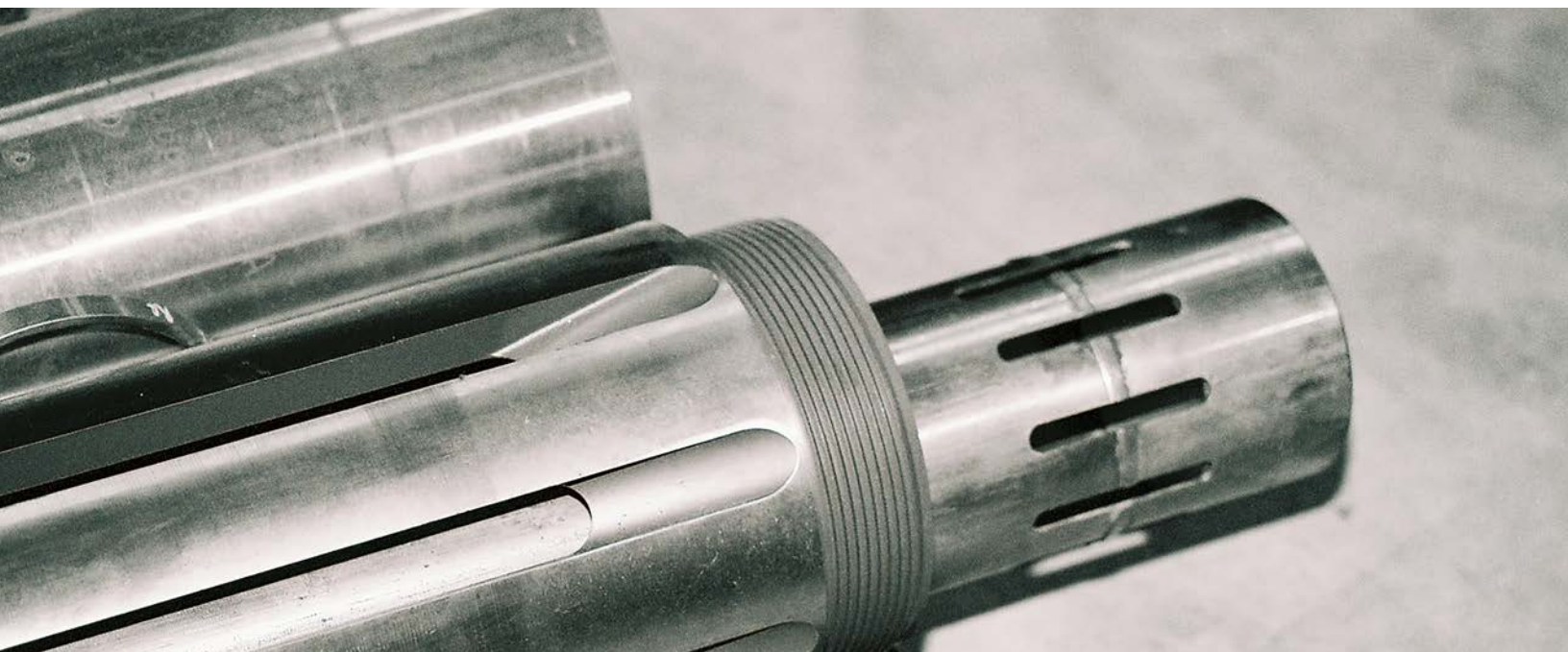




COMPLETION SERVICES

SECTION 4

Sealbore Packers and Accessories



SEALBORE PACKERS AND ACCESSORIES

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Comp-Perm™ Permanent Sealbore Packers

The Superior Completion Services **Comp-Perm™ Permanent Sealbore Production Packers** are part of a highly versatile system of tools and accessories that can be set mechanically, hydraulically, or on wireline. The production packers are frequently used as sump packers or on stimulation jobs where extremely high pressures and/or temperatures are encountered.

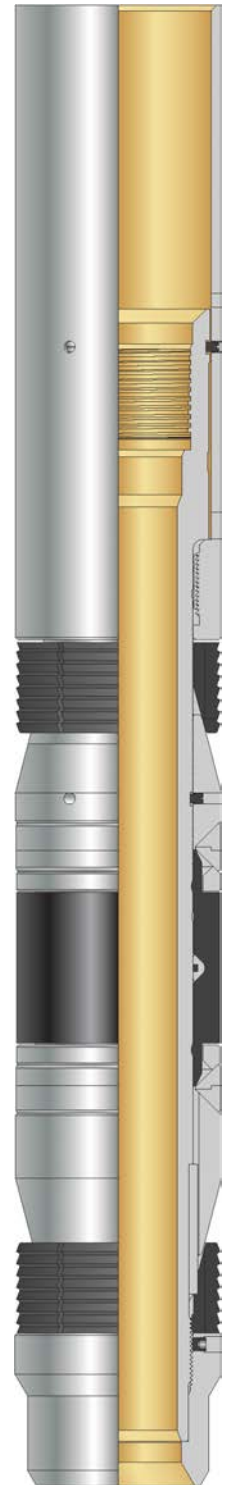
Standardized threads, seal diameters, seal lengths and packer tops allow maximum interchangeability with other common sealbore equipment. Optional packer bottoms are included in the full line of packer accessory equipment.

APPLICATIONS

- Completion operations
- Sand control
- Production packer applications

Features and Benefits

- Wireline-, mechanical- or hydraulic-setting options
- Adjustable shear for setting
- Metal backup system expands to casing ID to prevent rubber extrusion
- Parts keyed for easy millout
- A variety of elastomer materials (AFLAS®, Viton®, nitrile) are available



Comp-Perm™ Permanent Sealbore Packers

TECHNICAL DATA

Differential pressure rating 10,000 psi (68.9 MPa)
Temperature rating up to 350°F (177°C)

Comp-Perm™ Permanent Sealbore Packers													
Casing OD		Casing Weight Range		Maximum Casing ID		Minimum Casing ID		Maximum Tool OD		Minimum Bore Through Seals		Packer Bore	
inch	mm	lb/ft	kg/m	mm	inch	inch	mm	inch	mm	inch	mm	inch	mm
5.00	127.0	15.0-20.8	22.3-30.9	4.41	112.0	4.16	105.6	3.97	100.8	1.94	49.2	2.69	68.3
5 ½	139.0	23.0-26.0	34.2-38.7	4.47	113.5	4.55	115.5	4.25	108.0	1.94	9.2	2.69	68.3
		17.0-23.0	25.3-34.2	4.89	124.3	4.67	118.6	4.44	112.7	1.94	9.2	2.69	68.3
		13.0-17.0	19.3-25.3	5.04	128.1	4.89	124.3	4.56	115.9	1.94	9.2	2.69	68.3
7	177.8	20.0-23.0	29.8-34.2	6.46	164.0	6.37	161.7	6.00	152.4	2.38	60.5	3.25	82.6
		23.0-26.0	34.2-38.7	6.37	161.7	6.28	159.4	5.88	149.2	2.38	60.5	3.25	82.6
		26.0-38.0	38.7-56.5	6.28	159.4	5.92	150.4	5.69	144.5	2.38	60.5	3.25	82.6
		20.0-23.0	29.8-34.2	6.46	164.0	6.37	161.7	6.00	152.4	3.00	76.2	4.00	101.6
		23.0-26.0	34.2-38.7	6.37	161.7	6.28	159.4	5.88	149.2	3.00	76.2	4.00	101.6
7 ¾	193.7	24.0-33.7	35.7-50.1	7.03	178.4	6.77	171.8	6.44	163.5	3.00	76.2	4.00	101.6
		33.7-39.0	50.1-58.0	6.77	171.8	6.63	168.3	6.25	158.8	3.00	76.2	4.00	101.6
9 ¾	244.5	29.3-53.5	43.6-79.6	9.06	230.2	8.54	216.8	8.13	206.4	3.50	88.9	4.75	120.7
		29.3-53.5	43.6-79.6	9.06	230.2	8.53	216.8	8.13	206.4	5.00	127.0	6.00	152.4
10 ¾	273.1	65.7	97.8	9.56	242.8	9.40	238.8	9.28	235.6	5.00	127.0	6.00	152.5

* Packers tested to API 11D1 and rated V0 – V6. Please contact your Superior representative for further information on specific sizes.

REFERENCES

Completion tools seal systems data sheet
Packer plugs and accessories data sheet

CompSet™ Packers

- CompSet™ HP-II (≤10,000 psi Differential)
- CompSet™ XTR (12,500 psi Differential)
- CompSet™ Ultra (15,000 psi Differential)
- CompSet™ Elite (17,500 psi Differential)

The Superior Completion Services **CompSet™** externally retrievable sealbore packers are designed for high-pressure (HP) and high-temperature completions. These packers provide positive isolation during maximum loads, differentials and temperature cycles for harsh completion. They also provide stimulation applications, including gravel and frac-packing, high-rate water packing, stimulations and horizontal completions. The CompSet™ packers can also be used as production sealbore packers and have been tested and manufactured in accordance with API 11D1 specifications.

APPLICATIONS

- Gravel/frac-packing
- Sand control
- Horizontal, deviated and vertical wells
- Zonal isolation; production isolation

Features and Benefits

- Single-sealing packing element eliminates extrusion and extends packer life downhole
- External retrieving sleeve facilitates easy packer retrieval with obstruction in sealbore
- Designed for simple external release and retrieval; optional internal release
- Large bore through packer and seals
- Single high-pressure sealing element
- Splined to facilitate milling removal if required
- Gauge ring on lower end of packer helps prevent premature setting when an obstruction or tight spot is encountered
- Hydraulic- or wireline-set
- Can be released with restricted ID
- Rotationally locked



CompSet™ Ultra Packer

The Superior Completion Services **CompSet™ Ultra Retrievable Sealbore Packer** is designed for ultra high temperature and pressure completions. The packer provides positive isolation during maximum loads, differentials and temperature cycles for harsh completion production environments.

APPLICATIONS

- Gravel/frac-packing
- Sand control
- Horizontal and vertical wells
- Zonal isolation; production isolation

Features and Benefits

- Single-sealing packing element eliminates extrusion and extends packer life downhole
- External retrieving sleeve facilitates packer retrieval with obstruction in sealbore
- Designed for simple external release and retrieval; optional internal release
- Large bore through packer and seals
- Single high-pressure sealing element
- Splined to facilitate milling removal if required
- Gauge ring on lower end of packer helps prevent premature setting when an obstruction or tight spot is encountered
- Hydraulic- or wireline-set
- Can be released with restricted ID
- Rotationally locked

TECHNICAL DATA

Available sizes	10 1/8 in., 9 7/8 in. and 7 3/4 in. (257.2 mm, 250.8 mm and 196.85 mm)
Differential pressure rating	15,000 psi (103.4 MPa)
Temperature rating	350°F (177°C)

REFERENCES

Completion tools seal systems data sheet



CompSet™ Elite Packer

The Superior Completion Services **CompSet™ Elite Retrievable Sealbore Packer** is a family of workstring conveyed, hydraulic-set, retrievable, sealbore production packers. These packers are designed specifically for high-pressure high-temperature (HPHT) environment and are qualified to the most stringent API11D1 validation grade V0-H.

APPLICATIONS

- Production packer
- Sand control, Stand-Alone
- Horizontal and vertical wells
- Zonal isolation; production isolation

Features and Benefits

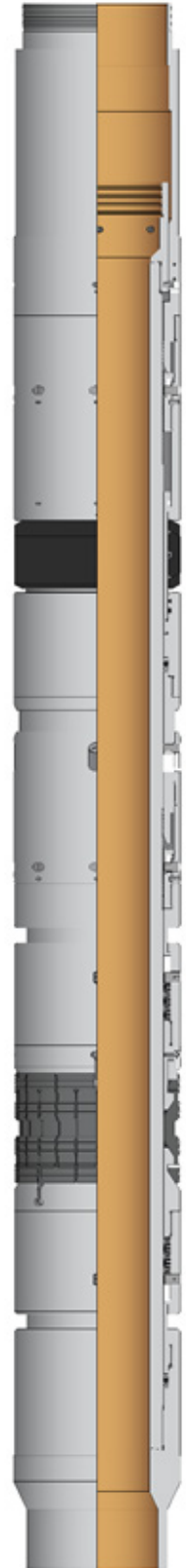
- Rated up to 17,500 psi (1,207 bar) and 300°F (149°C)
- API 11D1 – V0H validation ensures gas-tight sealing in HPHT and severe downhole environments
- External retrievability with a contingency internal retrieval option
- Single sealing packing element with proprietary backup package for reliable performance
- Pressure boosted element design
- Proprietary slip system design for 360-degree engagement and force distribution, withstands high tensile and- compressive loads, and allows for easy retrieval
- Active zero-motion feature to prevent unnecessary packer movement under extreme stress or differential unloads
- Element above slip design protects slip system from debris
- Accessories qualified to API 19AC with full metal-to-metal sealing
- NACE compliant metallurgy
- API Q1 Quality Management Program and monogram capability

TECHNICAL DATA

Available sizes	10 1/8 in., 9 7/8 in. and 7 3/4 in. (257.2 mm, 250.8 mm and 196.85 mm)
Differential pressure rating	17,000 psi (1,207 bar)
Temperature rating	300°F (149°C)

REFERENCES

Completion tools seal systems data sheet



CompSet™ Packers

TECHNICAL DATA

CompSet™ Packers				
	CSHP Series	Extreme Series	Ultra Series	Elite Series
Casing Size	5" - 11 3/4"	7 3/4" & 9 7/8" - 10 1/8"	7 3/4" & 9 7/8" - 10 1/8"	7 3/4" & 9 7/8" - 10 1/8"
Packer Bore	2.68" - 6.00"	4.00" & 6.00"	3.88" & 5.50"	3.875" & 5.250"
Differential Pressure Rating	≤ 10,000 psi	12,500 psi	15,000 psi	17,500 psi
Temperature Rating	Ambient - ≥250 °F	Ambient - 300 °F	40 -300 °F	Ambient -300 °F
API 11D1 Validation Grades	V6 - V0	V3 - V0	V0	V0-H

REFERENCES

Completion tools seal systems data sheet

Packer plugs and accessories data sheet

CompSet™ Packers

TECHNICAL DATA

CompSet HP											
Casing OD		Casing Weight Range		Maximum OD		Minimum ID*		Standard Seal ID		Differential Pressure Rating	
inch	mm	lb/ft	kg/m	inch	mm	inch	mm	inch	mm	psi	Mpa
5	127.0	11.5-15.0	17.1-22.3	4.25	108.0	2.69	68.2	1.93	48.9	10,000	69.0
		18.0-21.0	26.7-31.3	4.00	101.5	2.69	68.2	1.93	48.9	10,000	69.0
5 ½	139.7	13.0-15.5	19.3-23.0	4.52	121.8	2.69	68.3	1.93	48.9	10,000	69.0
		17.0-23.0	25.3-34.2	4.52	114.7	2.69	68.3	1.93	48.9	10,000	69.0
		26.0	38.70	4.52	108.0	2.69	68.3	1.93	48.9	10,000	69.0
6 ¾	168.3	28.0-32.0	41.6-47.6	5.52	140.1	2.69	68.3	1.93	48.9	7,500	51.7
7	177.8	20.0-26.0	29.7-38.7	6.08	154.3	3.25, 4.00	82.6, 101.6	2.38, 2.99	60.3, 75.8	10,000	69.0
		26.0-32.0	38.7-47.6	5.89	149.6	3.25, 4.00	82.6, 101.6	2.38, 2.99	60.3, 75.8	10,000	69.0
		32.0-38.0	47.6-56.5	5.74	145.7	3.25, 4.00	82.6, 101.6	2.38, 2.99	60.3, 75.8	10,000	69.0
		41.0	61.0	5.64	143.3	3.25	82.6	2.38	60.3	10,000	69.0
7 ½	193.7	24.0-29.7	35.7-44.2	6.68	169.7	3.25, 4.00	82.6, 101.6	2.38, 2.99	60.3, 75.8	10,000	69.0
		29.7-39.0	44.2-58.0	6.44	163.5	3.25, 4.00	82.6, 101.6	2.38, 2.99	60.3, 75.8	10,000	69.0
9 ¾	244.5	36.0-43.5	53.6-64.7	8.53	216.7	3.25, 4.00	82.6, 101.6	2.38, 2.99	60.3, 75.8	10,000	69.0
		36.0-43.5	53.6-64.7	8.53	216.7	4.75, 6.00	120.7-152.4	3.47, 4.99	88.1, 126.6	10,000	69.0
		43.5-53.5	64.7-79.6	8.32	211.4	3.25, 4.00	82.6, 101.6	2.38, 2.99	60.3, 75.8	10,000	69.0
		43.5-53.5	64.7-79.6	8.32	211.4	4.75, 6.00	120.7-152.4	3.47, 4.99	88.1, 126.6	10,000	69.0
9 ⅝	250.8	62.8	93.5	8.42	213.9	6.00	152.4	4.74	120.3	10,001	69.0
10 ¾	273.1	55.5-65.0	82.6-97.8	9.38	235.7	4.75, 6.00	120.7-152.4	3.47, 5.00	88.1, 127.0	8,000	55.2
11 ¾	298.5	54.0-65.0	80.4-96.7	10.40	264.2	4.75	120.7	3.47	88.1	8,000	55.2

CompSet Extreme (XTR)											
Casing OD		Casing Weight Range		Maximum OD		Minimum ID*		Standard Seal ID		Differential Pressure Rating	
inch	mm	lb/ft	kg/m	inch	mm	inch	mm	inch	mm	psi	Mpa
7 ¾	196.9	46.1	68.6	6.68	169.7	4.00	101.6	2.99	76.0	12,500	86.2
9 ¾	250.8	62.8	93.5	8.42	213.9	6.00	152.4	4.74	120.3	12,500	86.2
10 ¾	257.1	79.3	117.9	8.42	213.9	6.00	152.4	4.74	120.3	12,500	86.2

* Alternate bore configurations available upon request.

REFERENCES

Completion tools seal systems data sheet

Packer plugs and accessories data sheet

Seal Systems

Superior Completion Services provides a variety of **Seal Systems** and alloy materials to accommodate most well conditions. It is important to know the well conditions and the work needed before choosing the proper seal system. Consideration should be given to temperatures, hostile elements, seal movements and maximum pressure differentials. These factors will determine the seal type, metal material and accessories to be utilized.

For all sealbore tubing accessories, standardization of threads, seal diameters and seal lengths have been carefully considered in the design to maximize interchangeability with competitive sealbore equipment. All steel components for the sealbore tubing accessories are manufactured to meet NACE MR0175 standards for H₂S service. The accessories are also available in several types of material with the following examples:

- High-strength alloy steel for high-pressure applications
- 9CR-1MO alloy steel for H₂S and CO₂ applications
- High-nickel alloy steel for severe corrosion applications

Two basic seal types are currently available:

- Elastomer bonded to metal commonly known as molded seals available in:
 - Nitrile, Viton®, Fluorel®, EPDM, ECO
- HSN materials Chevron-style, lip-type seals commonly known as V-rings available in:
 - Nitrile, Viton, Fluorel, Teflon®, AFLAS®, Ryton® and Kalrez® materials

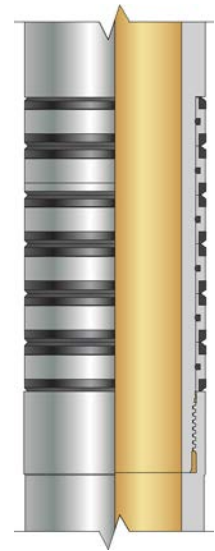
Molded Seal System

This system is recommended for applications where it is likely that the seals will be disengaged from the packer sealbore with differential pressure pre-sent. Two seal rings are bonded to a metal sleeve with an internal O-ring to provide a positive seal. This system is available in various elastomers and is application dependent.

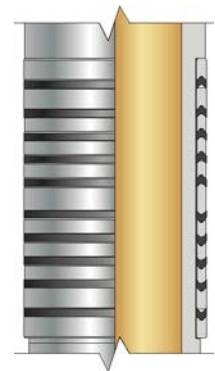
Standard Chevron Seal System

This system's seal stack consists of chevron seal rings with steel spacers. This seal configuration is best suited for applications in which the seals will not disengage from the packer sealbore.

HSN seal stack: *recommended for maximum temperatures of 350°F (177°C) in a standard service environment*



Molded Seal System



Standard Chevron Seal System

Seal Systems

Seal Spacer Tube

In installations requiring floating seals and sealbore extensions, installation costs can be reduced by using spacer tubes between the seal units, reducing the number of seal units required.

VTR Premium Seal System

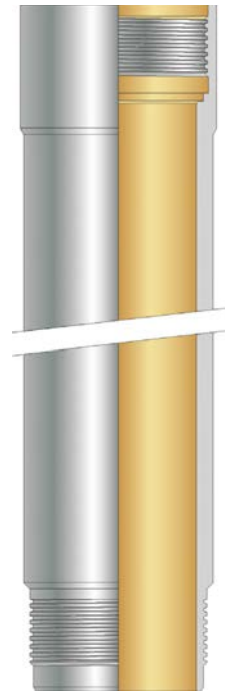
This system's seal stack consists of alternate Viton, Teflon and Ryton seal rings with middle and end metal spacers. It is recommended for maximum temperatures of 400°F (205°C) high pressure, and a limited H₂S and/or CO₂ environment. Not recommended for applications where amine-based inhibitors will be used.

ATR Premium Seal System

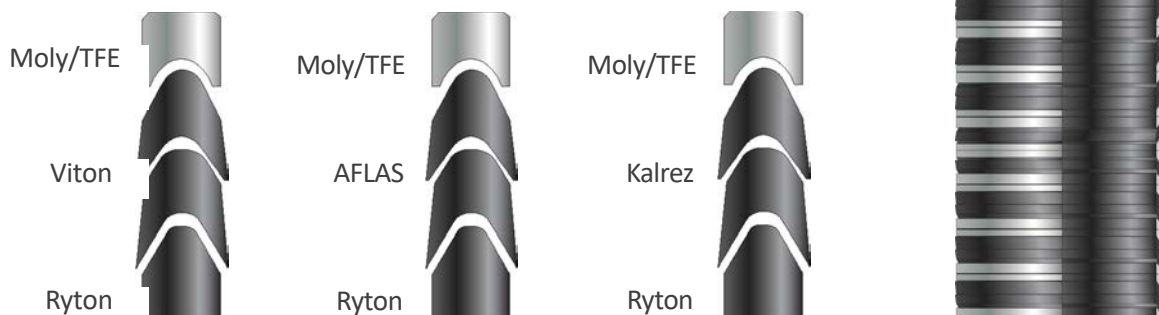
This system's seal stack consists of alternate AFLAS, Teflon and Ryton with metal end and middle spacers. Recommended for maximum temperatures of 400°F (205°C), amine inhibitors and H₂S and/or CO₂ environments.

KTR Premium Seal System

This system's special seal stack consists of Kalrez, Teflon and Ryton with metal end and middle spacers. Recommended for maximum temperatures of 500°F (260°C), amine inhibitors and a high H₂S and/ or CO₂ environment.



Seal Spacer Tube



Viton, Kalrez and Teflon are registered trademarks of DuPont Performance Elastomers LLC. Flourel is a registered trademark of 3M Co. AFLAS is a registered trademark of Asahi Glass Co., Ltd. Ryton is a registered trademark of Chevron Phillips Chemical Co. LLC.

Uni-Pac™ System

Superior Completion Services has developed a unique, state-of-the-art production seal for high-pressure, high-temperature (HP/HT) environments. This production sealing design uses the same technology incorporated in the HP packer one-piece sealing element. Uni-Pac™ Seals are designed to be used with locators, pop-lock assemblies, anchor assemblies, straddle assemblies and indexing mule shoes.

APPLICATIONS

- HP/HT environments

Features and Benefits

- Zero extrusion gap
- Reliable seal for unloads
- Limited thread connections
- No slip-on metal spacers
- One-piece mandrel
- Available with high-torque, metal-to-metal connections
- Premium Uni-Pac seals are offered in a variety of materials

TECHNICAL DATA

Available sizes	2.688 to 6.00 in. (68.3 to 152.4 mm)*
Differential pressure rating	up to 15,000 psi (103.4 MPa)

REFERENCES

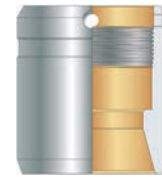
Completion tools tubing seal accessories data sheet
Mule shoes data sheet



Sealbore Packer Accessories

Re-entry Guide

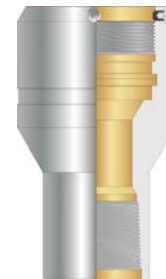
The re-entry guide is the standard bottom for all Superior Completion Services packers unless ordered otherwise. The wireline re-entry guide is available with a choice of thread connections to adapt to sealbore extensions, millout extensions or tubing run below a packer.



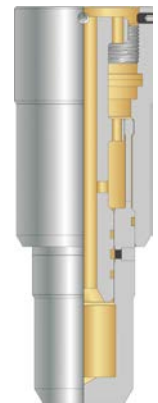
Re-entry Guide



Sealbore Extension Coupling



Sealbore Extension to Tubing Adapter



Knockout Plug

Sealbore Extension Coupling

This concentric coupling is used to connect two sealbore extensions together to obtain more sealbore length. These couplings allow for a continuous, concentric sealbore connection between sealbore extensions.

Adapters

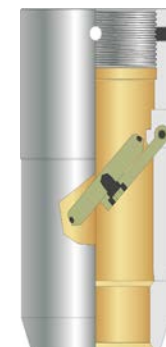
Tubing adapters used for running a tailpipe below a packer, sealbore extension or millout sub are available with a choice of tubing threads. Millout adapters are used to adapt the millout sub to the packer. These are not required for all sizes of sealbore packers.

Knockout Plug

With a knockout plug installed, the packer serves as a temporary bridge plug, allowing pressure work to be performed above the packer. The knockout plug is removed with the production tube as the seal assembly is landed and falls to the bottom of the well. These plugs feature a pressure-balanced equalization system to ensure easy and reliable operation.

Flapper Assembly

The flapper assembly contains a spring-loaded, flapper-type, backpressure valve that holds pressure from below only. The valve is opened with the production tube when the seal assembly is landed into the packer and automatically closes when the production tube is removed. A differential pressure below the packer acts across the seal area of the flapper, holding it closed. This force must be overcome with tubing weight to open the flapper.



Flapper Assembly

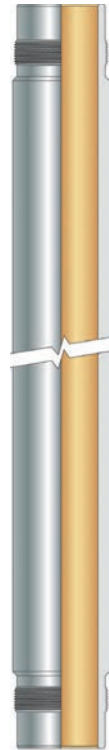
Sealbore Packer Accessories

Sealbore Extension

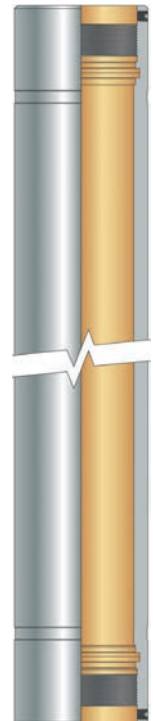
This extension is generally used in installations where floating seals are required due to excessive tubing contraction. Sealbore extensions have the same sealing bore ID as the corresponding packer to allow a continuous sealbore for the lower-most seals of a long seal assembly. Sealbore extensions are available in a variety of lengths.

Millout Sub

The millout sub is used in installations where a larger ID is required to accommodate the latching mechanism of a washover tool. This allows the permanent packer to be retrieved with the tool after milling over the outside of the packer. Millout subs are commonly installed between the packer and sealbore extension in installations using floating seal units.



Sealbore
Extension



Millout Sub

Sealbore Packer Accessories

The Superior Completion Services **Sealbore Packer Accessories** meet NACE MR0175 standards for H₂S service. The accessories are also available in other materials such as:

- High-strength alloy steel for high-pressure applications
- CR-MO alloy steels for H₂S and CO₂ applications
- Incoloy® alloys for severe corrosion applications

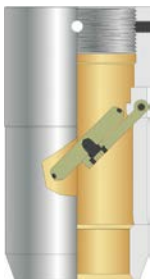
Cap



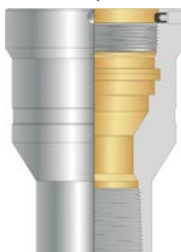
Knockout Plug



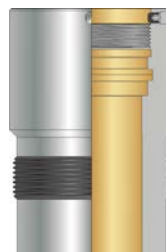
Flapper



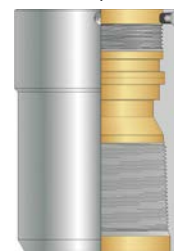
Packer Tubing Adapter



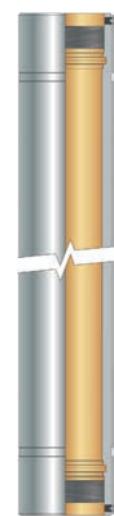
Millout Adapter



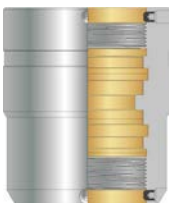
Millout-to-Tubing Adapter



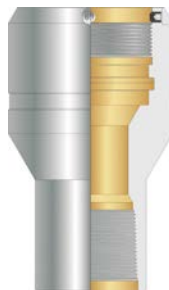
Millout Sub



Packer-to-Sealbore Extensions



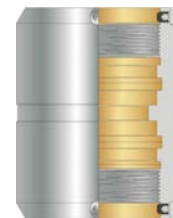
Sealbore Extension to Tubing Adapter



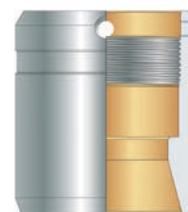
Sealbore Extension



Sealbore Extension Coupling



Re-entry Guide



Incoloy is a registered trademark of Special Metals Corporation.

Tubing Seal Accessories

Locator Seal Nipple

The Superior Completion Services locator seal nipple is run between the seal assembly and production tubing. The locator is designed to locate on the top of the sealbore to provide an indication of the seal assembly's location. The locator is designed to prevent downward tubing movement but allows the seals to move freely with tubing contraction.

Pop-Lock Locator

The pop-lock locator is run between the seal assembly and production tubing. The locator's latch assembly is designed to engage a corresponding thread in the downhole completion assembly. At a predetermined overpull, the latch will release from the thread, providing a surface indication of positive latch engagement and release. The locator provides a positive depth confirmation by tagging a large surface at the top of the packer's sealbore. Pop-lock locators are offered in a variety of threads, including premium threads.

Anchor Latch

The Superior Completion Services anchor latch is run between the seal assembly and the production string. A positive latch snaps into the corresponding thread on the completion assembly and anchors the tubing in place. The anchor latch may be released by applying a slight upstrain with RH rotation.

Tubing Seal Nipple

The tubing seal nipple allows the seal assembly to connect directly to the tubing without a locating shoulder or pop-lock locator assembly. The seals and tubing are then able to pass through the corresponding sealbore without locating.



Locator Seal Nipple Assembly



Pop-Lock Locator



Anchor Latch



Tubing Seal Nipple

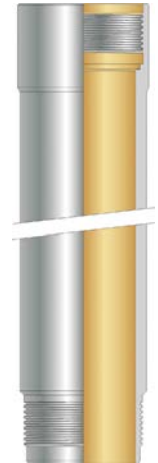
Tubing Seal Accessories

Seal Spacer Tube

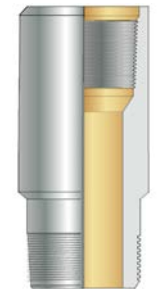
In installations requiring floating seals and sealbore extensions, installation costs can be reduced by using spacer tubes between the seal units, reducing the number of seal units required.

O-Ring Seal Sub

The Superior Completion Services O-ring sub provides a seal between a polished stinger (run on the end of wash pipe) and a corresponding outer assembly. Other applications for the sub include diverting fluid through screen assemblies or isolating lower zones from upper zones during treating operations.



Seal Spacer
Tube



O-Ring Seal
Sub

Dual-Flow Head

The Superior Completion Services **Dual Flow Head** is run in conjunction with a production seal assembly, forming a positive seal in the top gravel pack packer and may also be used with Superior Completion’s sealbore packers to create a dual tubing completion. The long-string flow is routed through isolation tubing running through the upper zone screen assembly. The upper zone flows concentrically between the OD of the isolation string and the ID of the production seal assembly.

APPLICATIONS

- Dual tubing completions
- High-pressure completions
- Deep dual completions

Features and Benefits

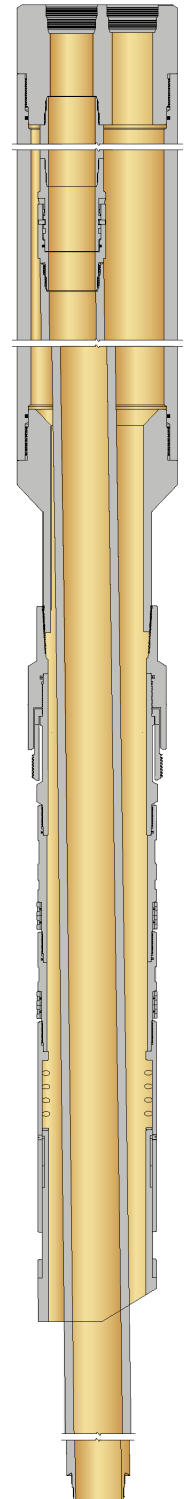
- Allows high-pressure dual completions
- Easily retrieved; no dual-packer required

TECHNICAL DATA

Dual-Flow Head							
Size		Tubing 1		Tubing 2		Lower Seal Assembly OD	
inch	mm	inch	mm	inch	mm	in	mm
7 x 7 $\frac{7}{8}$ x 2 $\frac{3}{8}$	177.8 x 193.7 x 60.3	2 $\frac{3}{8}$	60.3	2 $\frac{3}{8}$	60.3	4	101.6
9 $\frac{5}{8}$ x 4 $\frac{3}{4}$ x 2 $\frac{7}{8}$	244.5 x 120.7 x 73.0	2 $\frac{7}{8}$	75.0	2 $\frac{7}{8}$	73.0	4 $\frac{3}{4}$	120.7
9 $\frac{5}{8}$ x 6 x 3 $\frac{1}{2}$	244.5 x 152.4 x 88.9	3 $\frac{1}{2}$	88.9	3 $\frac{1}{2}$	88.9	6	152.4

REFERENCES

- Comp-Perm™ permanent sealbore packers data sheet
- CompSet™ packers data sheet
- CompSet™ Ultra packer data sheet



Mule Shoes

Half-Mule Shoe

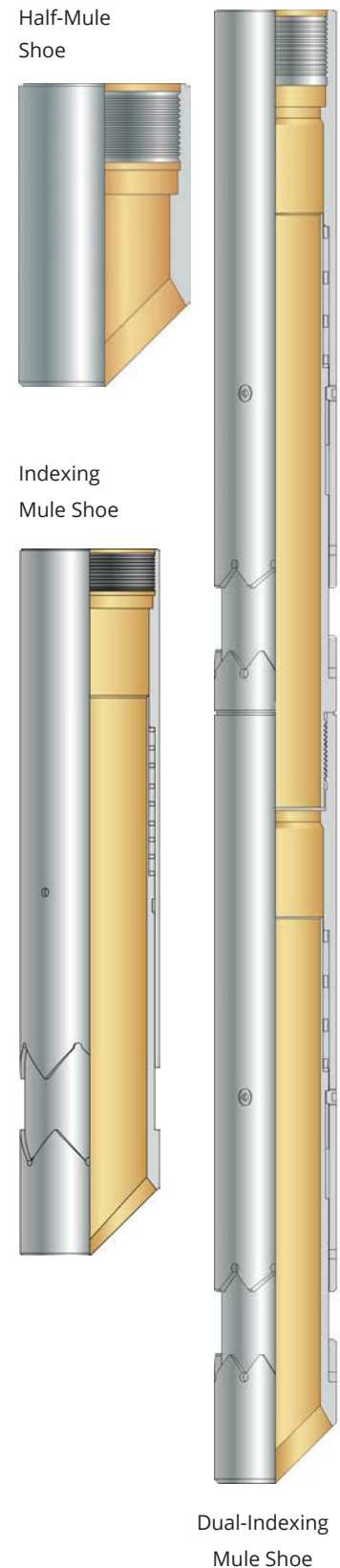
The Superior Completion Services half-mule shoe is run below seal assemblies to allow easy entry into packer bores.

Indexing Mule Shoe

The Superior Completion Services indexing mule shoe with spring protection is designed to assist in guiding the end of a downhole assembly when entering a reduced ID, such as a packer bore or liner top. The rotational action incorporated in the mule shoe design eliminates the need to rotate the pipe from surface. The lower portion of the mule shoe rotates in multi-degree increments, manipulating the angled end of the mule shoe to easily enter the reduced ID. The sub is actuated by applying set-down weight to the end of the assembly, compressing the actuator spring. As the set-down weight is removed, the end of the assembly travels through a J-track, rotating a fixed distance each cycle.

Dual-Indexing Mule Shoe

The dual-indexing mule shoe includes two indexing mechanisms to provide redundant operation. This is especially useful in highly deviated wells or in applications where wellbore cleanliness is in question.



Mule Shoes

TECHNICAL DATA

Mule Shoes						
	Size		Maximum OD		Minimum OD	
	inch	mm	inch	mm	in	mm
Half-Mule Shoe	2.287	58.1	2.63	66.7	1.94	49.2
	3.250	82.6	3.19	81.0	2.38	60.5
	4.000	101.6	3.87	98.3	3.00	76.2
	4.750	120.7	4.69	119.1	3.50	88.9
	6.000	152.4	5.94	150.8	5.00	127.0
Indexing Mule Shoe with Spring Protection	2.687	68.3	2.63	66.7	1.90	48.3
	3.250	82.6	3.19	81.0	2.35	59.6
	4.000	101.6	3.95	100.3	2.91	74.0
	4.750	120.7	4.68	118.9	3.21	81.5
	6.000	152.4	5.94	150.8	4.86	123.3
Indexing Mule Shoe with Spring Protection	2.687	68.3	2.63	66.7	1.90	48.3
	3.250	82.6	3.19	81.0	2.35	59.6
	4.000	101.6	3.95	100.3	2.91	74.0
	4.750	120.7	1.68	42.7	3.21	81.5

Mechanical Shear Safety Joint

The Superior Completion Services **Mechanical Shear Safety Joint** provides a known break point in the downhole assembly. It has been designed to withstand differential pressures of 10,000 psi (68.9 MPa) for standard service applications. Upon request, 12,500- and 15,000-psi (86.2- and 103.4-MPa) differential pressure rated designs are available. Milled slots and lugs provide a rotational lock feature to aid in packer entry, fishing and milling operations. Premium threads and metallurgy are also available upon request.

APPLICATIONS

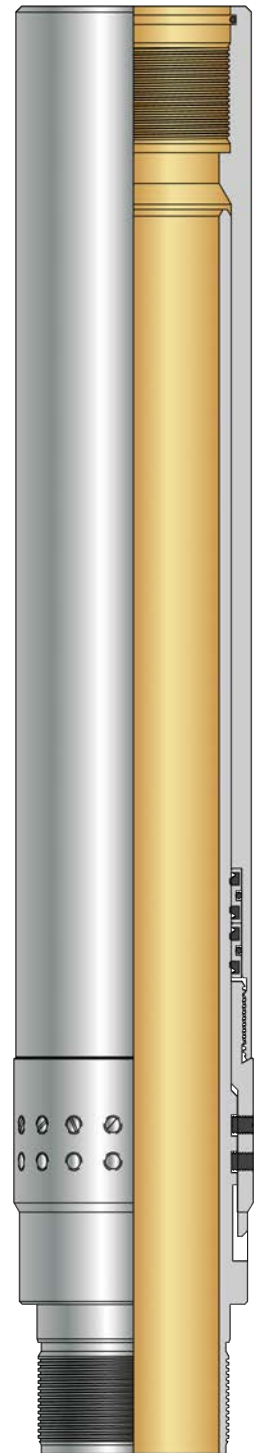
- Long horizontal sections
- General completion assemblies

Features and Benefits

- Rotationally locked assembly
- Shear-pinned value is adjustable to break at 70,000 to 230,000 lb (31,818 to 104,545 kg) tension
- 12-, 24- and 36-in. (304.8-, 609.6- and 914.4-mm) seal surface are available
- Optional overshoot with internal molded seals used during contingency operations

TECHNICAL DATA

Mechanical Shear Safety Joint						
	Size		Maximum OD		Minimum ID	
	inch	mm	inch	mm	in	mm
Molded Safety Shear Sub	2 ¾	60.3	2.93	74.4	1.94	49.3
	2 ⅞	73.0	3.56	90.3	2.36	59.8
	3 ½	88.9	4.38	111.3	3.00	76.2
Safety Shear Sub	4	101.6	4.92	124.8	3.49	88.5
	4 ½	114.3	5.19	131.9	3.89	98.7
Molded Safety Shear Sub	5	127.0	5.85	148.6	4.25	108.0
	5 ½	139.7	6.13	155.6	4.74	120.3
	7	177.8	7.69	195.2	6.04	153.4



Hydraulic Shear Safety Joint

The Superior Completion Services **Hydraulic Shear Safety Joint** is designed for the ComPlete™ single-trip systems to run above screen sections, blank sections, and directly above isolation packers. This shear sub contains a hydraulic-release mechanism, which is able to carry the full load of the gravel pack assembly into the wellbore. This prevents the load from being carried by the shear joint screws, allowing long, heavy assemblies to be run without fear of premature shearing.

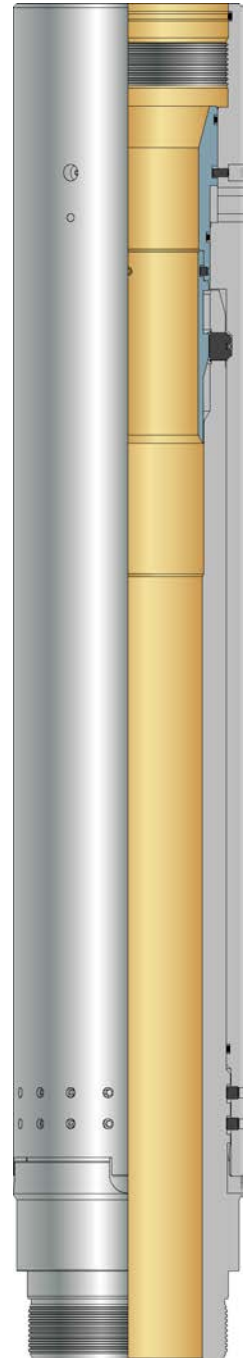
The hydraulic-actuation feature is initiated by applying tubing to annulus differential pressure. Once actuated, the load is relieved from the hydraulic mechanism and transferred to the shear screws. If retrieval is initiated, this break point in the assembly enables retrieval of isolation packers separately from screens in the same zone. The shear joint contains polished OD sealing lengths ranging from 8 to 24 in. (203.2 to 609.6 mm). A bonded inverted seal overshoot is available for re-entry if needed.

APPLICATIONS

- Long completion intervals
- Multizone single-trip completions

Features and Benefits

- Allows full weight carrying capability prior to actuation
- Allows standard shear values for retrieval while maintaining high weight carrying ability
- Rotationally locked assembly
- Production molded seal assembly available for contingency operations



Hydraulic Shear Safety Joint

TECHNICAL DATA

Hydraulic Shear Safety Joint								
	Maximum OD		Minimum ID		Collapse/ Burst Rating		Seal Travel Length	
	inch	mm	inch	mm	inch	mm	in	mm
Short Hydraulic Shear Joint*	8.05	204.5	3.75	95.3	10,000	69.0	24	609.6
	8.12	206.1	5.13	130.2	8,500	58.6	8	203.2
Hydraulic Shear Joint	7.00	177.8	4.26	108.1	12,500	86.2	24	609.6
	7.53	191.3	5.46	138.8	8,500	58.6	24	609.6

* Recommended to be run above Complete™ MST system isolation packers.

REFERENCES

Complete™ system data sheets (HST, MST, RST)

Expansion Shear Joints

The Superior Completion Services **Expansion Shear Joints** provide limited up or down movement between the upper and lower connections. The expansion joint is rotationally locked and sealed to withstand high differential pressures. The assembly is shear-pinned together and movement will not occur until the pre-set shear release value is exceeded.

APPLICATIONS

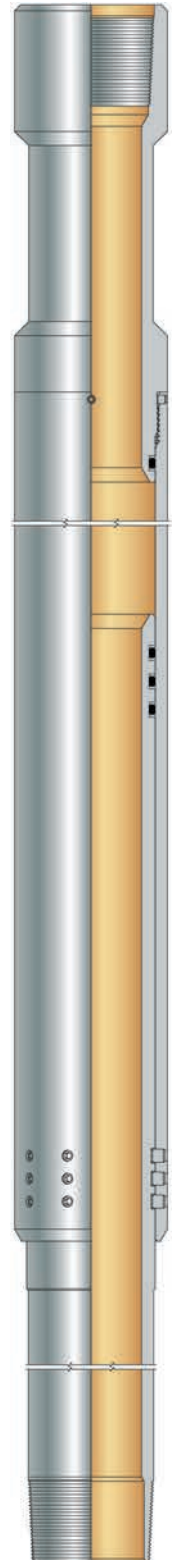
- Long assemblies with projected tubing movement
- Subsea wells
- Reservoirs with concerns over compaction

Features and Benefits

- Allows both upward and downward travel
- Variable initial shear value settings
- Provides a smooth mandrel for resealing if required
- Bonded seal overshot available for contingency operations

TECHNICAL DATA

Expansion Shear Joints							
Size		Maximum OD		Minimum ID		Maximum Stroke	
inch	mm	inch	mm	inch	mm	feet	m
2 3/8	60.3	3.03	77.0	1.97	50.0	10	3.1
3 1/2	88.9	4.11	104.4	2.85	72.4	10	3.1
4 1/2	114.3	5.53	140.5	3.98	101.1	10	3.1
5 1/2	139.7	7.38	187.5	4.68	118.9	5	1.5



Packer Plugs and Accessories

VT Equalizing Packer Plug

The VT Equalizing Packer Plug is used to temporarily seal the ID of Superior Completion Services' sealbore packer. The plug latches into the top threads of the packer to form a positive seal in both directions. The packer plug contains an equalizing valve to allow the plug to be set and returned above a flapper valve or other closed system.

Dual-Equalizing Packer Plug

The Dual-Equalizing Packer Plug has the same features as Superior Completion Services' VT equalizing packer plug. It includes an optional grapple release control bar that may be run with a standard short catch overshot for retrieval.

Packer Plug Running Tool

The Packer Plug Running Tool consists of an overshot that is shear-pinned to the packer plug control bar prior to being run into the wellbore. The running tool also engages an equalizing valve located above the top of the packer plug. The equalizing valve is run in the open position, which allows the plug to be landed in a closed system. Once landed, the running tool is sheared free, closing the equalizing valve and isolating the area below the packer plug.

Packer Plug Retrieving Tool

The Packer Plug Retrieving Tool is made up of a washover head with an internal retrieving sleeve. The retrieving sleeve engages the lug mounted on the packer plug control bar to provide positive engagement for reliable retrieving. The overshot has milling teeth to break up hard debris when washing over the plug control bar.

Debris-Free Retrieving Tool

The Superior Completion Services Debris-Free Packer Plug Retrieving Tool is uniquely designed to allow complete washover of the packer plug prior to engaging the retrieving tool. The retrieving tool is shrouded by a shearscrewed and spring-loaded wash pipe assembly. Once the packer plug is circulated clean, set-down weight shears the retrieving tool from the outer shroud, allowing it to engage the plug. The spring-loaded shroud stays engaged with the plug top, trapping debris that may have been washed into the tubing.



VT Equalizing Packer Plug



Packer Plug Retrieving Tool



Packer Plug Running Tool



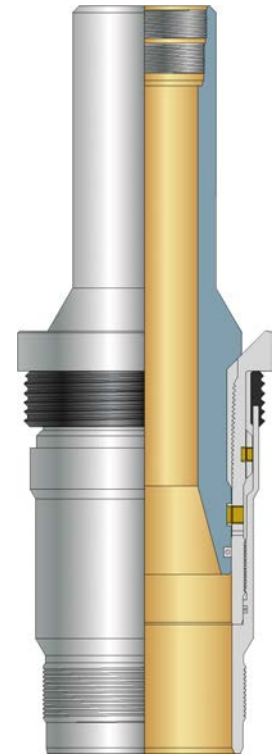
Dual-Equalizing Packer Plug



Debris-Free Retrieving Tool

Straddle Fixture

The Superior Completion Services **Straddle Fixture** isolates the uppermost molded seal frac sleeve of an intelligent (selective) or dual sand control completion. The straddle running tool includes a premium box connection; the shear pins rotationally lock the running tool. The Straddle Fixture is forced in position and anchored with an anchor latch ring and released with upward pull. The fixture is designed with an internal retrieving thread for easy engagement. Straight upward pull will shear the support under the latch ring, releasing the fixture. The **Straddle Fixture** will also release with a slight upward pull and RH rotation.



APPLICATIONS

- Production isolation

Features and Benefits

- Positive locator
- Rotationally locked assembly
- Shear-type/straight-pull release
- Redundant rotational release
- Pressure balanced

TECHNICAL DATA

Available seal unit sizes	4 to 6 in. (110.6 to 152.4 mm)
Available materials	4140 and 13 chrome

REFERENCES

CompSet™ Packers data sheet
CompSet™ Ultra Packers data sheet

Spud-Type Packer Retrieving Tool

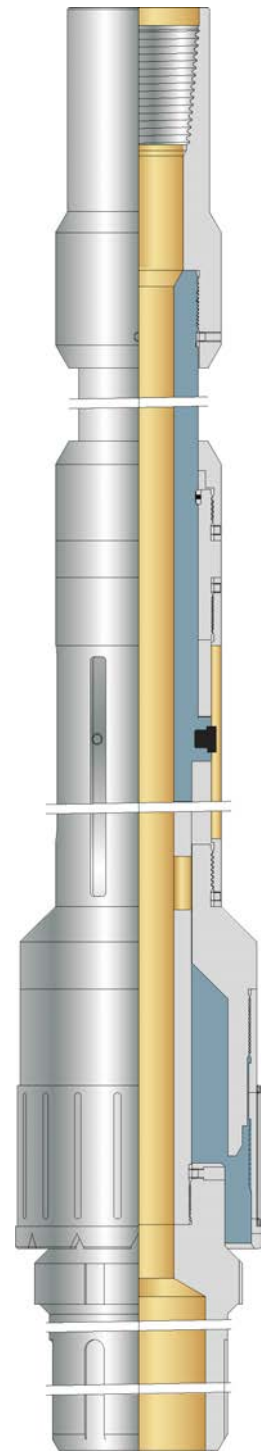
The **Spud-Type Packer Retrieving Tool** is utilized to reclaim Superior Completion Services' CompSet™ series of externally retrievable packers. The tool utilizes a standard retrieving overshoot in conjunction with an inner jar-down mandrel to assist in releasing the CompSet™ HP packers. The inner mandrel is free to move up and down through the overshoot, providing a mechanical jarring effect.

APPLICATIONS

- Packer retrieval

Features and Benefits

- Sliding inner mandrel assists in mechanical jarring action
- Standard retrieving overshoot
- Allows upward and downward jarring action on the packer
- LH thread for contingency release



REFERENCES

CompSet™ Packers data sheet
CompSet™ Ultra Packers data sheet