



ZERS GROUP OF COMPANIES  
«COMPLETION, OPERATION AND WELL REPAIR»



# COMPLETION EQUIPMENT

LINER HANGERS

STAGE CEMENTING COLLARS

CASING  
PACKERS

CENTRALIZERS

SLIDING SLEEVES

FLOAT EQUIPMENT



SHOES



THERE ARE NO TRIFLES IN WELL CASING!



GROUP OF COMPANIES

## **«COMPLETION, OPERATION AND WELLS REPAIR»**

Since its foundation in 1998 GC "ZERS" has developed and introduced into production more than 350 of units sizes and technical products used for quality improving of well construction. These are complexes for beds isolation, casing and tubing packers of different application, collars for multiple stage cementing and collar cementing, liner hangers, complex solutions for hydraulic fracturing, non-return valves, centralizers, filters and other casing string equipment.

We provided services for our equipment at more than 4000 wells and more than 85000 units developed by ZERS were run in holes.

Vast experience in new equipment development and thorough analysis of its operation in field conditions allowed us to create and patent a number of new generation devices. Responsibility for our products quality, terms of production, possibility of independent pricing led us to creation of our own production line thus allowing vertical integration from «development stage» through «manufacturing» to «commissioning», interaction between the stages each year allows us to reach more and more impressive results.

# CONTENTS

Certificates and Licenses .....	5
---------------------------------	---

## I. LINER HANGERS

Noncemented Retrievable Liner Hanger PHN-E .....	8
Noncemented Liner Hanger PHN1 .....	10
Noncemented Liner Hanger PHN2 .....	13
Noncemented Liner Hanger, rotating while running in PHNV .....	15
Noncemented liner hanger with oriented wedge PHN-KO .....	17
Protected Cemented Liner Hanger PHCZ .....	19
Protected Rotated Cemented Liner Hanger PHCZV .....	23
Hydraumechanical Cemented Liner Hanger PHGMC .....	26
Protected Hydraumechanical Cemented Liner Hanger PHGMCZ .....	31
Liner Hanger with disconnection before cementing PHRC .....	33
Cemented Liner Hanger for flush-joint pipes PHCBT .....	37
Protected Liner Hanger for Stage Cementing PHZSC .....	39

## II. PACKERS

Hydraulic Pass-Through Packer PGP, PGP1, PGP6 .....	44
Hydraulic Pass-Through Packer with Small-Size Valve Unit PGPM1.245 .....	46
Hydraulic Packer for Collar Cementing PGMC, PGMC2, PGMC4, PGMC 6 .....	48
Packer for Collar Cementing PMC, PMC-R .....	51
Water-Swellable and Oil-Swellable Packer PNV and PNN .....	53

## III. EXTERNAL CASING ATTACHMENTS

Collar for collar cementing MMC1 .....	58
String disconnecter for water wells RKVS .....	60
Multiple-unit revolvable disconnecter RKVO .....	62
Collar cementing valve KMC .....	64
Cementing basket CK .....	65
Pressure test device PO .....	66
Device for stage-by-stage run-in-hole operation USSK, USSKP .....	68
Hydraulic fracturing device UGRH .....	70
Screener UECS .....	72
Casing float KOSH2, KOSHBT .....	73
Seat-trap SL .....	75
Auxiliary top modular packer PDV-M .....	76
Top Auxiliary Packer PDV2 .....	77
Trip stop-tap SPD2 .....	78
Bow springs centralizer PC .....	79
Hard elastic centralizer PCR .....	81

Lowfrictional centralizer-turbolizer CTN . . . . .	<b>82</b>
Stop Ring SKC . . . . .	<b>83</b>
Cementing throttle nonreturn valve CKOD . . . . .	<b>84</b>
Casing shoe BK . . . . .	<b>85</b>
Well screen FS, FB . . . . .	<b>88</b>

#### **IV. DRILLING EQUIPMENT**

Hole Selective Washing Device USPS . . . . .	<b>96</b>
--	-----------

#### **IV. HYDRAULIC FRACTURING**

Technical equipment set for a liner well casing with the following multistage hydraulic fracturing . . . . .	<b>100</b>
Pressure test nipple for hydraulic fracturing POGRP . . . . .	<b>102</b>
Nonreturn valve KO . . . . .	<b>103</b>
Hydraulic packer for hydraulic fracturing PGRP . . . . .	<b>104</b>
Water and oil swellable packer for hydraulic fracturing . . . . .	<b>106</b>
Collar for staged hydraulic fracturing MSGRP and MSGRP-G . . . . .	<b>107</b>
Collar for collar cementing for hydraulic fracturing MMC-G . . . . .	<b>109</b>
Set of equipment for multistage fracturing performance with unlimited number of ports and possibility of the second multistage fracturing or opening-closing of ports . . . . .	<b>111</b>
Collar for staged hydraulic fracturing MSGRP-U . . . . .	<b>112</b>

#### **V. EXAMPLES OF ASSEMBLIES APPLIED FOR DIFFERENT PURPOSES**

Well casing with noncementing liner . . . . .	<b>116</b>
Well casing with noncementing liner with washing through a shoe with an option of rotating during running in and zones separation with swellable packers . . . . .	<b>117</b>
Well casing with noncementing liner with zones separation by inflatable packers . . . . .	<b>118</b>
Well casing with cementing liner with continuous cementing, with zones separation by hose packers . . . . .	<b>119</b>
Well casing with collar cementing liner with additional separation of upper formations by inflatable packers . . . . .	<b>120</b>
Well casing with noncementing liner with packaging for MSHF performance and zones separation with hydraulic and swellable packers . . . . .	<b>121</b>
Well casing with collar cementing liner, with packaging for MSHF performance and zones separation with swellable packers . . . . .	<b>122</b>
Well casing with collar cementing liner, with packaging for MSHF performance and zones separation with hydraulic packers . . . . .	<b>123</b>
Well casing with collar cementing liner with two-stage cementing . . . . .	<b>124</b>







# CERTIFICATES AND LICENSES

**РОССИЙСКАЯ ФЕДЕРАЦИЯ**  
**СЕРТИФИКАТ СООТВЕТСТВИЯ**  
(обязательная сертификация)

№ **C-RU.H005.B.00025** ТР **05983441**  
(номер сертификата соответствия) (учетный номер бланка)

**ЗАЯВИТЕЛЬ** Общество с ограниченной ответственностью "Научно-технический центр "ЭЗРС"  
(полное наименование в соответствии с Единым государственным реестром юридических лиц)  
Адрес: Россия, 109147, г. Москва, Б. Факельный переулок, дом 22, помещение V. ОГРН: 1026201080290. Телефон (495) 912-28-24, факс (495) 912-09-44. E-mail: ntczrs@mail.ru

**ИЗГОТОВИТЕЛЬ** Общество с ограниченной ответственностью "Научно-технический центр "ЭЗРС"  
(полное наименование в соответствии с Единым государственным реестром юридических лиц)  
Адрес: Россия, 109147, г. Москва, Б. Факельный переулок, дом 22, помещение V. ОГРН: 1026201080290. Телефон (495) 912-28-24, факс (495) 912-09-44. E-mail: ntczrs@mail.ru

**ОРГАН ПО СЕРТИФИКАЦИИ** Научное некоммерческое партнерство "НПО "Буравая техника"-Первый ВНИИБТ-сертификат"  
(полное наименование в соответствии с Единым государственным реестром юридических лиц)  
180014, Московская область, г. Люберцы, 1-й Панковский проезд, д. 3, офис 313. Телефон факс (495) 344-09-03, 502-29-48.  
Федеральный регистрационный номер 1025001207679. Аттестат рег. № РОСС RU.0001.11Н005 выдан 08.09.2010г. Федеральным агентством по техническому регулированию и метрологии.

**ПОДТВЕРЖДАЕТ, ЧТО** Подписчик хвостовиков согласно перечню в приложении № 0134542. Серийный выпуск.

код ОК 005 (ОКП)	36 6580
код ЕКПС	
код ТН ВЭД России	

**СООТВЕТСТВУЕТ ТРЕБОВАНИЯМ** Технический регламент о безопасности машин и оборудования (Постановление (Технических Регламентов) Правительства РФ от 15.09.2009 г. № 753).  
(полное наименование в соответствии с Единым государственным реестром юридических лиц)  
См. приложение № 0134543

**ПРОВЕДЕННЫЕ ИССЛЕДОВАНИЯ** Протокол сертификационных испытаний № 20/11 от 06.05.2011 г. (ИСПЫТАНИЯ) И ИЗМЕРЕНИЯ ИЛ ННП "ВНИИБТ-сертификат" (РОСС RU.0001.21ХТ19).  
Акт анализа состояния производства от 22.07.2011 г.

**ПРЕДСТАВЛЕННЫЕ ДОКУМЕНТЫ** Документы, удостоверяющие соответствие в части по сертификации в отношении действительности соответствия продукции требованиям заявленного регламента (полное наименование в соответствии с Единым государственным реестром юридических лиц)

**СРОК ДЕЙСТВИЯ СЕРТИФИКАТА СООТВЕТСТВИЯ** с 02.08.2011 по 02.08.2016

**Руководитель (заместитель руководителя) органа по сертификации** *А.К. Забурдаев* А.К. Забурдаев  
**Эксперт (эксперты)** *А.А. Демин* А.А. Демин

**РОССИЙСКАЯ ФЕДЕРАЦИЯ**  
**СЕРТИФИКАТ СООТВЕТСТВИЯ**  
(обязательная сертификация)

№ **C-RU.H005.B.00024** ТР **05983440**  
(номер сертификата соответствия) (учетный номер бланка)

**ЗАЯВИТЕЛЬ** Общество с ограниченной ответственностью "Научно-технический центр "ЭЗРС"  
(полное наименование в соответствии с Единым государственным реестром юридических лиц)  
Адрес: Россия, 109147, г. Москва, Б. Факельный переулок, дом 22, помещение V. ОГРН: 1026201080290. Телефон (495) 912-28-24, факс (495) 912-09-44. E-mail: ntczrs@mail.ru

**ИЗГОТОВИТЕЛЬ** Общество с ограниченной ответственностью "Научно-технический центр "ЭЗРС"  
(полное наименование в соответствии с Единым государственным реестром юридических лиц)  
Адрес: Россия, 109147, г. Москва, Б. Факельный переулок, дом 22, помещение V. ОГРН: 1026201080290. Телефон (495) 912-28-24, факс (495) 912-09-44. E-mail: ntczrs@mail.ru

**ОРГАН ПО СЕРТИФИКАЦИИ** Научное некоммерческое партнерство "НПО "Буравая техника"-Первый ВНИИБТ-сертификат"  
(полное наименование в соответствии с Единым государственным реестром юридических лиц)  
180014, Московская область, г. Люберцы, 1-й Панковский проезд, д. 3, офис 313. Телефон факс (495) 344-09-03, 502-29-48.  
Федеральный регистрационный номер 1025001207679. Аттестат рег. № РОСС RU.0001.11Н005 выдан 08.09.2010г. Федеральным агентством по техническому регулированию и метрологии.

**ПОДТВЕРЖДАЕТ, ЧТО** Пакеры согласно перечню в приложении № 0134540.  
**ПРОДУКЦИЯ** Серийный выпуск.

код ОК 005 (ОКП)	36 6582
код ЕКПС	
код ТН ВЭД России	

**СООТВЕТСТВУЕТ ТРЕБОВАНИЯМ** Технический регламент о безопасности машин и оборудования (Постановление (Технических Регламентов) Правительства РФ от 15.09.2009 г. № 753).  
(полное наименование в соответствии с Единым государственным реестром юридических лиц)  
См. приложение № 0134541

**ПРОВЕДЕННЫЕ ИССЛЕДОВАНИЯ** Протокол сертификационных испытаний № 19/11 от 06.05.2011 г. (ИСПЫТАНИЯ) И ИЗМЕРЕНИЯ ИЛ ННП "ВНИИБТ-сертификат" (РОСС RU.0001.21ХТ19).  
Акт анализа состояния производства от 22.07.2011 г.

**ПРЕДСТАВЛЕННЫЕ ДОКУМЕНТЫ** Документы, удостоверяющие соответствие в части по сертификации в отношении действительности соответствия продукции требованиям заявленного регламента (полное наименование в соответствии с Единым государственным реестром юридических лиц)

**СРОК ДЕЙСТВИЯ СЕРТИФИКАТА СООТВЕТСТВИЯ** с 02.08.2011 по 02.08.2016

**Руководитель (заместитель руководителя) органа по сертификации** *А.К. Забурдаев* А.К. Забурдаев  
**Эксперт (эксперты)** *А.А. Демин* А.А. Демин

**ТАМОЖЕННЫЙ СОЮЗ**  
**СЕРТИФИКАТ СООТВЕТСТВИЯ**

№ TC RU C-RU.H005.B.00045  
Серия RU № 0029649

**ОРГАН ПО СЕРТИФИКАЦИИ** Орган по сертификации нефтегазового оборудования ННП "ВНИИБТ-сертификат". Адрес: 140004, Московская область, г. Люберцы, 1-й Панковский проезд, д. 1 "Б", офис № 10 (юридический); 140014, Московская область, г. Люберцы, 1-й Панковский проезд, д. 3, офис 313 (фактический). Телефон (495) 6449803, 5022248. Факс (495) 5449811. E-mail: ruo-son@mail.ru Аттестат аккредитации № РОСС RU.0001.11Н005 выдан 18.10.2013 г. Федеральной службой по аккредитации.

**ЗАЯВИТЕЛЬ** Общество с ограниченной ответственностью научно-технический центр "ЭЗРС"  
Адреса: Россия, 109147, г. Москва, Б. Факельный пер., д. 22, помещение V (юридический); Россия, 107078, Москва, ул. Новая Басманная, д. 14, стр. 1 (фактический). ОГРН: 1026201080290. Телефон: (495) 6322194. Факс: (495) 6322197. E-mail: info@ezrs.ru

**ИЗГОТОВИТЕЛЬ** Общество с ограниченной ответственностью научно-технический центр "ЭЗРС"  
(юридический); Россия, 107078, Москва, ул. Новая Басманная, д. 14, стр. 1 (фактический). ОГРН: 1026201080290. Телефон: (495) 6322194. Факс: (495) 6322197. E-mail: info@ezrs.ru

**ПРОДУКЦИЯ** Оборудование и оснастка для заканчивания и крепления скважин согласно перечню в приложении к настоящему сертификату на 2-х листах (бланки № 0036864 и № 0036865).  
Серийный выпуск

**КОД ТН ВЭД ТС** 8431 43 000 0

**СООТВЕТСТВУЕТ ТРЕБОВАНИЯМ** Технического регламента Таможенного союза ТР ТС 010/2011 "О безопасности машин и оборудования" (Утвержден Решением Комиссии Таможенного союза от 18 октября 2011 г. № 823)

**СЕРТИФИКАТ ВЫДАН НА ОСНОВАНИИ** - протокола сертификационных испытаний № 46/14 от 03.11.2014 г., выданного испытательной лабораторией ННП "ВНИИБТ-сертификат" (аттестат аккредитации № РОСС RU.0001.21ХТ19 действителен по 05.03.2016).  
- акта по результатам анализа состояния производства от 03.11.2014 г., проведенного органом по сертификации нефтегазового оборудования ННП "ВНИИБТ-сертификат" (аттестат аккредитации № РОСС RU.0001.11Н005 действителен по 08.09.2015 г.)

**ДОПОЛНИТЕЛЬНАЯ ИНФОРМАЦИЯ** Условия хранения - по ГОСТ 15150: 4Ж2. Срок хранения без переконсервации - не более 18 месяцев. Срок эксплуатации равен сроку эксплуатации обсадной колонны. Схема сертификации 1с.

**СРОК ДЕЙСТВИЯ** с 03.12.2014 г. по 02.12.2019 г. ВКЛЮЧИТЕЛЬНО

**Руководитель (уполномоченное лицо) органа по сертификации** *А.К. Забурдаев* А.К. Забурдаев  
**Эксперт (эксперт-аудитор)** *В.И. Семин* В.И. Семин

**ФЕДЕРАЛЬНАЯ СЛУЖБА**  
**ПО ЭКОЛОГИЧЕСКОМУ, ТЕХНОЛОГИЧЕСКОМУ И АТОМНОМУ НАДЗОРУ**

**РАЗРЕШЕНИЕ** № РРС 00-046030

На применение

Оборудование (техническое устройство, материал);  
Оборудование и оснастка для заканчивания и крепления скважин согласно перечню в приложении к настоящему разрешению.

Код ОКП (ТН ВЭД): 36 6580, 36 6383, 36 6582

Изготовитель (поставщик): Общество с ограниченной ответственностью "Научно-технический центр "ЭЗРС" (г. Москва, Б. Факельный пер., 22, помещение V).

Основание выдачи разрешения: Техническая документация, заключение экспертизы промышленной безопасности ННП "ВНИИБТ-сертификат" № 43/11 от 30.09.2011 г. (рег. № 14-ТУ-Д12325-2011), сертификаты соответствия ОС ННП "ВНИИБТ-сертификат" № РОСС RU.H005.H00052, № C-RU.H005.B.00024 и № C-RU.H005.B.00025 от 02.08.2011 г.

Условия применения:  
1. Обеспечение соответствия поставляемого оборудования требованиям промышленной безопасности Российской Федерации.  
2. Применение поставляемого оборудования в нефтяной и газовой промышленности, в соответствии с условиями, ограничениями и требованиями технической документации.

Срок действия разрешения **до 28.11.2016**

Дата выдачи **28.11.2011** *С.Г. Раднонова* Заместитель руководителя С.Г. Раднонова

АВ 070273









# LINER HANGERS

Noncemented Retrievable Liner Hanger PHN-E . . . . .	<b>8</b>
Noncemented Liner Hanger PHN1 . . . . .	<b>10</b>
Noncemented Liner Hanger PHN2 . . . . .	<b>13</b>
Noncemented Liner Hanger, rotating while running in PHNV . . . . .	<b>15</b>
Noncemented liner hanger with oriented wedge PHN-KO . . . . .	<b>17</b>
Protected Cemented Liner Hanger PHCZ . . . . .	<b>19</b>
Protected Rotated Cemented Liner Hanger PHCZV . . . . .	<b>23</b>
Hydraumechanical Cemented Liner Hanger PHGMC . . . . .	<b>26</b>
Protected Hydraumechanical Cemented Liner Hanger PHGMCZ . . . . .	<b>31</b>
Liner Hanger with disconnection before cementing PHRC . . . . .	<b>33</b>
Cemented Liner Hanger for flush-joint pipes PHCBT . . . . .	<b>37</b>
Protected Liner Hanger for Stage Cementing PHZSC . . . . .	<b>39</b>



## NONCEMENTED RETRIEVABLE LINER HANGER PHN-E

This liner hanger is intended for RIH and hanging of oncemented liners with the following retrieve if necessary.

This liner hanger for liners RIH and hanging consists of two units mounted on the same body:

- anchoring unit which ensures liner hanging in service string;
- disconnecting unit which ensures the device RIH together with a liner and performance of technical operations such as washover, equipment installation and anchoring unit actualization with the folowing hydraulic disconnection of transport string from the device.

If it is necessary to retrieve the device with liner out of hole a string with the mounted in the case pass inner retriever spear (or a special device) is run-in hole. If straining of string in the hanger area is about 5 t deactivation of anchoring unit is performed and the device is pulled out of the hole.



PARAMETER DESCRIPTION	VALUE	
	PHN. 60/102-E	PHN. 73/114-E
Liner Nominal Diameter equipped with the device, mm	60	73
Casing String Nominal Diameter which the device is run into and installed, mm	102	114
Outer Diameter of the device on the body (at centralizer), mm	83	94
Pass diameter of the device (after actualization), mm	50	60
Values of controlling overpressure for actuation of units <sup>1</sup> , MPa		
- anchoring unit	11±10%	11±5%
- breaker unit	16±10%	15±5%
Maximum axial load at the device disconnection (w/o liner equipped with all the devices weight) <sup>1</sup> , kN (tn)	40 (4)	50 (5)
Maximum inner overpressure, MPa	20	20
Maximum operational temperature <sup>2</sup> , °C	100	
Maximum tensile force <sup>3</sup> , kN	200 (20)	300 (30)
Connecting threads:		
- upper according to GOST 633	60	73
- lower GOST 633	60	73
Length in operating position, mm	1308	1320
Weight, kg, not more		
- in operating position	30	32

<sup>1</sup> Values are given when all the shear bolts on the unit are used.

<sup>2</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.

<sup>3</sup> Calculated value, when stresses reach yield point of the material.



## NONCEMENTED LINER HANGER PHN1

Non-cemented Liner Hanger PHN1 is intended for well casing with liners without cementing and is manufactured in two versions with different means of closing the internal space:

- with throttling shut down valve by increasing productivity of washover;
- with start of cementing plug or ball and its pumping until its setting in a special seat in a hanger.

Hangers PHN1 equipped with UFI (units of filters isolation) can perform washover through a shoe.

PHN1 hanger consists of 4 stand-alone and independent units:

- anchoring unit which ensures liner hanging in service string;
- hydraulic-mechanical packer unit which ensures pressurization of inner annulus;
- hydraulic breaker unit which ensure RIH of units together with the liner, performance of technological operations such as washover, actuation of all the devices and further automatic disconnection of transport string from the device;
- mechanical breaker doubling the hydraulic one.

Design of PHN1 device is practically identical to that of Protected Cemented Liner Hanger PHCZ1 except the only difference that at the end of the pipe going throughout the device there is a stop-seat or throttling valve instead of hollow hanging plug, and the pipe is notsealed but has holes.



PARAMETER DESCRIPTION	VALUE		
	PHN1. 102/146; PHN1. 102/146-01	PHN1. 114/168; PHN1. 114/168-01	PHN1. 114/168-UIF
Liner Nominal Diameter equipped with the device, mm	102	114	
Casing String Nominal Diameter which the device is run into and installed, mm	146	168	
Maximum inner diameter of a casing string in which anchoring is performed, mm	135	154	
Outer Diameter of the device body (at centralizer), mm	120 (122)	138 (141)	
Pass diameter of the device (after actualization), mm	89	99	
Values of controlling inner overpressure for actuation of units <sup>1</sup> , MPa			
- anchoring unit	16,5	16	
- packer unit	16,5	16	
- breaker unit	20	20	
Maximum pressure differential between the zones separated by a packer unit, MPa	15		
Maximum operational temperature <sup>2</sup> , °C	100		
Maximum tensile axial force on the body of breaker <sup>3</sup> , kN	600	700	
Connecting threads:			
- upper GOST 28487 (GOST R 50864)	3-86	3-102	3-102
- lower GOST 632	ОТТМ 102	ОТТМ 114	ОТТМ 114
- nozzle GOST 633	-	-	60
Length in operating position, mm	3340	3331	3563
Weight (for Version 01), kg, not more - in operating position	119 (125)	160 (163)	170

<sup>1</sup> Controlling overpressure values are given when all the shear bolts on the unit are used.

<sup>2</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.

<sup>3</sup> Calculated value, when stresses reach yield point of the material.

**107078, Moscow, Novaya Basmanaya str., 14-1**

 390025, Ryazan Region, Ryazan, Promyshlennaya str., 21  
 629803, Tyumen Region, YNAD, Noyabrsk, industrial zone, pan. 4  
 628600, Tyumen Region, KMAD-Yugra, Nijnevartovsk, Industrialnaya str., 29  
 461042, Orenburg Region, Buzuluk, Pyatigorskaya str., 39a build  
 664041, Irkutsk Reaion, Irkutsk. Sovetskaya str., 124-E

 E-mail: info@zers.ru  
 Web: www.zers.ru

PARAMETER DESCRIPTION	VALUE			
	PHN1. 127/178; PHN1. 127/178- 01	PHN1. 127/178- 114; PHN1. 127/178- 114-01	PHN1. 127/178- UIF	PHN1. 127/178- 114-UIF
Liner Nominal Diameter equipped with the device, mm	127	114	127	114
Casing String Nominal Diameter which the device is run into and installed, mm	178	178	178	178
Maximum inner diameter of a casing string in which anchoring is performed, mm	166			
Outer Diameter of the device body (at centralizer), mm	149 (152)			
Pass diameter of the device (after actualization), mm	111	99	111	99
Values of controlling overpressure for devices actuation <sup>1</sup> , MPa				
- anchoring unit	16			
- packer unit	16			
- breaker unit	20			
Maximum pressure differential between the zones separated by a packer unit, MPa	15			
Maximum operational temperature <sup>2</sup> , °C	100			
Maximum tensile axial force on the body of breaker <sup>3</sup> , kN	800	700	800	700
Connecting threads:	3-102	3-102	3-102	3-102
- upper GOST 28487 (GOST R 50864)	OTTM	OTTM	OTTM	OTTM
- lower GOST 632	127	114	127	114
- nozzle according to GOST 633	-	-	60	60
Length in operating position, mm	3395	3375	3678	3678
Weight, kg, not more	182	182	190	182
- in operating position	(185)	(185)		

<sup>1</sup> Controlling overpressure values are given when all the shear bolts on the unit are used.

<sup>2</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.

<sup>3</sup> Calculated value, when stresses reach yield point of the material.





## NONCEMENTED LINER HANGER PHN2

Non-cemented Liner Hanger PHN2 is intended for well casing with liners without cementing.

PHN2 hanger is a complex of 4 units:

- anchoring unit which ensures liner hanging in the preceding string;
- mechanical packer unit which ensures pressurization of inner annulus;
- hydraulic breaker unit which ensures RIH of units together with the liner, performance of technological operations such as washover, actuation of all the devices and further automatic disconnection of the transport string from the device;
- mechanical breaker doubling the hydraulic one.

Design of PHN2 device is practically identical to that of Cemented Hydraumechanical Hanger PHGMC except the only difference that at the end of the pipe going throughout the device there is a stop-seat.

Liner Hanger PHN2.127/178-114 is produced in UIF design which allows to perform washing through a shoe.

**107078, Moscow, Novaya Basmannaya str., 14-1**

 390025, Ryazan Region, Ryazan, Promyshlennaya str., 21  
 629803, Tyumen Region, YNAD, Noyabrsk, industrial zone, pan. 4  
 628600, Tyumen Region, KMAD-Yugra, Nijnevartovsk, Industrialnaya str., 29  
 461042, Orenburg Region, Buzuluk, Pyatigorskaya str., 39a build  
 664041, Irkutsk Reaion, Irkutsk. Sovetskaya str., 124-E

 E-mail: info@zers.ru  
 Web: www.zers.ru

PARAMETER DESCRIPTION	VALUE			
	PHN2. 102/140	PHN2. 127/178- 114	PHN2. 168/245	PHN2. 178/245
Liner Nominal Diameter equipped with the device, mm	102	114	168	178
Casing String Nominal Diameter which the device is run into and installed, mm	140	178	245	245
Outer Diameter of the device body (at centralizer), mm	115 (117)	149 (152)	211 (213)	211 (213)
Pass diameter of the device (after actualization), mm	85	99	150,5	157
Maximum inner diameter of a casing string in which anchoring is performed, mm	127	167	231	231
Values of controlling inner overpressure for actuation of units <sup>1</sup> , MPa			14	20
- anchoring unit				
- breaker unit				
Off-loading for packer unit actuation, kN			150	
Maximum pressure differential between the zones separated by a packer unit, MPa			30	
Maximum operational temperature <sup>2</sup> , °C			100	
Maximum tensile axial force on the body of breaker <sup>3</sup> , kN	600	700	1000	1000
Connecting threads <sup>4</sup> :				
- upper GOST 28487 (GOST R 50864)	3-86	3-102	3-133	3-133
- lower GOST 632	OTTM 102	OTTM 114	OTTM 168	OTTM 178
Length in operating position, mm	3612	4183	3769	4095
Weight in operating position, kg	108	240	385	420

<sup>1</sup> Controlling overpressure values are given when all the shear bolts on the unit are used.

<sup>2</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.

<sup>3</sup> Calculated value, when stresses reach yield point of the material.

<sup>4</sup> For device PHN2.102/140 thread OTTM 102 is produced according to TR 14-161-163.



## NONCEMENTED LINER HANGER, ROTATING WHILE RUNNING IN PHNV

Non-cemented Liner Hanger PHNV is intended for well casing with liners without cementing for liner rotation while RIH.

Hangers PHNV equipped with UIF (units of filters isolation) can perform washover through a shoe.

PHNV hanger is a complex of 4 stand-alone and independent units:

- anchoring unit which ensures liner hanging in service string;
- hydraulic-mechanical packer unit which ensures pressurization of inner annulus;
- hydraulic breaker unit which ensures RIH of units together with the liner, performance of technological operations such as washover, actuation of all the devices and further automatic disconnection of the transport string from the device;
- mechanical breaker doubling the hydraulic one.



**107078, Moscow, Novaya Basmannaya str., 14-1**

390025, Ryazan Region, Ryazan, Promyshlennaya str., 21  
629803, Tyumen Region, YNAD, Noyabrsk, industrial zone, pan. 4  
628600, Tyumen Region, KMAD-Yugra, Nijnevartovsk, Industrialnaya str., 29  
461042, Orenburg Region, Buzuluk, Pyatigorskaya str., 39a build  
664041, Irkutsk Reaion, Irkutsk. Sovetskaya str., 124-E

E-mail: info@zers.ru  
Web: www.zers.ru

PARAMETER DESCRIPTION	VALUE
	PHNV1. 127/178-114-UIF OTTG
Liner Nominal Diameter equipped with the device, mm	114
Nominal Diameter of Casing tring which the device is run into and installed, mm	178
Maximum rotation torque, kN x m	8
Outer Diameter of the device body (at centralizer), mm	149 (152)
Pass diameter of the device (after actualization), mm	99
Values of controlling overpressure for devices actuation <sup>1</sup> , MPa	
- anchoring unit	16
- packer unit	16
- breaker unit	20
Maximum pressure differential between the zones separated by a packer unit, MPa	15
Maximum operational temperature <sup>2</sup> , °C	100
Maximum tensile axial force on the dvice body <sup>3</sup> , kN	700 (70)
Connecting threads:	
- upper GOST 28487 (GOST R 50864)	3-102
- lower GOST 632	OTTG114
- nozzle according to GOST 633	60
Length in operating position, mm	3950
Weight, kg, not more	
- in operating position	192

<sup>1</sup> Controlling overpressure values are given when all the shear bolts on the unit are used.

<sup>2</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.

<sup>3</sup> Calculated value, when stresses reach yield point of the material.

**107078, г. Москва, ул. Новая Басманная, д. 14, стр. 1**

390025, Рязанская обл., г. Рязань, Промышленная ул., д. 21

629803, Тюменская обл., ЯНАО, г. Ноябрьск, промзона, пан. 4

628600, Тюменская обл., ХМАО-Югра, г. Нижневартовск, ул. Индустриальная, д. 29

461042, Оренбургская обл., г. Бузулук, Пятигорская ул., д. 39а

664041, Иркутская обл., г. Иркутск, ул. Советская, д. 124-Е

E-mail: [info@zers.ru](mailto:info@zers.ru)Web: [www.zers.ru](http://www.zers.ru)

## NONCEMENTED LINER HANGER WITH ORIENTED WEDGE PHN-KO

Noncemented liner hanger with oriented wedge PHN-KO is applied for noncemented liner RIH with the following spudding of the second well bore from the hanger wedge and lowering of the second noncemented liner.

When using the device like PHN-KO the following process operations are performed:

- the device RIH as a part of a drillstring liner;
- hanger wedge direction orientation is performed with the help of the orientation device of packaging in holes UOKS;
- anchor is actuated with pressure rising to 13 MPa;
- wedge rotating part is fixed toward to liner and a drill string is disconnected from a liner at 16 MPa pressure.

The hanger operating principle ensures orientation of the wedge in the preset direction. Pressure on hanger units is imparted only if the wedge is correctly installed.



**107078, Moscow, Novaya Basmannaya str., 14-1**

390025, Ryazan Region, Ryazan, Promyshlennaya str., 21  
629803, Tyumen Region, YNAD, Noyabrsk, industrial zone, pan. 4  
628600, Tyumen Region, KMAD-Yugra, Nijnevartovsk, Industrialnaya str., 29  
461042, Orenburg Region, Buzuluk, Pyatigorskaya str., 39a build  
664041, Irkutsk Reaion, Irkutsk. Sovetskaya str., 124-E

E-mail: info@zers.ru  
Web: www.zers.ru

PARAMETER DESCRIPTION	VALUE	
	PHN-KO1.121	PHN-KO1.143
Liner Nominal Diameter equipped with the device, mm	102	114
Maximum Outer Diameter, mm	114	136
Pass diameter of the device (after actuation), mm	52	60
Length in operating position, mm	5793	5610
Weight in operating position, kg	309	423
Values of controlling overpressure for devices actuation <sup>1</sup> , MPa:		
- anchoring unit	13	13
- breaker unit	16	16
Wedge bend angle, degree	2°30'	2°30'
Maximum operational temperature <sup>2</sup> , °C	100	100
Maximum tensile axial force <sup>3</sup> , kN	300	380
Connecting threads:		
- upper GOST 28487 (GOST R 50864)	3-86	3-86
- lower GOST 632	OTTM 102	OTTM 114

<sup>1</sup> Controlling overpressure values are given when all the shear bolts on the unit are used.

<sup>2</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.

<sup>3</sup> Calculated value, when stresses reach yield point of the material.





## PROTECTED CEMENTED LINER HANGER PHCZ

Protected cemented liner hanger PHCZ is intended for RIH, hanging and pressurization of liner in a cemented hole, performing of technological operations connected with cementing and sequential actuation of anchor unit and packer unit and further disconnection of transport string and liner.

The device application area – vertical, tilting (flat) well bores and bores with horizontal ends with diameter which liners are run in and cemented.

PHCZ hanger is a complex of 4 stand-alone and independent units:

- anchoring unit which ensures liner hanging in service string;
- hydraulic-mechanical packer unit which ensures pressurization of inner annulus;
- hydraulic breaker unit which ensures RIH of units together with the liner, performance of technological operations such as washover, actuation of all the devices and further automatic disconnection of the transport string from the device;
- mechanical breaker doubling the hydraulic one.

After the liner is RIH at the preset depth and technological washovers are carried out the following technological operations are performed for PHCZ device actuation:

- performing of the liner cementing with running of the cementing plug after the injection of the cement slurry for its separation from the displacement fluid;
- driving the cement slurry to the annular space until receiving of “stop” signal;
- anchor unit actuation is performed with inner overpressure raising up to  $P = 16\text{MPa}$ . - the pressure is passed to the inner space of hydraulic drive through holes in female pin. Hydraulic drive moves the slips radially and decentralize them;
- anchor unit actuation is performed with inner overpressure raising up to  $P = 16\text{MPa}$ . Pressure is passed to the inner space of the hydraulic drive, the screws are cut off and thruster moves and interacts with sealing rings and centralizer between them, presses sealing rings to the service string walls;

**107078, Moscow, Novaya Basmannaya str., 14-1**390025, Ryazan Region, Ryazan, Promyshlennaya str., 21  
629803, Tyumen Region, YNAD, Noyabrsk, industrial zone, pan. 4  
628600, Tyumen Region, KMAD-Yugra, Nijnevartovsk, Industrialnaya str., 29  
461042, Orenburg Region, Buzuluk, Pyatigorskaya str., 39a build  
664041, Irkutsk Reaion, Irkutsk. Sovetskaya str., 124-EE-mail: [info@zers.ru](mailto:info@zers.ru)  
Web: [www.zers.ru](http://www.zers.ru)

- breaker unit actuation is performed with inner overpressure raising up to  $P = 20\text{MPa}$ . Pressure is passed on the plunger, shear screws are ruined, the plunger moves up releasing seats and thus disconnecting from outer case and liner connected with it;
- mechanical breaker unit is actuated with service string rotation to the right 20 times; beforehand it is necessary to adjust the weight at the indicator which corresponds to the weight of the service string in the liquid;
- washover is performed and the service string is pulled out.

While well casing liner includes the following technical units:

*- for liner continuous cementing*

liner casing starter is equipped with a shoe, than check valve and stopping branch pipe. Hanger PHCZ is mounted on the last pipe of the liner which is connected with the transport string;

*- for liner collar cementing*

casing starter of liner filtering part is equipped with a shoe, above the filtering part packer for collar cementing (PGMC/ PGMC2/ PGMC4) is mounted. Hanger PHCZ is mounted on the last pipe of the liner which is connected with the transport string.

PARAMETER DESCRIPTION	VALUE		
	PHCZ. 89/140-76	PHCZ1. 102/146	PHCZ1. 114/168
Liner Nominal Diameter equipped with the device, mm	89	102	114
Diameter, recommended wall thickness (inner diameter) of casing string which the device is run into and installed, mm	139,7 *9,2 (121,3)	146,1 *7,7 (130,7)	168,3 *8,9 (150,5)
Maximum outer diameter of the device body (at centralizer), mm	111 (114)	120 (122)	138 (141)
Pass diameter of the device after actuation, mm	76	89	99
Maximum inner diameter of a casing string in which anchoring is performed, mm	128	137	155
Values of controlling overpressure for actuation of units <sup>1</sup> , MPa			
- anchoring unit		16	
- packer unit		16	
- breaker unit		20	
Maximum pressure differential between the zones separated by a packer, MPa		15	
Maximum operational temperature <sup>2</sup> , °C		100	
Maximum tensile axial force on the body parts <sup>3</sup> , kN	600	600	700
Connecting threads <sup>4</sup> :			
- upper GOST 28487 (GOST R 50864)	3-86	3-86	3-102
- lower GOST 632	89	ОТТМ 102	ОТТМ 114
Length in operating position, mm	3361	3788	3757
Weight in operating position, kg	107	140	174,4



PARAMETER DESCRIPTION	VALUE			
	PHCZ1. 114/168- 102	PHCZ1. 127/178	PHCZ1. 127/178- 114	PHCZ1. 127/178- 102
Liner Nominal Diameter equipped with the device, mm	102	127	114	102
Diameter, recommended wall thickness (inner diameter) of casing string which the device is run into and installed, mm	168,3 *8,9 (150,5)		177,8 *10,4 (157)	
Maximum outer diameter of the device body (at centralizer), mm	138 (141)		149 (152)	
Pass diameter of the device after actuation, mm	89	111	99	89
Maximum inner diameter of a casing string in which anchoring is performed, mm	155		167	
Values of controlling overpressure for actuation of units <sup>1</sup> , MPa				
- anchoring unit			16	
- packer unit			16	
- breaker unit			20	
Maximum pressure differential between the zones separated by a packer, MPa			15	
Maximum operational temperature <sup>2</sup> , °C			100	
Maximum tensile axial force on the body parts <sup>3</sup> , kN	600	800	700	600
Connecting threads <sup>4</sup> :				
- upper GOST 28487 (GOST R 50864)	3-102	3-102	3-102	3-102
- lower GOST 632	OTTM 102	OTTM 127	OTTM 114	OTTM 102
Length in operating position, mm	3757	3678	3775	3765
Weight in operating position, kg	174,4	187	187	180,4

<sup>1</sup> Controlling overpressure values are given when all the shear bolts on the unit are used.

<sup>2</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.

<sup>3</sup> Calculated value, when stresses reach yield point of the material.

<sup>4</sup> For device PHCZ.89/140-76 bottom thread is produced according to GOST 633. For device PHCZ.102/140-80/117, PHCZ1.102/146, PHCZ1.114/168-102, PHCZ1.127/178-102 thread OTTM 102 is produced according to TY 14-161-163.



## PROTECTED ROTATED CEMENTED LINER HANGER PHCZV

Protected cemented rotated liner hanger PHCZV is intended for rotating RIH, hanging and pressurization of liner in a cemented hole, performing of technological operations connected with cementing with rotation and sequential actuation of anchor unit and packer unit and further disconnection of transport string and liner.

PHCZV hanger is a complex of 4 stand-alone and independent units:

- anchoring unit which ensures liner hanging in service string;
- hydraulic-mechanical packer unit which ensures pressurization of inner annulus;
- hydraulic breaker unit which ensures RIH of units together with the liner, performance of technological operations such as washover, actuation of all the devices and further automatic disconnection of the transport string from the device;
- mechanical breaker unit which perform rotation to the right during RIH and cementing operations and doubles the hydraulic breaker if it is impossible to raise the a pressure. To actuate the unit of mechanical breaking it is necessary to rotate a transport string to the left trough 180 degree and then keep rotating to the right at least 10 times in order to break a transport string from a liner.

After the liner is RIH at the preset depth, with rotation if necessary, and technological washovers are carried out the following technological operations are performed for PHCZV device actuation:

- performing of the liner cementing with running of the cementing plug after the injection of the cement slurry for its separation from the displacement fluid;
- driving the cement slurry to the annular space untill receiving of "stop" signal;
- anchor unit actuation is performed with inner overpressure raising up to  $P = 16 \text{ MPa}$ ;
- packer unit actuation is performed with inner overpressure raising up to  $P = 16 \text{ MPa}$ ;

**107078, Moscow, Novaya Basmannaya str., 14-1**

390025, Ryazan Region, Ryazan, Promyshlennaya str., 21  
629803, Tyumen Region, YNAD, Noyabrsk, industrial zone, pan. 4  
628600, Tyumen Region, KMAD-Yugra, Nijnevartovsk, Industrialnaya str., 29  
461042, Orenburg Region, Buzuluk, Pyatigorskaya str., 39a build  
664041, Irkutsk Reaion, Irkutsk. Sovetskaya str., 124-E

E-mail: [info@zers.ru](mailto:info@zers.ru)  
Web: [www.zers.ru](http://www.zers.ru)

- breaker unit actuation is performed with inner overpressure raising up to  $P = 20$  MPa.
- mechanical breaker unit is actuated with transport string rotation to the left for 180 degree and the following rotation to the right;
- washover is performed and transport string is pulled out.

---

While well casing liner includes the following technical units:

*- for liner continuous cementing*

liner casing starter is equipped with a shoe, than check valve and stopping branch pipe. Hanger PHCZV is mounted on the last pipe of the liner which is connected with the transport string;

*- for liner collar cementing*

casing starter of liner filtering part is equipped with a shoe, above the filtering part packer for collar cementing (PGMC/PGMC2/PGMC4) is mounted. Hanger PHCZV is mounted on the last pipe of the liner which is connected with the transport string.

PARAMETER DESCRIPTION	VALUE		
	PHCZV 102/146	PHCZV 127/178	PHCZV 127/178-114
Liner Nominal Diameter equipped with the device, mm	102	127	114
Diameter, recommended wall thickness (inner diameter) of casing string which the device is run into and installed, mm	146,1 *7,7 (130,7)	177,8 *10,4 (157)	
Maximum outer diameter of the device body (at centralizer), mm	120 (122)	149 (152)	149 (152)
Pass diameter of the device after actuation, mm	89	111	99
Maximum inner diameter of a casing string in wich anchoring is performed, mm	137	167	167
Values of controlling overpressure for actuation of units <sup>1</sup> , MPa:			
- anchoring unit	16		
- packer unit	16		
- breaker unit	20		
Maximum pressure differential between the zones separated by a packer, MPa	15		
Maximum operational presure <sup>2</sup> , °C	100		
Maximum tensile axial force on the body parts <sup>3</sup> , kN	600	800	700
Connecting threads:			
- upper GOST 28487 (GOST R 50864)	3-86	3-102	3-102
- lower GOST 632	ОТТГ-102	ОТТГ-127	ОТТГ-114
Length in operating position, mm	3894	3945	3945
Weight in operating position, kg	157	195	201

<sup>1</sup> Controlling overpressure values are given when all the shear bolts on the unit are used.

<sup>2</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.

<sup>3</sup> Calculated value, when stresses reach yield point of the material.





## HYDRAUMECANICAL CEMENTED LINER HANGER PHGMC

Hydraumechanical Cemented Liner Hanger PHGMC is intended for RIH, hanging and pressurization of liner in a cemented well, performing of technological operations connected with cementing and sequential actuation of anchor units and packer and further automatic disconnection of transport string from the liner and transport string pulling out.

PHGMC hanger is a complex of 4 stand-alone and independent units:

- anchoring unit;
- hydraulic breaker;
- mechanical packer;
- mechanical breaker doubling the hydraulic one.

The hanger is provided with a number of interlocks: hydraulic breaking is protected against early actuation before suspended plug is cut, the packer may be actuated only after disconnection.

The hanger consists of two parts: adjustment tool and the hanger itself, the latter includes packer unit, anchor unit and lead-in funnel.

When using hangers like PHGMC the following process operations are performed:

- the device is RIH as a part of a transport string liner;
- performance of washovers with limited pressure (no more than 75% of anchoring pressure);
- washover of the bottomhole without pressure limits (anchor actuation changes ring space insignificantly);
- performing of the liner cementing with running of the cementing plug after the injection of the cement slurry for its separation from the displacement fluid;
- displacing the cement slurry into outer annulus of the liner with limited displacement pressure after the suspended plug is cut off (no more than 75% of disconnection pressure) and receipt of stop signal;

**107078, г. Москва, ул. Новая Басманная, д. 14, стр. 1**

390025, Рязанская обл., г. Рязань, Промышленная ул., д. 21  
629803, Тюменская обл., ЯНАО, г. Ноябрьск, промзона, пан. 4  
628600, Тюменская обл., ХМАО-Югра, г. Нижневартовск, ул. Индустриальная, д. 29  
461042, Оренбургская обл., г. Бузулук, Пятигорская ул., д. 39а  
664041, Иркутская обл., г. Иркутск, ул. Советская, д. 124-Е

E-mail: [info@zers.ru](mailto:info@zers.ru)  
Web: [www.zers.ru](http://www.zers.ru)

- anchor unit actuation is performed with inner overpressure raising up to  $P = 14\text{MPa}$ ;
- hydraulic breaker unit is actuated with pressure rising to 20 MPa;
- mechanical breaker unit is actuated with transport string rotation to the right;
- packer unit is actuated by partial unloading of the transport string weight onto the "head" part of the liner;
- washover is performed and the transport string is pulled out.

PARAMETER DESCRIPTION	VALUE			
	PHGMC. 102/140- 85/117	PHGMC. 102/140- 89/119	PHGMC. 102/146	PHGMC. 114/ 168-102
Liner Nominal Diameter equipped with the device, mm	102	102	102	102
Nominal Diameter of Casing string which the device is run into and installed, mm	140	140	146	168
Maximum outer diameter of the device body (at centralizer), mm	115 (117)	117 (119)	120 (122)	145
Pass diameter of the device (after actuation), mm	85	89	89	89
Maximum inner diameter of a casing string in which anchoring is performed, mm	127	129	132	158
Values of controlling overpressure for actuation of units <sup>1</sup> , MPa				
- anchoring unit	18,5		14	
- breaker unit	23,5		20	
Maximum pressure differential between zones separated by the mechanical-hydraulic packer, MPa	30			
Maximum operational temperature <sup>2</sup> , °C	100			
Maximum tensile axial force on the body of breaker <sup>3</sup> , kN	600	600	600	600
Connecting threads:				
- upper GOST 28487 (GOST R 50864)	3-86	3-86	3-102	3-133
- lower TY 14-161-163	OTTM-102	OTTM-102	OTTM-102	OTTM-102
Length in operating position, mm	3612	3687	3754	3769
Weight in operating position, kg	107,5	110	152	152

<sup>1</sup> Controlling overpressure values are given when all the shear bolts on the unit are used.

<sup>2</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.

<sup>3</sup> Calculated value, when stresses reach yield point of the material.

PARAMETER DESCRIPTION	VALUE			
	PHGMC. 114/168	PHGMC. 127/178- 114	PHGMC. 178/245- 114	PHGMC. 127/178
Liner Nominal Diameter equipped with the device, mm	114	114	114	127
Nominal Diameter of Casing string which the device is run into and installed, mm	168	178	245	178
Maximum outer diameter of the device body (at centralizer), mm	138 (141)	150 (152)	211 (213)	150 (152)
Pass diameter of the device (after actuation), mm	99	99	99	111
Maximum inner diameter of a casing string in which anchoring is performed, mm	132	160	231	160
Values of controlling overpressure for actuation of units <sup>1</sup> , MPa				
- anchoring unit	14			
- breaker unit	20			
Maximum pressure differential between zones separated by the hanger packer unit, MPa	30			
Maximum operational temperature <sup>2</sup> , °C	100			
Maximum tensile axial force on the body of breaker <sup>3</sup> , kN	700	700	700	800
Connecting threads:	3-102	3-102	3-102	3-102
- upper GOST 28487 (GOST R 50864)	ОТТМ-	ОТТМ-	ОТТМ-	ОТТМ-
- lower GOST 632	114	114	114	127
Length in operating position, mm	3769	3875	4265	3855
Weight in operating position, kg	152	213	400	196

<sup>1</sup> Controlling overpressure values are given when all the shear bolts on the unit are used.

<sup>2</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.

<sup>3</sup> Calculated value, when stresses reach yield point of the material.



**107078, Moscow, Novaya Basmannaya str., 14-1**

390025, Ryazan Region, Ryazan, Promyshlennaya str., 21

629803, Tyumen Region, YNAD, Noyabrsk, industrial zone, pan. 4

628600, Tyumen Region, KMAD-Yugra, Nijnevartovsk, Industrialnaya str., 29

461042, Orenburg Region, Buzuluk, Pyatigorskaya str., 39a build

664041, Irkutsk Reaion, Irkutsk. Sovetskaya str., 124-E

E-mail: info@zers.ru

Web: www.zers.ru

PARAMETER DESCRIPTION	VALUE			
	PHGMC. 146/219	PHGMC. 178/245- 146	PHGMC. 168/245	PHGMC. 178/245
Liner Nominal Diameter equipped with the device, mm	146	146	168	178
Nominal Diameter of Casing string which the device is run into and installed, mm	219	245		
Maximum outer diameter of the device body (at centralizer), mm	182 (184)	211 (213)		
Pass diameter of the device (after actuation), mm	129	129	150,5	157
Maximum inner diameter of a casing string in which anchoring is performed, mm	196	231		
Values of controlling overpressure for actuation of units <sup>1</sup> , MPa				
- anchoring unit	16		14	
- breaker unit	20		20	
Maximum pressure differential between zones separated by the hanger packer unit, MPa	30	15	15	15
Maximum operational temperature <sup>2</sup> , °C	100			
Maximum tensile axial force on the body of breaker <sup>3</sup> , kN	1000			
Connecting threads:	3-133	3-133	3-133	3-133
- upper GOST 28487 (GOST R 50864)	OTTM-	OTTM-	OTTM-	OTTM-
- lower GOST 632	146	146	168	178
Length in operating position, mm	4010	4275	3769	4095
Weight in operating position, kg	319	400	385	380

<sup>1</sup> Controlling overpressure values are given when all the shear bolts on the unit are used.

<sup>2</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.

<sup>3</sup> Calculated value, when stresses reach yield point of the material.



## PROTECTED HYDRAUMECANICAL CEMENTED LINER HANGER PHGMCZ

Hydraumechanical Cemented Liner Hanger PHGMCZ with increased carrying capacity is intended for RIH, hanging and pressurization of liner in a cemented well, performing of technological operations connected with cementing and sequential actuation of anchor units and packer and further automatic disconnection of transport string from the liner and transport string pulling out.

PHGMCZ hanger is a complex of 4 stand-alone and independent units:

- hydraulic anchor;
- hydraulic breaker;
- mechanical packer;
- mechanical breaker unit doubling the hydraulic one.

The hanger is provided with a number of interlocks: hydraulic breaking and hydraulic anchor are protected against early actuation before suspended plug is cut, the packer may be actuated only after disconnection.

The hanger consists of two parts: adjustment tool and the hanger itself, the latter includes packer unit, anchor unit and lead-in funnel.

When using hangers like PHGMCZ the following process operations are performed:

- the device is RIH as a part of a transport string liner;
- performance of washovers without pressure limitation;
- performing of the liner cementing with running of the cementing plug after the injection of the cement slurry for its separation from the displacement fluid;
- displacing the cement slurry into outer annulus of the liner with limited displacement pressure after the suspended plug is cut off (no more than 75% of disconnection pressure) and receiving of "stop" signal;
- anchor unit actuation is performed with inner overpressure raising up to 14 MPa;
- hydraulic breaker unit is actuated with pressure rising to 20 MPa;
- mechanical breaker unit is actuated with transport string rotation to the right;

- packer unit is actuated by partial unloading of the transport string weight onto the “head” part of the liner;
- washover is performed and the transport string is pulled out.

PARAMETER DESCRIPTION	VALUE	
	PHGMCZ. 127/178	PHGMCZ. 127/178-114
Liner Nominal Diameter equipped with the device, mm	127	114
Nominal Diameter of Casing string which the device is run into and installed, mm	178	178
Maximum outer diameter of the device body (at centralizer), mm	150 (152)	150 (152)
Pass diameter of the device (after actuation), mm	111	99
Maximum inner diameter of a casing string in wich anchoring is performed, mm	160	160
Values of controlling overpressure for actuation of units <sup>1</sup> , MPa:		
- anchoring unit		14
- breaker unit		20
Maximum pressure differential between zones separated by the mechanical-hydraulic packer, MPa		30
Maximum operational temperature <sup>2</sup> , °C		100
Maximum tensile axial force on the body of breaker <sup>3</sup> , kN		1000 (100)
Connecting threads:		
- upper GOST 28487 (GOST R 50864)	3-102	3-102
- lower TY 14-161-163	OTTM-127	OTTM-114
Length in operating position, mm	4045	4065
Weight in operating position, kg	196	213

<sup>1</sup> Controlling overpressure values are given when all the shear bolts on the unit are used.

<sup>2</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.

<sup>3</sup> Calculated value, when stresses reach yield point of the material.



## LINER HANGER WITH DICONNECTION BEFORE CEMENTING PHRC

Liner Hanger with diconnection before cementing PHRC is applied for hanger RIH and liner pressurization in the hole.

The device is a complex of 3 stand-alone and independent units on the same body:

- anchoring unit which ensures liner hanging in service string;
- mechanical packer unit which ensures pressurization of inner annulus;
- hydraulic breaker unit which ensures RIH of units together with the liner, performance of technological operations such as washover, actuation of all the devices and further automatic disconnection of the transport string from the device liner cementing followed by packer unit actuation.

The hanger consists of two parts: adjustment tool and the hanger itself, the latter includes packer unit, anchor unit and lead-in funnel.

When using hangers like PHRC the following process operations are performed:

- the device is RIH as a part of a transport string liner;
- performance of washovers with limited pressure (no more than 75% of anchoring pressure);
- washover of the bottomhole without pressure limits (anchor actuation changes ring space area insignificantly);
- starting of a ball and its driving until its setting in the PGMC packer seat or in the special seat set above the check valve;
- PGMC actuation (for collar cementing);
- anchor unit actuation is performed with inner overpressure raising up to 13 MPa;
- the raising of pressure upto 16 MPa opens PGMC packer cementing slots (for collar cementing) or the raising of pressure upto 20 MPa leads to shearing of the special seat with a ball to restore circulation;
- disconnection of adjustment tool from the hanger is performed through



Tel.: +7 (495) 632-21-94  
+7 (495) 632-21-95

Fax: ext. 121

**107078, Moscow, Novaya Basmannaya str., 14-1**

390025, Ryazan Region, Ryazan, Promyshlennaya str., 21  
629803, Tyumen Region, YNAD, Noyabrsk, industrial zone, pan. 4  
628600, Tyumen Region, KMAD-Yugra, Nijnevartovsk, Industrialnaya str., 29  
461042, Orenburg Region, Buzuluk, Pyatigorskaya str., 39a build  
664041, Irkutsk Reaion, Irkutsk. Sovetskava str., 124-E

E-mail: [info@zers.ru](mailto:info@zers.ru)  
Web: [www.zers.ru](http://www.zers.ru)

relief of the transport string and its rotation to the right at least 10 times;

- performing of the liner cementing with running of the cementing plug after the injection of the cement slurry for its separation from the displacement fluid;
- driving the cement slurry to the annular space untill receiving of "stop" signal;
- packer unit is actuated by partial unloading of the transport string weight onto the "head" part of the liner;
- washover is performed and the transport string is pulled out.



PARAMETER DESCRIPTION	VALUE		
	PHRC 102/140- 89/119	PHRC 102/146	PHRC 114/168-102
Liner Nominal Diameter equipped with the device, mm	102	102	102
Casing String Nominal Diameter which the device is RIH and installed, mm	140	146	168
Maximum outer diameter of the device body (at centralizer), mm	117 (119)	120 (122)	138 (141)
Pass diameter of the device (after actuation), mm	89	89	89
Maximum inner diameter of a casing string in which anchoring is performed, mm	127	132	158
Inner overpressure for anchoring unit actuation, МПа	13,0±5%		
Maximum swinging moment at the mechanical disconnection, kg*m	30 - 40		
Maximum tensile force <sup>1</sup> , kN	600		
Maximum pressure differential between the zones separated by a packer unit, ΔP, МПа	30		
Maximum inner overpressure, МПа	25		
Maximum operational temperature <sup>2</sup> , °C	100		
Connecting threads: - upper according to GOST 28487-90 - lower according to TR 14-161-163-96	3-86 ОТТМ-102	3-86 ОТТМ-102	3-102 ОТТМ-102
Length of the device fully assembled, mm, no more	4478	4490	4686
Weight, kg, not more	130,5	144,5	217

<sup>1</sup> Calculated value, when stresses reach yield point of the material.

<sup>2</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.

**107078, Moscow, Novaya Basmannaya str., 14-1**

 390025, Ryazan Region, Ryazan, Promyshlennaya str., 21  
 629803, Tyumen Region, YNAD, Noyabrsk, industrial zone, pan. 4  
 628600, Tyumen Region, KMAD-Yugra, Nijnevartovsk, Industrialnaya str., 29  
 461042, Orenburg Region, Buzuluk, Pyatigorskaya str., 39a build  
 664041, Irkutsk Reaion, Irkutsk. Sovetskaya str., 124-E

 E-mail: info@zers.ru  
 Web: www.zers.ru

PARAMETER DESCRIPTION	VALUE		
	PHRC 114/168	PHRC 127/178	PHRC 127/178-114
Liner Nominal Diameter equipped with the device, mm	114	127	114
Casing String Nominal Diameter which the device is RIH and installed, mm	168	178	178
Maximum outer diameter of the device body (at centralizer), mm	138 (141)	149 (152)	149 (152)
Pass diameter of the device (after actuation), mm	99	111	99
Maximum inner diameter of a casing string in which anchoring is performed, mm	158	164	164
Inner overpressure for anchoring unit actuation, MPa	13,0±5%		
Maximum swinging moment at the mechanical disconnection, kg*m	30 - 40		
Maximum tensile force <sup>1</sup> , kN	700	800	700
Maximum pressure differential between the zones separated by a packer unit, ΔP, МПа	30		
Maximum inner overpressure, MPa	25		
Maximum operational temperature <sup>2</sup> , °C	100		
Connecting threads: - upper according to GOST 28487-90 - lower according to TR 14-161-163-96	3-102 OTTM-114	3-102 OTTM-127	3-102 OTTM-114
Length of the device fully assembled, mm, no more	4670	4689	4709
Weight, kg, not more	208,8	219,6	226,7

<sup>1</sup> Calculated value, when stresses reach yield point of the material.

<sup>2</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.



## CEMENTED LINER HANGER FOR FLUSH-JOINT PIPES PHCBT

Cementing liner hanger for flush-joint pipes PHCBT is applied for running in the hole and continuous cementing of the liner consisting of flush-joint pipes.

The PHCBT liner hanger consists of the upper sub and casing jointed with the lower sub using special left-handed thread. There is a special groove in the casing that holds the collet supported by the piston that in turn held by shear bolts. There is a suspended plug positioned within the inner channel of the device mounted with two hollow shear plugs.

The device operates as follows. While liner cementing top wiper plug is touching down the suspended plug seat and the shearing of two hollow plugs is performed due to the pressure increasing, and the access of fluid to the plunger space is opened. The pressure increasing is performed after the "stop" signal receiving, shear bolts are ruined and plunger moves releasing a collet. Under tension the blades of the collet clench and therefore the liner is disconnected from the transport string.

Liner hanger is equipped with the mechanical breaker unit doubling the hydraulic one. It is actuated with transport string rotation to the right.

The device application area – vertical, tilting (flat) well bores and bores with horizontal ends with diameter 102, 114, 120 and 140 mm which liners are run in and cemented and consisting of flush-joint pipes.

**107078, Moscow, Novaya Basmannaya str., 14-1**

390025, Ryazan Region, Ryazan, Promyshlennaya str., 21  
629803, Tyumen Region, YNAD, Noyabrsk, industrial zone, pan. 4  
628600, Tyumen Region, KMAD-Yugra, Nijneartovsk, Industrialnaya str., 29  
461042, Orenburg Region, Buzuluk, Pyatigorskaya str., 39a build  
664041, Irkutsk Reaion, Irkutsk. Sovetskaya str., 124-E

E-mail: info@zers.ru  
Web: www.zers.ru

PARAMETER DESCRIPTION	VALUE			
	PHCBT 102/140	PHCBT 114/140	PHCBT 120/146	PHCBT 140/168
Liner Nominal Diameter equipped with the device, mm	102	114	120	140
Maximum outer diameter of the device, mm	108	120	123	144
Pass diameter of the device, mm	96,5	98,5	105	124
Diameter of a hole in a plug seat, mm	30	40	40	40
Maximum inner pressure on the device body, MPa	25	25	25	25
Length of the device fully assembled, mm	2105	2105	2105	2105
Weight, kg	45	78	73,35	78,1
Maximum tensile force <sup>1</sup> , kN (tn)	600 (60)	700 (70)	770 (77)	900 (90)
Maximum operational temperature <sup>2</sup> , °C	100	100	100	100
Connecting threads: - upper GOST 633 - lower TR 14-157-61-99	73 TMK-3	73 TMK-3	73 TMK-3	73 TMK-3

<sup>1</sup> Calculated value, when stresses reach yield point of the material.

<sup>2</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.



## PROTECTED LINER HANGER FOR STAGE CEMENTING PHZSC

Protected liner hanger for multiple-stage cementing PHZSC is applied for running-in, suspending and pressurization of liners with two-stage cementing. Hanger is used together with the MMC1 collar or packer PGMC.

When using the device like PHZSC the following process operations are performed:

- the device is RIH as a part of a transport string liner;
- performing of the first stage of the liner cementing with running of the cementing plug after the injection of the cement slurry, for its separation from the displacement fluid;
- matching of the top cementing plug with lower hollow cementing plug installed at the support;
- driving the cement slurry to the annular space of the liner, removal of protection from the early actuation when passing the cementing plugs through the clutch, and receiving of the "stop" signal of the first stage, and closing of the cementing slots;
- opening of the cementing slots through the increasing of the internal manometric pressure at the depth of clutch installation up to the opening pressure of the cementing slots;
- flushing of the cementslurry of the first stage that is over the collar cementing slots;
- performing of the second stage of liner cementing with the cementing plug running after cementing slurry injection for its separating from the displacement fluid;
- matching of the top cementing plug with lower hollow cementing plug installed at the support;
- driving of the cement slurry to the annular space until receiving of 2nd stage "stop" signal and cementing slots closing;
- checking of the collar slots closing by the dropping of the pressure down to zero;
- increasing of the internal overpressure and consequential actuating of PHZSC hanger units – anchor, packer and liner breaker from transport string;



**107078, Moscow, Novaya Basmannaya str., 14-1**

 390025, Ryazan Region, Ryazan, Promyshlennaya str., 21  
 629803, Tyumen Region, YNAD, Noyabrsk, industrial zone, pan. 4  
 628600, Tyumen Region, KMAD-Yugra, Nijnevartovsk, Industrialnaya str., 29  
 461042, Orenburg Region, Buzuluk, Pyatigorskaya str., 39a build  
 664041, Irkutsk Reaion, Irkutsk. Sovetskaya str., 124-E

 E-mail: info@zers.ru  
 Web: www.zers.ru

- washover is performed and transport string is pulled out;
- drilling out of the cementing plugs and MMC collar seat after the end of waiting on cement.

PARAMETER DESCRIPTION	VALUE	
	PHZSC. 102/146	PHZSC. 114/168
Liner Nominal Diameter equipped with the device, mm	102	114
Nominal Diameter of Casing string which the device is run into and installed, mm	146	168
Maximum outer diameter of the device (at centralizer), mm	120 (122)	138 (141)
Pass diameter of the device (after actuation), mm	89	99
Minimal pass diameter at the top sub, mm	55	61
Maximum diameter of the circle circumscribed the extensible and sealing elements of the device in operating position, mm	159	159
Length in operating position, mm	3797	3816
Weight in operating position, kg	165	170
Maximum tensile force <sup>1</sup> , kN	600	700
Values of controlling overpressure for actuation of units <sup>2</sup> , MPa:		
- anchoring unit		16
- packer unit		16
- breaker unit		20
Hollow suspended plugs shear pressure, MPa		4,0÷5,0
Maximum pressure differential between the zones separated by a hydraumechanical packer, MPa		15,0
Maximum operational temperature <sup>3</sup> , °C		100
Connecting threads:		
- upper GOST 28487	3-86	3-102
- lower GOST 632	OTTM 102	OTTM 114

<sup>1</sup> Calculated value, when stresses reach yield point of the material.

<sup>2</sup> Controlling overpressure values are given when all the shear bolts on the unit are used.

<sup>3</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.

<sup>4</sup> For device PHZSC.102/146 thread OTTM 102 is produced according to TR 14-161-163.







## PACKERS

Hydraulic Pass-Through Packer PGP, PGP1, PGP6 .....	<b>44</b>
Hydraulic Pass-Through Packer with Small-Size Valve Unit PGPM1.245 .....	<b>46</b>
Hydraulic Packer for Collar Cementing PGMC, PGMC2, PGMC4, PGMC 6 .....	<b>48</b>
Packer for Collar Cementing PMC, PMC-R .....	<b>51</b>
Water-Swellable and Oil-Swellable Packer PNV and PNN .....	<b>53</b>



**107078, Moscow, Novaya Basmannaya str., 14-1**

390025, Ryazan Region, Ryazan, Promyshlennaya str., 21  
629803, Tyumen Region, YNAD, Noyabrsk, industrial zone, pan. 4  
628600, Tyumen Region, KMAD-Yugra, Nijnevartovsk, Industrialnaya str., 29  
461042, Orenburg Region, Buzuluk, Pyatigorskaya str., 39a build  
664041, Irkutsk Reaion, Irkutsk. Sovetskaya str., 124-E

E-mail: [info@zers.ru](mailto:info@zers.ru)  
Web: [www.zers.ru](http://www.zers.ru)



## HYDRAULIC PASS-THROUGH PACKER PGP, PGP1, PGP6

Hydraulic pass-through packer for cross-flow prevention of PGP-type is applied to ensure reliable sealing of gas-oil-water-bearing layers.

Packer consists of two main units: sealing hose and valve unit. PGP, PGP1 and PGP6 are equipped with valve system with spring.

Packer works as follows: when cementing plug is passing through the packer, it cuts off a hollow pin, opening thus liquid access to the valve unit. So this is preparation for actuation. After receiving the signal "stop" and pressure relief the preparation of valve system to the packer setting process is carried out and by the following pressure increase in the column the liquid goes to the under-hose cavity. After depressurization in the packers PGP, PGP1 and PGP6 the valve system switches and cuts off liquid in the under-hose cavity, keeping liquid volume under the hose.



PARAMETER DESCRIPTION	ЗНАЧЕНИЕ						
	PGP89 (PGPU89)	PGP102/89 (PGPU102/89)	PGP1.114 (PGPU1.114)	PGP127	PGP6.146 (-01)	PGP1.168 (PGP6.168)	PGP178
Casing String (Liner) Nominal Diameter equipped with a packer, mm	89	102	114	127	146	168	178
Nominal Diameter of open bore hole (bitsize) which packer is to be run in, mm	120,6	124	146	152,4	215,9	215,9	215,9
Maximum pressure differential between separated zones at nominal packing coefficient, MPa	15						
Length of well zone overlapped by packer sealing element, mm	2900 (1200)			2900	1120 (2820)	1120	1120
Packering coefficient:							
- nominal	1,12	1,11	1,1	1,07	1,23	1,1	1,09
- maximum	1,25	1,3	1,3	1,25	1,45	1,4	1,4
Maximum operational temperature <sup>1</sup> , °C	100						
Maximum inner overpressure on the packer body, MPa	25						
Maximum tensile axial force on the body <sup>2</sup> , kN	500	600	700	800	850	1200	1100
Pass diameter, after actuation, mm	75,9	88	99	105,6	129	150,5	157
Outer Diameter, mm	108	118	134	142	180	197	203
Length, not more:							
- in operating position, mm	5374 (3724)	5431 (3610)	5396 (3696)	5600	4088 (5908)	4503 (4423)	4247
Weight, not more:							
- in operating position, kg	108 (77,9)	137 (116)	124,7 (96,6)	178,6	185,6 (247)	220 (213)	250

<sup>1</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.

<sup>2</sup> Calculated value, when stresses reach yield point of the material.



## HYDRAULIC PASS-THROUGH PACKER WITH SMALL-SIZE VALVE UNIT PGPM1.245

Hydraulic pass-through packer for cross-flow prevention PGPM1, for casing strings 245 mm is applied to ensure reliable sealing of gas-oil-water-bearing layers at any depth.

Packer PGPM1 consists of the following main units: body with mounted sealing rubberized fabric unit, unit protecting packer from early actuation, valve unit body, valve unit, bottom sub.

Packer works as follows: during cementing process cementing plug is passing through inside the packer, it cuts off hollow shear pins with sealing ring thus opening liquid access to the packer valve unit. After receiving "stop" signal and pressure relief the valve is switched and the preparation of valve system to the packer setting process is carried out and by the following pressure increase in the column the liquid goes to the under-hose cavity. Overpressure raise up to 6-8 MPa at the packer setting depth leads to inflation of the sealing element which is pressed to the hole walls hermetically. After depressurization the valve system switches and cuts off liquid in the under-hose cavity keeping liquid volume under the hose.

PARAMETER DESCRIPTION	VALUE	
	PGPM1. 245B	PGPM1. 245VG
Outer Diameter, mm	280	
Pass diameter, after actuation, mm	224	
Length of well zone overlapped by packer sealing element, mm	2080	
Packer setting coefficient:		
- nominal	1,11	
- maximum	1,24	
Maximum pressure differential between separated zones at nominal packer setting coefficient, MPa	15	
Maximum inner overpressure on the packer body, MPa	15	28
Maximum outer overpressure on the packer body, MPa	12	15
Maximum tensile axial force on the packer body <sup>1</sup> , kN	2000	
Maximum operational temperature <sup>2</sup> , °C	100	
Length, not more:		
- in operating position, mm	5350	5520
Weight, not more:		
- in operating position, kg	501	
Reliability coefficient, no less than:	0,95	

<sup>1</sup> Calculated value, when stresses reach yield point of the material.

<sup>2</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.

## HYDRAULIC PACKER FOR COLLAR CEMENTING PGMC, PGMC2, PGMC4, PGMC6

Hydraulic packer for collar cementing PGMC is applied for performing of collar cementing and secure separating of filtering and cementing parts of flush casing strings (liners) and isolation of the oil-, gas-, and water- bearing layers.

PGMC packer consists of two devices combined in one body: a hydraulic packer and a cementing collar. Collar part of the device is the system of mechanically interconnected plugs fixed on shearing bolts that overlap cementing slots and entrance to under-hose cavity. Design of packing part is similar to the design of PGP packer.

PGMC working principle is as follows: before cementing, a ball is dropped into the transport string and pumped until setting down a seat. With pressure increasing up to 4.0 MPa  $\pm 10\%$  bolts are sheared and plug is moved down until bumping the shoulder thus opening liquid access to valve system of the device packer part. After that pressure is dropped down to 0 and valve system prepares the packer to actuation. On subsequent increasing of pressure up to 6-8 MPa hose inflates separating hermetically cementing and noncementing parts of the liner in annular space. Following release of pressure down to 0 witches valve system and shuts liquid access to the packer part of the device.

PGMC2 and PGMC4 packers works in the similar way, but they do not require pressure release for preparation of the valve system for packer setting.

The next cycle of pressure raising up to 16 (14.5; 14) MPa opening of cementing slots is performed. After tempering and flushing of cement slurry hollow cementing plug (together with top cementing plug) is set down to the seat and closes the cementing slots and fixes its position.



PARAMETER DESCRIPTION	VALUE						
	PGMC 89 (PGMCU 89)	PGMC 102/89 (PGMCU 102/89)	PGMC6.114 (PGMCU6. 114)	PGMC 127	PGMC6. 146	PGMC1. 168	PGMC 178
Casing String Nominal Diameter equipped with a packer, mm	89	102	114	127	146	168	178
Nominal diameter of hole open bore (bit size) which packer is to be run in, mm	120,6	123,8	146	152,4	215,9	215,9	215,9
Maximum pressure differential between separated zones at nominal packer setting coefficient, MPa	15						
Length of well zone overlapped by packer sealing element, mm	2900 (1200)		2900		1120		
Inner overpressure to open cementing slots <sup>1</sup> , MPa ±10%	16	16	15,9	15	15	16	15,6
Inner overpressure to close cementing slots <sup>1</sup> , MPa ±10%	5,0	3	2,9	3,0	2,6	2,5	2,5
Packer setting coefficient:							
- nominal	1,12	1,11	1,11	1,11	1,18	1,13	1,13
- maximum	1,25	1,3	1,35	1,3	1,45	1,3	1,35
Maximum operational temperature <sup>2</sup> , °C	100						
Maximum tensile axial force on the body <sup>3</sup> , kN	500	600	700	800	850	1200	950
Pass diameter, after actuation, mm	75,9	88	98,5	105,6	129	150,5	157
Outer Diameter, mm	108	118	134	142	180	197	203
Length, not more:							
- in operating position, mm	5588 (3938)	5660 (3805)	5645 (3945)	5660	5923	5279	5404

<sup>1</sup> Controlling overpressure values are given when all the shear bolts on the unit are used.

<sup>2</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.

<sup>3</sup> Calculated value, when stresses reach yield point of the material.

**107078, Moscow, Novaya Basmanaya str., 14-1**

390025, Ryazan Region, Ryazan, Promyshlennaya str., 21

629803, Tyumen Region, YNAD, Noyabrsk, industrial zone, pan. 4

628600, Tyumen Region, KMAD-Yugra, Nijnevartovsk, Industrialnaya str., 29

461042, Orenburg Region, Buzuluk, Pyatigorskaya str., 39a build

664041, Irkutsk Reaion, Irkutsk. Sovetskaya str., 124-E

E-mail: info@zers.ru

Web: www.zers.ru

PARAMETER DESCRIPTION	VALUE		
	PGMC2.102/89	PGMC4.102 (PGMCU4.102)	PGMC4.114 (PGMCU4.114)
Casing String (Liner) Nominal Diameter equipped with a packer, mm	102		114
Nominal diameter of hole open bore (bit size) which packer is to be run in, mm	124		146
Maximum pressure differential between separated zones at nominal packer setting coefficient, MPa	15		
Length of well zone overlapped by packer sealing element, mm	70*	3000 (1200)	3000 (1200)
Inner overpressure to open cementing slots <sup>1</sup> , MPa ±10%	16		
Inner overpressure to close cementing slots <sup>1</sup> , MPa ±10%	3	5	
Packer setting coefficient:			
- nominal	1,06	1,07	1,14
- maximum	1,29	1,25	1,25
Maximum operational temperature <sup>2</sup> , °C	100		
Maximum inner overpressure on the packer body, MPa	25		
Maximum outer overpressure on the packer body <sup>3</sup> , MPa	25		
Maximum tensile axial force on the body <sup>4</sup> , kN	600	600	600
Pass diameter, after actuation, mm	89	85	95
Outer Diameter, mm	118	116	128
Length, not more:			
- in operating position, mm	2836	5200 (3500)	5271 (3571)

<sup>1</sup> Actuation pressure with all shear bolts cut off.<sup>2</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.<sup>3</sup> Calculated value.<sup>4</sup> Calculated value when stresses reach yield point of the material.

\* PGMC2.102 packer unit is hydraumechanical and has two sealing cups.



## PACKER FOR COLLAR CEMENTING PMC, PMC-R

Packer for collar cementing PMC is applied for cemented and non-cemented casing string parts separation (liner) while performing of collar cementing. Packer is used together with collar cementing valve KMC.

Packer is produced in two designs PMC and PMC-R that differ in the type of a sealing element:

- in PMC a sealing element consists of three sealing rings;
- in PMC-R a sealing element is a rubberized fabric hose.

Packer is actuated before cementing by a ball dropping and its pumped until setting down a seat inside a packer. This leads to deformation of a sealing element and packing of annular space between walls of a well and a casing string (liner).

Packer is equipped with a trip valve which ensures RIh without overflow.



**107078, Moscow, Novaya Basmannaya str., 14-1**

390025, Ryazan Region, Ryazan, Promyshlennaya str., 21  
629803, Tyumen Region, YNAD, Noyabrsk, industrial zone, pan. 4  
628600, Tyumen Region, KMAD-Yugra, Nijnevartovsk, Industrialnaya str., 29  
461042, Orenburg Region, Buzuluk, Pyatigorskaya str., 39a build  
664041, Irkutsk Reaion, Irkutsk. Sovetskaya str., 124-E

E-mail: info@zers.ru  
Web: www.zers.ru

PARAMETER DESCRIPTION	VALUE	
	PMC 102	PMC-R 102 (PMCU-R 102)
Outer Diameter, mm	118	
Drift diameter after drilling-out, mm	88	
Length of well zone overlapped by packer sealing element, mm	280	2800 (1200)
Packer setting coefficient:		
- nominal	1,06	1,11
- maximum	1,29	1,3
Maximum pressure differential between separated zones at nominal packer setting coefficient, MPa	15	
Inner overpressure on the packer bodycase, MPa	25	
Maximum tensile axial force on the body <sup>1</sup> , kN	600	
Maximum operational temperature <sup>2</sup> , °C	100	
Length, not more:		
- in operating position, mm	1416	4991 (3291)
Weight, not more:		
- in operating position, kg	45	104 (91)
Reliability function, not less	0,95	

<sup>1</sup> Calculated value when stresses reach yield point of the material.

<sup>2</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.

## WATER-SWELLABLE AND OIL-SWELLABLE PACKER PNV AND PNN

“NTC “ZERS” LLC has developed different packer models in which the sealing element is made of elastomeric material that is able to swell out on the contact with certain fluids (water or oil).

Swellable packers have the following significant advantages:

- secure and irreversible isolation of the layers at well construction;
- packer design doesn't include valve systems and moving parts which can cause packer failure;
- there is no need in special operations and special running tool for their installation in the well;
- ability to self-healing and recovery of the sealing properties.

.....  
Packers with elastomeric material which swells in hydrocarbon medium is marked as PNN, and packers with elastomeric material which swells in water medium is marked as PNV.

PNV and PNN packers can be installed within the casing string as well as in the hole open bore, they can be applied at various stages of well construction including fixing of the lateral holes as the redundant device for increasing of lateral holes fixing quality at the space between liner hanger and slot made in a flow string.

Packers with sealing elements made of swellable elastomeric materials can also be used for effective and secure separation of layers at construction of horizontal and multilateral wells, for improvement of cementing quality, in complexes for controlled layers separation with FSO filters and KRR devices, as well as in many other operations at wells fixing and layers separation.

PNV and PNN swellable packer models are designed for separation of space in an open hole or in a casing string.



**107078, Moscow, Novaya Basmanaya str., 14-1**

390025, Ryazan Region, Ryazan, Promyshlennaya str., 21  
629803, Tyumen Region, YNAD, Noyabrsk, industrial zone, pan. 4  
628600, Tyumen Region, KMAD-Yugra, Nijnevartovsk, Industrialnaya str., 29  
461042, Orenburg Region, Buzuluk, Pyatigorskaya str., 39a build  
664041, Irkutsk Reaion, Irkutsk. Sovetskaya str., 124-E

E-mail: info@zers.ru  
Web: www.zers.ru

PARAMETER DESCRIPTION	PNV AND PNN PACKER TYPICAL SIZE					
	102/118	102/124	114/136	114/144	114/148	127/148
Liner Nominal Diameter on which packer is run in, mm	102	102	114	114	114	127
Recommended wellbore diameter which packer is installed in, mm	124...128	132	143...146	152...156	156...160	156...160
Maximum pressure differential on packer, MPa	70					
Elastomeric material length, mm	1200					
Packer length, mm	2600					
Packer Outer Diameter, mm	118	124	136	144	148	148
Weight, kg	58	61	72	75	78	81
Maximum operational temperature, °C	100					
Estimated packer swelling time for full isolation of the well space <sup>1</sup> , days	5...7			7...9		

<sup>1</sup> Parameters values are shown for the rated wellbore diameter on the base of used swelling resins types and well conditions (temperature, well fluid type on running down and operation, etc.).











# EXTERNAL CASING ATTACHMENTS

Collar for collar cementing MMC1 .....	<b>58</b>
String disconnecter for water wells RKVS .....	<b>60</b>
Multiple-unit revolvable disconnecter RKVO .....	<b>62</b>
Collar cementing valve KMC .....	<b>64</b>
Cementing basket CK .....	<b>65</b>
Pressure test device PO .....	<b>66</b>
Device for stage-by-stage run-in-hole operation USSK, USSKP .....	<b>68</b>
Hydraulic fracturing device UGRH .....	<b>70</b>
Screener UECS .....	<b>72</b>
Casing float KOSH2, KOSHBT .....	<b>73</b>
Seat-trap SL .....	<b>75</b>
Auxiliary top modular packer PDV-M .....	<b>76</b>
Top Auxiliary Packer PDV2 .....	<b>77</b>
Trip stop-tap SPD2 .....	<b>78</b>
Bow springs centralizer PC .....	<b>79</b>
Hard elastic centralizer PCR .....	<b>81</b>
Lowfrictional centralizer-turbolizer CTN .....	<b>82</b>
Stop Ring SKC .....	<b>83</b>
Cementing throttle nonreturn valve CKOD .....	<b>84</b>
Casing shoe BK .....	<b>85</b>
Well screen FS, FB .....	<b>88</b>



## COLLAR FOR COLLAR CEMENTING MMC1

Collar for collar cementing is applied for two-stage or collar cementing of casings or liners with diameter 102, 114, 127, 140, 146, 168, 178 and 245 mm.

While using collar like MMC1 the following process operations are performed:

- performance of the first stage of casing cementing with start of the first cementing plug after pumping in cement slurry;
- driving the cement slurry to the casing annular space untill receiving of "stop" signal;
- internal overpressure increase and opening of cementing slots in collar;
- flushing of extra cement slurry of the first stage;
- performance of the second stage of casing cementing with start of the second cementing plug after pumping in cement slurry;
- driving the second stage cement slurry to the casing annular space untill receiving of "stop" signal;
- closing of collar slots by raising of inner overpressure.



1st cementing plug



2nd cementing plug



Stopping nozzle

PARAMETER DESCRIPTION	VALUE							
	ММС1.102	ММС1.114	ММС1.127	ММС1.140	ММС1.146	ММС1.168	ММС1.178	ММС1.245
Casing String Nominal Diameter equipped with the collar, mm	102	114	127	140	146	168	178	245
Nominal diameter of hole open bore (bit size) which packer is to be run in, mm	124	142,9	155,6	190,5	190,5	215,9	215,9	295,3
Maximum Outer Diameter, mm	120	136	148	172	178	197	204	282
Pass diameter, after actuation, mm	88	98	110	124	130	150	158	220
Inner overpressure to open cementing slots <sup>1</sup> , MPa ±10%	16,0	16,0	14,0	16,0	16,0	16,0	16,0	14,0
Inner overpressure to close cementing slots <sup>1</sup> , MPa ±10%	3,5	2,2	2,0	4,0	5,0	5,0	4,0	3,5
Maximum operational temperature <sup>2</sup> , °C	100							
Maximum inner overpressure on the collar casing, MPa	25							
Maximum outer overpressure on the collar casing <sup>3</sup> , MPa	35,0	35,0	18,0	18,0	18,0	18,0	18,0	19,0
Maximum tensile axial force on the body <sup>3</sup> , kN	600	700	800	1000	1000	1200	1200	2300
Length, not more: - in operating position, mm	1013	1990	2299	2865	2865	2888	2865	2333
Weight, not more: - in operating position, kg	29,1	67,5	95	118	122	134	150	265

<sup>1</sup> Actuation pressure with all shear bolts cut off.

<sup>2</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.

<sup>3</sup> Calculated value.



## STRING DISCONNECTOR FOR WATER WELLS RKVS

Disconnecter RKVS 168/324 is applied for transport string disconnection during tie-back casings (liners) running in. RKVS 168/324 is applied in holes cased with casings with diameter 324 mm which liners of casing tubes with diameter 168 mm are run in.

While using disconnecter RKVS 168/324 the following process operations are performed:

- disconnecter RKVS 168/324 and provided tool set (accessories) are run in as a part of a liner 168 mm on a flush transport pipe string with inner diameter not less than 150 mm;
- performing of the liner cementing with running of the cementing plug after the injection of the cement slurry for its separation from the displacement fluid;
- driving of the cement slurry to the annular space until receiving of "stop" signal;
- disconnecter off-loading (setting) on funnel which has been mounted in casing string 324 mm;
- liner disconnection from transport string by rotating string to the right;
- then washover is performed and the transport string is pulled out.

Disconnecter operation medium are chemicalized drilling and cementing slurries, oilfield brine, oil and gas at temperature 100 °C.

PARAMETER DESCRIPTION	VALUE
Liner Nominal Diameter equipped with the device, mm	168
Nominal Diameter of Casing string which disconnector is run into and installed, mm	324
Disconnector Maximum Outer Diameter, mm	206
Disconnector length, with suspended plug, not more than, mm	943
Disconnector weight, with suspended plug, not more than, kg	99,5
Maximum tensile force, kN (tn)	700 (70)
Maximum inner pressure on the device case, MPa	25,0
Maximum operational temperature, °C	100
Connecting threads <sup>1</sup> - upper and lower according to GOST 632-80	OTTM 168

<sup>1</sup> Connecting thread type is agreed with Customer.



## ROTATING MULTIPLE DISCONNECTOR FOR OPEN HOLES RKVO

Disconnecter RKVO 168 is applied for sectional running in of a casing string 168 mm with the option of first section reaming with rotation and washing out during running in process.

While using disconnecter RKVO 168 the following process operations are performed:

- disconnecter RKVO and provided tool set (facilities) are run in as a part of a liner 168 mm on a flush transport pipe string with inner diameter not less than 100 mm;
- performing of reaming with rotation to the right and washing out if necessary;
- performing of a liner cementing with running of the cementing plug after the injection of the cement slurry for its separation from the displacement fluid;
- driving of the cement slurry to the annular space until receiving of "stop" signal;
- hydraulic disconnection of the section from drill string through inner overpressure raise;
- mechanical disconnection by rotating string to the right if hydraulic disconnection is impossible;
- washover is performed and the transport string is pulled out;
- the second section is run in and connected to the first section hermetically;
- cementing slots are opened in MMC1.168 collar and the second section cementing is performed with a cementing plug start and closing of slots after receiving of "stop" signal.



**107078, г. Москва, ул. Новая Басманная, д. 14, стр. 1**

390025, Рязанская обл., г. Рязань, Промышленная ул., д. 21

629803, Тюменская обл., ЯНАО, г. Ноябрьск, промзона, пан. 4

628600, Тюменская обл., ХМАО-Югра, г. Нижневартовск, ул. Индустриальная, д. 29

461042, Оренбургская обл., г. Бузулук, Пятигорская ул., д. 39а

664041, Иркутская обл., г. Иркутск, ул. Советская, д. 124-Е

PARAMETER DESCRIPTION	VALUE
Liner Nominal Diameter equipped with the device, mm	168
Disconnecter Maximum Outer Diameter, mm	203
Drift diameter after actuation, mm	150
Disconnecter length, not more than, mm	1375
Disconnecter weight, not more than, kg	171
Maximum tensile force, kN (tn)	1300 (130)
Maximum rotation torque, kN*m	15
Disconnecter unit actuation pressure, MPa	18,5
Maximum turnout at mechanical disconnection, kg*m	50–70
Maximum inner pressure on the device case, MPa	25,0
Maximum operational temperature, °C	100
Connecting threads <sup>1</sup> : - upper according to GOST 28487-90 - lower	3-133 TMK UP CWB 168

<sup>1</sup> Connecting thread type is agreed with Customer.



## COLLAR CEMENTING VALVE KMC

Collar cementing valve is applied for collar cementing of liners and is used as a whole with packer PMC or PMC-R.

Valve opens hydraulically by pressure increase. Valve closes automatically at any moment when annular pressure is more than pipe pressure. Final valve closing and fixation in the set position is performed when a cementing plug is set into a seat in a valve.

PARAMETER DESCRIPTION	VALUE	
	KMC 102	KMC 114
Liner Nominal Diameter equipped with the device, mm	102	114
Hole open bore diameter which the device is run into and installed, mm	123,8-124	142,9
Maximum outer diameter of the device, mm	118	130
Pass diameter of the device (after actuation), mm	88	99
Length of the device fully assembled, mm, no more	594	670
Device Weight, kg, not more	15,4	20,7
Maximum tensile force, at which the limit of the stretching strain of body parts is achieved <sup>1</sup> , kN (tn)	600 (60)	700 (70)
Pressure for cementing slots opening <sup>2</sup> , MPa±10%	16,0	
Maximum operational temperature <sup>3</sup> , °C	100	
Connecting threads <sup>4</sup> :		
- upper according to TR 14-161-163-96 (GOST 632-80)	OTTM 102	OTTM 114
- lower according to TR 14-161-163-96 (GOST 632-80)	OTTM 102	OTTM 114

<sup>1</sup> Calculated value, when stresses reach yield point of the material.

<sup>2</sup> Actuation pressure with all shear bolts cut off.

<sup>3</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.

<sup>4</sup> Connecting thread type is agreed with Customer.



## CEMENTING BASKET CK

Cementing basket is applied for construction of base for sedimentation of cement slurry filling outer annulus outside a casing with diameter 102, 114, 127, 140, 146, 168 and 178 mm.

During squeezing of cement slurry a cementing plug goes through the inner hollow of the device and disengages early actuation protection. After receiving of "stop" signal and checking of a check valve for leak-tightness the inner pressure is raised up to the actuation pressure of the device preset before the device running into hole. Shear bolts are destroyed and actuation happens. Petal shell is outstretched and touches the hole wall thus constructing a base for sedimentation of solid phase of cement slurry. Condensed cement connecting strip is formed by itself on it thus preventing lowering of the cement slurry column in the hole.

PARAMETER DESCRIPTION	VALUE						
	CK102 /140	CK114	CK127	CK140	CK146	CK168	CK178
Maximum Outer Diameter, mm	117	130	144	163	170	193	200
Casing String Diameter equipped with the device, mm	101,6	114,3	127	139,7	146,1	168	178
Pass diameter, after actuation, mm	89	99	112	126	127	150	162
Device actuation pressure <sup>1</sup> , MPa	16	16	16	16	16	16	16
Maximum diameter of basket opening, mm	185	195	195	205	240	250	260
Length, mm	955	1050	1050	1150	1150	1150	1150
Weight, kg, not more	29	31	34	52	55,5	65,5	69
Maximum operational temperature <sup>2</sup> , °C	100	100	100	100	100	100	100

<sup>1</sup> Actuation pressure with all shear bolts cut off.

<sup>2</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.



## PRESSURE TEST DEVICE PO

Pressure test device is applied for drill string or tubing pressure testing and gaging. The device is included into drill string during well bore preparation to casing string running in. It is installed at the adjusted depth. After all the necessary elaborations and flushing has been performed a plug is started down the hole. After drill string washing up to PO the plug is set into a seat. Drill string pressure testing is performed with gradual pressure increase. When pressure  $25.0 \pm 2.5$  MPa is reached shear bolts are cut off and bush is moved against bottom sub butt end thus opening slots in the body.

The produced modification PO2 has significantly lower hydraulic hammer effect caused with wash-out ports.



PARAMETER DESCRIPTION	VALUE			
	PO-NKT 73	PO-NKT B-73	PO.000	PO.102
Drill string nominal diameter equipped with the device, mm	73	73	73; 89	73; 89
Maximum outer diameter of the device, mm	89	93,2	121	105
Pass diameter of the device, mm	30	30	40	30
Maximum inner overpressure, MPa $\pm 10\%$	30,0			
Length of the device fully assembled, mm	830	830	857	911
Device Weight, kg, not more	28,3	31,4	59	51
Maximum tensile force <sup>1</sup> , kN (tn)	2000 (200)			
Pressure to open wash-out ports <sup>2</sup> , MPa $\pm 10\%$	25			
Maximum operational temperature <sup>3</sup> , °C	100			
Connecting threads (upper and lower) according to GOST R 50864-90 (TR 3668-00-7-1403-00-39-2005)	73 GOST 633	B-73 GOST 633	3-102	3-86 (3-83)

<sup>1</sup> Calculated value, when stresses reach yield point of the material.

<sup>2</sup> Actuation pressure with all shear bolts cut off.

<sup>3</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.

PARAMETER DESCRIPTION	VALUE		
	PO.102	PO.114	PO.127
Drill string nominal diameter equipped with the device, mm	73, 89	114	127
Maximum outer diameter of the device, mm	105	158,8	158,8
Pass diameter of the device, mm	30	55	55
Maximum inner overpressure, МПа ±10%	30	30	30
Length of the device fully assembled, mm	826	1437	1091
Device Weight, kg, not more	42,2	155,3	118,3
Maximum tensile force <sup>1</sup> , kN (tn)	2000 (200)		
Pressure to open wash-out ports <sup>2</sup> , МПа±10%	25	25	25
Maximum operational temperature <sup>3</sup> , °C	100		
Connecting threads (upper and lower) according to GOST R 50864-90 (TR 3668-00-7-1403-00-39-2005)	3-86 3-83	3-122 (3-133)	3-133

<sup>1</sup> Calculated value, when stresses reach yield point of the material.

<sup>2</sup> Actuation pressure with all shear bolts cut off.

<sup>3</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.



## DEVICE FOR STAGE-BY-STAGE RUN-IN-HOLE OPERATION USSK, USSKP

Stage-by-stage RIH of liners appeared firstly as a practical solution for the problem of casing strings running into wells with intensive curvature and (or) long horizontal section thus there is always a risk of insufficient running in and fail to reach design depth while running in a liner. Secondly it appeared as a possibility to perform a liner collar cementing at a given interval by cementing its second section.

The device for stage-by-stage lowering of casing strings (liners) USSK is intended for running in of a liner first (lower) section on a drill string without its cementing with further running in, leak-tight connection and cementing of the second section. USSK is threaded onto the upper pipe of the liner first section and is RIH on a drill string.

USSK consists of two principal units: hydraulic disconnection unit to disconnect from a transport string and mechanical disconnection (unthreading) unit to disconnect from transport string implemented in a single device. After liner running into the adjusted depth and flushing a ball is run into the transport string and pumped until setting down a seat. Pumping screws are cut by raising pressure to 14 MPa and hydraulic liner disconnector unit is actuated. If there is no possibility to raise inner overpressure, disconnection is performed by rotating (20 rotations) of the transport string to the left.

*Device for stage-by-stage RIH of casing strings (liners) with packer sealing USSKP.*

The USSKP consists of three principal units: inflatable packer unit, liner hydraulic disconnector from transport string and liner mechanical disconnector (unthreader) from a transport string implemented in a single device. Presence of a packer in the USSKP device allows to perform hydraulic fracturing after cementing both in the second and the first zones of the liner section.



PARAMETER DESCRIPTION	VALUE	
	USSK 102	USSK 114
Liner Nominal Diameter equipped with the device, mm	102	114
Hole open bore diameter which the device is run into and installed, mm	123,8-124	142,9
Maximum outer diameter of the device, mm	118	132
Pass diameter of the device (after actuation), mm	88	99
Length of the device fully assembled, mm, no more	2381	2416
Device Weight, kg, not more	60	98,1
Maximum tensile force, at which the limit of the stretching strain of body parts is achieved <sup>1</sup> , kN (tn)	600 (60)	700 (70)
Disconnection unit actuation pressure <sup>2</sup> , МПа±10%	13,0	
Maximum operational temperature <sup>3</sup> , °C	100	
Connecting threads: - upper according to GOST 28487-90 - lower according to TR 14-161-163-96 (GOST 632-80)	3-86 OTTM 102	3-102 OTTM 114

<sup>1</sup> Calculated value, when stresses reach yield point of the material.

<sup>2</sup> Actuation pressure with all shear bolts cut off.

<sup>3</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.

STABBING SHOE	USSK 102.100	USSK 114.100
Maximum outer diameter of the device, mm	117	127
Pass diameter of the device, mm	88	99
Minimum pressure for the device actuation, kg±10%	2000	2000
Maximum spring to check casing components joining, kg	5000	5000
Length of the device fully assembled, mm, no more	250	280
Device Weight, kg, not more	6,1	6,4
Upper connecting thread according to TR 14-161-163-96 (GOST 632-80)*	OTTM 102	OTTM 114

\* Connecting thread type is agreed with Customer.

**107078, Moscow, Novaya Basmannaya str., 14-1**

390025, Ryazan Region, Ryazan, Promyshlennaya str., 21  
629803, Tyumen Region, YNAD, Noyabrsk, industrial zone, pan. 4  
628600, Tyumen Region, KMAD-Yugra, Nijnevarovsk, Industrialnaya str., 29  
461042, Orenburg Region, Buzuluk, Pyatigorskaya str., 39a build  
664041, Irkutsk Reaion, Irkutsk. Sovetskaya str., 124-E

E-mail: info@zers.ru  
Web: www.zers.ru



## HYDRAULIC FRACTURING DEVICE UGRH

Sealing device UGRH is applied for protection of production string with nominal diameter 146, 168 and 178 mm from overpressure due to hydraulic fracturing in sidetrack wells. The device is used in sidetrack wells cased with liners diameter 102, 114 and 127 mm, run in with hangers PHC3, PHGMC or PHRC with drift pass inner diameter 89, 99 and 111 mm respectively. Index "N" in UGRH titles is used to mark a device mounted at a hanger head. This device has larger pass comparing to UGRH mounted at the bottom sub.

The advantages of the hydraulic fracturing device UGRH:

- the design is easy to use and service;
- installation of the device requires no operations with producing strings and overpressure at a well collar;
- self-sealing elements of sealing unit can hold significant pressure differentials;
- large driftpass allows large-volume hydrofracturing performance and reduces abrasive wear of parts inner surface.

The device consists of a hydraulic anchor, sub with conical back nut, extension nozzle, sealing unit and guiding shoe.

PARAMETER DESCRIPTION	VALUE								
	UGRH-102/140	UGRH-102/146	UGRH-114/168-102	UGRH-114/168	UGRH-127/178-114	UGRH-127/178	UGRH-102/146H	UGRH-114/168H	UGRH-127/178H
Nominal diameter of production string for anchor installation, mm	140	146	168	168	178	178	146	168	178
Inner diameter of hanger mounting seat for installation of sealing unit, mm	85	89	89	99	99	111	108	122	135
Anchor Outer Diameter, mm	118	122	141	141	148	148	122	141	148
Pass diameter, after actuation, mm	60	60	60	76	76	76	76	96	96
Maximum pressure differential, MPa	70								
Maximum operational temperature <sup>1</sup> , °C	100								
Connecting thread according to GOST 633-80	89								

<sup>1</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.



## SCREENER UECS

UECS is a screener to limit sedimentation processes in cement slurry filling casing annulus behind casing with diameter 245, 324 and 426 mm.

UECS device includes spring petal shell interacting with screening element – easily deformable rubber petal collar. Assembly fixture is implemented as bolts with sharpened end which penetrate the casing pipe surface when threaded in.

When cementing is finished petal collar and screener shell are in close contact with each other and with well wall (including that of non-circular section) and form a base for sedimentation of solids from cement slurry. Condensed cement connecting strip is formed by itself on it thus preventing lowering of the cement slurry column in the hole.

PARAMETER DESCRIPTION	VALUE		
	UECS-245	UECS-324	UECS-426
Maximum Outer Diameter, mm	400	484	600
Casing String Diameter, mm	245	324	426
Length, mm	343	320	360
Weight, kg	14,5	15	16
Maximum operational temperature <sup>1</sup> , °C	100		

<sup>1</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.



## CASING FLOAT KOSH2, KOSHBT

Casing float KOSH-type is applied for prevention of backflow of cement slurry or drilling mud from annulus into inner space of casing string with nominal diameter 89, 102, 114 and 127 mm.

Casing float KOSH2 is used in wells where casings (liners) with nominal diameter 89, 102, 114 and 127 mm are used. Casing float KOSH2 is used in wells which collarless casings with nominal diameter 102, 114, 120 and 140 mm are run in.

It is possible to mount KOSH2.114 and KOSH2.127 valves on pipes with thread OTTG 114 and OTTG 127 GOST 632-80.

Inner parts of KOSH valves are made of aluminium alloy.

PARAMETER DESCRIPTION	VALUE			
	KOSH2. 89	KOSH2. 102	KOSH2. 114	KOSH2. 127
Casing string nominal diameter equipped with the device, mm	89	102	114	127
Maximum outer diameter of the device, mm	108	110	127	141,3
Pass diameter of the device, mm	76	89	99	111
Ball diameter, mm	46	46	55	55
Maximum inner pressure on the device case, MPa	25			
Maximum pressure differential maintained by the valve in bottom-top direction, MPa	10			
Length of the device fully assembled, mm	400	380	404	420
Device Weight, kg, not more	9,2	9,2	12,8	16,8
Maximum tensile force <sup>1</sup> , kN (tn)	600 (60)		700 (70)	800 (80)
Maximum operational temperature, °C	100			
Connecting threads <sup>2</sup> - upper and lower according to GOST 632-80	NKT89	OTTM102	OTTM114	OTTM127

<sup>1</sup> Calculated value.

<sup>2</sup> For KOSH2.89 valve thread is produced according to GOST 633-80. For KOSH2.102 valve thread is produced according to TR 14-161-163-96.

**107078, Moscow, Novaya Basmannaya str., 14-1**

 390025, Ryazan Region, Ryazan, Promyshlennaya str., 21  
 629803, Tyumen Region, YNAD, Noyabrsk, industrial zone, pan. 4  
 628600, Tyumen Region, KMAD-Yugra, Nijnevartovsk, Industrialnaya str., 29  
 461042, Orenburg Region, Buzuluk, Pyatigorskaya str., 39a build  
 664041, Irkutsk Reaion, Irkutsk. Sovetskaya str., 124-E

 E-mail: info@zers.ru  
 Web: www.zers.ru

PARAMETER DESCRIPTION	VALUE			
	KOSHBT 102	KOSHBT 114	KOSHBT 120	KOSHBT 140
Casing string nominal diameter equipped with the device, mm	102	114	120	140
Maximum outer diameter of the device, mm	103,2	115,2	121,5	140,5
Pass diameter of the device, mm	86,5	98,5	105	124
Ball diameter, mm	46	55		
Seat hole diameter, mm	30	40		
Maximum inner pressure on the device case, MPa	25			
Maximum pressure differential maintained by the valve in bottom-top direction, MPa	10			
Length of the device fully assembled, mm	450			
Device Weight, kg, not more	9,4	11,2	11,97	14,6
Maximum tensile axial force <sup>1</sup> , kN (tn)	600 (60)	700 (70)	770 (77)	900 (90)
Maximum operational temperature <sup>2</sup> , °C	100			
Connecting threads <sup>3</sup> - upper and lower according to TR 14-157-61-99	TMK-3 102	TMK-3 114	TMK-3 120	TMK-3 140

<sup>1</sup> Calculated value.

<sup>2</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.

<sup>3</sup> Connecting thread type is agreed with Customer.





## SEAT-TRAP SL

Seat-trap is applied for accumulation of cementing plugs and seats fragments and to facilitate their following drilling out.

Seat-trap inner parts are made of aluminium alloy.

PARAMETER DESCRIPTION	VALUE		
	SL 102	SL 114	SL 178
Nominal Diameter of a casing string equipped with the device, mm	102	114	178
Maximum outer diameter of the device, mm	110	127	187
Drift diameter of the device (after drilling), mm	89	99	157
Drift diameter of the device (before drilling), mm	21	28	50
Maximum inner pressure on the body, MPa	25,0		
Length of the device fully assembled, mm	385	420	450
Device weight, kg, not more	7,3	12,3	27
Maximum tensile force <sup>1</sup> , kN (tn)	600 (60)	700 (70)	1200 (120)
Connecting threads <sup>2</sup> : - upper and lower according to GOST 632-80	OTTM102	OTTM114	OTTM 178

<sup>1</sup> Calculated value.

<sup>2</sup> For SL 102 connecting thread is made according to TU 14-161-163-96.



## AUXILIARY TOP MODULAR PACKER PDV-M

PDV-M device is applied for sealed joint with “head” of a liner run in with the help of hangers PHCZ-type and for additional sealing of liner “head”.

Besides the device joint shoe can be used to ensure sealed joint with a liner “head” and if necessary to build up a liner to shut a leakage higher than the liner “head”.

The device is run in hole on drill pipes and is actuated with the tool partial off-load. Disconnection is performed automatically at under tension over own weight more than 5 tn.

PARAMETER DESCRIPTION	VALUE		
	PDV-M 102	PDV-M 114	PDV-M 127
Liner Nominal Diameter equipped with the device, mm	102	114	127
Maximum outer diameter of the device, mm	122	140	149
Pass diameter of the device, mm	89	99	111
Minimum pressure for the device actuation, kg	5000		
Maximum tension for disconnection, kg	5000		
Maximum tensile force <sup>1</sup> , kN	600	700	800
Maximum pressure differential between the zones separated by a hydraumechanical packer, $\Delta P$ , MPa	15		
Length of the device fully assembled, mm	1430	1485	1720
Weight, kg	37,4	64	77,4
Maximum operational temperature <sup>2</sup> , °C	100		
Connecting threads:	3-86	3-102	3-102
- upper according to GOST 28487-90	OTTM	OTTM	OTTM
- lower according to TR 14-161-163	102	114	127

<sup>1</sup> Calculated value, when stresses reach yield point of the material.

<sup>2</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.



## TOP AUXILIARY PACKER PDV2

PDV2 device is applied for hermetical connection with a liner “head” which was run in with PHGMC liners. Also it is used for additional sealing of a liner “head”.

The device is run in hole on drilling pipes and is actuated by the partial unload of drilling string weight. Disconnection is performed automatically by a drilling string pulling out.

PARAMETER DESCRIPTION	VALUE
	PDV2.102/146
Liner Nominal Diameter equipped with the device, mm	102
Maximum Outer Diameter of the device, mm	122
Drift Diameter of the device, mm	89
Minimal load for packer actuation, kg	5000
Maximum tension for disconnection, kg	5000
Maximum tensile force <sup>1</sup> , kN	600
Maximum pressure drop between the zones separated with hydraumechanical packer, $\Delta P$ , MPa	15
Length of fully assembled device, mm	1724
Weight of the device, kg	62,0
Maximum operational temperature <sup>2</sup> , °C	100
Connecting threads: - upper according to GOST 28487-90	3-86

<sup>1</sup> Calculated value when stresses reach yield point of the material.

<sup>2</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.



## TRIP STOP-TAP SPD-2

The device SPD2 is applied for the liner and transport string self-priming in the process of running into a well and receiving of the “stop” signal while performing of continuous cementing. At that the hollow cementing plug which is a part of PHCZ or PHGMC liner hanger together with the upper cementing PCV plug is set into the device seat.

Besides the device can be applied for actuation of PHRC hanger anchor unit while RIH of a liner with continuous cementing using PHRC hanger.

PARAMETER DESCRIPTION	VALUE		
	SPD2.102	SPD2.114	SPD2.127
Liner Nominal Diameter equipped with the device, mm	102	114	127
Maximum outer diameter of the device, mm	114	127	141,3
Pass diameter of the device, mm	88	99	111
Bush shear pressure, MPa± 10%	6,0		
Seat shear pressure, MPa± 10%	18,0		
Maximum tensile force <sup>1</sup> , kN	600	700	800
Length of the device fully assembled, mm	721	743	781
Weight, kg	19,2	24,7	27,6
Maximum operational temperature <sup>2</sup> , °C	100		
Connecting thread according to GOST 632-80 (for SPD2.102 according to TR 14-161-163-96)	OTTM-102	OTTM-114	OTTM-127

<sup>1</sup> Calculated value, when stresses reach yield point of the material.

<sup>2</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.



## BOW SPRINGS CENTRALIZER PC

Bow spring welded centralizers type PC are applied for centralizing of casing strings during their RIH and cementing inside wells. Use of centralizers allows to achieve uniform clearance between casing pipe and well walls, thus preventing appearance of behind-the-casing interformation flows (total insulation with cementfluid, without breaks), and as a result significantly extend well service life. Centering of a casing string is provided with preset bow springs of a centralizer.

Bow spring centralizers type PC consist of two shells and six bow springs with a special profile and section.

Principal innovation of functionality is in the design of bow spring centralizer type PC. Bow spring welded centralizers PC are provided with just two welds with minimum load at their shell. Centering planks of the centralizer have no welds and are made of solid steel sheet.

Bow spring centralizers type PC are made of high-quality sheet steel using laser cutting and further multistage treatment on sheet-benders.

Automatic laser cutting of the sheet provides perfect blanks with no need in further mechanical treatment. Multistage bending on sheet-benders provides high strength and precision of the constructions. Final welding and thermal treatment provide uniform strength of the centralizer's structure.

Spring bow centralizers type PC are fixed on casing string with special retaining screws.

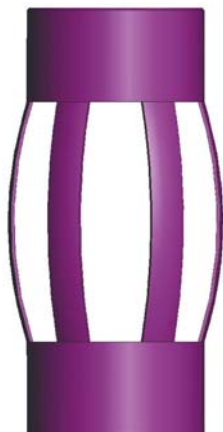
**107078, Moscow, Novaya Basmannaya str., 14-1**

 390025, Ryazan Region, Ryazan, Promyshlennaya str., 21  
 629803, Tyumen Region, YNAD, Noyabrsk, industrial zone, pan. 4  
 628600, Tyumen Region, KMAD-Yugra, Nijnevartovsk, Industrialnaya str., 29  
 461042, Orenburg Region, Buzuluk, Pyatigorskaya str., 39a build  
 664041, Irkutsk Reaion, Irkutsk. Sovetskaya str., 124-E

 E-mail: info@zers.ru  
 Web: www.zers.ru

CODE	VALUE							
	Casing String Diameter, mm	Outer Diameter, mm	Well bore diameter, mm	Inner Diameter, mm	Radial centering force, kg	Axial force pushing centralizer into a nominal diameter, kg	Centralizer length, mm	Weight, kg, not more
PC 89/120-124	89	145	120 - 124	92	800	150	396	1,97
PC-102/122	102	145	120 - 124	106	800	185	396	1,9
PC2A 114/144	114	160	140 - 143	116	800	190	620	4,95
PC2B-114/144	114	148	140 - 143	116	800	190	620	5,68
PC 127/156	127	170	157	130	800	260	620	4,6
PC 140/191-216	140	269	191 - 216	142	800	305	620	6,2
PC 140/191-216-01	140	254		142	800	280	680	6,1
PC 146/191-216	146	274		148	800	320	680	6,5
PC 146/191-216-01	146	255		148	800	300	680	6,52
PC 168/216	168	295,5	216	171	800	430	680	7,2
PC 168/216-01	168	254		171	800	400	680	7,2
PC 178/216	178	297,5		181	800	465	680	8,4
PC 178/216-01	178	256		181	800	400	680	8,3
PC 178/216-02	178	244		181	800	400	680	7,2
PC 219/295	219	350	295	222	1050	565	680	8,5
PC 245/295	245	373,5		249	1050	635	680	8,9
PC 245/295-01	245	352		249	1050	600	680	9
PC 324/394	324	448		329	1350	900	680	13,3





## HARD ELASTIC CENTRALIZER PCR

Bow spring welded centralizers type PCR are applied for centralizing of casing strings during their RIH and cementing inside wells. Centering of a casing string is provided with preset bow springs of a centralizer. Bow spring centralizers type PCR consist of two shells and six bow springs with a special profile and section.

The principal distinction of PCR centralizers from PC centralizers is a plank radially curved inward and outer diameter. PCR centralizer outer diameter is less for some millimeters than well bore diameter which it is run in.

Technical result is achieved through the construction of bow spring centralizer PCR. It consists of centralizing arch planks and two solid courses, centralizer arch spring planks have radial form in section and their outer surface is covered with polymeric coating with antifriction properties. This prevents cutting of casing inner surface with centralizer sharp plank edges and wall layer destruction in open well bore. As the result casing passing through a well bore becomes easier. Especially in low-angle and flat part of wells as centralizer arch planks interact with casing and well bore inner surface through sliding friction with the lowest friction coefficient.

PARAMETER DESCRIPTION	VALUE	
	PCR 102/122	PCR 114/148
Casing String Diameter, mm	102	114
Outer Diameter, mm	122	148
Well bore diameter, mm	123,8	152,4
Inner Diameter, mm	106	116
Radial centering force, kg	850	
Centralizer length, mm	296	
Weight, kg, not more	1,5	1,55



## LOW-FRICTION CENTRALIZER-TURBULIZER CTN

Low-friction centralizer-turbolizer is applied for casing RIH and turbolization of cement slurry upward flow during cementing.

Lowfriction centralizers application allows to improve casing passing through a bore especially in flatwells and wells with significant vertical deviation.

Centralizers CTN reduce risk of tool sticking. It is mounted on casing pipe moveably and is protected from shifting with lockdown rings FK.

PARAMETER DESCRIPTION	VALUE						
	CTN-102/116	CTN-102/119	CTN-114/138	CTN-114/150	CTN-127/146	CTN-168/206	CTN-178/206
Liner Nominal Diameter equipped with the device, mm	102	102	114	114	127	168	178
Outer Diameter, mm	116	119	138	150	146	206	206
Nominal diameter of hole open bore (bit size) which the device is run in, mm	123,8	123,8	142,9	155,6	155,6	215,9	215,9
Length, mm	185	185	220	220	220	250	250
Friction coefficient at dry friction	0,2						
Friction coefficient at fluid friction	less than 0,08						

It can be produced according to Customer's individual sizes.



## STOP RING SKC

Stop ring SKC is applied to hold centralizers at the preset part of a casing string during its running in and cementing in a hole.

A ring is fixed at the preset part of a casing pipe with special fixing screws.

PARAMETER DESCRIPTION	VALUE					
	SKC-102	SKC-114	SKC-127	SKC-146	SKC-168	SKC-178
Casing String Nominal Diameter equipped with stop rings SKC, mm	102	114	127	146	168	178
Maximum Outer Diameter, mm	114,3	127,0	139,7	165-0,4	188-0,3	193,7
Inner diameter of the device, mm	104	116+0,35	129+0,4	150,5	172+0,3	181+0,3
Width of the ring, mm, no more	18,5	19	19	25	25	25
Number of fixing screws, pcs	4			6		
Weight of the device, kg, no more	0,25	0,31	0,32	0,72	0,90	0,74



## CEMENTING THROTTLE NONRETURN VALVE CKOD

Cementing throttle non-return valve is applied for preventing of cementing slurry backflow during cementing and for self-filling of casing inner space during RIH.

Inner parts of the valve are made of easy drilled out materials.

PARAMETER DESCRIPTION	VALUE				
Casing String Nominal Diameter equipped with CKOD valve, mm	146	168	178	245	324
Maximum Outer Diameter, mm	166	187	194,5	270	348
Pass diameter, mm	130,7	152,3	161,6	226,7	304,9
Ball diameter, mm	76				
Length in operating position, mm	430	432	436	429	442
Length in transporting position, mm	420	430	440	440	450
Weight in operating position, kg	19,5	22,1	24,5	55,1	95,9
Weight in transporting position, kg	20,4	23,2	25,7	56,4	98,3
Maximum operational temperature <sup>1</sup> , °C	100				
Maximum tensile force on the device case <sup>2</sup> , kN (tn)	900 (90)	920 (92)	1050 (105)	1700 (170)	1900 (190)
Maximum inner pressure on the valve case, MPa	25				
Maximum pressure differential hold by the valve, MPa	15				
Connecting threads <sup>3</sup> : - upper and lower according to GOST 632-80	OTTM 146	OTTM 168	OTTM 178	OTTM 245	OTTM 324

<sup>1</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.

<sup>2</sup> Calculated value, when stresses reach yield point of the material.

<sup>3</sup> OTTG or BTS connecting threads can be produced on demand.



## CASING SHOE BK

BK is a casing shoe applied for directing a casing string during its running in the well bore.

There are four design variants:

- 1). BK-M – shoes with metal cap (if customer approves a cap is made of aluminum alloy according to D16T GOST 4784-97 or of pig iron mark Sch20 GOST 1412-85, default variant is aluminum);
- 2). BK-M – shoes with metal cap “bullet-like” (a cap is made of aluminum alloy according to D16T GOST 4784-97);
- 3). BK-P – shoes with polymer cap. BK-P shoes can also be produced without washing holes (“blind”). Index “Г” is added to such models.
- 4). BK-M – rotating shoes with eccentric cap (a cap is made of aluminum alloy according to D16T GOST 4784-97).

### SHOES WITH POLYMER-CONCRETE CAP

CODE	VALUE							
	Casing String Nominal Diameter, mm	Central hole diameter, mm	Side holes diameter, mm	Pass diameter, mm	Connecting threads <sup>1</sup> , according to GOST 632-80	Outer Diameter, mm, not more	Length, mm	Weight, kg, not more
BK-P 89	89	40	10	80	89	108	262	7,4
BK-P 102	102	40	12	91	ОТТМ 102	110	260	5,7
BK-P 114	114	50	12	102	ОТТМ 114	127	287	8,1
BK-P 127	127	60	12	115	ОТТМ 127	141,3	285	9,9
BK-P 140	140	70	15	127	ОТТМ 140	153,7	294	15,4
BK-P 146	146	70	15	133	ОТТМ 146	166	302	15,5
BK-P 168	168	80	15	155	ОТТМ 168	187,7	316	18,6
BK-P 178	178	90	18	164	ОТТМ 178	194,5	341	19,6
BK-P 194	194	100	20	178	ОТТМ 194	216	365	28,1
BK-P 219	219	110	20	205	ОТТМ 219	245	370	35,8
BK-P 245	245	120	20	228	ОТТМ 245	270	390	43,1
BK-P 273	273	130	20	259	ОТТМ 273	298,5	384	56,6
BK-P 299	299	150	20	281	ОТТМ 299	324	389	63,4
BK-P 324	324	160	20	307	ОТТМ 324	351	400	62,6
BK-P 340	340	170	20	323	ОТТМ 340	365	405	63,6
BK-P 426	426	220	20	406	ОТТМ 426	451	433	123,5

<sup>1</sup> Connecting thread type is agreed with Customer. For BK-P 89, BK-P 89G shoes thread is produced according to GOST 633-80. For BK-P 102, BK-P 102Г, BK-M 102 thread is produced according to TR 14-161-163-96.

**107078, Moscow, Novaya Basmannaya str., 14-1**

390025, Ryazan Region, Ryazan, Promyshlennaya str., 21

629803, Tyumen Region, YNAD, Noyabrsk, industrial zone, pan. 4

628600, Tyumen Region, KMAD-Yugra, Nijnevarovsk, Industrialnaya str., 29

461042, Orenburg Region, Buzuluk, Pyatigorskaya str., 39a build

664041, Irkutsk Reaion, Irkutsk. Sovetskaya str., 124-E

E-mail: info@zers.ru

Web: www.zers.ru

## SHOES WITH METAL CAP

CODE	VALUE							
	Casing String Nominal Diameter, mm	Central hole diameter, mm	Side holes diameter, mm	Pass diameter after drilling, mm	Connecting threads, according to GOST 632-80	Outer Diameter, mm, not more	Length, mm	Weight, kg, not more
BK-M 89	89	45	10	82	89	108	198	5,2
BK-M 102	102	50	12	94	OTTM 102	110	218	4
BK-M 114	114	55	15	107	OTTM 114	127	259	7,1
BK-M 127	127	60	15	119	OTTM 127	141,3	269	8,2
BK-M 140	140	70	15	132	OTTM 140	153,7	263	9,7
BK-M 146	146	70	15	138	OTTM 146	166	268	12,5
BK-M 168	168	80	15	160	OTTM 168	187,7	282	15,9
BK-M 178	178	90	20	170	OTTM 178	194,5	293	16,5
BK-M 194	194	100	20	185	OTTM 194	216	308	22,9
BK-M 219	219	110	20	210	OTTM 219	245	328	31,4
BK-M 245	245	120	20	236	OTTM 245	270	341	36,8
BK-M 273	273	130	20	264	OTTM 273	298,5	350	43,6
BK-M 299	299	150	20	290	OTTM 299	324	352	47,8
BK-M 324	324	160	20	315	OTTM 324	351	359	56,4
BK-M 340	340	170	20	331	OTTM 340	365	364	58,4
BK-M 426	426	220	20	415	OTTM 426	451	406	89,7

<sup>1</sup> Connecting thread type is agreed with Customer. For BK-M 89, BK-M 89G shoes thread is produced according to GOST 633-80. For BK-M 102, BK-M 102Г thread is produced according to TR 14-161-163-96. For BK-M 426 thread is produced according to TR 14-3-760-78.



**107078, г. Москва, ул. Новая Басманная, д. 14, стр. 1**

390025, Рязанская обл., г. Рязань, Промышленная ул., д. 21

629803, Тюменская обл., ЯНАО, г. Ноябрьск, промзона, пан. 4

628600, Тюменская обл., ХМАО-Югра, г. Нижневартовск, ул. Индустриальная, д. 29

461042, Оренбургская обл., г. Бузулук, Пятигорская ул., д. 39а

664041, Иркутская обл., г. Иркутск, ул. Советская, д. 124-Е

E-mail: info@zers.ru

Web: www.zers.ru

## BULLET-LIKE SHOE



CODE	VALUE							
	Casing String Nominal Diameter, mm	Central hole diameter, mm	Side holes diameter, mm	Pass diameter after drilling, mm	Connecting threads <sup>1</sup> , according to GOST 632-80	Outer Diameter, mm, not more	Length, mm	Weight, kg, not more
BK-M 102P	102	35	15	94	OTTM 102	110	450	7,8
BK-M 114P	114	35	15	107	OTTM 114	127	465	11

<sup>1</sup> Connecting thread type is agreed with Customer. For BK-M 102P thread is produced according to TR 14-161-163-96.

## SHOE WITH ROTATING ECCENTRIC CAP



ШИФР ИЗДЕЛИЯ	ЗНАЧЕНИЕ						
	Casing String Nominal Diameter, mm	Central hole diameter, mm	Pass diameter after drilling, mm	Connecting threads, according to GOST 632-80	Outer Diameter, mm, not more	Length, mm	Weight, kg, not more
BK-Vr 102	102	45	88	OTTM 102	110	273	5,7
BK-Vr 114	114	50	99	OTTM 114	127	333	9,4
BK-Vr 127	127	60	117	OTTM 127	141,3	347	11,4
BK-Vr 168	168	65	155	OTTM 168	188	427	22,1

## WELL SCREEN FS, FB

Well screens design made by our company are based on analysis of a great amount of research works and results long-time field experience of using such edvices and recomendations of oil&gas companies.

There are two types of well imperfection - penetration degree imperfection and opening attitude imperfection.

Well imperfect according to penetration degree is a well with open hole but it didn't enter formation at full capacity, only partially (fig. 1).

Well though brought to formation bottom but connected with formation only through holes in casing pipes, cementing ring or special well filter is called imperfect according to formation penetration (fig. 1,b).

In practice these wells occur the most frequently.

Rate  $G$  of imperfect well is most frequently lower than rate  $G_c$  perfect, working in the same conditions than imperfect one.

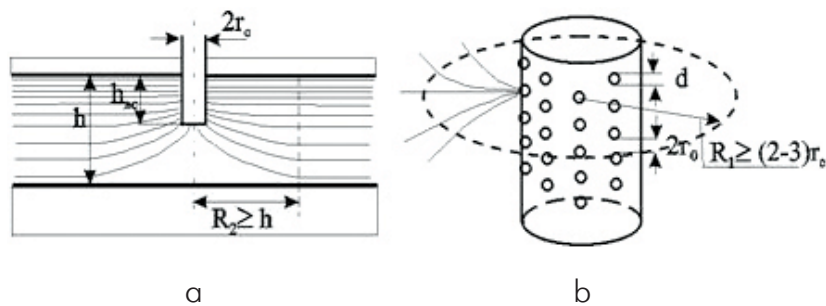


Fig. 1. Imperfect well screen figure:  
a - penetration degree; b - formation opening.

It should be noted that imperfectness of vertical wells influences less significantly on its productivity that imperfectness of flat well.

Research performed by Schurov V.I. through electrolytic modelling (fig. 2) revealed significant dependence of rate from density of perforations only up to 16-20 holes for 1 m. Further increase of number of holes in filters case doesn't increase the rate but leads to causeless increase of economic costs.

It should be noted that well productivity penetrating anisotropic formation with less holes diameter and bigger holes number exceeds productivity gained from larger holes diameter but less holes number (fig. 4.3, dc. 2, 3, 4).

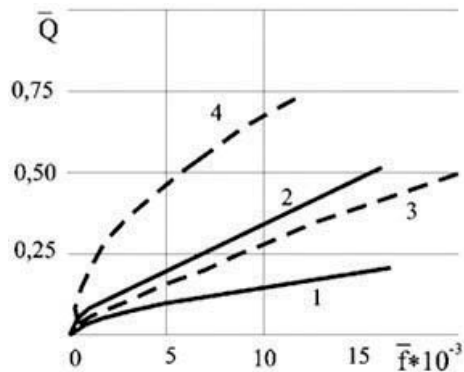


Fig. 4.3  $\bar{Q}$  dependence of  $\bar{f}$  perforation porosity  
 1 – anisotropic formation ( $d=6.3 \cdot 10^{-3}$  m;  
 2 – isotropic formation ( $d=6.3 \cdot 10^{-3}$  m);  
 3 – isotropic formation ( $d=2 \cdot 10^{-3}$  m);  
 4 – isotropic formation ( $d=0.5 \cdot 10^{-3}$  m);  
 $d$  – perforation holes diameter;  $f=f_h/F$ ;  $f_h$  –  
 holes surface for 1 lin. m of perforated surface  $F$

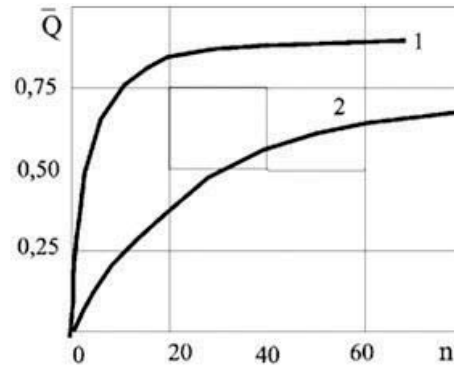


Fig. 4.4  $\bar{Q}$  dependence of number of holes  $n$   
 1 –  $a=0.3$ ,  $b=0.1$ ; 2 –  $a=10$ ,  $b=0.001$

*Without further reasons and calculations we should note that ZERS considers the most efficient well filter design including 28 holes with diameter 10 mm on 1 m.*

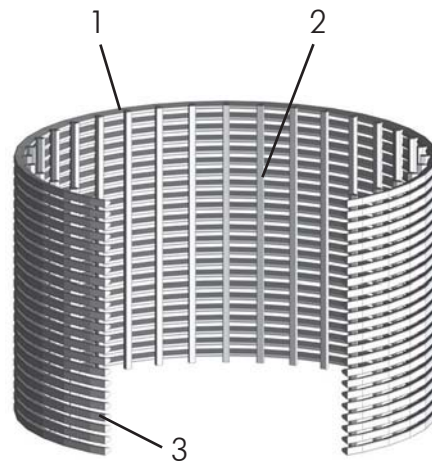
Well filter FS-type is applied as a part of casing string filtering part and is used to prevent destruction of productive formation bottom-hole area and sand or other mechanical impurities intrusion. Filter is run into productive formation and is installed in a preset interval of the well with the help of liner hanger or as a part of a casing string. FS-type filter is a device consisting of case with holes, on the outer side of which there is a slit-type filtering element manufactured by spiral winding of stainless steel wire with a special triangular section on to longitudinal load-bearing elements (stringers). The length of the filtering element, slit size and number of holes in the body as per 1 linear meter of its length are defined by its intended operational conditions and are subject to approval with the customer.

FS strainer is available in variants with hollow plugs «caps» (variant K) and without them. The plugs are installed in the holes of the case and provide filter leak-tightness up to 15 MPa of inner overpressure. It thus allows to washover well through a casing shoe. The hollow plugs are removed by mechanical destruction.

**107078, Moscow, Novaya Basmannaya str., 14-1**

390025, Ryazan Region, Ryazan, Promyshlennaya str., 21  
629803, Tyumen Region, YNAD, Noyabrsk, industrial zone, pan. 4  
628600, Tyumen Region, KMAD-Yugra, Nijneartovsk, Industrialnaya str., 29  
461042, Orenburg Region, Buzuluk, Pyatigorskaya str., 39a build  
664041, Irkutsk Reaion, Irkutsk. Sovetskava str., 124-E

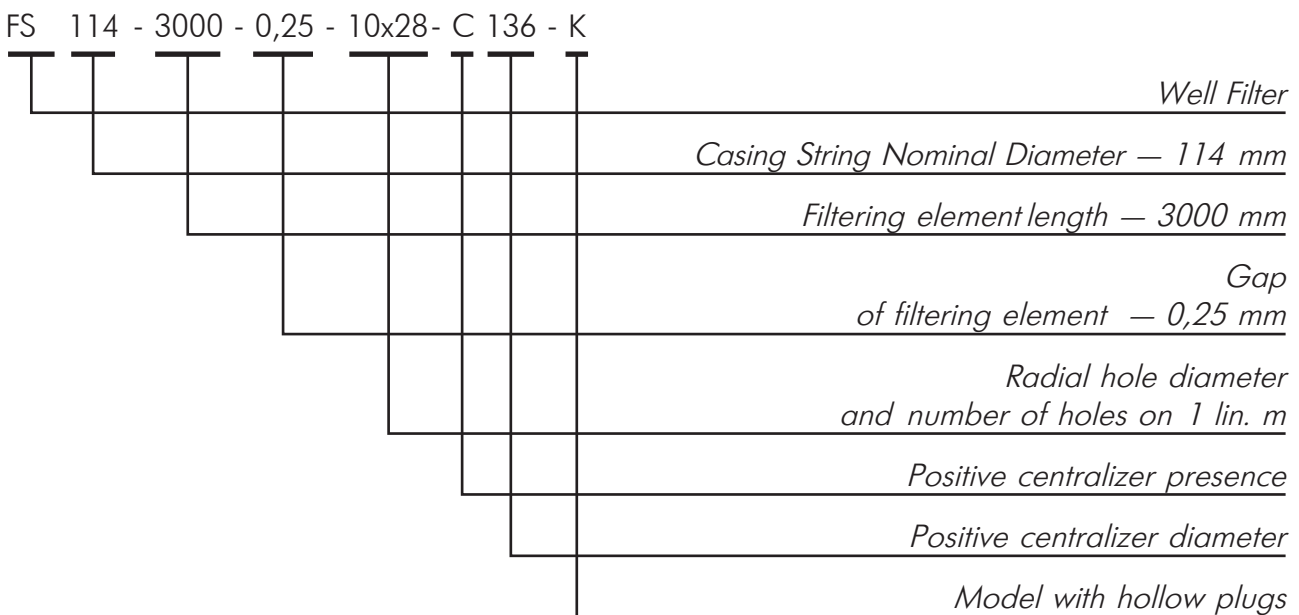
E-mail: [info@zers.ru](mailto:info@zers.ru)  
Web: [www.zers.ru](http://www.zers.ru)



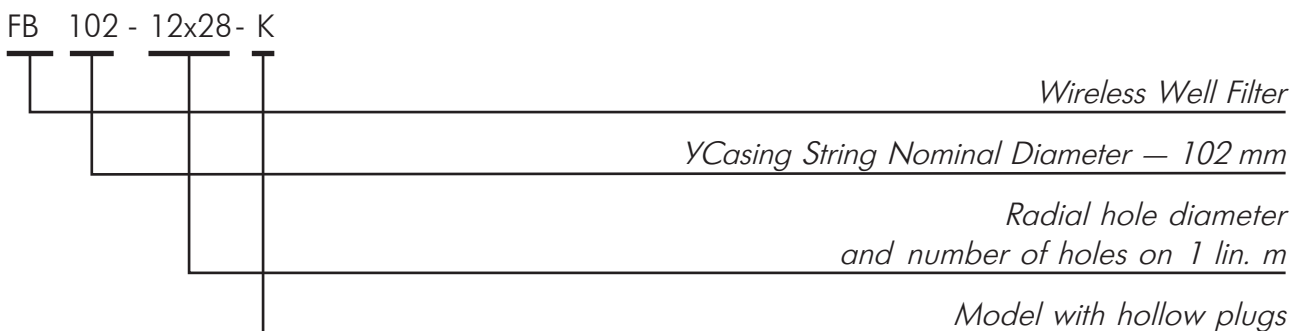
- 1 – Shaped wire.
- 2 – Stringer.
- 3 – Slit width (gap).

Wireless filter type FB differs from type FS filter by lack of filtering element on the case outer surface. It is also available in plugged and plug-less variants. Maximum pressure of filter pressuring for the variant with hollow plugs is 15 MPa.

Here is an example of designation code for mesh strainer with hollow plugs for casing string diameter 114 mm with slit size of 0,25 mm and filtering element length of 3000 mm provided with a solid centralizer with diameter of 136 mm:



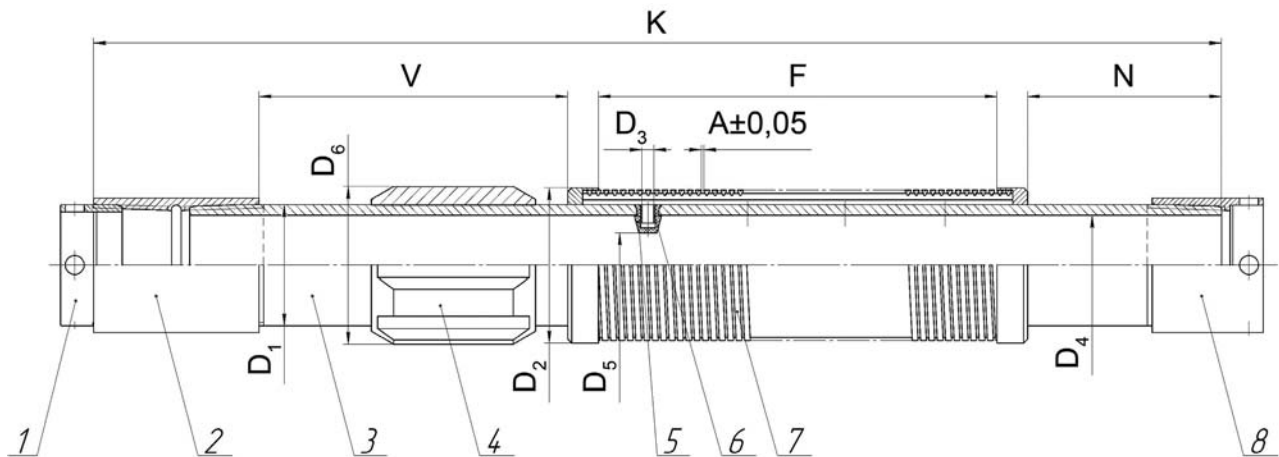
Here is an example of designation code for wireless filter with hollow plugs with diameter 12 mm holes which is ordered for a casing string with diameter 102 mm:



**107078, Moscow, Novaya Basmannaya str., 14-1**

390025, Ryazan Region, Ryazan, Promyshlennaya str., 21  
629803, Tyumen Region, YNAD, Noyabrsk, industrial zone, pan. 4  
628600, Tyumen Region, KMAD-Yugra, Nijnevartovsk, Industrialnaya str., 29  
461042, Orenburg Region, Buzuluk, Pyatigorskaya str., 39a build  
664041, Irkutsk Reaion, Irkutsk. Sovetskaya str., 124-E

E-mail: info@zers.ru  
Web: www.zers.ru



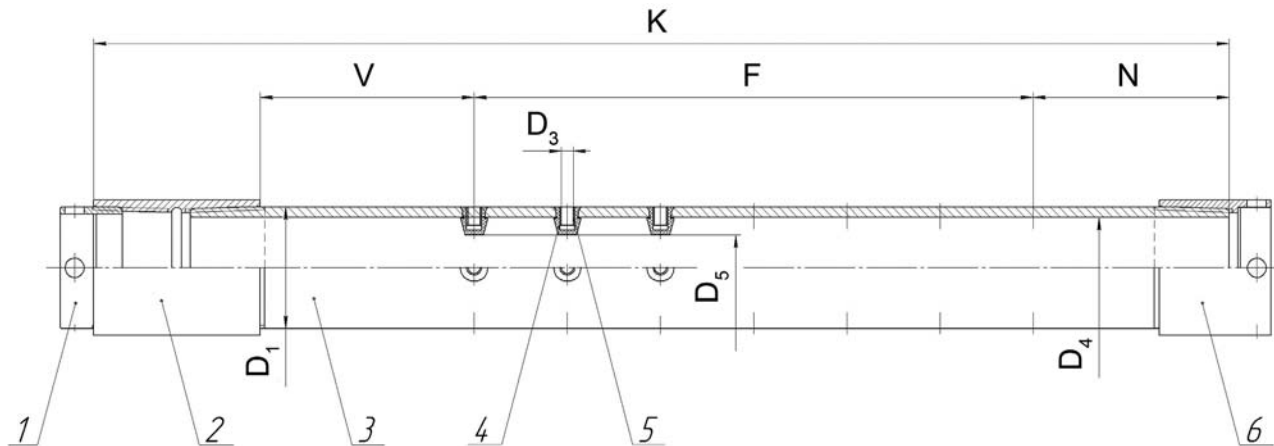
1.Plug 2.Collar 3.Body 4.Solid centralizer 5.Hollow plug 6.Hub 7.Filtering element 8.Plug

At figure there is a filter type FS with hollow plugs.

PARAMETER DESCRIPTION	VALUE						
Casing diameter, D1, mm	48	60	73	89	102	114	127
Maximum diameter of filtering element, D2, mm	65	78	90	107	116	129	148
Radial hole diameter in model with hollow plugs, D3, mm	10						
Radial hole diameter in model without hollow plugs, D3*, mm	12; 15						
Filter Pass diameter, D4, mm	40,3	50,3	62,0	75,9	88,6	101,5	114,2
Outer Diameter according to positive centralizer, D5*, mm	-	-	100	116	125	136	150
Filter length, K*, mm	4588...11088					4600...11100	
Filtering element Length, F, mm	3000 or 6000						
Top part length of filter case, B, mm	not less than 1200						
Bottom part length of filter case, N, mm	no less than 300						
Filtering element gap, A±0,05*, mm	0,15; 0,20; 0,25; 0,30; 0,35; 0,40; 0,50; 0,60; 0,70; 0,85; 1,00						

\* Other sizes are available on demand.





1.Plug 2.Collar 3.Body 4.Hollow plug 5.Hub 6.Plug

At figure there is a filter type FB with hollow plugs.

PARAMETER DESCRIPTION	VALUE						
Casing diameter, D <sub>1</sub> , mm	140	146	168	178	194	219	245
Maximum diameter of filtering element, D <sub>2</sub> , mm	159	166	188	198	213	238	264
Radial hole diameter model with hollow plugs, D <sub>3</sub> , mm	10						
Radial hole diameter without hollow plugs, D <sub>3</sub> *, mm	12; 15						
Filter Pass diameter, D <sub>4</sub> , mm	127,3	133,1	153,7	164,0	178,5	205,7	228,7
Outer diameter according to positive centralizer, D <sub>5</sub> , mm	162	174	195	206	224	258	285
Filter length, K*, mm	4616...11134						
Length of filtering element, F*, mm	3000 or 6000						
Top part length of filter case, B, mm	not less than 1200						
Bottom part length of filter case, N, mm	no less than 300						
Filtering element gap, A±0,05*, mm	0,15; 0,20; 0,25; 0,30; 0,35; 0,40; 0,50; 0,60; 0,70; 0,85; 1,00						

\* Other sizes are available on demand.



# IV

## DRILLING EQUIPMENT

Hole Selective Washing Device USPS .....	<b>96</b>
--	-----------



**107078, Moscow, Novaya Basmannaya str., 14-1**

390025, Ryazan Region, Ryazan, Promyshlennaya str., 21  
629803, Tyumen Region, YNAD, Noyabrsk, industrial zone, pan. 4  
628600, Tyumen Region, KMAD-Yugra, Nijnevartovsk, Industrialnaya str., 29  
461042, Orenburg Region, Buzuluk, Pyatigorskaya str., 39a build  
664041, Irkutsk Reaion, Irkutsk. Sovetskaya str., 124-E

E-mail: [info@zers.ru](mailto:info@zers.ru)  
Web: [www.zers.ru](http://www.zers.ru)



## HOLE SELECTIVE WASHING DEVICE USPS

Hole selective washing device is applied for performing of injections of plugs with fillers during drilling with bottomhole engine. The device is mounted above KNBK.

When the device is not actuated slurry goes through it smoothly. To activate the device it is necessary to drop an activation ball into drilling pipes and pump until it is set into a seat. When the activation ball reaches the seat circulating holes open. Due to this KNBK is hermetically disconnectd as it is mounted lower. The circulation goes through the side holes and slurry injection goes into loss zones. When a drilling pump is stopped a spring returns stem to the top position and circulation holes are closed.

After all planned technical operations are finished two steel deactivating balls are dropped into drilling pipes and pumped with calculated value of slurry in order to deactivate the device. Deactivating balls reach the device and close the holes due to liquid flow and deactivating ball is pumped through a seat. The circulating holes are closed. Slurry continues to flow through the device. Used balls both activating and deactivating come to trap and don't interfere with the following operations.

**107078, г. Москва, ул. Новая Басманная, д. 14, стр. 1**

390025, Рязанская обл., г. Рязань, Промышленная ул., д. 21  
629803, Тюменская обл., ЯНАО, г. Ноябрьск, промзона, пан. 4  
628600, Тюменская обл., ХМАО-Югра, г. Нижневартовск, ул. Индустриальная, д. 29  
461042, Оренбургская обл., г. Бузулук, Пятигорская ул., д. 39а  
664041, Иркутская обл., г. Иркутск, ул. Советская, д. 124-Е

E-mail: info@zers.ru  
Web: www.zers.ru

PARAMETER DESCRIPTION	VALUE	
	USPS 121	USPS 171
Outer diameter of the device, mm	121	171
Diameter of circulating holes, mm	28	28
Number of circulating holes, pcs	2	2
Number of operation cycles, without pulling out, units	5	5
Diameter of activation ball, mm	38,1	50,8
Diameter of deactivation ball, mm	34,9	34,9
Length, mm	1688	1841
Weight, kg	113	260
Connecting threads: - top and bottom according to GOST R 50836-96**	3-102	3-133
Maximum tensile force <sup>1</sup> , kN (tn)	1962 (200)	4905 (500)

<sup>1</sup> Calculated value.







# V

## HYDRAULIC FRACTURING

Technical equipment set for a liner well casing with the following multistage hydraulic fracturing .....	<b>100</b>
Pressure test nipple for hydraulic fracturing POGRP .....	<b>102</b>
Nonreturn valve KO .....	<b>103</b>
Hydraulic packer for hydraulic fracturing PGRP .....	<b>104</b>
Water and oil swellable packer for hydraulic fracturing .....	<b>106</b>
Collar for staged hydraulic fracturing MSGRP and MSGRP-G .....	<b>107</b>
Collar for collar cementing for hydraulic fracturing MMC-G .....	<b>109</b>
Set of equipment for multistage fracturing performance with unlimited number of ports and possibility of the second multistage fracturing or opening-closing of ports .....	<b>111</b>
Collar for staged hydraulic fracturing MSGRP-U .....	<b>112</b>

## TECHNICAL EQUIPMENT SET FOR A LINER WELL CASING WITH THE FOLLOWING MULTISTAGE HYDRAULIC FRACTURING

Technical equipment sets for multistage hydraulic fracturing vary in a liner well casing type:

- without cementing;
- with collar cementing;
- continuous cementing.

Also there are different types of horizontal sector separation into zones:

- with the help of swellable packers;
- with the help of hydraumechanical packers.

---

Set for wells casing with a liner without cementing with the following multistage hydraulic fracturing includes the following technical equipment:

1. Shoe;
2. Nonreturn ball valve KOSH2;
3. Nonreturn valve KO;
4. Hydraulically opening collar MSGRP-G;
5. Required amount of packers (swellable and hydraumechanical) and collars MSGRP which are opened with balls;
6. Noncemented liner hanger PHN.

---

Set for wells casing with a liner with collar cementing with the following multistage hydraulic fracturing includes the following technical equipment:

1. Shoe;
2. Nonreturn ball valve KOSH2;
3. Nonreturn valve KO;
4. Hydraulically opening collar MSGRP-G;
5. Required amount of packers (swellable and hydraumechanical) and collars MSGRP which are opened with balls;
6. Seat-trap SL;
7. Collar cementing packer PGMC or collar cementing coupling for hydraulic fracturing MMC-G;
8. Cemented liner hanger PHCZ or PPHGMC.

**107078, г. Москва, ул. Новая Басманная, д. 14, стр. 1**390025, Рязанская обл., г. Рязань, Промышленная ул., д. 21  
629803, Тюменская обл., ЯНАО, г. Ноябрьск, промзона, пан. 4  
628600, Тюменская обл., ХМАО-Югра, г. Нижневартовск, ул. Индустриальная, д. 29  
461042, Оренбургская обл., г. Бузулук, Пятигорская ул., д. 39а  
664041, Иркутская обл., г. Иркутск, ул. Советская, д. 124-ЕE-mail: [info@zers.ru](mailto:info@zers.ru)  
Web: [www.zers.ru](http://www.zers.ru)

After well casing with a liner and normalization are finished connection with liner is performed with hydraulic fracturing device UGRH, wellhead setting up and fittings are mounted.

Actually multistaged hydraulic fracturing is performed with collars MMSGRP which are actuated one-by-one at the right time. Collars are opened with inner overpressure increase in pass with the help of pressing balls of different diameter beginning with the smallest one and their setting to seats with different pass diameter. MSGRP-G hydraulically opening collar is used for the first interval hydraulic fracturing. Formation separation in annular space is performed with hydraumechanical and swellable packers included into assembly RIH.

Equipment sets are delivered for liners 102 and 114 mm and can be used for up to 10 intervals of hydraulic fracturing at operational pressure up to 70 MPa.



## PRESSURE TEST NIPPLE FOR HYDRAULIC FRACTURING POGRP

Pressure test nipple POGRP is applied for pressure testing of all the assembly of multizone hydraulic fracturing as a part of an assembled liner.

Nipple POGRP is included as a part of a liner and is mounted after a casing shoe.

The device is actuated with a composite ball drop and its pumping to setting into a seat POGRP after which pressure increases. Liner pressure testing is performed with gradually increasing overpressure. When pressure 15 MPa is reached POGRP is actuated and open slots open in it.

PARAMETER DESCRIPTION	VALUE		
	POGRP102	POGRP114	POGRP127
Liner Nominal Diameter equipped with the device, mm	102	114	127
Maximum outer diameter of the device, mm	121	134	144
Pass diameter of the device, mm	89	99	112
Device actuation pressure <sup>1</sup> , MPa	20	20	20
Length, mm	4170	4170	4170
Weight, kg	50,2	68,4	74,1
Maximum operational temperature <sup>2</sup> , °C	100	100	100
Connecting threads <sup>3</sup> - upper and lower GOST 632	OTTM-102	OTTM-114	OTTM-127

<sup>1</sup> Controlling overpressure values are given when all the shear bolts on the unit are used.

<sup>2</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.

<sup>3</sup> For device POGRP102 thread OTTM 102 is produced according to TR 14-161-163.



## NONRETURN VALVE KO

Nonreturn valve KO is installed in liner assembly for multizone hydraulic fracturing is applied for reliable disconnection of tube space and annulat space.

Valve is actuated after liner RIH with dropping and pumping of a ball.

PARAMETER DESCRIPTION	VALUE	
	KO.102	KO.114
Liner Nominal Diameter equipped with the device, mm	102	114
Maximum outer diameter of the device, mm	114	127
Pass diameter (after drilling), mm	89	99
Maximum pressure differential on case, MPa	70	70
Maximum pressure differential hold by the valve, MPa	45	45
Length, mm	240	240
Weight, kg	19,2	24,7
Maximum operational temperature <sup>1</sup> , °C	100	100
Connecting threads, according to GOST 632-80 (for KO.102 according to TR 14-161-163-96)	OTTM-102	OTTM-114

<sup>1</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.



## HYDRAULIC PACKER FOR HYDRAULIC FRACTURING PGRP

Hydraulic packer PGRP is applied for open well bore (or casing string) intervals isolation during different technological operation performance including multistage hydraulic fracturing (MSHF).

Packer operates as follows:

- after liner running into the adjusted depth and flushing a controlling ball is moved till it setting into a valve KO seat. After this pressure begins to increase.
- for packer hydraulic drive unit actuation overpressure 16 (33) MPa is created in liner pipes. When the adjusted pressure is achieved shear bolts are cut off and packer is actuated.

For packer operation at significant pressures it is recommended to install packer in intervals with open bore nominal diameter.



PARAMETER DESCRIPTION	VALUE				
	PGRP.102/118	PGRP.102/136	PGRP.114/136	PGRP.114/144	PGRP.114/148
Liner Nominal Diameter equipped with the device, mm	102	102	114	114	114
Nominal diameter of hole open bore (bit size) which the device is run in, mm	123,8	142,9	142	152,4	155,6
Outer Diameter, mm	118	136	136	144	148
Pass diameter, after actuation, mm	88	88	99	99	99
Maximum tensile axial force on the body <sup>1</sup> , kN	600	600	700	700	700
Maximum inner overpressure for packer actuation, MPa: - at all 10 shear balts - at 5 shear balts			33 16		
Maximum pressure differential between the zones separated by a packer, MPa			70		
Maximum inner overpressure on the packer, MPa			70		
Maximum operational temperature <sup>2</sup> , °C			100		
Length, mm	1460	1295	1610	1700	1700
Weight, kg	51	56	65	78	80
Connecting threads: - upper and lower according to GOST 632-80 (for PGRP.102/118 and PGRP.102/136 according to TR 14-161-163-96)	ОТТМ-102	ОТТМ-102	ОТТМ-114	ОТТМ-114	ОТТМ-114

<sup>1</sup> Calculated value.

<sup>2</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.



## WATER AND OIL SWELLABLE PACKER FOR HYDRAULIC FRACTURING

“NTC “ZERS” LLC has developed and produce oil swellable packers in which the sealing element is made of elastomeric material that is able to swell out on the contact with oil and can hold pressure differential 700 atm in nominal diameter bore.

Besides case of these packers is made of steelwith improved strength properties.

PARAMETER DESCRIPTION	PNV AND PNN PACKER TYPICAL SIZE					
	102/118	102/124	114/136	114/144	114/148	127/148
Liner Nominal Diameter on which packer is run in, mm	102	102	114	114	114	127
Recommended wellbore diameter which packer is installed in, mm	124 ...	132	143 ...	152 ...	156 ...	156 ...
Maximum pressure differential on packer, MPa	70					
Elastomeric material length, mm	1200					
Ppacker length, mm	2600					
Packer Outer Diameter, mm	118	124	136	144	148	148
Weight, kg	58	61	72	75	78	81
Maximum operational temperature, °C	100					
Estimated packer swelling time for full isolation of the well space <sup>1</sup> , days	5...7			7...9		

<sup>1</sup> Parameters values are shown for the rated wellbore diameter on the base of used swelling resins types and well conditions (temperature, well fluid type on running down and operation, etc.).



## OPERATED COLLAR FOR STAGED HYDRAULIC FRACTURING MSGRP AND MSGRP-G

Collar for staged hydraulic fracturing MSGRP is applied for multizone hydraulic fracturing performance.

Set of collars is RIN as a part of liner GRP assembly. Each collar is installed into preset zone of well bore. MSGRP-G collar is installed in the first hydraulic fracturing zone (above shoe, POGRP, KO and packer).

MSGRP-G is actuated with pressure increasing up to 30 MPa.

MSGRP collars are actuated through pulling and pressing of balls with different diameter into a well beginning with the smallest one.

Collars are run in as a part of a liner as together with swellable and hydraumechanical packers.

Collars can be equipped both with usual metalcomposite balls and soluble composite balls. Balls diameters are given in the table.

NUMBER	BALLS DIAMETER		COLLAR CODE
	mm	inches	
1	70,92	2,792	MSGRP */70 <sup>1</sup>
2	67,57	2,660	MSGRP */67
3	64,32	2,532	MSGRP */64
4	61,19	2,409	MSGRP */61
5	58,17	2,290	MSGRP */58
6	55,25	2,175	MSGRP */55
7	52,43	2,064	MSGRP */52
8	49,71	1,957	MSGRP */49
9	47,07	1,853	MSGRP */47

<sup>1</sup> \* means collar diameter.

PARAMETER DESCRIPTION	VALUE			
	MSGRP-G 102	MSGRP 102	MSGRP-G 114	MSGRP 114
Liner Nominal Diameter equipped with the device, mm	102	102	114	114
Nominal diameter of hole open bore (bit size) which the device is run in, mm	123,8	123,8	142,9	142,9
Outer Diameter, mm	118	117	133	133
Pass diameter, after actuation, mm	89	89	99	99
Inner overpressure to open collar cementing slots <sup>1</sup> , MPa ±10%	30	16,0	30	16,0
Maximum inner overpressure on the collar casing, MPa	70			
Maximum outer overpressure on the collar casing, MPa	70			
Maximum tensile axial force on the body <sup>2</sup> , kN	400	400	400	500
Maximum operational temperature <sup>3</sup> , °C	100			
Length, mm	2350	899	2351	907
Weight, kg	58	26,0	70,6	36,3

<sup>1</sup> Controlling overpressure values are given when all the shear bolts on the unit are used.

<sup>2</sup> Calculated value, when stresses reach yield point of the material.

<sup>3</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.



## COLLAR FOR COLLAR CEMENTING FOR HYDRAULIC FRACTURING MMC-G

Collar cementing valve is applied for collar cementing performance of liner with assembly for hydraulic fracturing with separation of horizontal sector into zones with hydraumechanical packers.

While using collar like MMC-G the following process operations are performed:

- washing and washing ports opening through inner overpressure increase are carried out after isolation of pipe inner space from annular space;
- washing with starting of ball is carried out;
- cementing ports opening when a ball is set into a collar seat.
- performance of casing cementing with starting of cementing plug after pumping in cement slurry.
- driving of cement slurry to the casing annular space untill receiving of "stop" signal;
- closing of collar ports by raising of inner overpressure.

**107078, Moscow, Novaya Basmannaya str., 14-1**

 390025, Ryazan Region, Ryazan, Promyshlennaya str., 21  
 629803, Tyumen Region, YNAD, Noyabrsk, industrial zone, pan. 4  
 628600, Tyumen Region, KMAD-Yugra, Nijnevartovsk, Industrialnaya str., 29  
 461042, Orenburg Region, Buzuluk, Pyatigorskaya str., 39a build  
 664041, Irkutsk Reaion, Irkutsk. Sovetskaya str., 124-E

 E-mail: info@zers.ru  
 Web: www.zers.ru

PARAMETER DESCRIPTION	VALUE	
	MMC-G 102	MMC-G 114
Casing string nominal diameter equipped with the collar, mm	102	114
Nominal diameter of hole open bore (bit size) which collar is run in, mm	124	142,9
Maximum Outer Diameter, mm	118	133
Pass diameter, mm	88	98
Values of controlling overpressure for devices actuation <sup>1</sup> , MPa:		
- circulation ports opening		16,0
- cementing ports opening		11,0
- cementing ports closing		5,0
Maximum operational temperature <sup>2</sup> , °C		100
Maximum inner overpressure on the collar casing <sup>3</sup> , MPa		70,0
Maximum outer overpressure on the collar casing <sup>3</sup> , MPa		70,0
Maximum tensile force <sup>3</sup> , kN		600 (60)
Length, mm	1715	1121
Weight, kg	58,4	47,9
Connecting thread according to TR 14-161-163-96	OTTM 102	OTTM 114

<sup>1</sup> Values are given when all the shear bolts on the unit are used.

<sup>2</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.

<sup>3</sup> Calculated value, when stresses reach yield point of the material.





## SET OF EQUIPMENT FOR MULTISTAGE FRACTURING PERFORMANCE WITH UNLIMITED NUMBER OF PORTS AND POSSIBILITY OF THE SECOND MULTISTAGE FRACTURING OR OPENING-CLOSING OF PORTS

The set of equipment includes: a key for collars control and collars GRP geared towards the key.

A key for collars KUM.114 control is a hydraulically actuated device run in on coiled tubing for randomly opening/closing of unlimited number of GRP collars.

The device has the following main advantages:

1. Key cams hydraulically actuated with pressure differential.
2. Automatic disconnection of key from collar after its opening/ closing.
3. Option of further collar control.
4. Small size of the device.

PARAMETER	VALUE
Outer max $\varnothing$ , mm	88
Inner $\varnothing$ , mm	15
Length, mm	449
Activation rate, l/s	4
Activation pressure, MPa	4-5
Connecting threads	Thread 60 GOST 633-80

### KEY OPERATIONAL STAGES

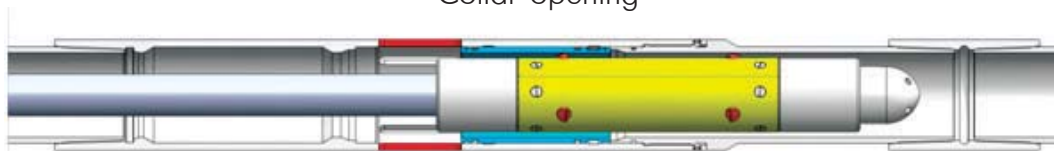
Collar location



Engagement



Collar opening





## COLLAR FOR STAGED HYDRAULIC FRACTURING MSGRP-U

Collar for staged hydraulic fracturing MSGRP-U is applied for multiformation hydraulic fracturing performance. A set of collars is run in hole as a part of GRP liner assembly. Each collar is installed in the preset well bore formation. MSGRP collars actuation is performed with the device KUM.114 which is run in on coiled tubing. In this case collars are actuated randomly.

Also collars actuation is possible according to standard process with balls of different diameter. In this case seats are pulled out with a special device and without drilling after collars are actuated.

Collars are run in as a part of a liner together with swellable and hydraumechanical packers. Liner assembly includes unlimited number of collars installation.

PARAMETER DESCRIPTION	VALUE
	MSGRP-U.114
Liner nominal diameter equipped with the device, mm	114
Nominal diameter of well open bore (bit size) which the device is run in, mm	142,9
Outer diameter, mm	133
Pass diameter, after actuation, mm	99
Maximum inner overpressure on collar case, MPa	70
Maximum outer overpressure on collar case, MPa	70
Maximum tensile axial load on case <sup>1</sup> , kN	400
Maximum operational temperature <sup>2</sup> , °C	100
Length, mm	949
Weight, kg	35

<sup>1</sup> Calculated value, when stresses reach yield point of the material.

<sup>2</sup> Reference only, depends on operating conditions of general mechanical rubber goods in a well.







# VI

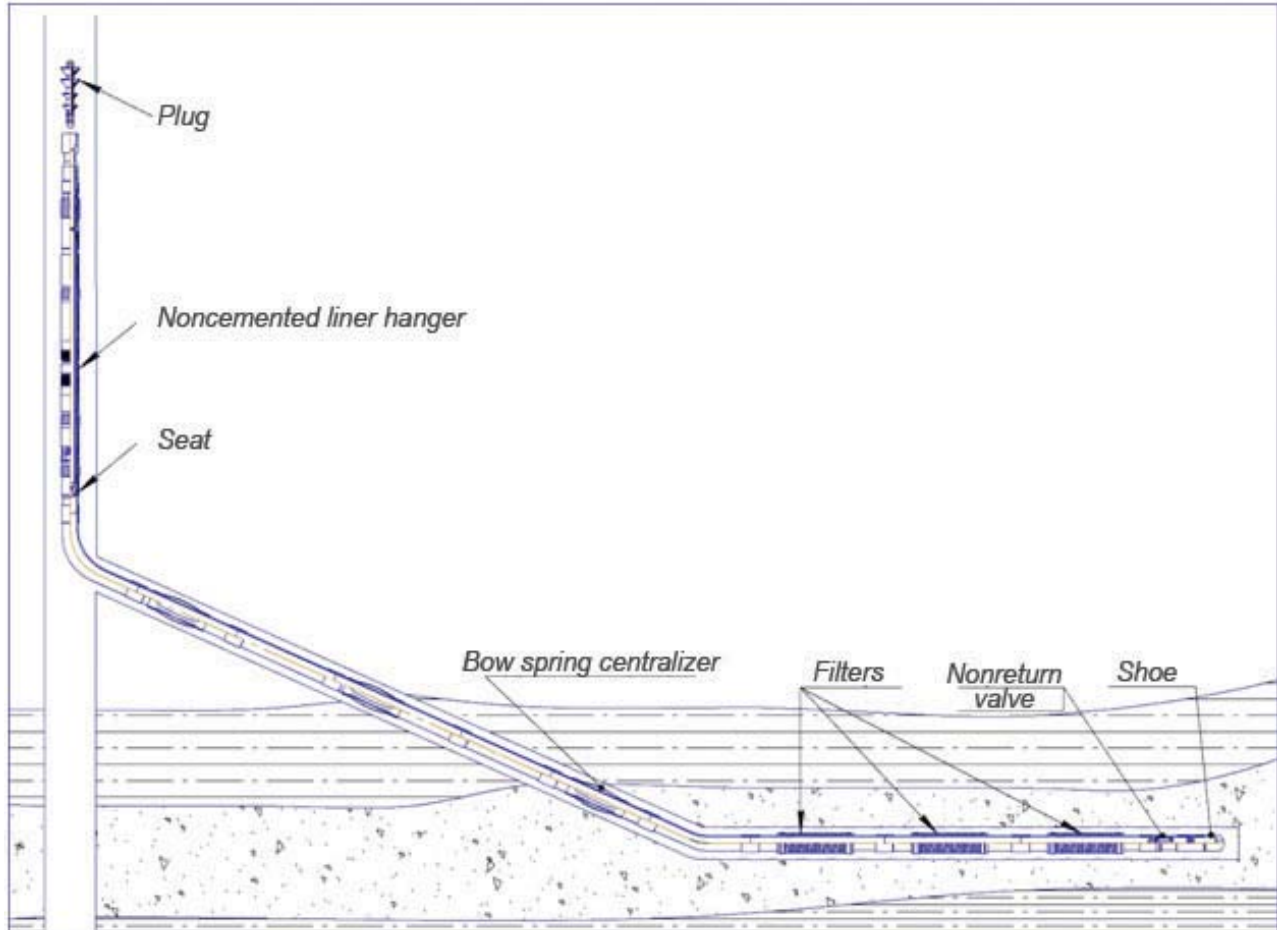
## EXAMPLES OF ASSEMBLIES APPLIED FOR DIFFERENT PURPOSES

Well casing with noncementing liner . . . . .	<b>116</b>
Well casing with noncementing liner with washing through a shoe with an option of rotating during running in and zones separation with swellable packers . . . . .	<b>117</b>
Well casing with noncementing liner with zones separation by inflatable packers . . . . .	<b>118</b>
Well casing with cementing liner with continuous cementing, with zones separation by hose packers . . . . .	<b>119</b>
Well casing with collar cementing liner with additional separation of upper formations by inflatable packers . . . . .	<b>120</b>
Well casing with noncementing liner with packaging for MSHF performance and zones separation with hydraulic and swellable packers . . . . .	<b>121</b>
Well casing with collar cementing liner, with packaging for MSHF performance and zones separation with swellable packers . . . . .	<b>122</b>
Well casing with collar cementing liner, with packaging for MSHF performance and zones separation with hydraulic packers . . . . .	<b>123</b>
Well casing with collar cementing liner with two-stage cementing . . . . .	<b>124</b>

## WELL CASING WITH NONCEMENTING LINER

For well casing with noncementing liner the following assembly is used:

1. PHN-type hanger;
2. Lowfrictional and spring centralizers;
3. FS or FB filters (depend on collector resistance);
4. Nonreturn valve (only in cases when FS filter is used);
5. Shoe.



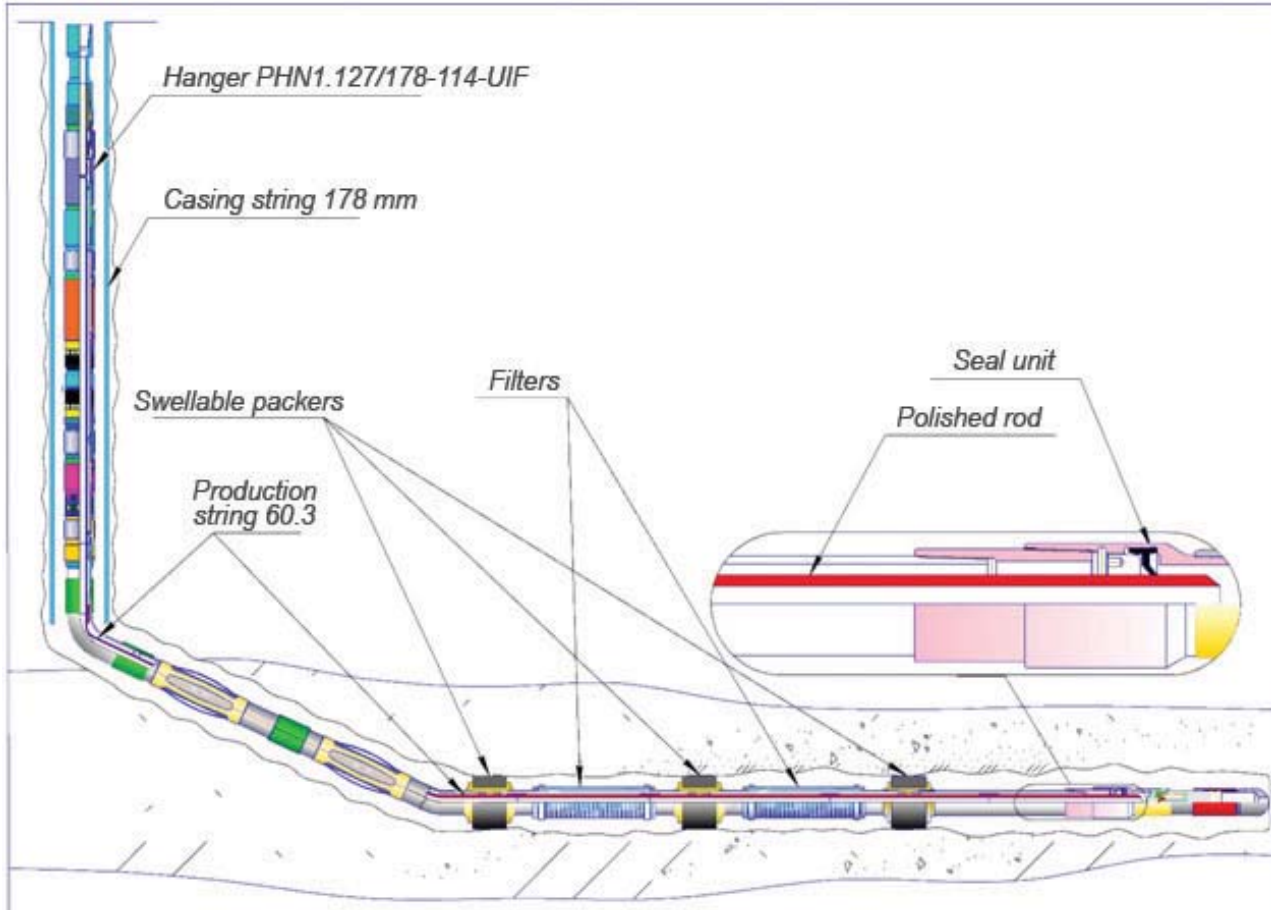


## WELL CASING WITH NONCEMENTING LINER WITH WASHING THROUGH A SHOE WITH AN OPTION OF ROTATING DURING RUNNING IN AND ZONES SEPARATION WITH SWELLABLE PACKERS

For well casing with noncementing liner with washing through a shoe and zones separation with swellable packer the following assembly is used:

1. PHN-UIF hanger or PHNV-UIF (if rotation is needed during running in);
2. Lowfrictional and spring centralizers;
3. FS or FB filters (depend on collector resistance);
4. UIF seal unit;
5. Nonreturn valve (only in cases when FS filter is used);
6. Shoe.

After liner assembling string with polish rod at the end is RIH. The operation is completed when the rod is set into UIF seal unit.

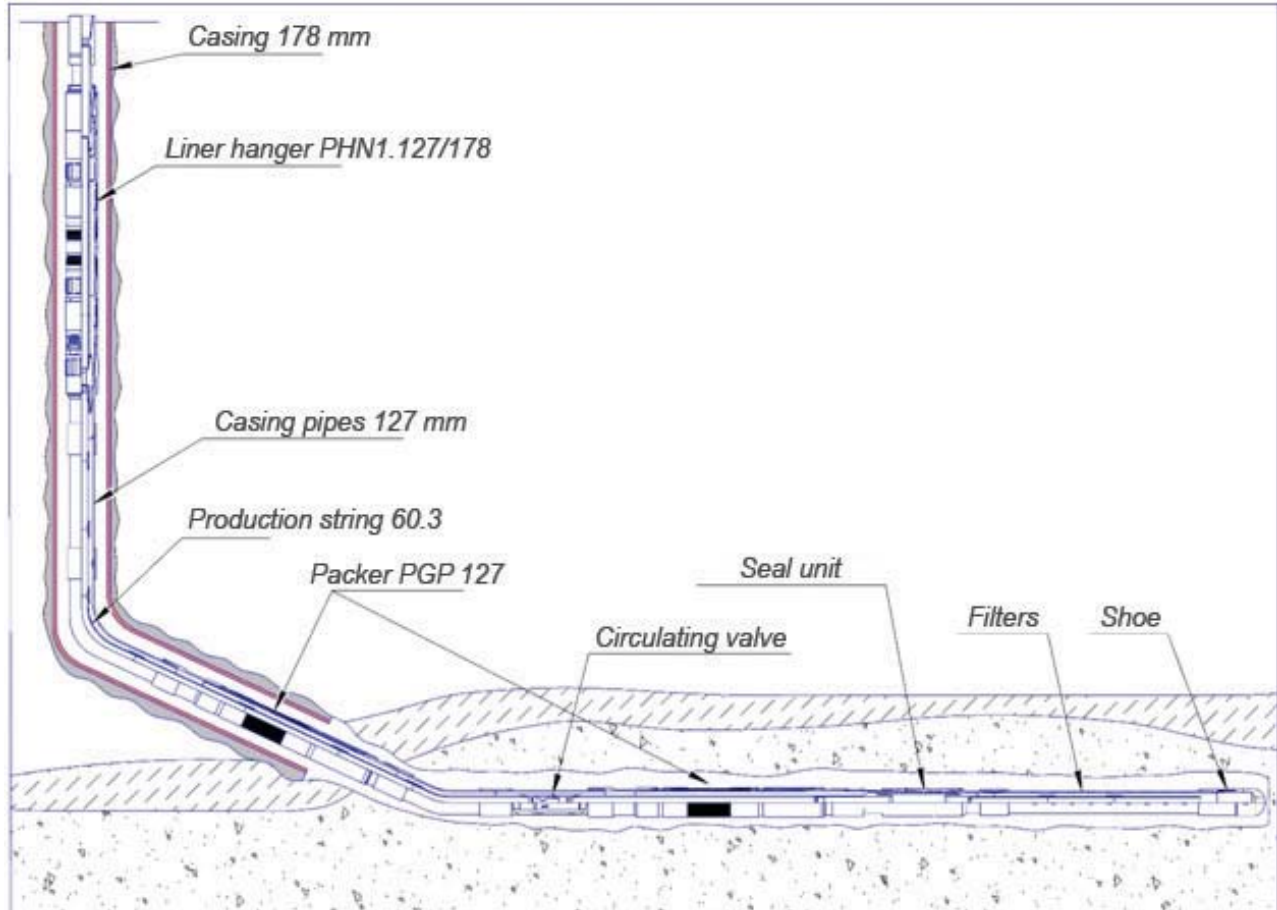


## WELL CASING WITH NONCEMENTING LINER WITH ZONES SEPARATION BY INFLATABLE PACKERS

For well casing with noncementing liner with washing through a shoe and zones separation with swellable packers the following assembly is used:

1. PHN-UIF hanger;
2. Lowfrictional and spring centralizers;
3. PGP packers;
4. UIF2 seal unit;
5. FS or FB filters (depend on collector resistance);
6. Nonreturn valve (only in cases when FS filter is used);
7. Shoe.

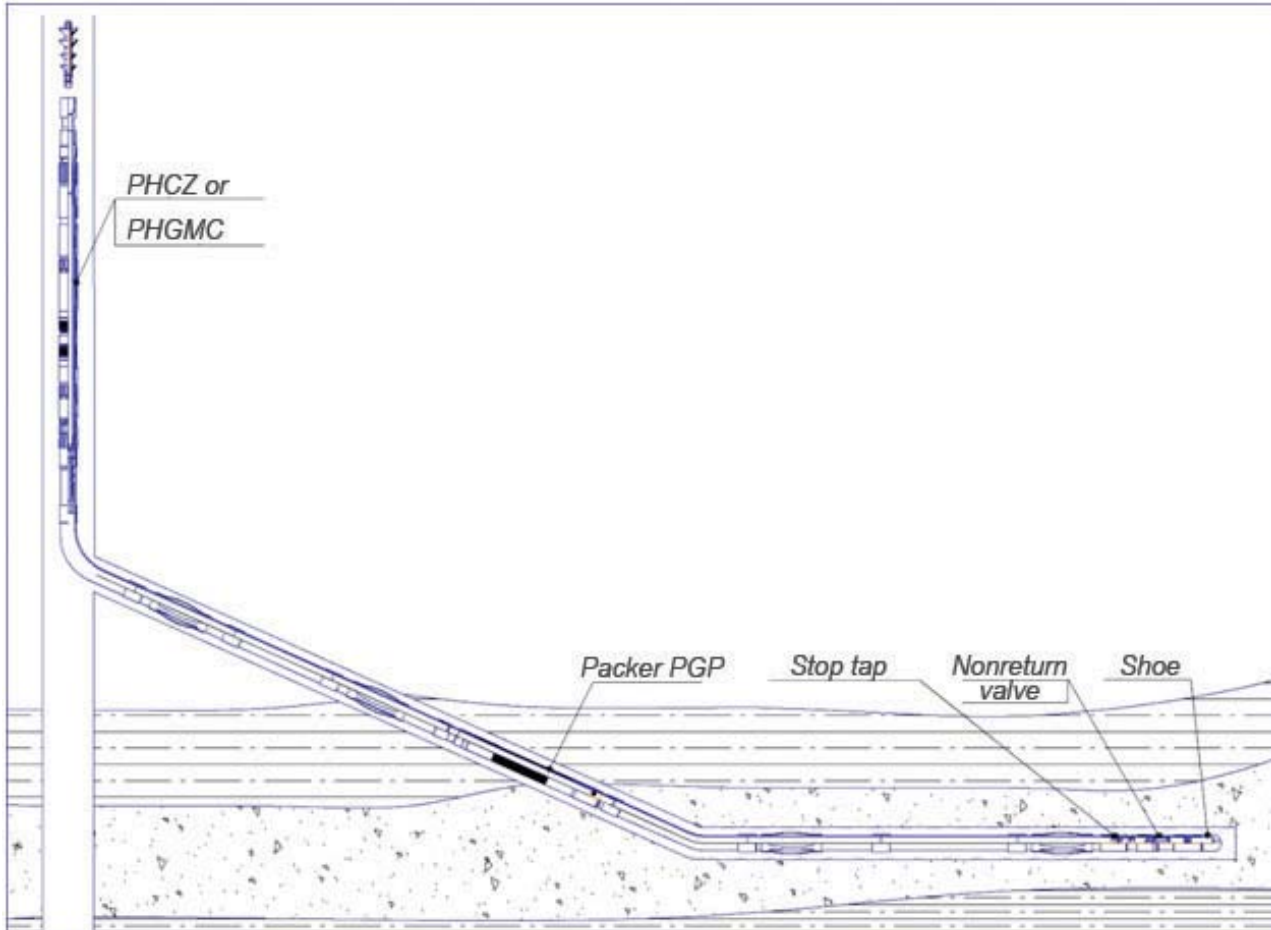
After liner assembling string with special rod at the exact part is RIH. The operation is completed when the rod is set into UIF2 seal unit.



## WELL CASING WITH CEMENTING LINER WITH CONTINUOUS CEMENTING, WITH ZONES SEPARATION BY HOSE PACKERS

For well casing with cementing liner with continuous cementing, with zones separation by inflatable packers the following assembly is used:

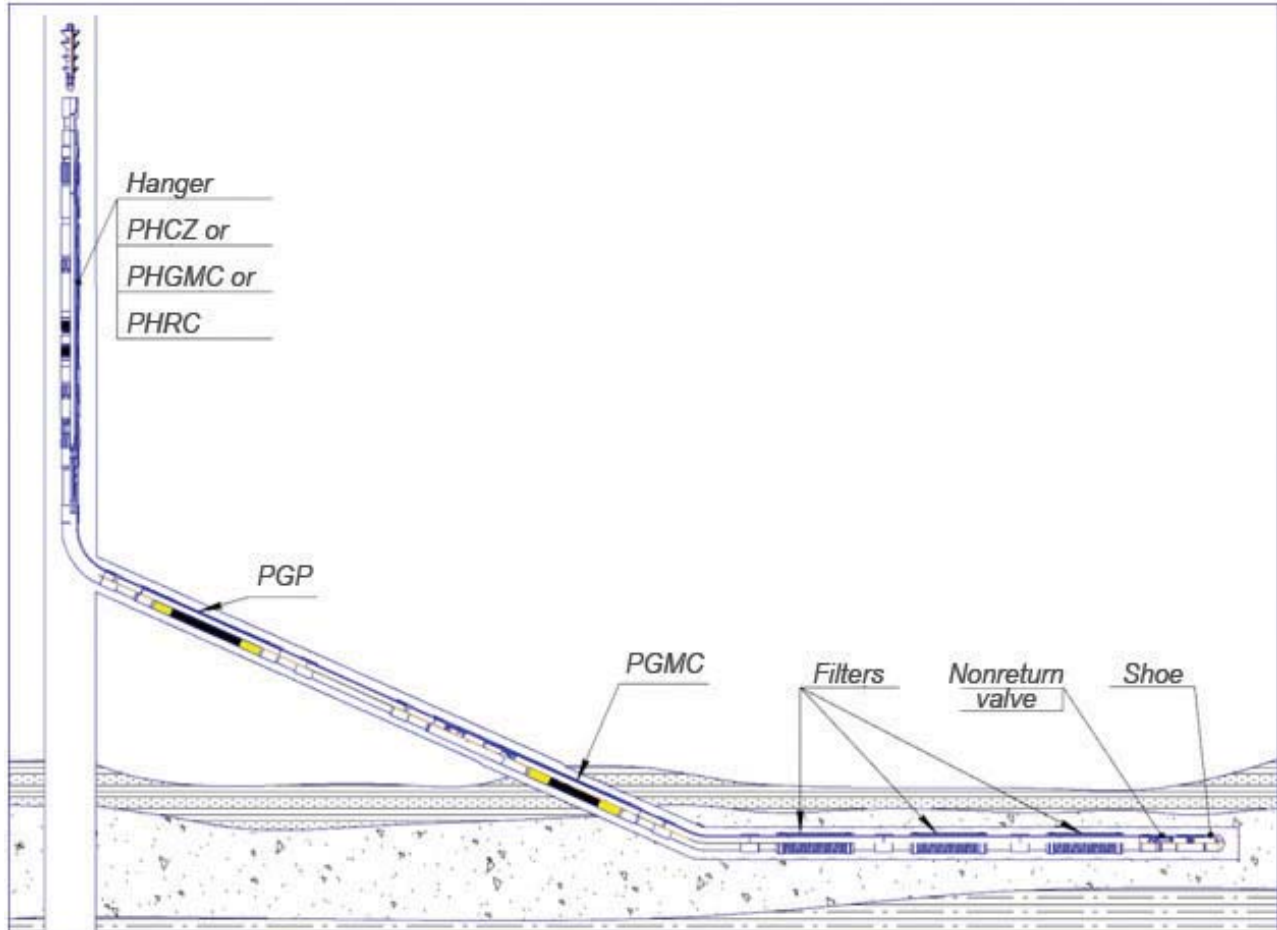
1. PHCZ or PHGMC or PHRC hanger;
2. Cementing baket CK;
3. Lowfrictional and spring centralizers;
4. PGP packer;
5. Stop-Tap;
6. Valve KOSH2;
7. Shoe.



## WELL CASING WITH COLLAR CEMENTING LINER WITH ADDITIONAL SEPARATION OF UPPER FORMATIONS BY INFLATABLE PACKERS

For well casing with collar cementing liner with additional separation of upper formations by inflatable packers the following assembly is used:

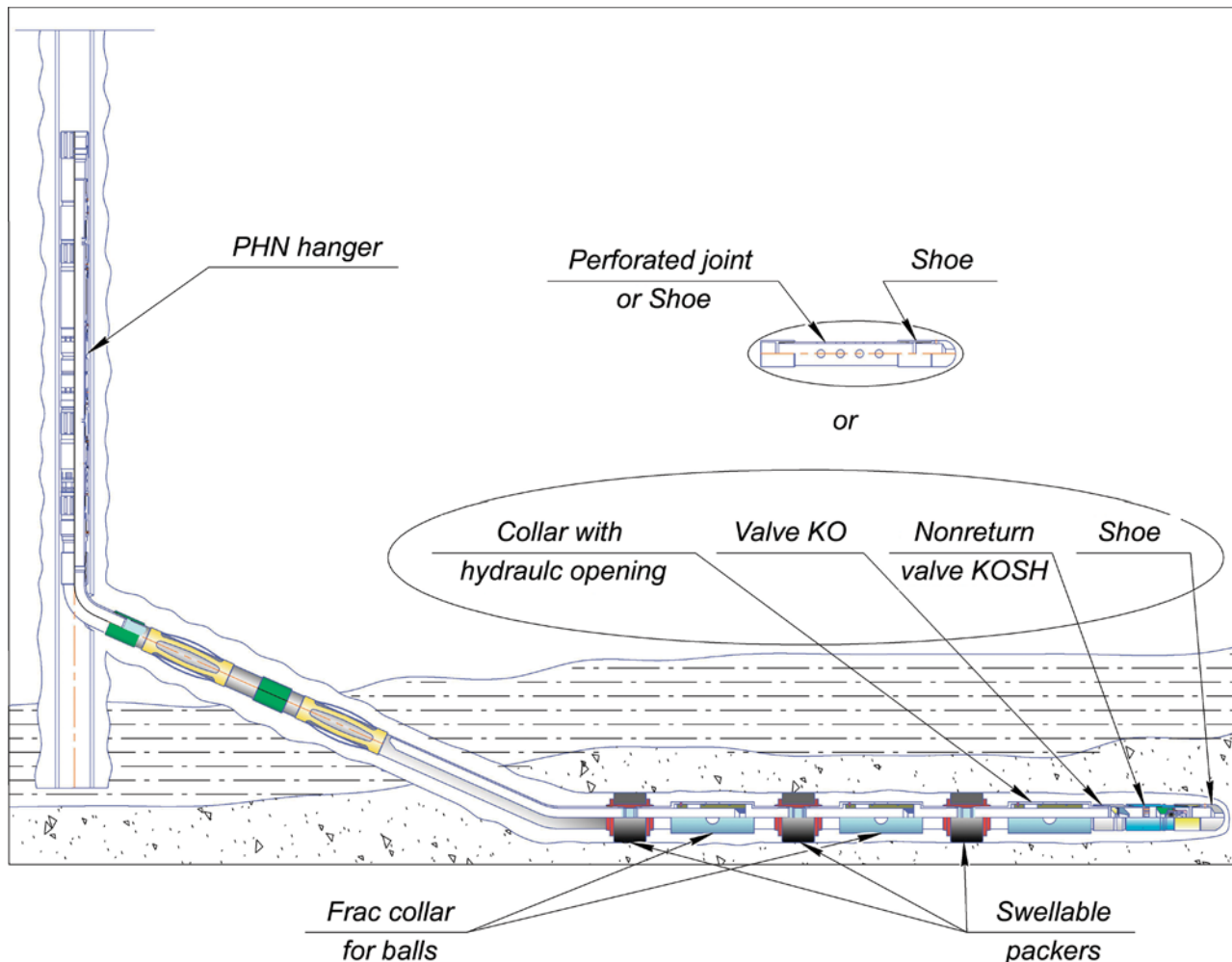
1. PHCZ or PHGMC or PHRC hanger;
2. PGP packer (one or several);
3. Cementing baket CK;
4. Lowfrictional and spring centralizers;
5. PGMC packer;
6. FS or FB filters (depend on collector resistance);
7. Valve KOSH2;
8. Shoe BK-M.



## WELL CASING WITH NONCEMENTING LINER WITH PACKAGING FOR MSHF PERFORMANCE AND ZONES SEPARATION WITH HYDRAULIC AND SWELLABLE PACKERS

For well casing with noncementing liner with packaging for MSHF performance and zones separation with hydraulic and swellable packers the following equipment is used:

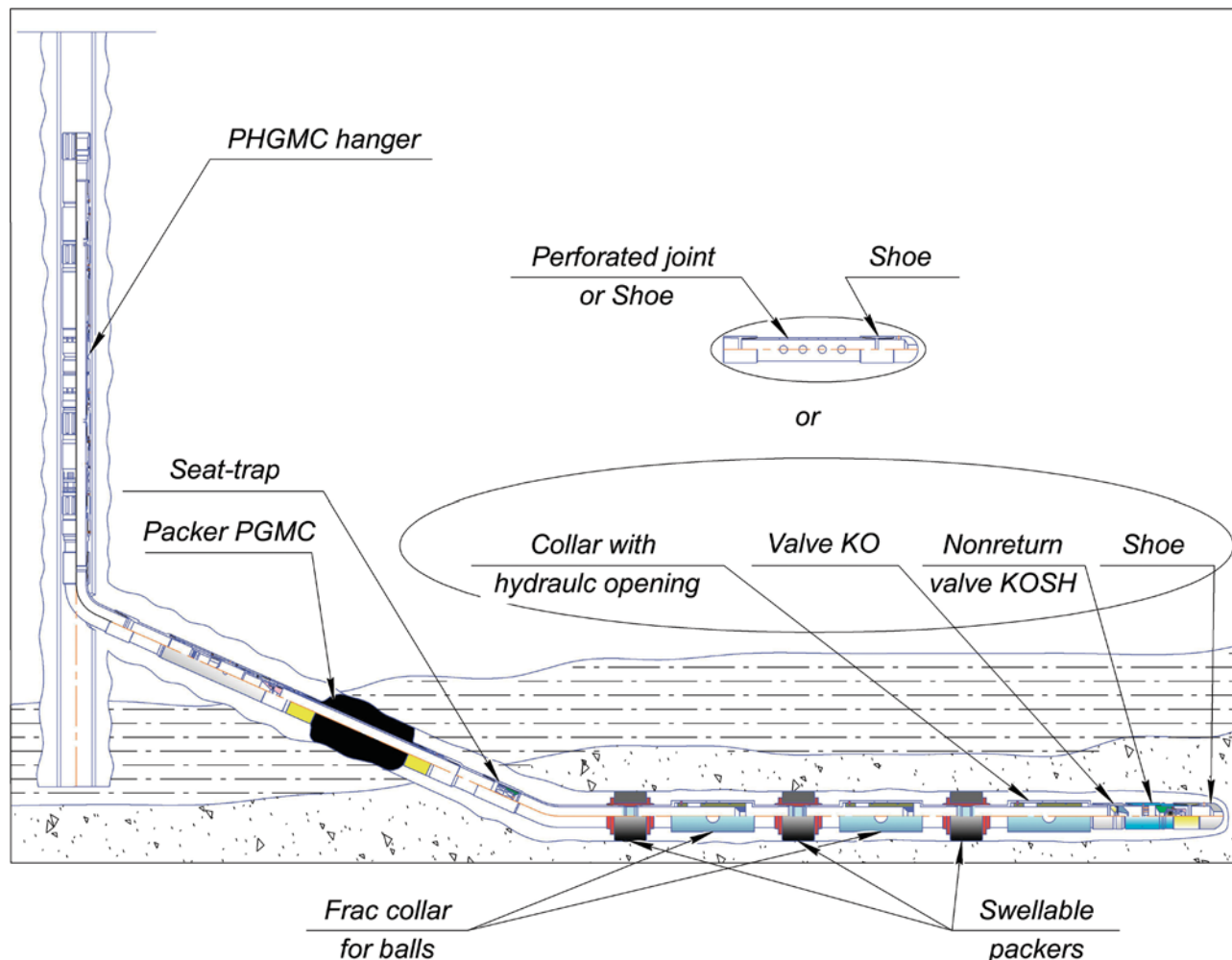
1. PHN-type hanger;
2. Lowfrictional and spring centralizers;
3. PGRP packers;
4. MMSGRP collars (for balls);
5. MSGRP-G collars (opening hydraulically);
6. Valve KO;
7. POGRP tools;
8. Nonreturn valve;
9. Shoe.



## WELL CASING WITH COLLAR CEMENTING LINER, WITH PACKAGING FOR MSHF PERFORMANCE AND ZONES SEPARATION WITH SWELLABLE PACKERS

For well casing with collar cementing liner with packaging for MSHF performance and zones separation with swellable packers the following equipment is used:

1. PHCZ or PHGMC hanger;
2. Cementing baket CK;
3. Lowfrictional and spring centralizers;
4. PGMC packer;
5. Seat-trap SL;
6. PNN or PNV packers;
7. MMSGRP collars (for balls);
8. Perforated nipple;
9. Shoe BK-M.

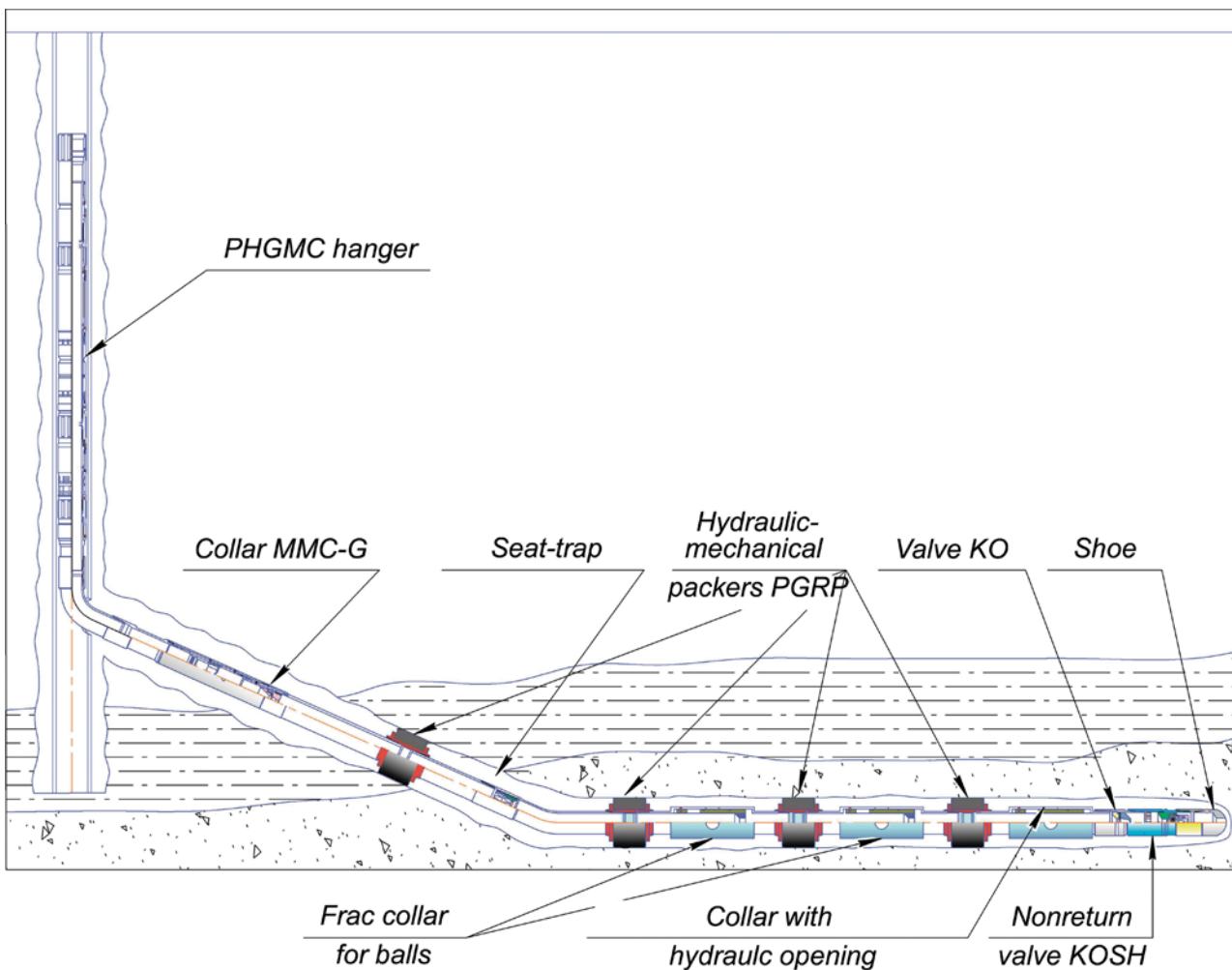




## WELL CASING WITH COLLAR CEMENTING LINER, WITH PACKAGING FOR MSHF PERFORMANCE AND ZONES SEPARATION WITH HYDRAULIC PACKERS

For well casing with collar cementing liner with packaging for MSHF performance and zones separation with hydramechanical packers the following equipment is used:

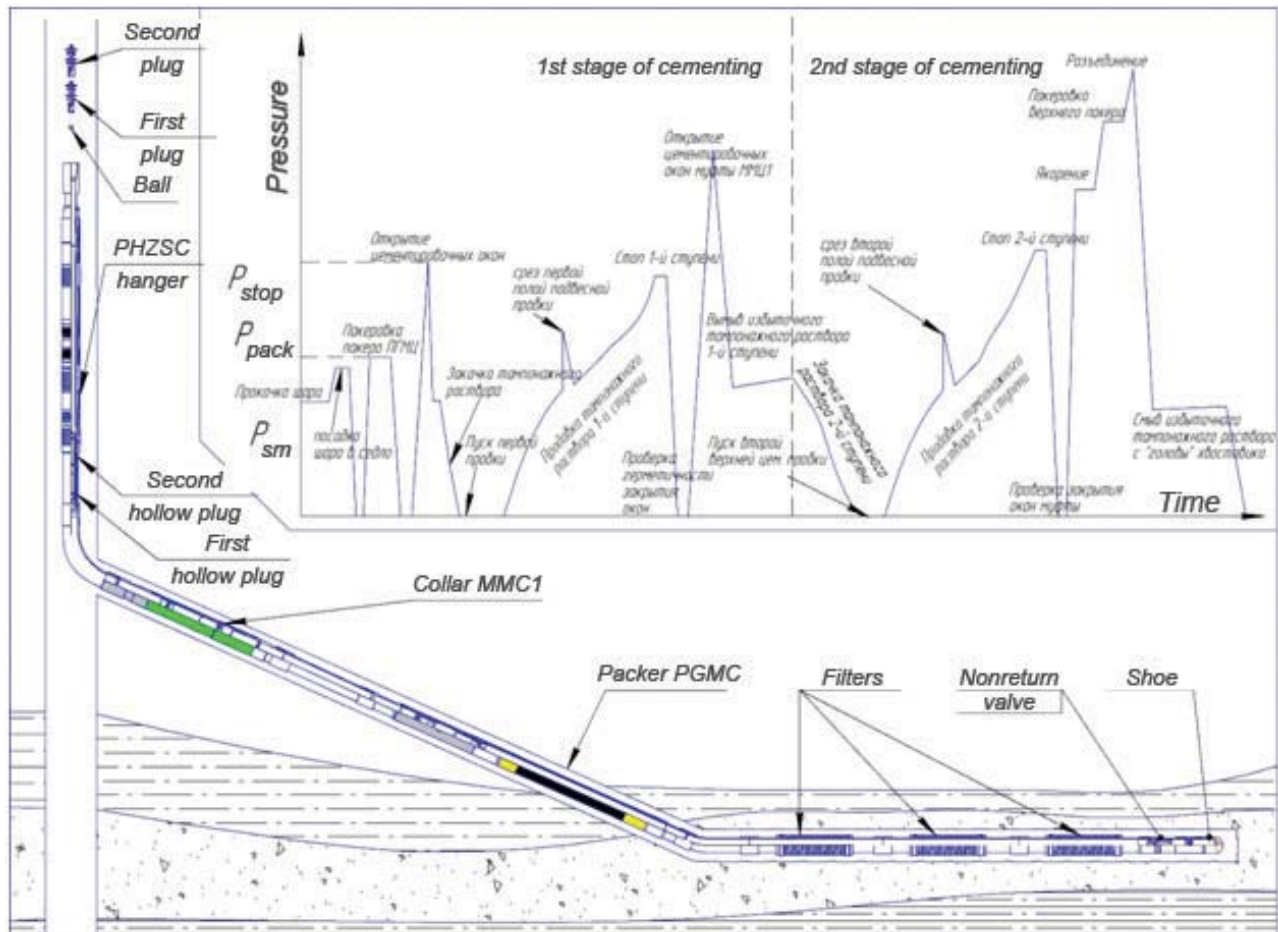
1. PHCZ or PHGMC hanger;
2. Cementing baket CK;
3. Lowfrictional and spring centralizers;
4. MMC-G collar;
5. Seat-trap SL;
6. PGRP packers;
7. MSGRP collars (for balls);
8. MSGRP-G collars (opening hydraulically);
9. Valve KO;
10. Valve KOSH2;
11. Shoe BK-M.



## WELL CASING WITH COLLAR CEMENTING LINER WITH TWO-STAGE CEMENTING

For well casing with collar cementing liner with two-stage cementing the following equipment is used:

1. PHZSC hanger;
2. Lowfrictional and spring centralizers;
3. Collar MMC1;
4. PGMC packer;
5. FS or FB filters (depend on collector resistance);
6. Nonreturn valve (only in cases when FS filter is used);
7. Shoe BK-M.



## BUSINESS FOOTPRINT





**107078, Moscow, Novaya Basmannaya str., 14-1**

390025, Ryazan Region, Ryazan, Promyshlennaya str., 21  
629803, Tyumen Region, YNAD, Noyabrsk, industrial zone, pan. 4  
628600, Tyumen Region, KMAD-Yugra, Nijnevartovsk, Industrialnaya str., 29  
461042, Orenburg Region, Buzuluk, Pyatigorskaya str., 39a build  
664047, Irkutsk Region, Irkutsk, Sovetskaya str., 124-E

Tel.: +7 (495) 632-21-94  
+7 (495) 632-21-95  
+7 (495) 632-21-96  
+7 (495) 632-21-97  
Fax: ext. 121

E-mail: [info@zers.ru](mailto:info@zers.ru)  
Web: [www.zers.ru](http://www.zers.ru)



**107078, Москва, ул. Новая Басманная, д. 14, стр. 1**

390025, Рязанская обл., г. Рязань, Промышленная ул., д. 21  
629803, Тюменская обл., ЯНАО, г. Ноябрьск, промзона, пан. 4  
628600, Тюменская обл., ХМАО-Югра, г. Нижневартовск, ул. Индустриальная, д. 29  
461042, Оренбургская обл., г. Бузулук, Пятигорская ул., д. 39а  
664047, Иркутская обл., г. Иркутск, ул. Советская, д. 124-Е

Тел.: +7 (495) 632-21-94  
+7 (495) 632-21-95  
+7 (495) 632-21-96  
+7 (495) 632-21-97  
Факс: доб. 121

E-mail: [info@zers.ru](mailto:info@zers.ru)  
Web: [www.zers.ru](http://www.zers.ru)