller stops the installation.

Design:

The system consists of a RUMB controller and additional modules, designed to receive signals from sensors and other cluster pumping station equipment, output the control signals, and protect the electronic components of the automation system from high voltage impulse interference. The automation system composition is defined after the technical requirements are approved.

Advantages:

- Allows to implement the most complex installation launch algorithms, including cascade ones;
- Protection for all necessary sensors of vibration, temperature, and pressure;
- Remote monitoring.

Functionality:

- Status monitoring, management and protection of the unit and the motor from emergencies;
- Monitoring and control of motor operated valves;
- Monitoring of the built-in high-voltage electric motor protection cell status.
- Monitoring of the gas control system status;
- Monitoring of the fire alarm and suppression system status;
- Recording and storage of the operation history in non-volatile memory;

- Discontinuous operation with set periods of operation and idle time as well as with set absolute switch on/switch off time;
- operation interruption based on the process parameter sensors data;
- technical recording and display of the electricity consumed (for the current and past day, month, year) based on instantaneous actual power or the sensor data;
- recording of the volume of fluid pumped (for the current and past day, month, year);
- differentiation of the staff access level using proximity access identifiers;
- update of the software in the field using RUMB UPI data transfer device.

Technical specifications:

Due to the large number of versions available, the technical specifications depend on the questionnaire filled in when ordering HPU or MCPS. Manufacture according to mutually agreed technical requirements is possible.

If a frequency converter module is available:

- Smooth acceleration and deceleration;
- Manual pump electric motor supply frequency control;
- Automatic maintenance of one of the process parameters selected at the set level (e.g., pressure at the pump outlet) using the built-in PID controller;
- Climate control in the frequency converter section.

Functionality:

- Data transfer from the controller memory to a PC and vice versa using the RUMBUPI-06 data transfer device;
- Operation as part of the telemetry system, adaptation to any data communication protocols, radio modems, GSM/GPRS/3G, and satellite modems;
- Compatibility with upper-level control systems.



Installations for dual operation

We carry out selection of equipment for dual operation (DO), supply and lease of equipment, and engineering support during the implementation of DO installations. Implementation of DO installations is performed since 2005.

Purpose:

DO installations are used in oil production and are designed for dual operation of two or more reservoirs by one well.

Application:

- Wells having in the exposed section significant differences in reservoir properties and oil characteristics;
- Flooded wells with large pressure differences between formations;
- For connection with already exploited production level of a low-productive formation, the exploitation of which by an individual well is unprofitable;
- Wells with a large distance in depth between the objects.

Advantages:

- Increased oil recovery factor and well capacity due to the additional involvement in the development of low-permeability interlayers;
- Increased multilayer field areal sweep efficiency and intensity of development through separate involvement in the development of individual thin, multi-permeable layers-interlayers;
- Reduced capital investments for well drilling;
- Intensification of the process of regulation of offtake and injection in time and upon bore log;
- Increased profitability period of field development;
- Reduced operating costs;
- Efficient oil field formation pressure control, regulation of the direction and filtration rate of formation fluids.

Types of DO installation configurations:

- ESP-SRPU;
- ESP- ESP;
- Duplicate ESP;
- PCP-SRPU.

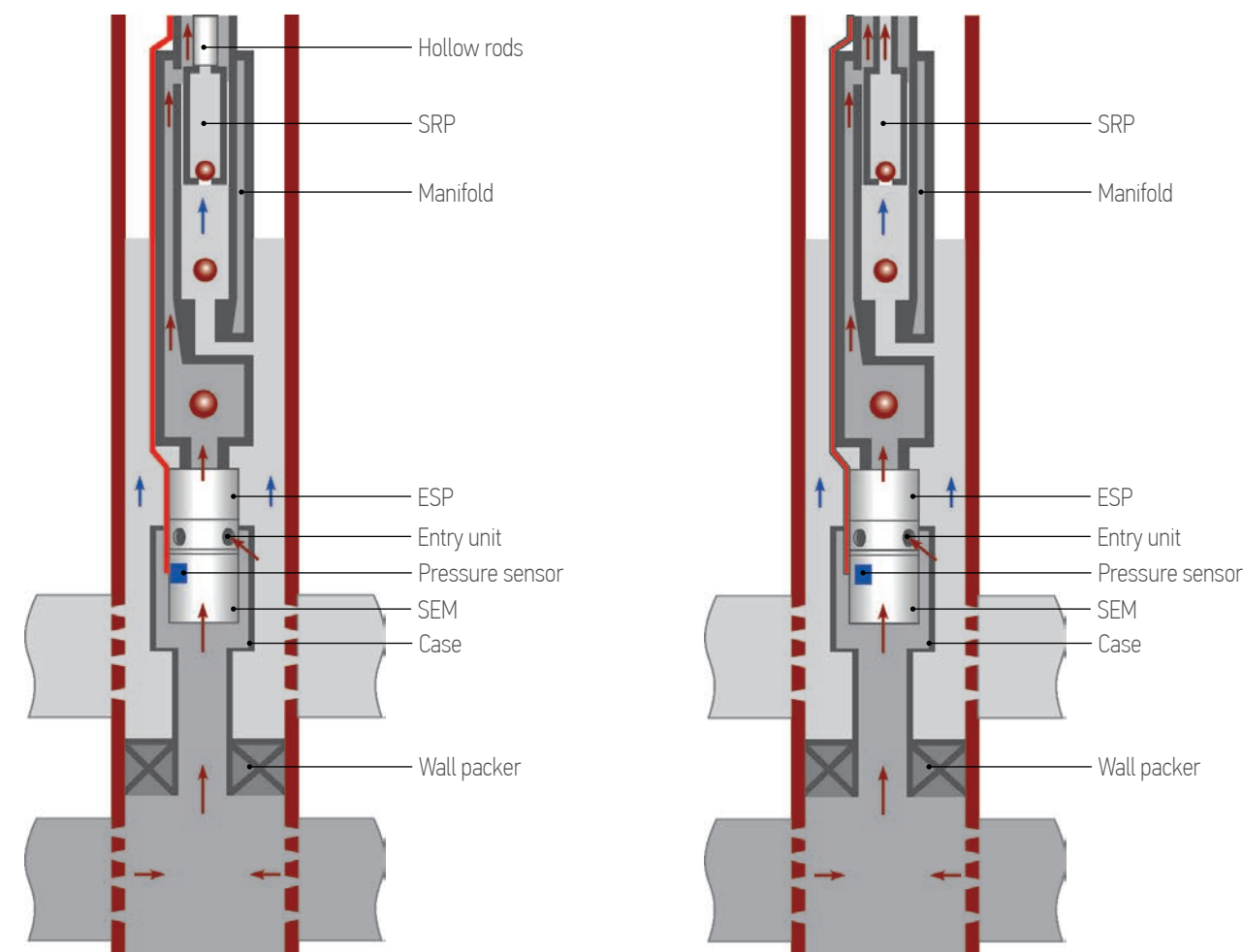
Efficiency:

- Increase in profitability of individual wells due to the connection of other development objects or differing in properties formations of a single development site;
- Decrease in the scope of drilling due to the use of a single well bore and organisation of simultaneous (joint) hydrocarbon reserve production from different development objects with a single well network.

Operating limitations:

- Nominal diameter of the production casing string not less than 5.75 in;
- Availability in the well at least two penetrated objects;
- Distance between the objects not less than three meters;
- Leak tightness of the production casing string and absence of the annulus hydrodynamic connection between the objects;
- Drift angle buildup not more than 2° per 32.81 in;
- Absence in the production well string of narrowing along the inside diameter in the form of slurry cake and packers in the interval of the target descent of the installation underground part.

Component layout of ESP-SRPU



Purpose:

Installation for dual operation of two objects with ECPU offtake from the lower product formation (and SRP from the upper product formation). The units are designed for dual operation of two objects separated by the packer with the possibility, if necessary, of separate lifting, metering, and transportation of products.

Application:

Oil-producing wells with two formations.

Advantages:

Complete information about the work of the reservoirs

Design:

A packer with an on-off device, a tubing string, a string of standard or hollow rods, a top SRP, a bottom ESP with a cable, a casing and a shank for connection to the lower formation. Surface equipment: SRP motor, ESP control station, two-channel wellhead fittings.

Work principle:

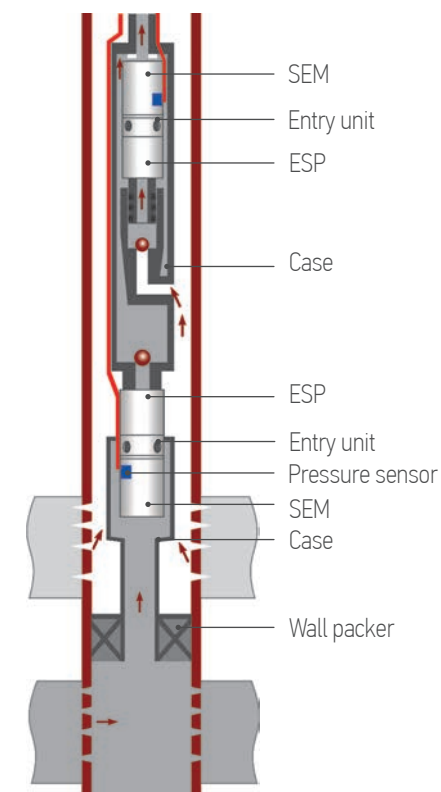
The products of the lower layer enter through the wall packer into the case with the electric motor and through the entry unit to the ESP intake and are pumped by it through the check valve into the cavity of the tubing and further to the surface. The products of the upper layer enter through the annular space into the channel for the intake of the SRP and are pumped by it into the column of tubing where they are mixed with the products of the lower layer and lifted to the surface. The pump is driven by rods. The operating mode of the installation is determined depending on pumps used and their motors.

Operating limitations:

- Nominal diameter of the production casing string not less than 5.75 in;
- Availability in the well at least two penetrated objects;
- Distance between the objects not less than three meters;
- Leak tightness of the production casing string and absence of the annulus hydrodynamic connection between the objects;
- Drift angle buildup not more than 2° per 32.81 in;
- Absence in the production well string of narrowing along the inside diameter in the form of slurry cake and packers in the interval of the target descent of the installation underground part.

Technical specifications:

Parameter name	Value	
	ESP-SRPU 146	ESP-SRPU 168
Production casing string diameter, in.	5.748	6.614
Diameter of the underground part of the installation, in., max	4.882	5.787
ESP case diameter, in., max	3.622	4.055
SEM case diameter, in., max	4.055	4.606
Type and brand of ESP control station	Approved for use in the Russian Federation	
Tubing joints as per GOST R 52203-2004	60; 73	60; 73; 89
Working medium	oil, formation water	
Maximum temperature of the working medium, K (°F), max	393(248)	



Component layout of ESP-ESP

Purpose:

The unit is designed for dual operation of two objects separated by the packer with the possibility of separate lifting, metering, and transportation of products.

Application:

Oil-producing wells with two formations.

Advantages:

- Standard equipment;
- Separate operation of each formation.

Work principle:

The products of the lower layer enter through the wall packer into the case with the electric motor and through the entry unit to the bottom ESP intake and are pumped by it through the check valve into the cavity of the tubing and further to the surface. The products of the upper layer enter through the annular space into the channel for the intake of the top ESP and are pumped by it into the column of tubing where they are mixed with the products of the lower layer and lifted to the surface. The operating mode of the installation is determined depending on pumps used and their motors.

Operating limitations:

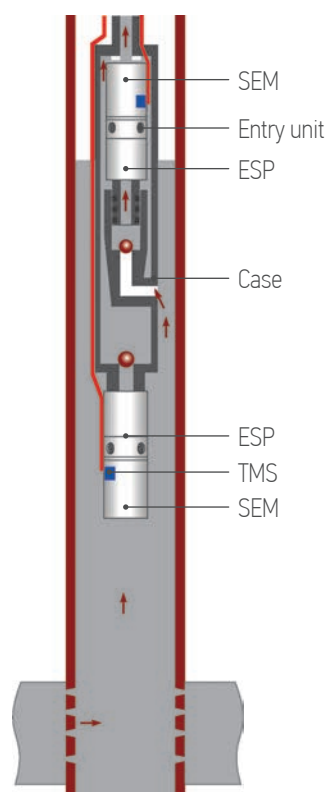
- Nominal diameter of the production casing string not less than 5.75 in;
- Availability in the well at least two penetrated objects;
- Distance between the objects not less than three meters;
- Leak tightness of the production casing string and absence of the annulus hydrodynamic connection between the objects;
- Drift angle buildup not more than 2° per 32.81 in;
- Absence in the production well string of narrowing along the inside diameter in the form of slurry cake and packers in the interval of the target descent of the installation underground part.

Check control:

- Production rate and water cut – direct measure during shutdown of one of the pumps;
- Downhole pressure – by telemetry.

Technical specifications:

Parameter name	Value
	ESP-ESP 168
D casing string, in.	6.614
D installation, in., max	5.787
D top ESP, in., max	3.622
D top SEM, in., max	4.055
D bottom ESP, in., max	4.055
D bottom motor, in, max	4.606
Tubing pipes as per GOST R 52203-2004	60; 73; 89



Component layout of the duplicate ESP

Purpose:

The unit is designed for simultaneous operation of the formation with the possibility of separate (alternate) or simultaneous lifting.

Application:

- Remote wells with limited logistics (seasonal lack of roads);
- Proppant backflow, discharge of SPM (suspended particulate matters) after bottom hole treatment and formation hydraulic fracturing;
- Well completion after drilling.

Advantages:

- Increased oil production;
- Increased development efficiency;
- Reduced operating costs.

Work principle:

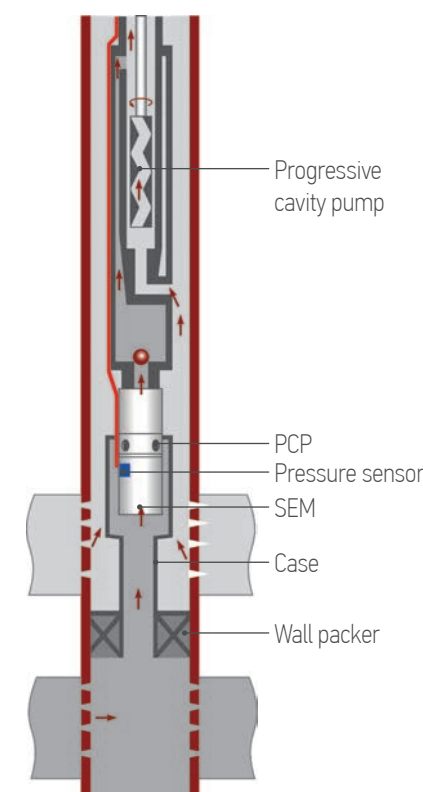
The products enter through the entry unit to the bottom ESP and are pumped by it through the check valve into the cavity of the tubing and further to the surface. At the same time, the products can enter through the annular space into the channel to the top ESP and are pumped by it into the tubing string, through which they are mixed with the products of the lower formation and lifted to the surface.

Operating limitations:

- Nominal diameter of the production casing string not less than 5.75 in;
- Availability in the well at least two penetrated objects;
- Distance between the objects not less than three meters;
- Leak tightness of the production casing string and absence of the annulus hydrodynamic connection between the objects;
- Drift angle buildup not more than 2° per 32.81 in;
- Absence in the production well string of narrowing along the inside diameter in the form of slurry cake and packers in the interval of the target descent of the installation underground part.

Technical specifications:

Parameter name	Value
	ESP-ESP 168
D casing string, in.	6.614
D installation, in., max	5.787
D top ESP, in., max	3.622
D top SEM, in., max	4.055
D bottom ESP, in., max	4.055
D bottom SEM, in., max	4.606
Tubing pipes as per GOST R 52203-2004	60; 73; 89



Component layout of PCP-SRPU for DO

using electrical submersible progressive cavity pump with a casing operating the lower object, and SRP or sucker-rod screw pump operating the upper object

Purpose:

Production of formation fluid from the upper formation using the SRP and from the lower formation using electrical submersible PCP

Application:

Oil-producing wells with two formations.

Advantages:

Production of formation fluid from two reservoirs simultaneously, using only one well. Complete information about the operation of the reservoirs.

Work principle:

The products of the lower layer enter through the wall packer into the case with the electric motor and through the entry unit to the ESP intake and are pumped by it through the check valve into the cavity of the tubing and further to the surface.

The products of the upper layer enter through the annular space into the channel for the intake of the SRP and are pumped by it into the column of tubing where they are mixed with the products of the lower layer and lifted to the surface. The pump is driven by rods. The operating mode of the installation is determined depending on pumps used and their motors.

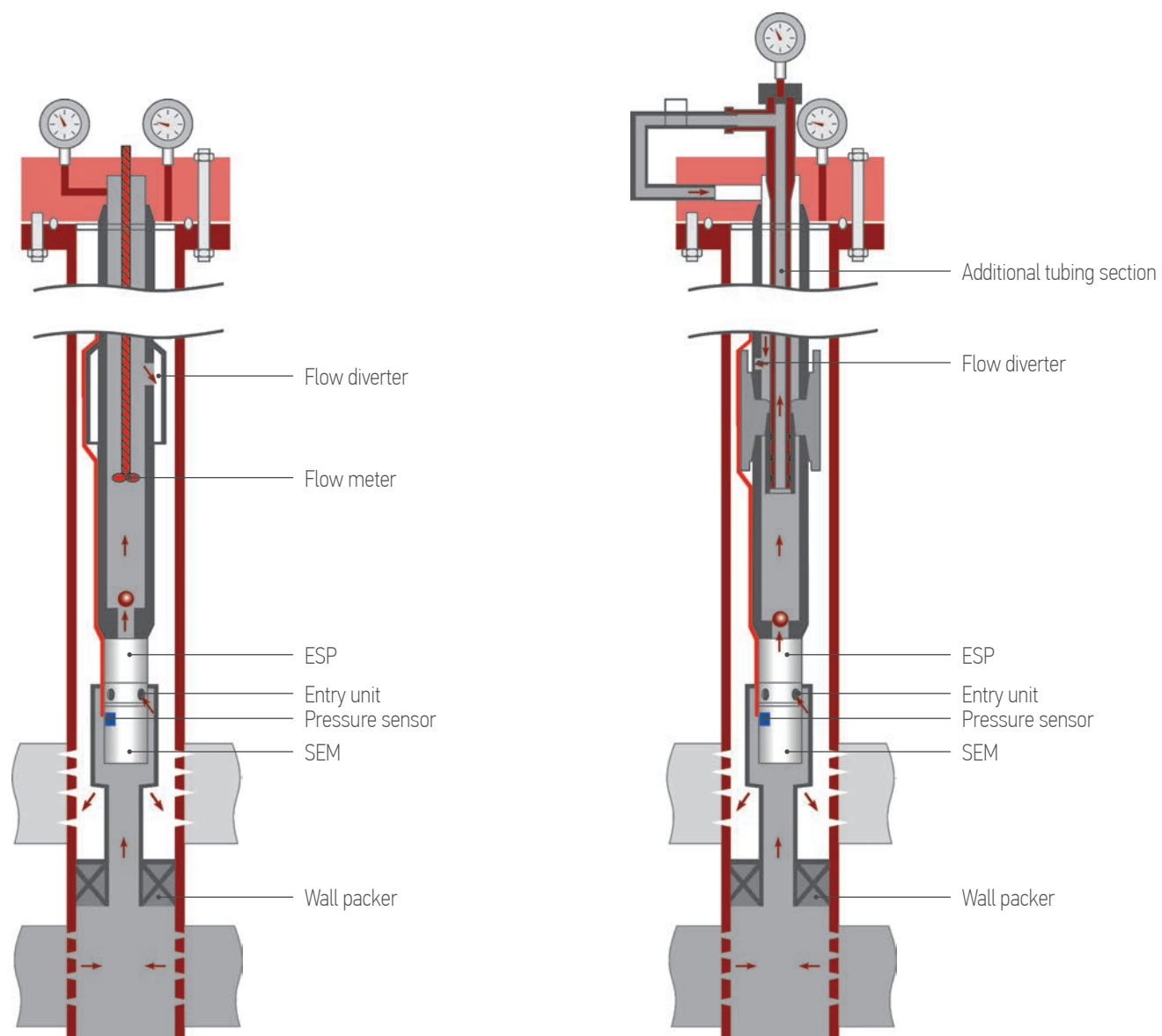
Operating limitations:

- Nominal diameter of the production casing string not less than 6.61 in;
- Availability in the well at least two penetrated objects;
- Distance between the objects not less than three meters;
- Leak tightness of the production casing string and absence of the annulus hydrodynamic connection between the objects;
- Drift angle buildup not more than 2° per 32.81 in;
- Absence in the production well string of narrowing along the inside diameter in the form of slurry cake and packers in the interval of the target descent of the installation underground part.

Technical specifications:

Parameter name	Value
	PCP-SRPU 168
Casing string diameter, in.	6.614
Diameter of the underground part of the installation, in., max	5.787
ESP case diameter, in., max	4.055
SEM case diameter, in., max	4.606
Type and brand of control station	Approved for use in the Russian Federation
Tubing pipes as per GOST R 52203-2004	60; 73; 89
Working medium	oil, formation water
Maximum temperature of the working medium, K (°F), max	393(248)

Downhole fluid pumping units



Purpose:

Downhole fluid pumping units (DFPU) enable pumping of the formation water from a water producing formation into the productive one to maintain the formation pressure of the oil-bearing formation.

Designs of installations for downhole pumping:

- single tubing installation –DFPU 146 (168)- NV – for downhole pumping of groundwater from the lower formation to the upper;
- double tubing installation – DFPU 146 (168)-2-NV – for downhole pumping of groundwater from the lower formation to the upper;
- single tubing installation – DFPU 146 (168)- VN – for downhole pumping of groundwater from the upper formation to the lower;

Application:

Flooding oil fields by downhole pumping of water from an aquifer of the overlying reservoir to the underlying productive one using ESP.

Advantages:

- Allows to maintain the formation pressure in small areas in the absence of the water injection system or if it is located at a great distance;
- Allows to save money on drilling;
- No need to install ground-based pumping equipment and ground pipelines;
- Enables pumping of the formation water from the water-bearing formation to the formation under development.

Work principle:

The installation for downhole pumping of groundwater from the lower formation to the upper one DFPU-146 (168)-VN operates as follows. When the power supply is turned on at the wellhead, the energy enters the electric motor through the cable passing through the sealed entry into the case, which drives the pump and it pumps fluid from the flow column through the cavity of the case, packer into the lower layer. The liquid level in the tubing and the annular space connected to it through the flow diverter decreases, and the products of the upper layer enter the annulus, i.e., water, which through the flow diverter goes further to the pump entry unit.

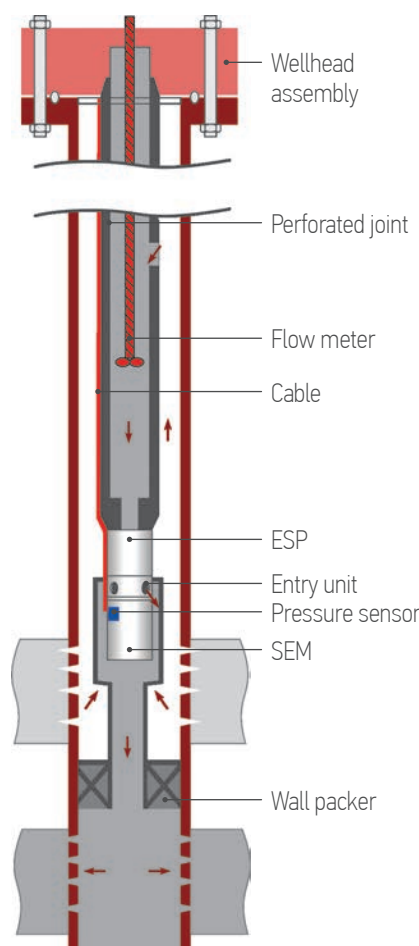
The volume of pumped water is measured by a flow meter installed between the flow diverter and the pump entry unit, and transmitted through the communication line and a power cable to the surface. The injection pressure in the reservoir is measured by a sensor installed in the electric motor and transmitting information to the surface via a power cable. The electric motor is assembled with a case, an input device, and a part of the cable in the workshop. The pump is connected to the rest of the cable at the wellhead.

Operating limitations:

- Nominal diameter of the production casing string not less than 6.61 in;
- Availability in the well at least two penetrated objects;
- Distance between the objects not less than three meters;
- Leak tightness of the production casing string and absence of the annulus hydrodynamic connection between the objects;
- Drift angle buildup not more than 2° per 32.81 in;
- Absence in the production well string of narrowing along the inside diameter in the form of slurry cake and packers in the interval of the target descent of the installation underground part.

Technical specifications:

Parameter name	Value			
	DFP-146-NV	DFP-146-2-NV	DFP-168-NV	DFP-168-2-NV
Casing string diameter, in.	5.748	5.748	6.614	6.614
Diameter of the underground part of the installation, in., max	4.882	4.882	5.787	5.787
ESP case diameter, in., max	3.622	3.622	4.055	4.055
SEM case diameter, in., max	4.055	4.055	4.606	4.606
Type and brand of ESP control station	Any approved for use in the Russian Federation			
Tubing pipes* as per GOST R 52203-2004	60; 73	89 and 48	60; 73; 89	89 and 48 102 and 60
Working medium	formation water			
Maximum temperature of the working medium, K (°F), max	393(248)			



Component layout of DFP-146 (168)-VN unit

Purpose:

Downhole fluid pumping units (DFPU) enable pumping of the formation water from a water producing formation into the productive one to maintain the formation pressure of the oil-bearing formation.

Application:

The need to pump the formation water from a water producing formation into the productive one to maintain the formation pressure of the oil-bearing formation.

Advantages:

- Allows to maintain the formation pressure in small areas in the absence of the water injection system or if it is located at a great distance;
- Allows to save money on drilling;
- No need to install ground-based pumping equipment and ground pipelines;
- Enables pumping of the formation water from the water-bearing formation to the formation under development.

Work principle:

The installation for downhole pumping of groundwater from the lower formation to the upper one DFPU-146 (168)-VN operates as follows. When the power supply is turned on at the wellhead, the energy enters the electric motor through the cable passing through the sealed entry into the case, which drives the pump and it pumps fluid from the flow column through the cavity of the case, packer into the lower layer.

The liquid level in the tubing and the annular space connected to it through an opening decreases, and the products of the upper layer enter the annulus, i.e., water, which through the opening goes further to the pump entry unit.

The volume of pumped water is measured by a flow meter installed between the opening and the pump entry unit, and transmitted through the logging cable, sealed and going through the wellhead assembly, to the surface.

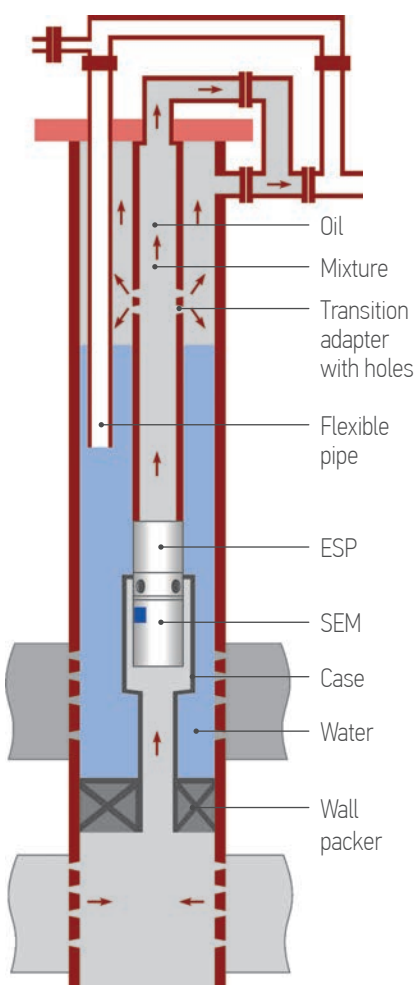
The injection pressure in the reservoir is measured by a sensor installed in the electric motor and transmitting information to the surface via a power cable. The installation operation mode depends on the pump used as well as its motor and the layer parameters.

Operating limitations:

- Nominal diameter of the production casing string not less than 5.75 (6,61) in;
- Availability in the well at least two penetrated objects, one of which is water-bearing and the other is oil-bearing;
- Distance between the objects not less than three meters;
- Leak tightness of the production casing string and absence of the annulus hydrodynamic connection between the objects;
- Drift angle buildup not more than 2° per 32.81 in;
- Absence in the production well string of narrowing along the inside diameter in the form of slurry cake and packers in the interval of the target descent of the installation underground part.

Technical specifications:

Parameter name	Value	
	DFP-146-VN	DFP-168-VN
Casing string diameter, in.	5.748	6.614
Diameter of the underground part of the installation, in., max	4.882	5.787
ESP case diameter, in., max	3.622	4.055
SEM case diameter, in., max	4.055	4.606
Type and brand of ESP control station	Any approved for use in the Russian Federation	
Tubing pipes as per GOST R 52203-2004	60; 73	60; 73; 89
Working medium	formation water	
Maximum temperature of the working medium, K (°F), max	393(248)	



Double-action pumping system with discharge of a part of associated water to the intake formation

Purpose:

The double-action pumping system (DAPS) is intended to increase the efficiency of operation of highly-watered oil wells by means of downhole separation of formation fluid to oil and water, raising low-watered oil to the wellhead, and injecting the major portion of the associated water into the intake formation without lifting it to the surface.

Application:

Highly watered oil wells with ESPU, which penetrated the upstream (in relation to the productive) intake formation suitable for injecting the associated water.

Advantages:

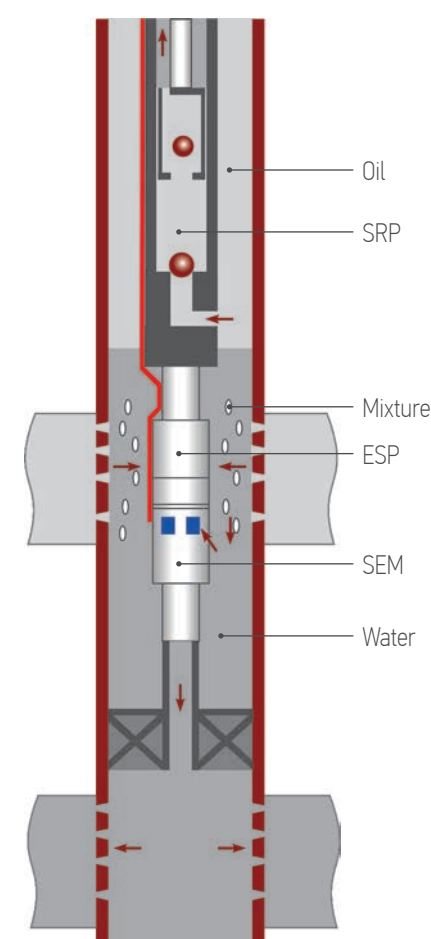
- Rise of low-watered oil to the surface;
- Injection of more associated water into the intake formation without bringing it to the surface.

Operating limitations:

- Nominal diameter of the production casing string not less than 5.75 in;
- Availability in the well at least two penetrated objects;
- Distance between the objects not less than three meters;
- Leak tightness of the production casing string and absence of the annulus hydrodynamic connection between the objects;
- Drift angle buildup not more than 2° per 32.81 in;
- Absence in the production well string of narrowing along the inside diameter in the form of slurry cake and packers in the interval of the target descent of the installation underground part.

Technical specifications:

Parameter name	Value	
	DAPS 01-146	DAPS 01-168
Casing string diameter, in.	5.748	6.614
Diameter of the underground part of the installation, in., max	4.882	5.787
ESP nominal diameter, in.	3.622; 4.055	3.622; 4.055; 4.606
Type and brand of ESP control station	Any approved for use in the Russian Federation	
Working medium	oil, formation water	
Maximum temperature of the working medium, K (°F), max	393(248)	



Double-action pumping system with product lifting using SRP and injection of a portion of the associated water using ESP into the underlying intake formation

Purpose:

Extraction of reservoir fluid from the upper layer using SRP and injection of part of the associated water into the underlying intake formation using ESP.

Application:

Highly watered oil wells with ESPU, which penetrated the upstream (in relation to the productive) intake formation suitable for injecting the associated water.

Advantages:

Complete information about formations.

Operating limitations:

- Nominal diameter of the production casing string not less than 5.75 in;
- Availability in the well at least two penetrated objects;
- Distance between the objects not less than three meters;
- Leak tightness of the production casing string and absence of the annulus hydrodynamic connection between the objects;
- Drift angle buildup not more than 2° per 32.81 in;
- Absence in the production well string of narrowing along the inside diameter in the form of slurry cake and packers in the interval of the target descent of the installation underground part.

Technical specifications:

The parameters of this unit are identical to those of the ESP-SRPU.



Top-driven installation for the system of reservoir pressure maintenance of VCPU (vertical centrifugal pumping unit) type

Purpose:

Vertical centrifugal pumping unit (VCPU) is designed to inject fresh, formation, and oilfield waters to the oil formation in order to maintain the reservoir pressure and pump over the fluid at the booster pumping stations.

Application:

Possibility of using VCPU in three component layouts:

1. Fluid injection into oil formation for reservoir pressure maintenance (RPM) in the shothole version;
2. Pumping-over the water-oil fluid at the booster pump stations (BPS) in the shothole version.
3. Fluid injection into the injection well for reservoir pressure maintenance.

Advantages:

- Long service life;
- Simple in installation and operation – the unit does not require a special room for its installation;
- Possibility to choose pressure head and performance characteristics for a single well;
- High maintainability;
- Possibility of creating the delivery pressure into the formation, greater as compared with the sectional centrifugal pump (SCP).

Design:

- | | |
|-------------------------|-------------------------------|
| 1 – electric motor; | 6 – end seal; |
| 2 – collar; | 7 – line shaft; |
| 3 – lubrication system; | 8 – submersible pump; |
| 4 – bearing assembly; | 9 – production casing string; |
| 5 – drive unit; | 10 – combination collar. |

Work principle:

The liquid through the inlet pipe enters the inlet of the submersible pump ESP, which then pumps the liquid through the pressure pipeline through the check valve into the pipeline. The control of water pressure at the inlet of the pumping unit is carried out using pressure sensors installed on the inlet and outlet pipelines. Temperature sensors are used to control bearing and end seal temperature.

Operating limitations:

If necessary, it can be completed with a heating cable.

Technical specifications:

Parameter name	Unit	Parameter value
Nominal feed	barrel / day	314.5÷5 032
Pressure head	ft	656.2÷2 789
Motor shaft speed (synchronous)	c-1(rpm)	50 (3000)
Intake pressure	ksi	0.029-2.901
Maximum discharge pressure	ksi	3.046
External leakage through the end seal, max	barrel / day	0.0302
Motor power	kW	15; 22; 30; 55; 75; 90
Life time (service life)	years	5

Characteristics of the pumped medium:

Parameter name	Value
Specific weight	0.578 to 0.682 oz/in ³
PH	5.4÷7.5
Total dissolved solids	1.618÷6.742 oz/yd ³
H2S	0÷7.282 oz/yd ³
CO2	4.045÷8.091 oz/yd ³
Na+K	0.5933÷1.348 oz/yd ³
Mg	0.02÷0.08 oz/yd ³
Cl	1.78÷1.888 oz/yd ³
SO4	0.54÷13.48 oz/yd ³
HCO3	2.697÷10.79 oz/yd ³
Ca	0.135÷0.297 oz/yd ³
Oil	1.348÷5.394 oz/yd ³
Weight concentration of solids	up to 1.348 z/yd ³ with size up to 200 μm
Temperature	+41 to + 176°F

Field service of electric submersible pumping units



Includes:

- Delivery to the well, mounting, dismantling of ESPU and surface electrical equipment (CS and transformer);
- Start after oilwell service and process stabilisation;
- Carrying out of maintenance and repair of SPOT, CS (with FC or with a smooth start) at the wellhead;
- Mounting of antenna-feeder device systems for transmitting information on the upper level from the CS controller and the possibility of its control from the operator panel;
- Prompt execution of current and emergency requests;
- Removal to the repair shop of surface and submersible equipment after dismantling

Main types of serviced equipment:

- ECPU – electrical centrifugal pump unit;
- SSPU with SD – sucker-rod screw pumping unit with a surface drive;
- EDPU – electric diaphragm pumping unit;
- EPPU – electric progressive cavity pumping unit;
- VCPU with TD – top-driven vertical centrifugal pumping unit;
- WCP – water centrifugal pump;
- DPI – equipment for dual production and injection;
- DEIH – downhole electric induction heater;
- TERM heater – designed to heat the formation fluid down the hole to increase the flow and reducing DARP (deposits of asphalts, resins, and paraffins) on equipment and tubing.
- CS – ESPU control station;
- SPOT – Submersible pump oil-immersed transformer.

Field service of reservoir pressure maintenance system equipment



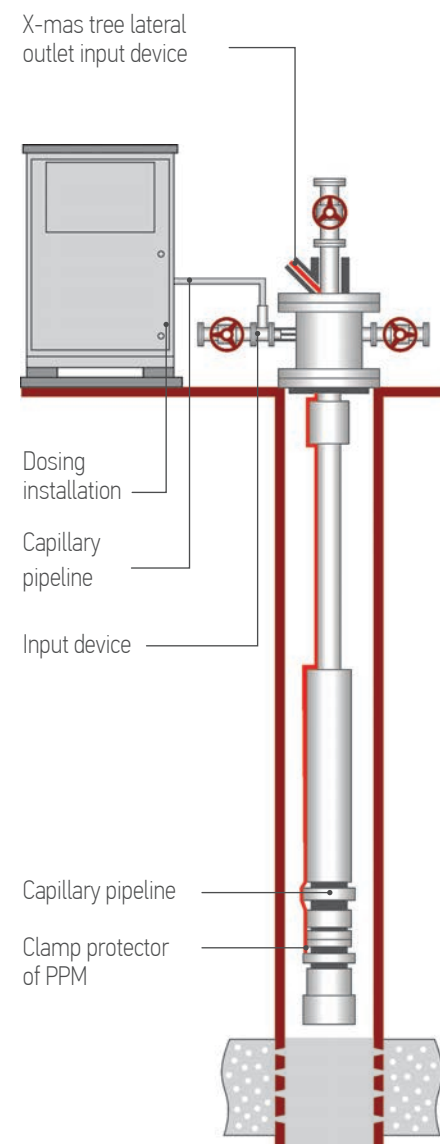
Includes:

- Delivery, mounting, dismantling of pump units of SCP and HPU;
- Scheduled maintenance of pumping units, including accessory equipment;
- Technical auditing of pumping unit.

Main types of serviced equipment:

- Sectional centrifugal pumps (SCP);
- Horizontal pumping units (HPU) of own production and from other manufacturers;
- Displacement pumps;
- High and low voltage control stations, motor excitation stations, low and high voltage electric motors;
- Shut-off valves, oil systems, electrical equipment, and hoisting mechanisms of station, etc.

Capillary systems for supplying chemicals to wells



Purpose:

Capillary systems for supplying chemical reagents are designed for dosing the reagent into oil, water, and gas wells in order to prevent the deposition of paraffins and inorganic salts, reduce the corrosivity of the extracted products, and break stable emulsions. The reagent enters the required section of the well through a capillary pipeline fixed on the outer surface of the tubing (see diagram).

Application:

Wells complicated by the formation of ARP, emulsion, salt deposits, and corrosion.

Advantages:

The use of the reagent dosing technology with the use of capillary devices allows to:

- Promptly change the dosage of the reagent;
- Guarantee the delivery of chemical agent to the required well point;
- Increase the well time between failures;
- Save a costly chemical reagent by delivering it directly to the target feed point with the most effective concentration and dosage.

Design:

The capillary system for supplying chemical reagents consists of surface and downhole parts: The dosing unit provides reagent dosing from 0.26 to 66.04 gal per day. Dosing units with asynchronous, electromagnetic, and step drives are used.

The surface pipeline is designed to connect the dosing unit and the wellhead assembly input device. Depending on the climatic conditions of operation, the capillary system for supplying chemicals can be completed with a surface heated pipeline.

The downhole part is represented by capillary armoured (and unarmoured) pipelines, sprayers, weights, centering mounts, valves, and other equipment of various designs. Capillary pipelines are made of polypropylene, normalised polyethylene, and stainless steel. Types of capillary pipelines: special polymer pipeline (SPP) and special polymer armoured pipeline (SPAP).

Work principle:

Reagent enters the required section of wells through a capillary pipeline fixed on the outer surface of the tubing:

- Into the tubing string to prevent paraffin deposits;
- To the entry of salt and corrosion inhibitor pump;
- In the perforation interval to prevent salt deposits and corrosion.

Technologies:

Using the capillary device, the following chemical agents can be dosed:

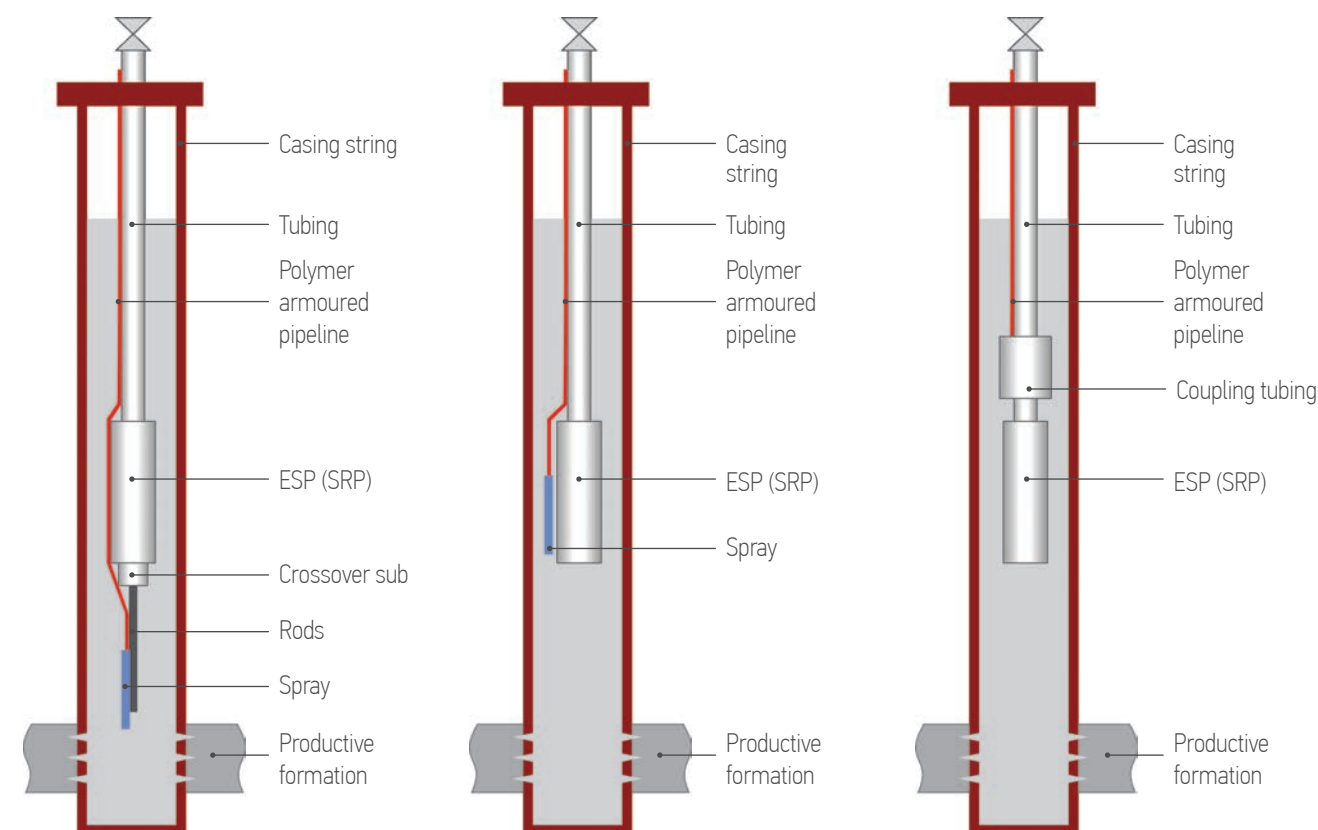
- In the perforation interval to prevent salt deposits and corrosion.

- Corrosion inhibitors (Rekod-608, SNPH-1004, SNPH-1007, Dok-12, Reapon-IF, Sonkor-9601, Sonkor-9701, Vikor-1A, etc.);
- Demulsifiers (Daufax DB-02, Daufax 63N40, Intex 720, Sondem 4401, SNPH-4410, 4403, Rekord-758, etc.);
- Scale inhibitors (Sonsol-2001A, SNPH-5312S, Sonsol-3001, Sonsol-3003M, SNPH-5313, etc.);
- Paraffin inhibitors (SNPH-7941, SNPH-7963, PAP-28A, Sonpar-5403, etc.);
- Solvents (Miaprom, Sonpar-5402, SNPH-7870, MS-25, ZHOU, etc.);
- Weak acids (5-15% HCl).

Technical specifications:

Technical specifications	Value
The resistance of capillary reagents to the ambient temperature should be set depending on the material of the capillary tube, not more than 32 °F:	
• high-density polyethylene	70
• polypropylene compositions	100
• thermoelastoplast	110
• vulcanised high-density polyethylene, propylene copolymers, and block copolymers	120
	160
KR capillary tube external diameter, in.:	0.3976; 0.5197; 0.5984
KR capillary tube internal diameter, in.	0.1772; 0.315; 0.3937
Ovality of KR capillary tube external diameter, max, %	15
Working pressure, max, ksi	0.7252
KR length, ft	up to 11 811

Schemes for the chemical agent delivery

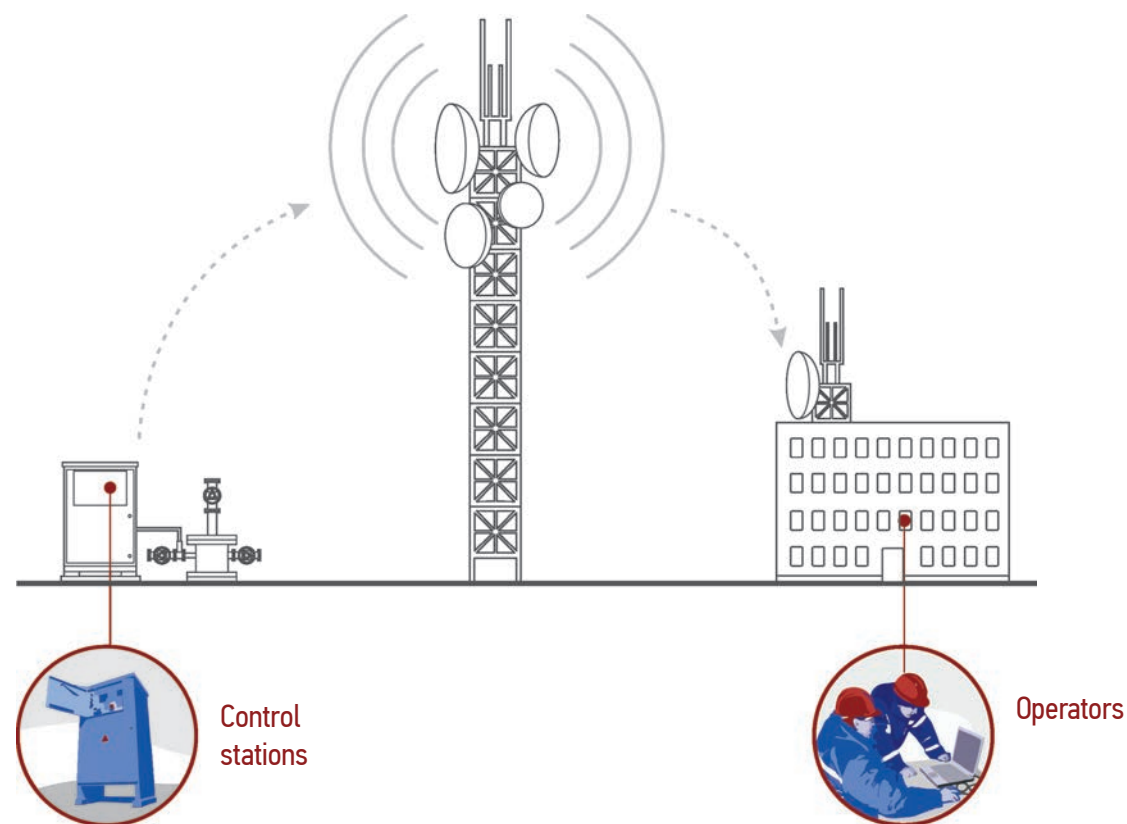


A – below installation

Б – at the intake of submersible pump

Б – to the interval of deposit formation

Equipping wells with GSM modems



Purpose:

The use of GSM-modems allows real-time:

- Remote adjustment of well operation parameters (e.g., increase or decrease the frequency of motor supply voltage);
- Quick analysis and error cause removal;
- Remote reading of archives of the controller and installation of more advanced versions of the software;
- Remote unblocking and start of the installation.

Application:

Oil and gas production facilities

Advantages:

- Possibility of remote control of the well operation
- Reduced labour and transportation costs when fulfilling emergency requests
- Ease of implementation and flexibility of settings

Design:

- GSM modem
- Antenna

Work principle:

The modem receives a digital signal from the user through a special programme, converts it to analogue, and transmits the request to servers that store the necessary information, then receives a response to the sent request in analogue form, converts it to digital and transmits it to the remote access programme.

Technologies:

Reception and transmission of data via the Internet, which requires a SIM card

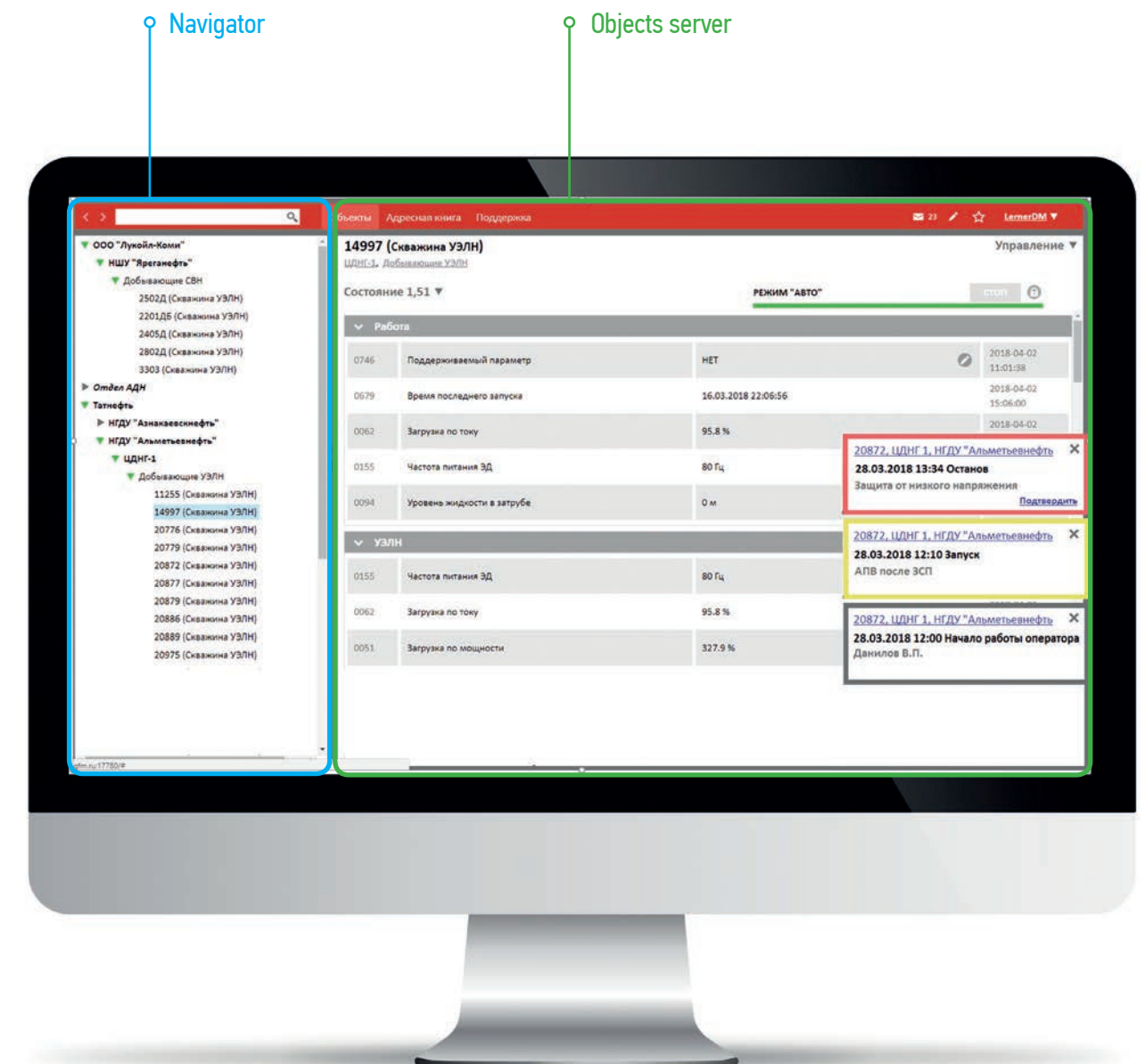
Designation:

- GSM-modem

Technical specifications:

- support for data transmission technologies: 3G, EDGE, GPRS, GSM
- data reception rate up to 236 kbps
- operation via HTTP, FTP protocols
- serial interface RS-485, RS-232

“Service-Navigator” remote control system for oil production facilities



Application:

Oil and gas production facilities

Advantages for the software complex:

- Information security
- Multi-platform
- Using WEB-technologies
- User-friendly interface
- Centralised storage of information and configurations

For convenience, facilities are structured by oil companies, oil and gas production divisions, and workshops.

Demarcation of access allows endowing each node of the system with the right of access to software, for example, organisation as a whole, a division, or an individual user.

The right can also be applied to any node.

Work principle:

Allows real-time:

- Remote adjustment of well operation parameters;
- Quick detection and elimination of the causes of stop;
- Remote reading of archives of the controller
- Remote start of the installation;
- Reduction of oil losses in wells.

Control of objects:

- The chronology of software changes is always kept for the object, as well as logging of faults, changes, recommended version;
- The software package allows you to work online with the object by managing and changing the modes of operation of the object. In the "Service-Navigator" software package, backsurface query of objects with controller equipment from various manufacturers is implemented.

Notification about the state of the object is implemented in the form of pop-up windows – Notifications are sent only to those who have the right to work with objects. Also, a system for processing critical notifications is applied.

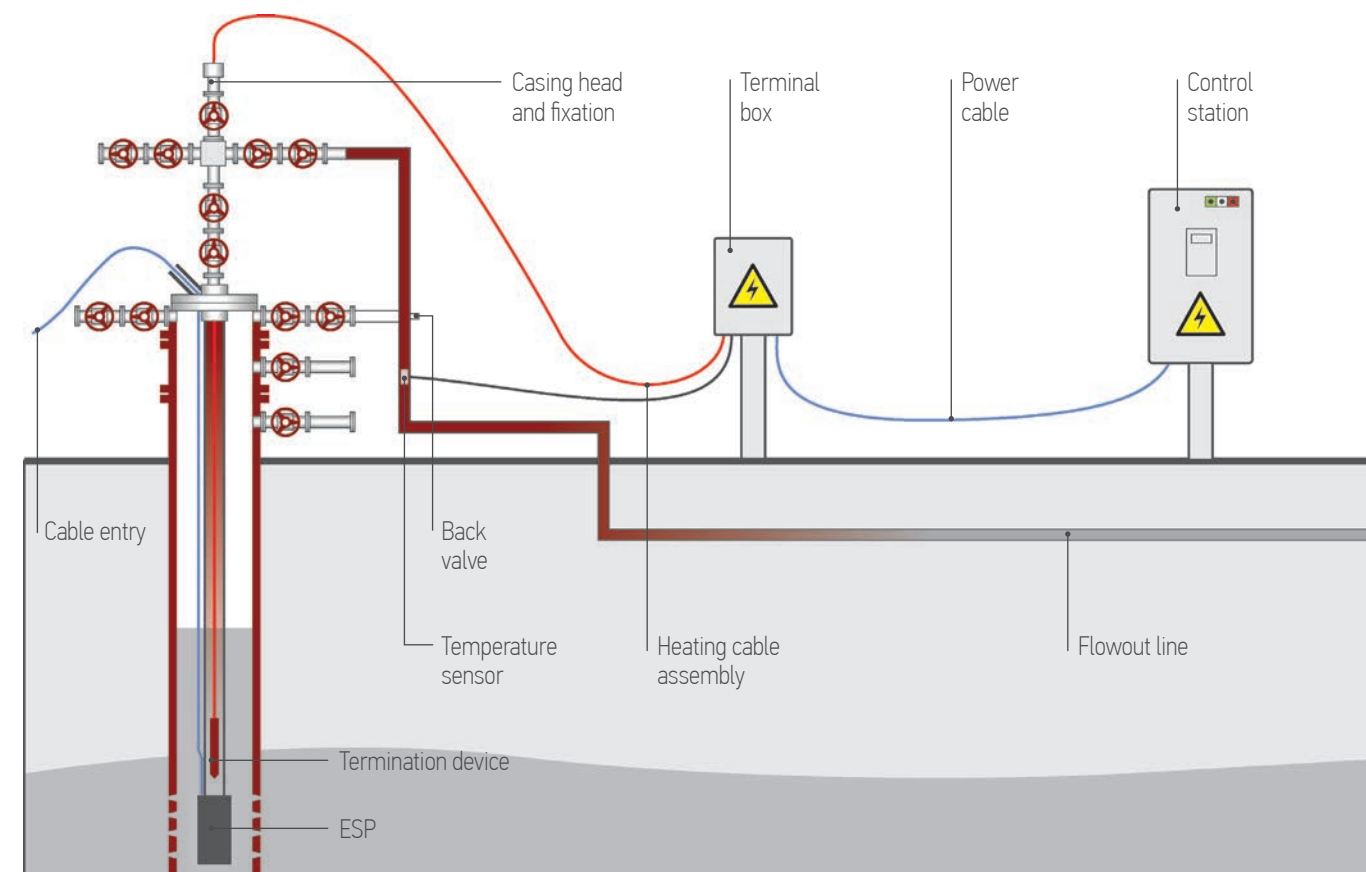
Main directions:

- Mobile version of the client
- Geolocation
- Unified catalogue of equipment
- Automated system for recording and tracking the movement of equipment
- Automated system for selecting equipment
- Intellectualisation

Technical specifications:

Possibility to create multiple users with different access rights

Heating cable to reduce the number of repairs due to paraffin blockage of tubing

**Purpose:**

One of the factors complicating the operation of well equipment is the formation of deposits of asphalts, resins, and paraffins (DARP), and an increased viscosity of the extracted fluid.

Lack of works on preventing and removing DARP leads to wells failure, need for their early repair, and increased production costs. In this regard, fighting DARP is important for intensifying oil extraction.

The heating cable with a termination device produced by LLC System-Service MC completed with a control station allows to heat a well in order to prevent hydrates formation and DARP, as well as reducing the fluids viscosity.

Application:

Wells with a high content of asphalts, resins, and paraffins, as well as increased viscosity of the extracted fluid.

Advantages:

- Reliability;
- Quick payback;

- Increase in the well cleaning and inter-overhaul periods for wells due to the use of the heating cable;
- Continuous heating of the well along the interval of deposits;
- Rejection of similar methods of combating paraffin.
- Installation of the heating cable into the well is carried out jointly with the repair / workover team
- Warming up of the fluid transported from the well and into the well
- Reducing the load on submersible pumps and pumps for production oil.

Design:

The composition of the downhole wellbore heating cable (DWHC) includes: a heating device with termination device KPpBP 120 3x10, controlling station Warm Stream, protectors for the cable protection and fixation.

Work principle:

The work principle of the installation for subsurface heating of wells is based on automatic controlled heating of the heating cable to temperatures that ensure the prevention of DARP, melting of DARP, or their complete removal. Further formation of DARP in the process of oil production is prevented.

Control of objects:

- The chronology of software changes is always kept for the object, as well as logging of faults, changes, recommended version;
- The software package allows you to work online with the object by managing and changing the modes of operation of the object.

In the "Service-Navigator" software package, backsurface query of objects with controller equipment from various manufacturers is implemented.

Notification about the state of the object is implemented in the form of pop-up windows – Notifications are sent only to those who have the right to work with objects. Also, a system for processing critical notifications is applied.

Solved problems and advantages:

1. Heating of the wellbore area and exclusion of resins and asphalts depositing in the tubing column.
2. Thinning of high-viscosity oils and increasing oil recovery.

Criteria for assessing the DWHC efficiency:

- Increased inter-repair period of a well;
- Reduced pressure in the flowout line;
- Reduced load on a pump and its drive unit;
- Stabilised work of the deep-well pumping unit and, as a consequence, increased debit of the extracted fluid.

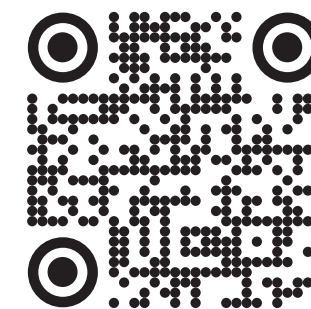
Technical specifications:

Parameter name	Value
Heater type	Outside the tubing
Heating cable	KPpBP 120 3x10, cross-section 0.015 in ²
Conductor material	Copper
Phase currents	A – 69A; B – 69A; C – 69A
Cable conductor temperature	188.6°F
Power consumption in heating mode	45.4 kW
Liquid temperature set point	98.6°F
Linear heater power	45.4 W/m

Servis NPO services

- Selection of various layouts of ECPU (electrical centrifugal pumping unit), SRPU (sucker-rod screw pumping unit), EPPU (electric progressive cavity pumping unit), with EDSS for special features of wells and operating conditions;
- Selection of technologies for dual production and injection;
- Advisory services on application of oilfield equipment;
- Development of oilfield equipment of non-standard configurations and layouts;
- Engineering support for implementation and operation of equipment in the regions of the Russian Federation and CIS countries;
- Cable extension production;
- Heating cable production;
- Operation monitoring of the equipment supplied.

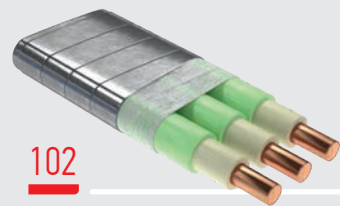
Questionnaire



PRODUCTION

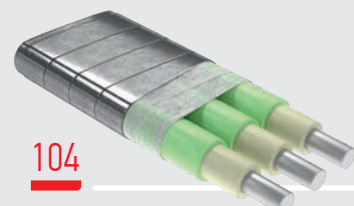
of Cabling
and Wiring Products

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tnk@sistemaservis.ru



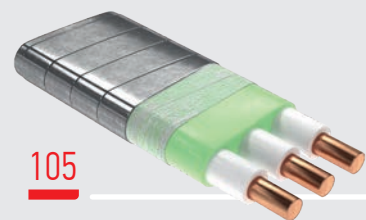
102

Cable for oil submersible electric pumps



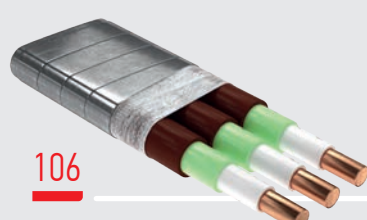
104

Cable with aluminium conductors for oil submersible electric pumps



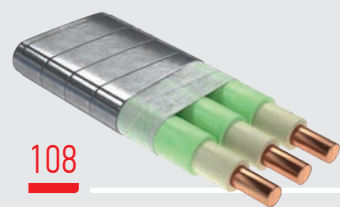
105

Common-sheath cable for submersible electric pumps



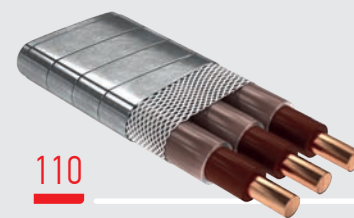
106

Heat-resistant cable for oil submersible electric pumps



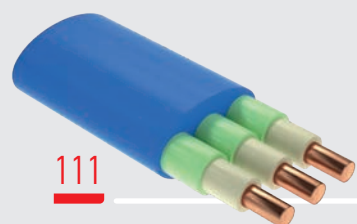
108

Cable with radiation modified polyethylene insulation



110

Heat-resistant flat cable for submersible electric pumps



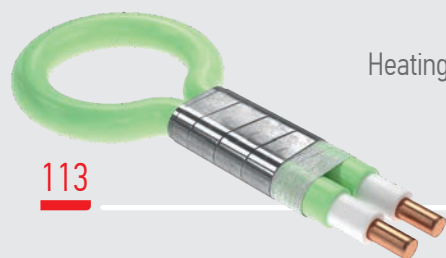
111

Unarmoured cable for oil submersible electric pumps



112

Multifunction heating cable



113

Heating cable



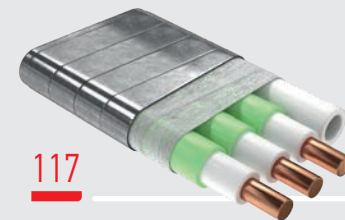
114

Enamelled wire



115

Film insulated wire



117

Universal cable unit



119

Cable lines



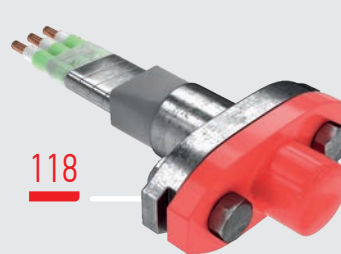
121

Terminal leads for submersible electric motors



116

Special polymer armoured pipeline



118

Extension cable



120

Slot insulation for submersible electric motors



122

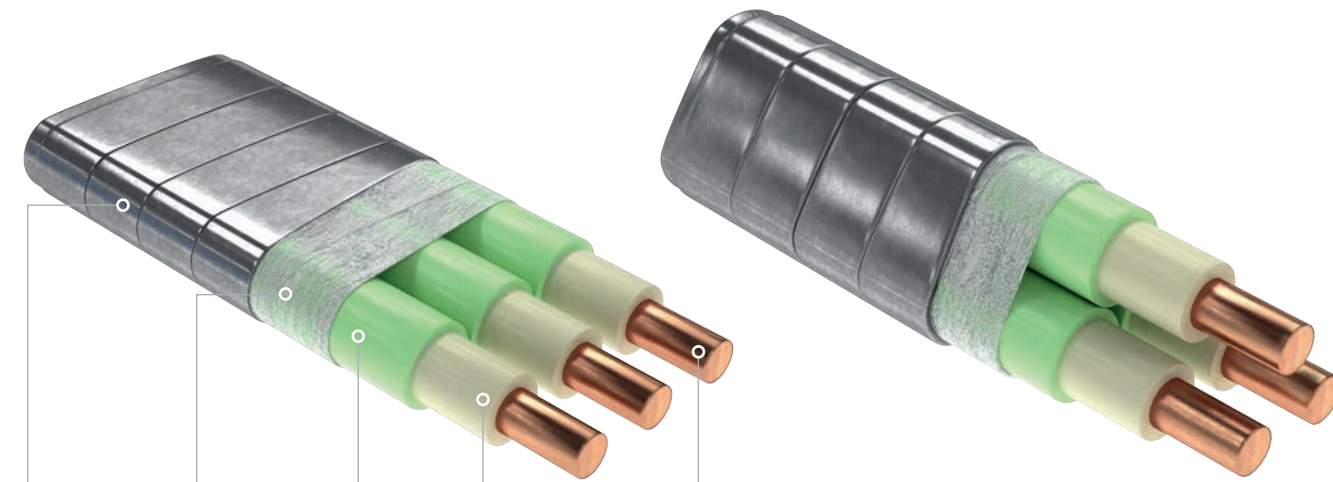
Production and restoration of metal drums for oil submersible cables

123

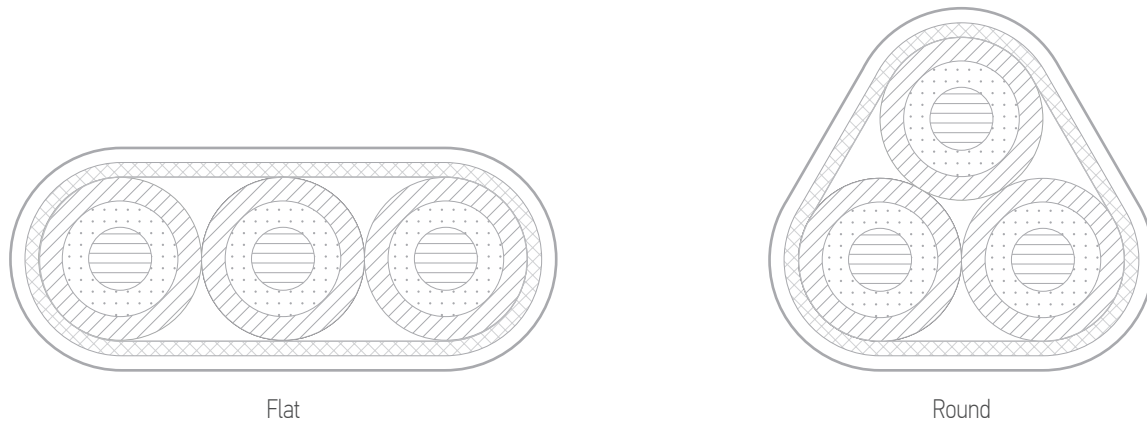
Services of Tatneft-Kabel

Cable for oil submersible electric pumps

KPBP-90, KPBK-90 (Spec. TU 16-505.129-2002), KPpBP-120, KPpBK-120 (Spec. TU 16.K71-293-2002), KPpTBP-130, KPpTBK-130 (Spec. TU 3542-097-04724019-2005)



Galvanized steel tape armour
Nonwoven fabric tape bedding
Second insulation layer
First insulation layer
Copper conductor



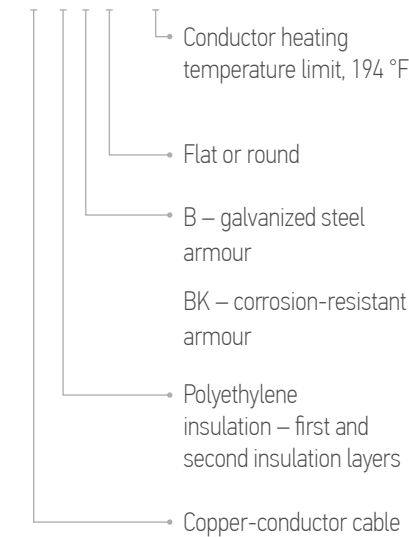
Purpose:

Cable with insulation made of polyethylene, polypropylene, propylene block copolymer with ethylene is designed to supply electrical energy to electric motors of oil production units at a rated voltage of 3.3 kV, frequency up to 50 Hz. Designed for use in boreal climate, placement category 1 and 5 according to GOST 15150-69, for operation in oil well fluid.

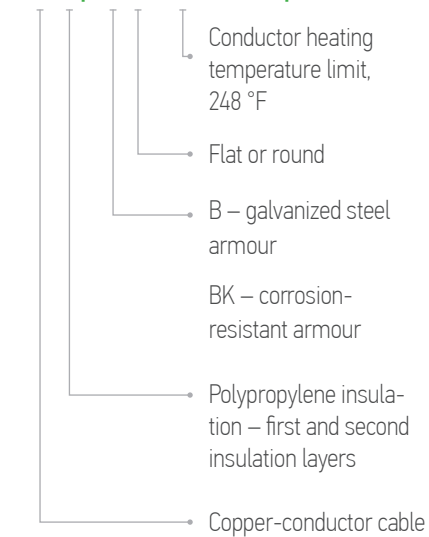
Execution:

Cable is produced in flat and round versions with armour made of galvanized steel tape or stainless steel tape.

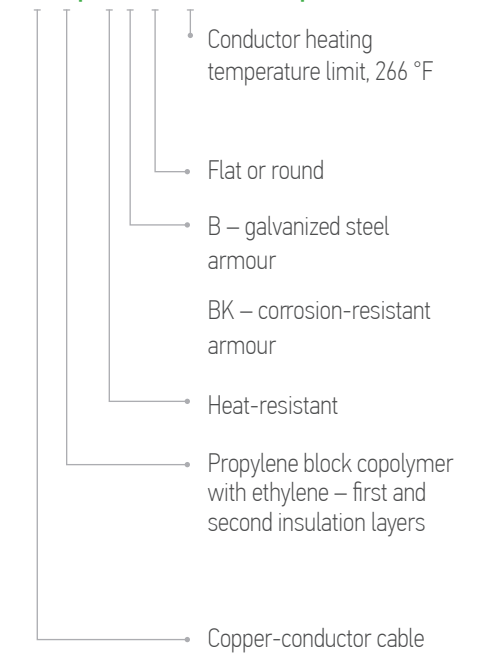
KPBP-90, KPBK-90



KPpBP-120, KPpBK-120



KPpTBP-130, KPpTBK-130

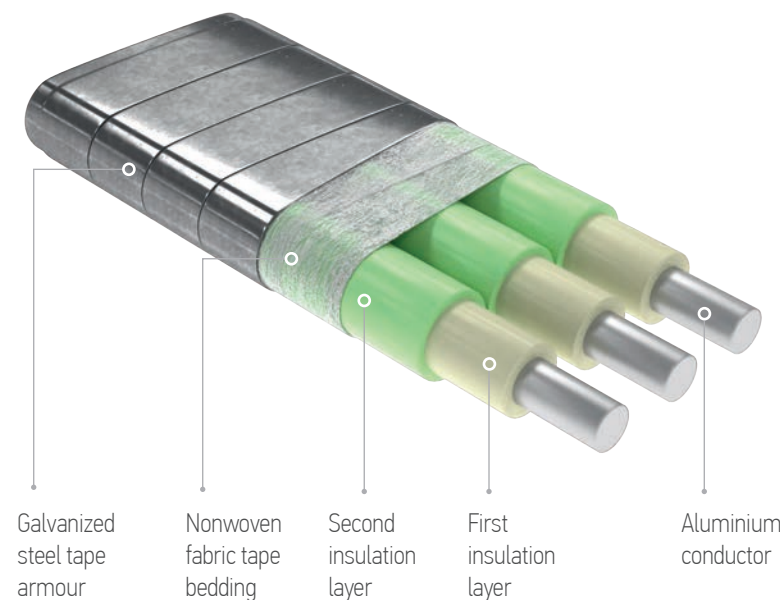


Specifications:

Cable type	Number and nominal cross-section area of conductors, in.	Estimated weight of 0.6214 mi (1 km) of cable, lb	External dimensions (diameter) of cable, in, max	Conductor heating temperature limit, °F
KPBP-90	3x0.315	1 795	0.4213x1.063	194
	3x0.394	1 980	0.5354x1.331	194
	3x0.630	2 469	0.5906x1.472	194
	3x0.984	3 197	0.6378x1.673	194
KPBK-90	3x0.315	1 658	0.9843	194
	3x0.394	1 870	1.142	194
	3x0.630	2 348	1.26	194
	3x0.984	3 078	1.402	194
KPpBP-120	3x0.315	1 720	0.4213x1.063	248
	3x0.394	2 059	0.5354x1.287	248
	3x0.630	2 566	0.5748x1.425	248
	3x0.984	3 318	0.5906x1.646	248
KPpBK-120	3x0.315	1 607	0.9843	248
	3x0.394	1 872	1.126	248
	3x0.630	2 361	1.213	248
	3x0.984	3 069	1.327	248
KPpBP-130	3x0.394	2 059	0.5354x1.287	266
	3x0.630	2 566	0.5748x1.425	266
	3x0.984	3 318	0.5906x1.646	266
KPpBK-130	3x0.394	1 872	1.126	266
	3x0.630	2 361	1.213	266
	3x0.984	3 069	1.327	266

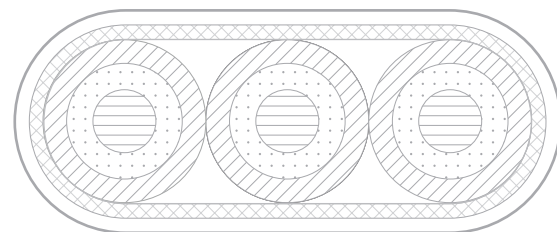
Cable with aluminium conductors for oil submersible electric pumps

AKPpBP-120, AKPpBK-120 (Spec. TU 3542-008-82321082-2015)



AKPpBP-120, AKPpBK-120

- Conductor heating temperature limit, 248 °F
- Flat or round
- B – galvanized steel armour
- BK – corrosion-resistant armour
- Propylene block copolymer with ethylene – first and second insulation layers
- Heat-resistant aluminium alloy cable



Flat

Purpose:

Cable with insulation made of polypropylene for installations of submersible electric pumps is designed to supply electrical energy to electric motors of oil production units at a rated voltage of 3.3 kV, frequency up to 50 Hz. Designed for use in boreal climate, placement category 1 and 5 according to GOST 15150-69, for operation in oil well fluid.

Execution:

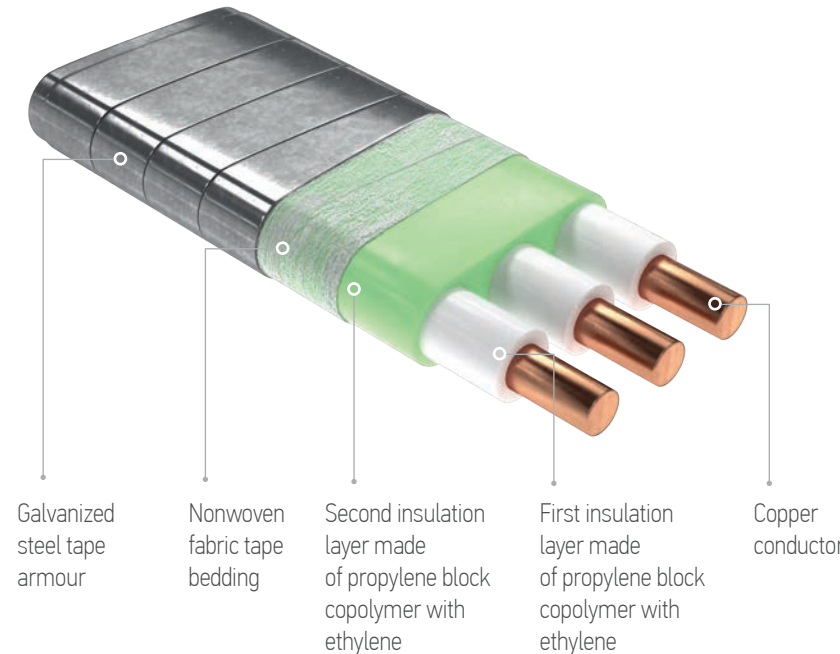
Cable is produced in flat and round versions with armour made of galvanized steel tape or stainless steel tape.

Specifications:

Cable type	Number and nominal cross-section area of conductors, in.	Estimated weight of 0.6214 mi (1 km) of cable, lb	External dimensions (diameter) of cable, in, max	Conductor heating temperature limit, °F
AKPpBP-120 (AKPpBK-120)	3x0.3937	1 420 (1 276)	0.5197x1.236 (0.9094)	248
	3x0.6299	1 649 (1 493)	0.563x1.343 (0.9803)	248
	3x0.9843	1 980 (1 810)	0.6102x1.488 (1.075)	248

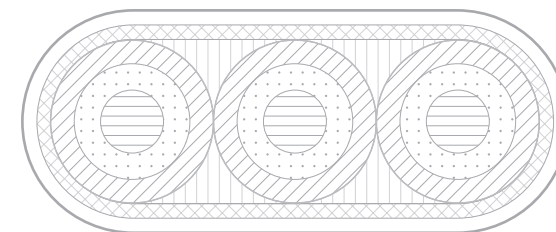
Common-sheath cable for submersible electric pumps

KPpOPpBP-130 (Spec. TU 3542-007-82321082-2014)



KPpOPpBP-130, 4.0

- Rated voltage, 4.0 kV – no designation in cable type
- Conductor heating temperature limit, 266 °F
- Flat
- B – galvanized steel armour
- BK – corrosion-resistant armour
- Propylene block copolymer with ethylene – first and second insulation layers and common sheath
- Copper-conductor cable



Flat

Purpose:

Overall insulation cable for installations of submersible electric pumps is designed to supply electrical energy to electric motors of oil production units at a rated voltage of 3.3 kV, frequency up to 70 Hz for operation in oil well fluid.

Execution:

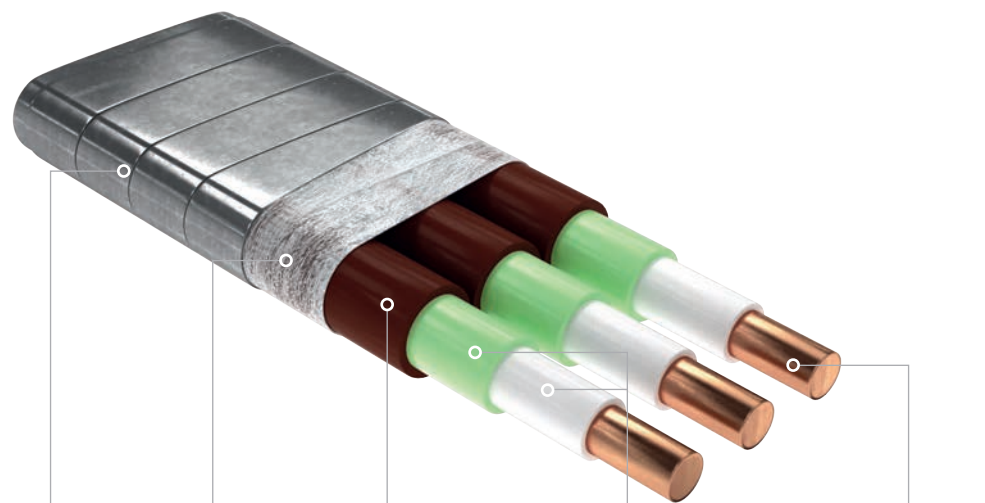
Cable is produced in flat version with common sheath with armour made of galvanized steel tape or stainless steel tape.

Specifications:

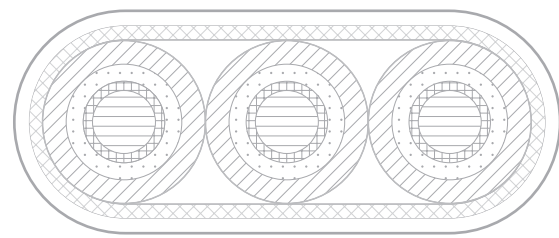
Cable type	Number and nominal cross-section area of conductors, in.	Estimated weight of 0.6214 mi (1 km) of cable, lb	External dimensions (diameter) of cable, in., max	Conductor heating temperature limit, °F
KPpOPpBP-130 (4.0 kV)	3x0.3937	2 183 (2 425)	0.5315x1.228 (0.6142x1.319)	266
	3x0.6299	2 712 (2 954)	0.5906x1.339 (0.6535x1.433)	266
	3x0.9843	3 505 (3 770)	0.6378x1.496 (0.6969x1.567)	266

Heat-resistant cable for oil submersible electric pumps

KPpFPpBP-150, KPpFPpB(k)K-150 (Spec. TU 3542-009-82321082-2015)



- Galvanized steel tape armour
- Nonwoven fabric bedding
- Insulation made of propylene block copolymer with ethylene
- Insulation made of fluorine-containing copolymer
- Copper conductor



Flat

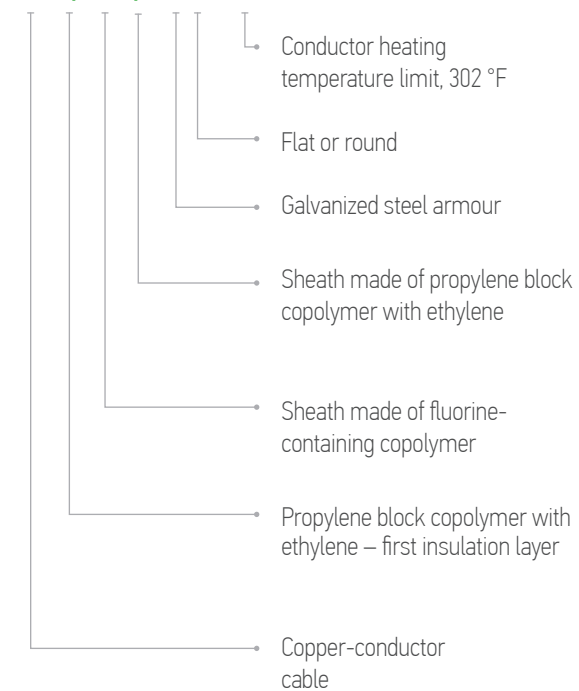
Purpose:

Copper-conductor cable with insulation made of propylene block copolymer with ethylene resistant to high ambient temperatures and fluorine-containing copolymer, designed to supply electrical energy to electric motors of oil production units at a rated voltage of 3.3 kV, frequency up to 70 Hz. Cable conductor continuous heating temperature is 302 °F.

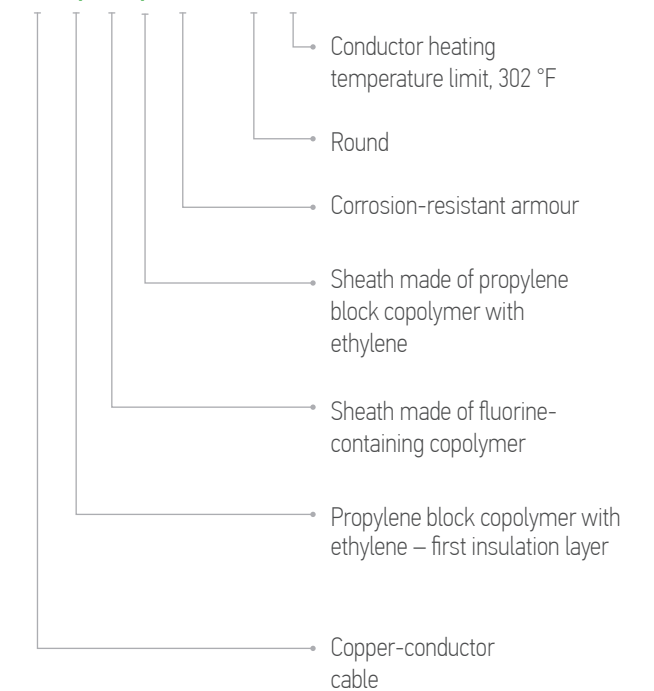
Execution:

Cable is produced in flat and round versions with armour made of galvanized steel tape or stainless steel tape.

KPpFPpBP-150



KPpFPpB(k)K-150

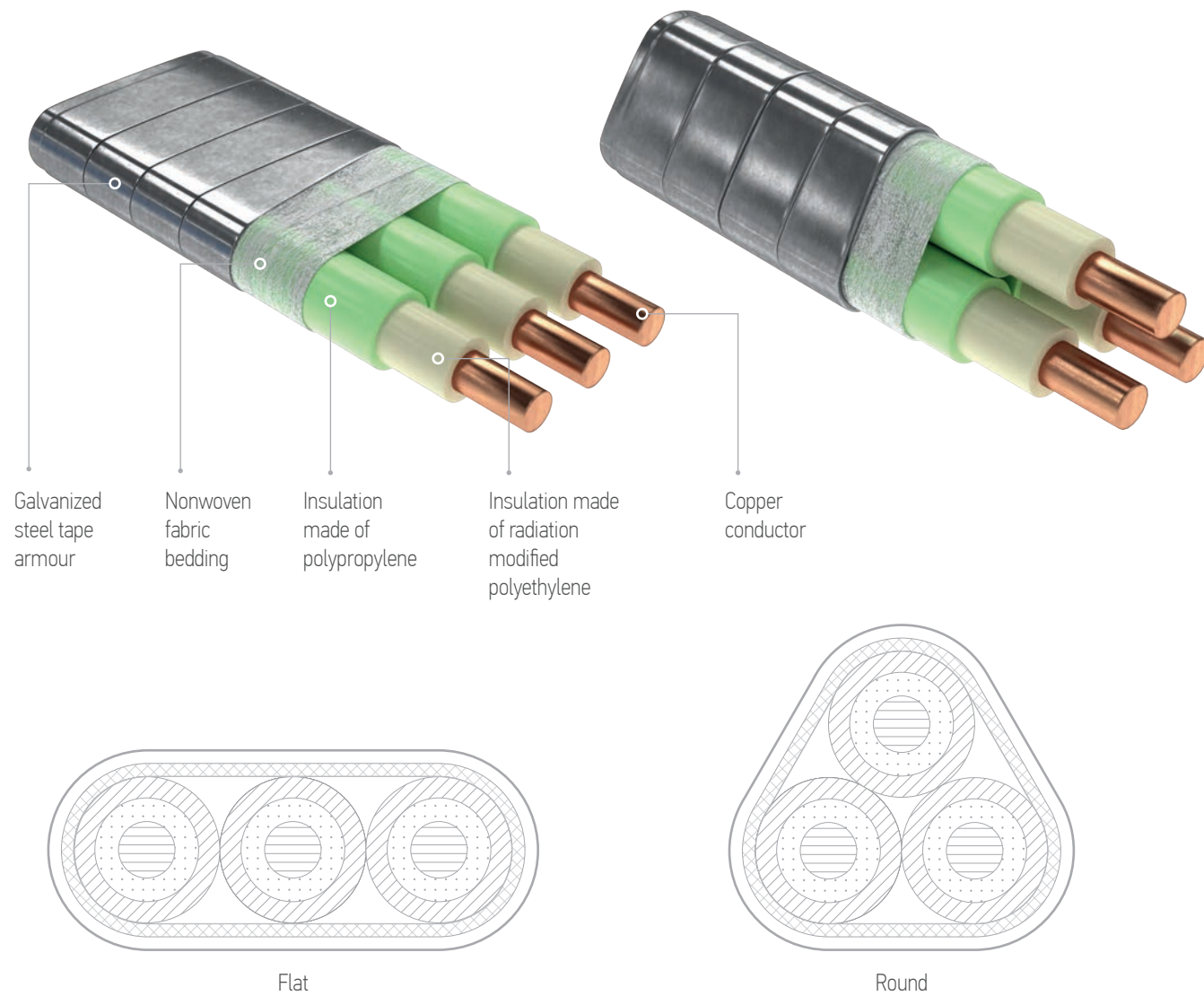


Specifications:

Cable type	Number and nominal cross-section area of conductors, in.	Estimated weight of 0.6214 mi (1 km) of cable, lb	External dimensions (diameter) of cable, in., max	Conductor heating temperature limit, °F
KPpFPpBP-150	3x0.394	1 843	0.5354x1.331	302
	3x0.6299	2 332	0.5906x1.472	302
	3x0.9843	3 049	0.6378x1.673	302
KPpFPpBK-150	3x0.394	1 830	0.5354x1.142	302
	3x0.6299	2 315	0.5906x1.303	302
	3x0.9843	3 031	0.6378x1.402	302

Cable with radiation modified polyethylene insulation

KPvPpBP-130, KPvPpBK-130 (Spec. TU 3542-004-82321082-2013)



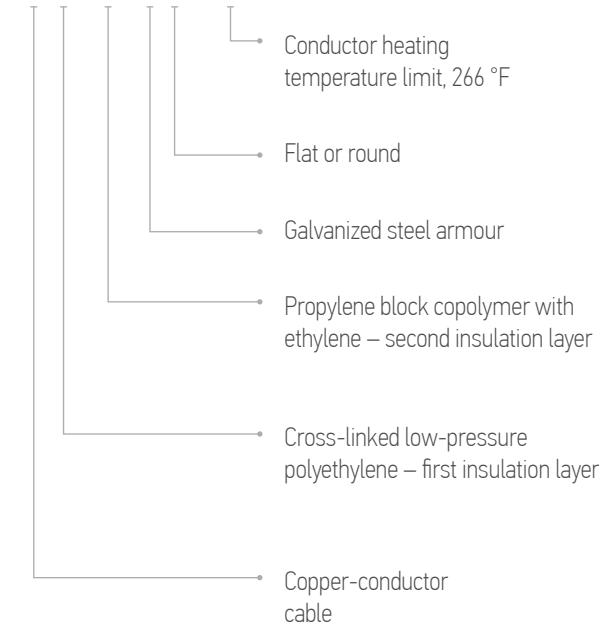
Purpose:

Copper-conductor cable with first insulation layer made of cross-linked low-pressure polyethylene (HDPE), second insulation layer made of propylene block copolymer with ethylene resistant to high ambient temperatures, designed to supply electrical energy to electric motors of oil production units at a rated voltage of 3.3 kV frequency up to 70 Hz. Cable conductor continuous heating temperature is 266 °F.

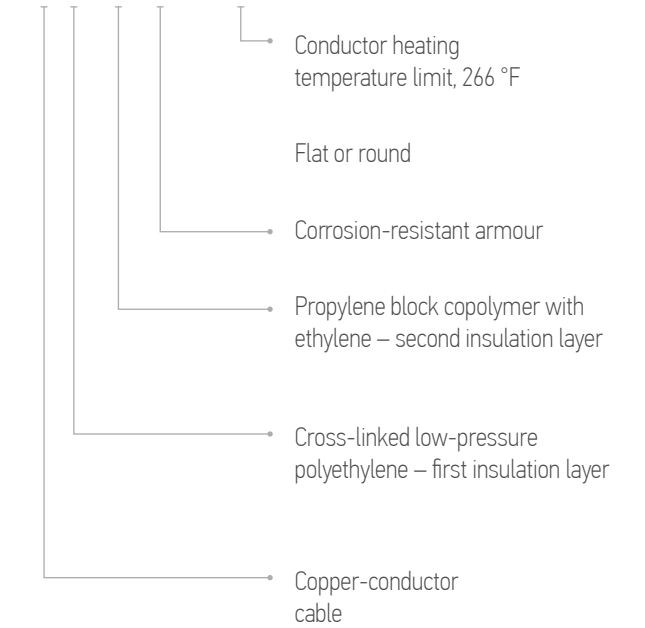
Execution:

Cable is produced in flat and round versions with armour made of galvanized steel tape or stainless steel tape.

KPvPpBP-130



KPvPpBK-130

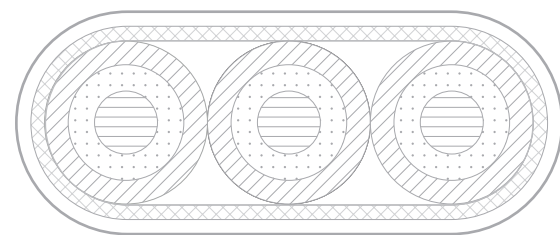
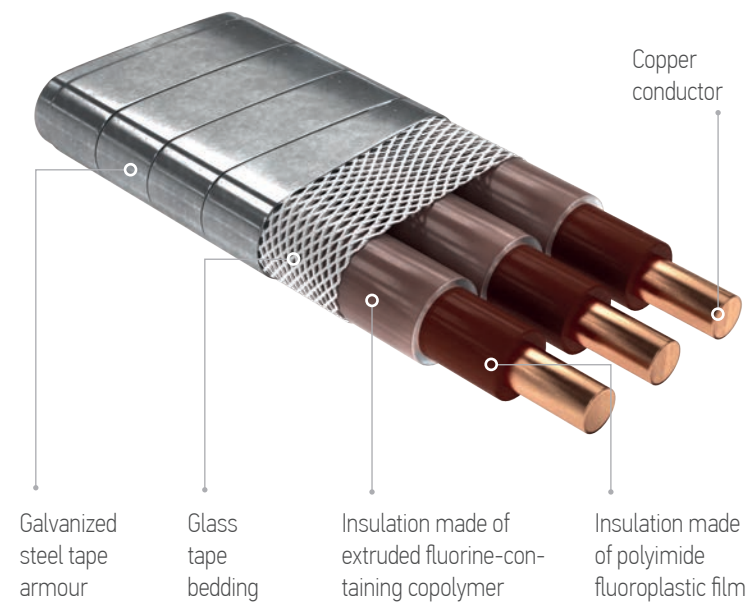


Specifications:

Cable type	Number and nominal cross-section area of conductors, in.	Estimated weight of 0.6214 mi (1 km) of cable, lb	External dimensions (diameter) of cable, in, max	Conductor heating temperature limit, °F
KPvPpBP-130	3x0.394	2 028	0.5433x1.291	266
	3x0.6299	2 491	0.5787x1.398	266
	3x0.9843	3 307	0.622x1.533	266
KPvPpBK-130	3x0.394	1 874	0.5433x1.094	266
	3x0.6299	2 359	0.5787x1.201	266
	3x0.9843	3 086	0.622x1.331	266

Heat-resistant flat cable for submersible electric pumps

KIFBP-200, KIFBP-230, KIFBP-250 (Spec. TU 3542-010-82321082-2015)



Flat

KIFBP - 200, 230, 250

- Conductor heating temperature limit, 392 °F (446 °F)
- Flat
- B – galvanized steel armour
- Bk – corrosion-resistant armour
- Fluorine – containing polymer – second insulation layer
- Polyimide fluoroplastic film – first insulation layer
- Copper-conductor cable

Purpose:

Cable is designed to supply electrical energy to submersible electric motors of oil production units at a rated voltage of up to 4.2 kV, frequency up to 200 Hz, in the temperature range from -76 °F to +446 °F. Designed for use in boreal climate, placement category 1 and 5 according to GOST 15150-69, for operation in oil well fluid. Can be used as extensions.

Execution:

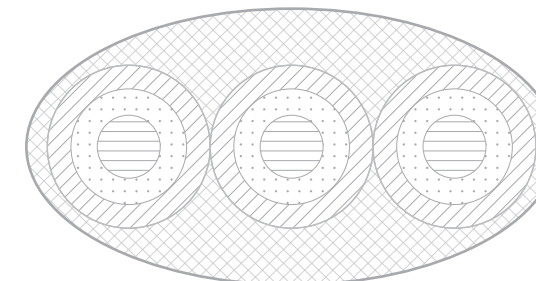
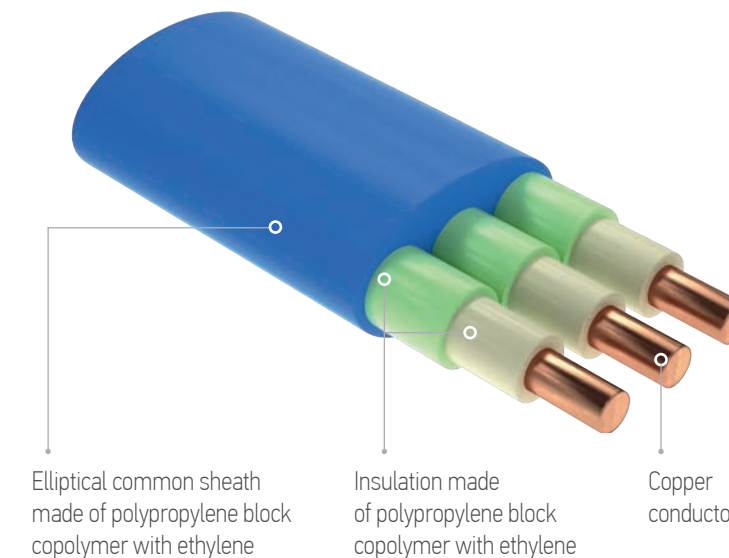
Cable is produced in flat version with armour made of galvanized steel tape or stainless steel tape.

Specifications:

Cable type	Number and nominal cross-section area of conductors, in.	Estimated weight of 0.62 mi (1 km) of cable, lb	External dimensions (diameter) of cable, in., max	Conductor heating temperature limit, °F
KIFBP-200 (KIFBP-230)	3x0.2362	1 093	0.374x0.7953	392 (446)
	3x0.315	1 301	0.3898x0.8425	200 (446)
	3x0.3937	1 521	0.4055x0.8898	200 (446)
	3x0.6299	2 138	0.4449x1.008	200 (446)

Unarmoured cable for oil submersible electric pumps

KPpOPPE-120



Flat (ellipse)

KPpOPPE-120

- Conductor heating temperature limit, 248 °F
- Propylene block copolymer with ethylene – insulation elliptical common sheath
- Propylene block copolymer with ethylene – first and second insulation layers
- Copper-conductor cable

Purpose:

Unarmoured cable with elliptical common sheath for installations of submersible electric pumps is designed to supply electrical energy to electric motors of oil production units at a rated voltage of 3.3 kV, 4 kV, frequency up to 70 Hz, for operation in oil well fluid.

Execution:

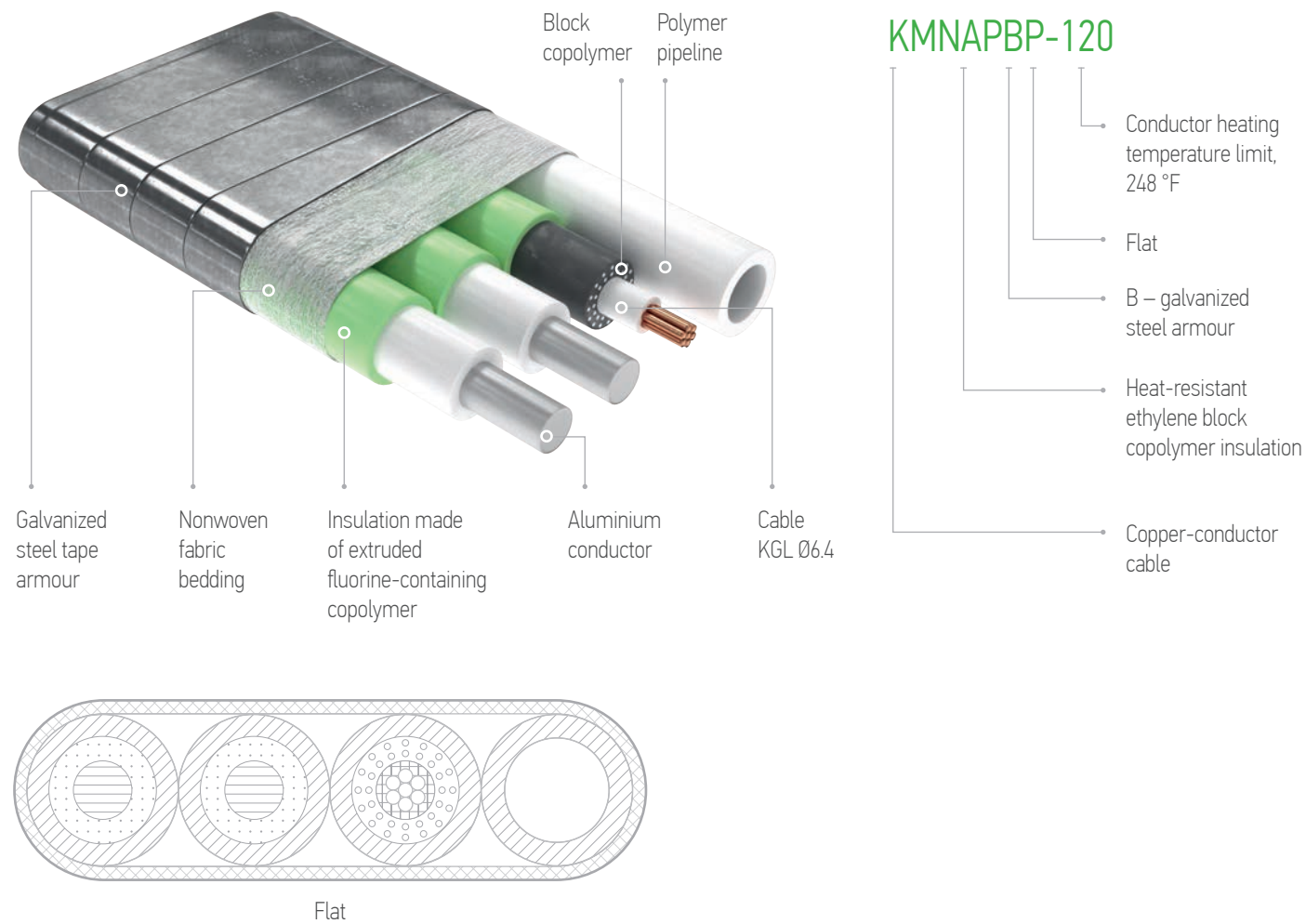
Cable is produced in flat version with elliptical common sheath made of polypropylene block copolymer with ethylene, without armour.

Specifications:

Cable type	Number and nominal cross-section area of conductors, in.	Estimated weight of 0.62 mi of cable, lb	External dimensions (diameter) of cable, in., max	Conductor heating temperature limit, °F
KPpOPPE-120	3x0.3937	1 343	0.6614x1.134	248
	3x0.5236	1 590	0.685x1.201	248
	3x0.6299	1 795	0.7008x1.24	248
	3x0.8327	2 189	0.7244x1.323	248
	3x0.9843	2 436	0.7402x1.37	248

Multifunction heating cable

KMNAPBP-K 120 2x10+1 (Spec. TU 16.K19-17-2012)



Purpose:

Cable KMNAPBP 120 2x10+1 is multifunction and is designed to fulfil the following functions simultaneously:

- warming up tubing strings in order to prevent asphalt, resin, and paraffin deposition on their internal surfaces;
- ensuring metered reagent supply to the downhole space;
- data transmission via a communication channel from bottomhole geophysical equipment.

Rated operating voltage of AC with frequency of 50 Hz. Designed for use in boreal climate, placement category 1 and 5 according to GOST 15150-69, for operation in oil well fluid.

Execution:

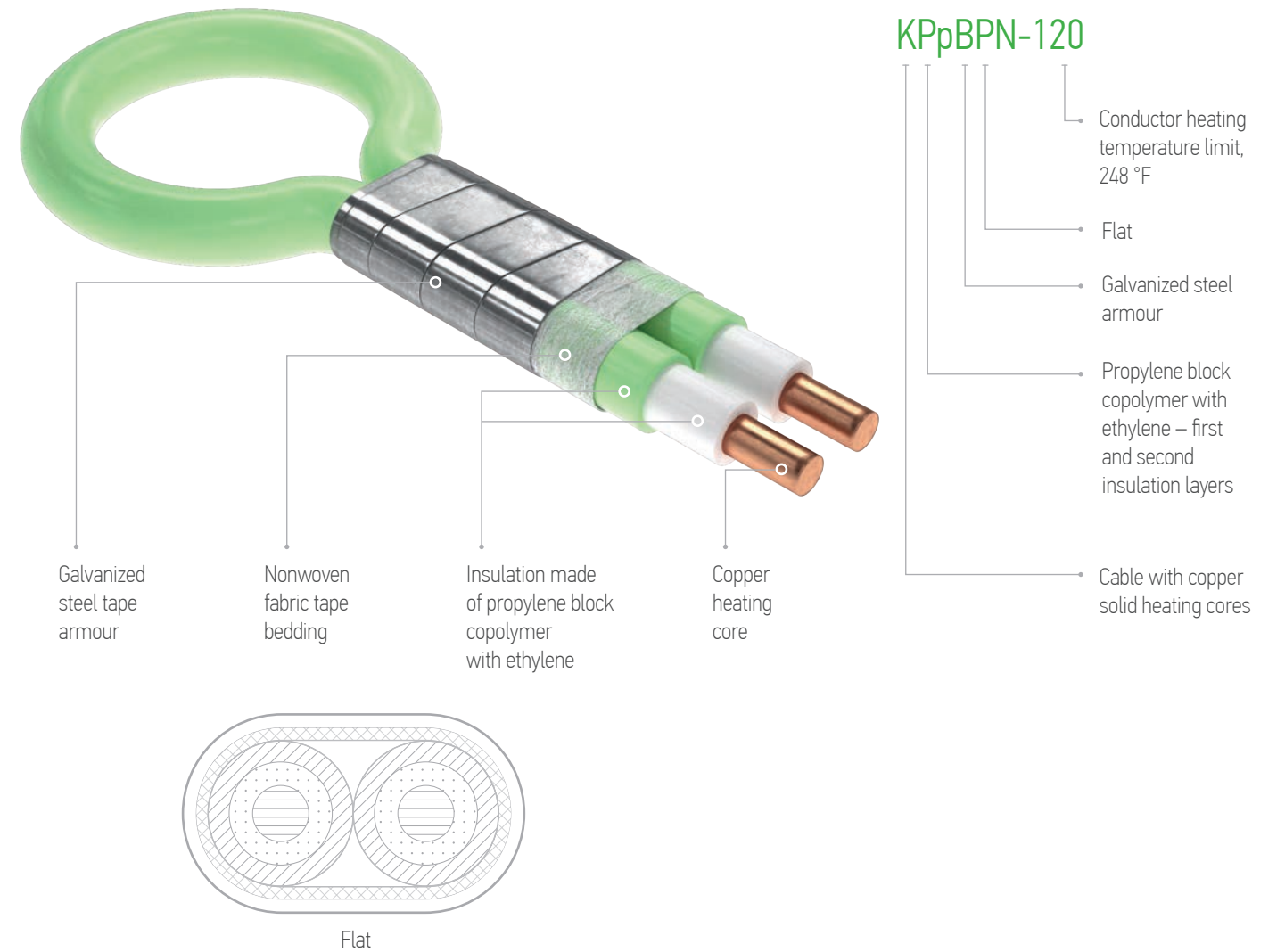
Cable is produced in flat version with armour made of galvanized steel tape or stainless steel tape.

Specifications:

Cable type	Number and nominal cross-section area of conductors, in.	Estimated weight of 0.62 mi of cable, lb	External dimensions (diameter) of cable, in., max	Conductor heating temperature limit, °F
KMNAPBP-120	3x0.3937	1 385	0.5197x1.268	248

Heating cable

KPpBPN-120 (Spec. TU 3558-002-09478996-2015)



Purpose:

Cable is designed for electric heating of tubing strings in order to reduce the viscosity of oil well fluid and prevent asphalt, resin, and paraffin deposition on tubing walls and oil pipeline walls. Designed for use in boreal climate, placement category 1 and 5 according to GOST 15150-69, for operation in oil well fluid.

Execution:

Cable is produced in flat version with armour made of galvanized steel tape or stainless steel tape.

Specifications:

Cable type	Number and nominal cross-section area of conductors, in.	Estimated weight of 0.62 mi of cable, lb	External dimensions (diameter) of cable, in, max	Conductor heating temperature limit, °F
KPpBPN-120	2x0.315	1 146	0.4331x0.7677	248
	2x0.3937	1 376	0.4528x0.8071	248

Enamelled wire

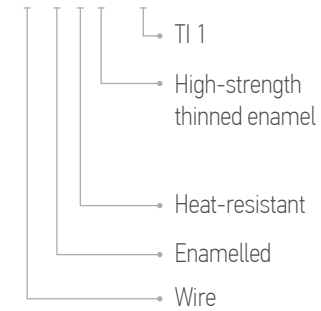


Enamel insulation
Copper wire Ø 0.40 to 0.002 in²

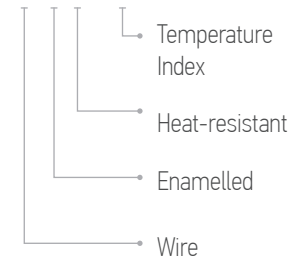


Round

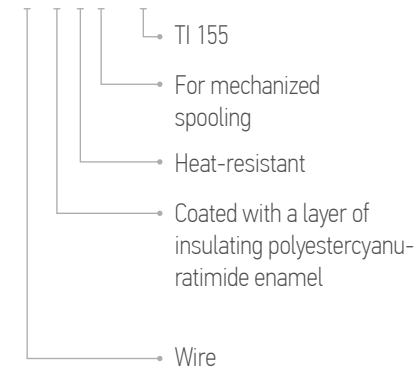
PETV-1, PETV-2



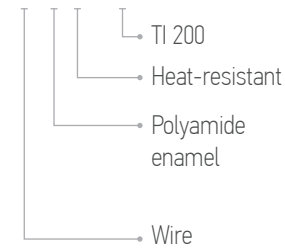
PET-155



PETM-155, PETM-155



PET-200



Purpose:

Wire is designed for the manufacture and overhaul of electric motor winding, transformers, relays, and inductors, as well as measuring and control units and other devices. Operating temperature from -76° to 392 °F

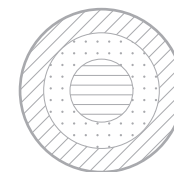
Execution:

PETV-1 (Spec. TU 16-705.110-79);
 PETV-2 (Spec. TU 16-705.110-79);
 PET-155 (Spec. TU 16.K71-160-92);
 PETM-155 (Spec. TU 16-705.173-80);
 PETVM-155 (Spec. TU 16-505.370-78);
 PET-200 (Spec. TU16-505.937-76).

Film insulated wire

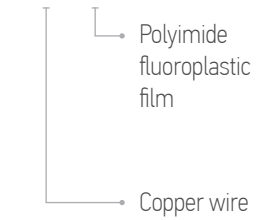


Insulation made of layers of polyimide fluoroplastic films.
Copper wire Ø 0.05906 to 0.124 in.

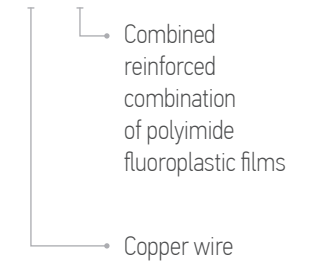


Round

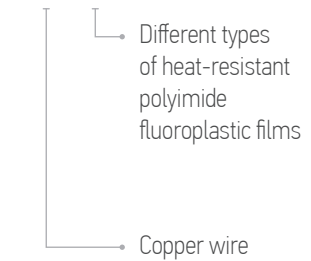
PPI



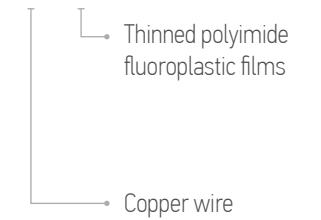
PPI-U



PPI-UT



PPI-UM



Purpose:

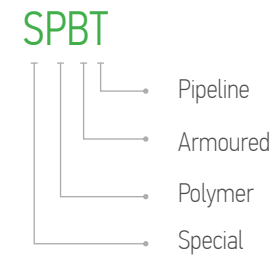
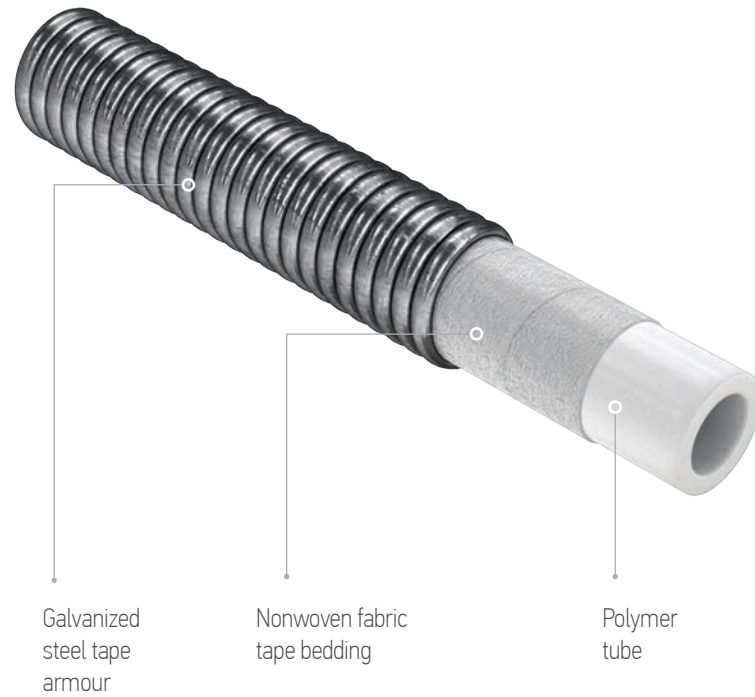
Wire is designed for submersible electric motor winding. It is used in the manufacture and overhaul of submersible electric motor stators.

The excellent electrical properties of the wire increase reliability of equipment subjected to overload.

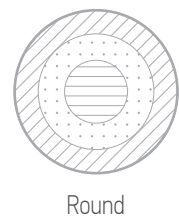
Execution:

PPI – (Spec. TU 16-705.159-80);
 PPI – U (Spec. TU 16-705.159-80);
 PPI – UT (Spec. TU 27.32.11-001-82321082-2018);
 PPI – UM (Spec. TU 16-705.159-80).

Special polymer armoured pipeline



Galvanized steel tape armour
Nonwoven fabric tape bedding
Polymer tube



Round

Purpose:

Designed for dosing chemical reagents in the required borehole section. The pipeline is capable of operating at high temperatures (up to 248°F). Designed for use in boreal climate, placement category 1 and 5 according to GOST 15150-69, for operation in oil well fluid.

Execution:

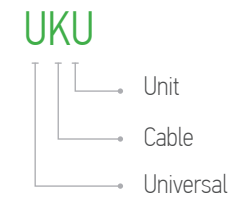
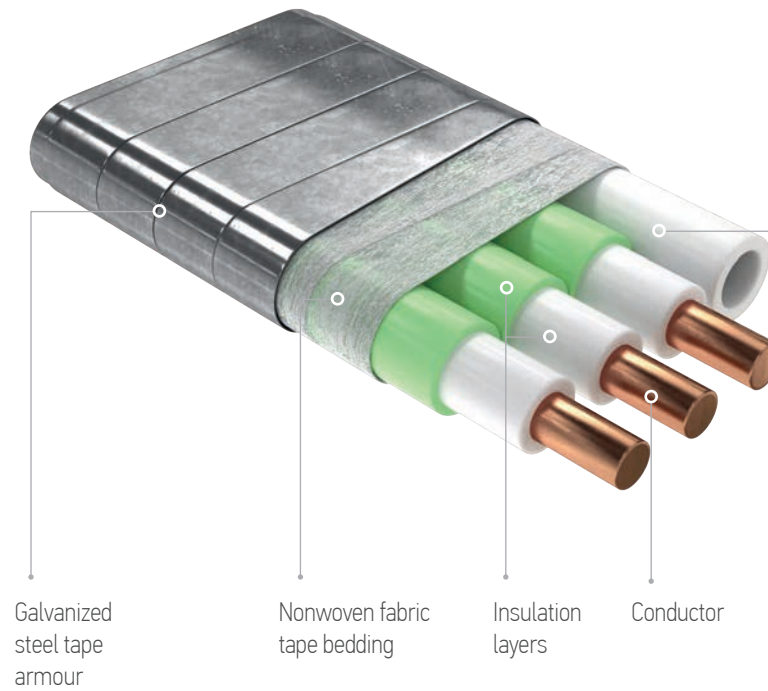
Pipeline is produced in flat and round versions with armour made of galvanized steel tape or stainless steel tape.

Design parameters:

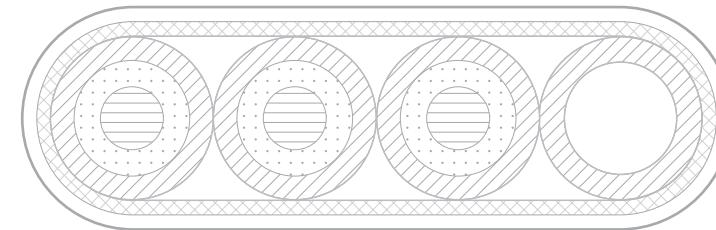
- quantity of polymeric pipelines – 1 to 4;
- polymeric pipeline external diameter 0.41±0.012 in; 0.57±0.012 in;
- polymeric pipeline internal diameter 0.18±0.02 in; 0.31±0.02 in.

Universal cable unit

UKU (Spec. TU 3542-010-82321082-2015)



Galvanized steel tape armour
Nonwoven fabric tape bedding
Insulation layers
Conductor
Polymer pipeline



Flat

Purpose:

Universal cable unit is designed to supply electrical energy to electric motors of oil production units at a rated voltage of 3.3 kV, frequency up to 50 Hz, and treatment of borehole bottoms with chemicals. Conductor heating temperature limit is 248°F. Designed for use in boreal climate, placement category 1 and 5 according to GOST 15150-69, for operation in oil well fluid.

Execution:

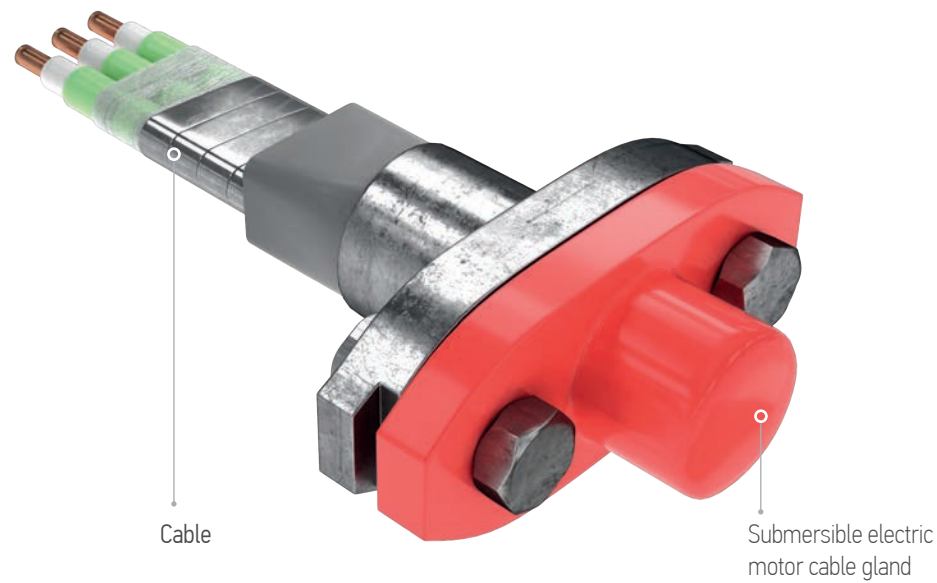
Cable unit is produced in flat version with armour made of galvanized steel tape or stainless steel tape.

Design parameters:

3x0.6299 + capillary tube (ext. Ø0.4134; int. Ø0.1772).

Extension cable

U, Up, UpT, UiF, UeS (Spec. TU 3542-011-82321082-2016)



Purpose:

Cable extension is designed to supply electrical energy to electric motors of oil production units, water lifting and pumping liquids from reservoir pits. Rated operating voltage of AC from 3.3 kV to 4.2 kV, frequency up to 70 Hz.

Execution:

Extension cable is made from all oil submersible cables produced by LLC Tatneft-Kabel, as well as using purchased lead-covered cables.

Design parameters:

Cross-section areas of conductors: 0.01; 0.02; 0.021; 0.023; 0.03 in².

U8/25

- Continuous operating temperature up to 194 °F
- Length 82.02 ft
- Cross-section area of conductors 0.0124 in.²
- Extension made with cable KPBP-90

Up10/30

- Continuous operating temperature up to 248 °F
- Length 98.43 ft
- Cross-section area of conductors 0.0155 in.²
- Extension made with cable KPpBP-120

UpT13.3/25

- Continuous operating temperature up to 266 °F
- Length 82.02 ft
- Cross-section area of conductors 0.02062 in.²
- Extension made with cable KPtBP-130

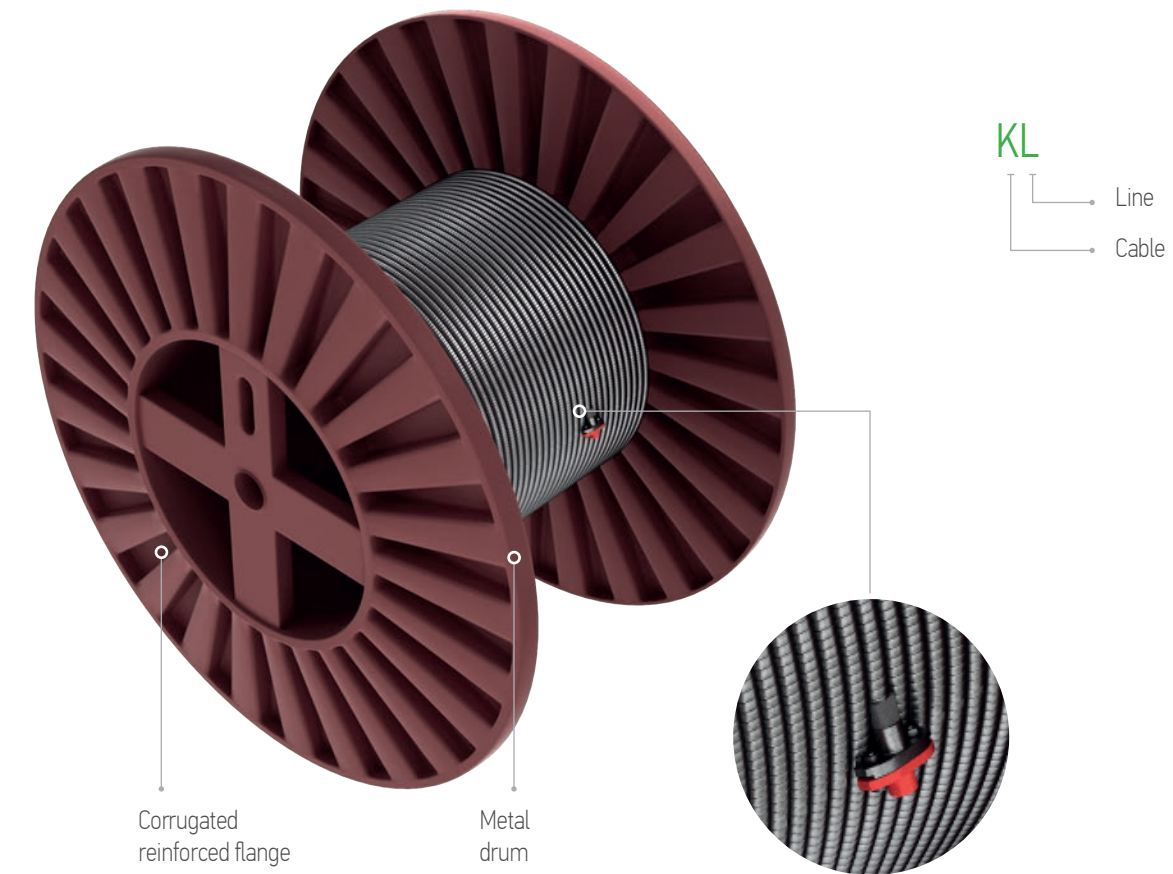
UiF16/25

- Continuous operating temperature up to 482 °F
- Length 82.02 ft
- Cross-section area of conductors 0.0248 in.²
- Extension made with cable KIFBP-200(250)

UeS10/25

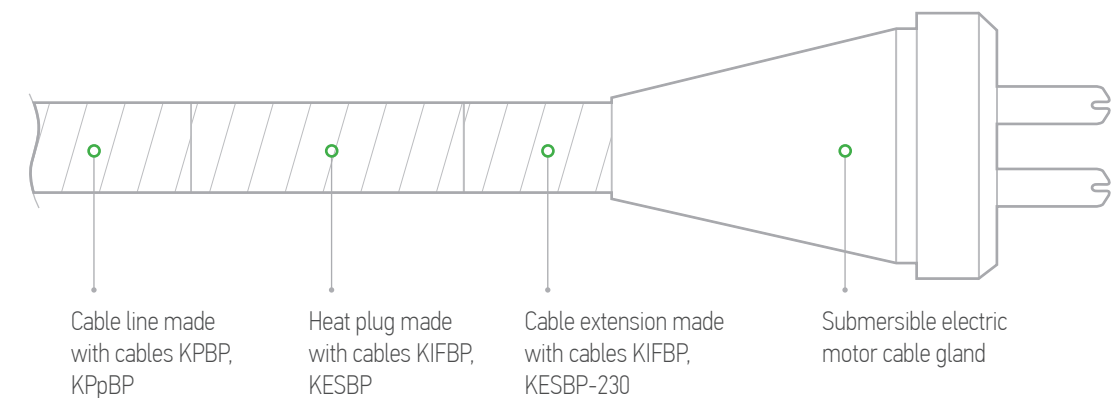
- Continuous operating temperature up to 446 °F
- Length 82.02 ft
- Cross-section area of conductors 0.0155 in.²
- Extension made with cable KESBP-230

Cable lines



Corrugated reinforced flange

Metal drum



Cable line made with cables KPBP, KPpBP

Heat plug made with cables KIFBP, KESBP

Cable extension made with cables KIFBP, KESBP-230

Submersible electric motor cable gland

Purpose:

Cable lines are designed to supply electrical energy to electric motors of oil production units, water lifting and pumping liquids from reservoir pits. Rated operating voltage of AC from 3.3 kV to 4.2 kV, frequency up to 70 Hz. The line schematic is developed individually, taking into account well conditions.

Execution:

Execution depends on Customer's specific technical requirements.

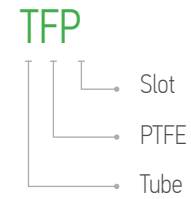
Design parameters:

Cross-section areas of conductors: 0.0124; 0.0155; 0.02062; 0.0248; 0.03278 in.².

Slot insulation for submersible electric motors



Electroinsulated PTFE tube



Purpose:

Electroinsulated fluoroplastic (PTFE) heat-resistant tube is designed to insulate slots for the winding of water and oil submersible electric motor stators.

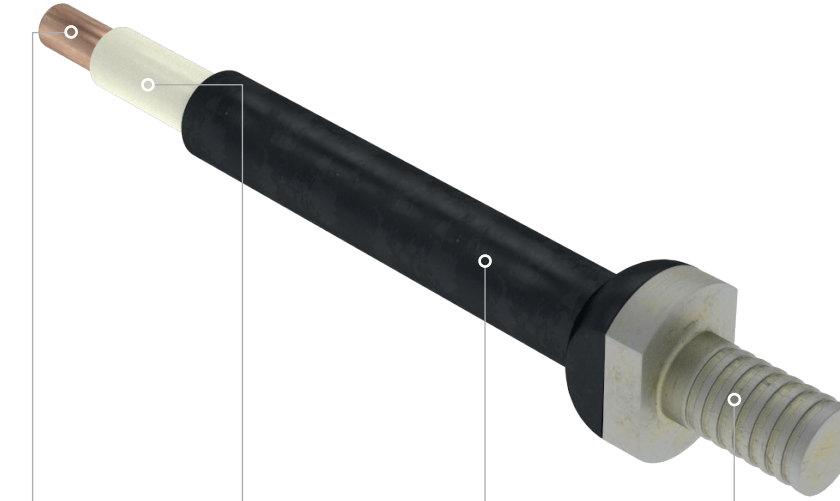
Execution:

Hollow tube.

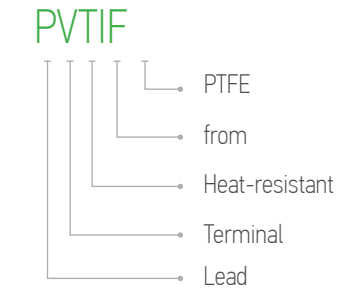
Specifications:

Cable type	Nominal cross-section area of conductors, in.	Maximum deviation from external diameter, in.	Nominal wall thickness, in.	Maximum deviation from nominal wall thickness, in.
TFP - 200 TFP - 250	0.4094	±0.004	0.0098 0.0106 0.0118	±0.002
	0.4331	±0.004	0.0098 0.0106 0.0118	±0.002
	0.4882	±0.004	0.0098 0.0106 0.0118	±0.002

Terminal leads for submersible electric motors



Flexible copper conductor
First insulation layer
Galvanized steel tape armour
Metal tip



Purpose:

Designed for connection of submersible electric motors as well as operation in oil-filled electric motors at voltages up to 4.2 kV AC, frequency up to 70 Hz, operating temperature range from -40 to +392 and +482 °F.

Execution:

Flexible.

Design:

Flexible copper insulated stranded conductor with metal tip.

Specifications:

Cable type	Nominal cross-section area of conductors, in.	Number and nominal wire diameter, in	Wire external diameter, in.		Direct current resistance of conductor per 0.6214 mi (1 km), Ohm, max
			Minimum	Maximum	
PVTIF	0.2362	0.75x0.28x0.009	0.185	0.2047	3,35
	0.3937	0.75x0.28x0.013	0.2244	0.252	2,04

Production and restoration of metal drums for oil submersible cables



Purpose:

Metal drum is designed for oil submersible cable winding and transportation.

Execution:

Drum No. 18, Drum No. 20.

Specifications:

Drum type	Flange diameter, ft.*	Overall width, ft*	Weight, lb*
No. 18	5.906	3.675	584.2
No. 20	6.562	4.101	793.7

* The table shows averaged data. The exact characteristics of the drums depend on Customer's technical requirements.

Services of Tatneft-Kabel

Stripping:

- Stripping of old insulation
- Remelting of copper conductors
- Production of new conductors
- Placing new insulation layers, armouring tape bedding.

Disposal:

Old cabling and wiring products disposal.

Modernization:

Modernization (overhaul) of cabling and wiring products of any cross-section area with a conductor heating temperature limit of up to 446 °F.

Repair for the Customer:

Overhaul is significantly cheaper than acquiring new equipment since part of the equipment is used again after inspection or remelting.

Tatneft-Kabel issues a guarantee for new submersible cables, and if we take into account that the submersible cables that we repair have reached the bedrock price after depreciation deductions, this is very cost-effective for our partners.

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LLC Servis NPO

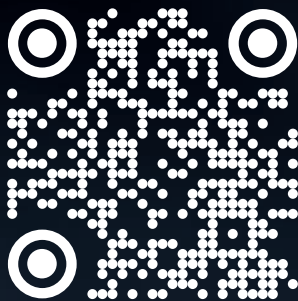
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