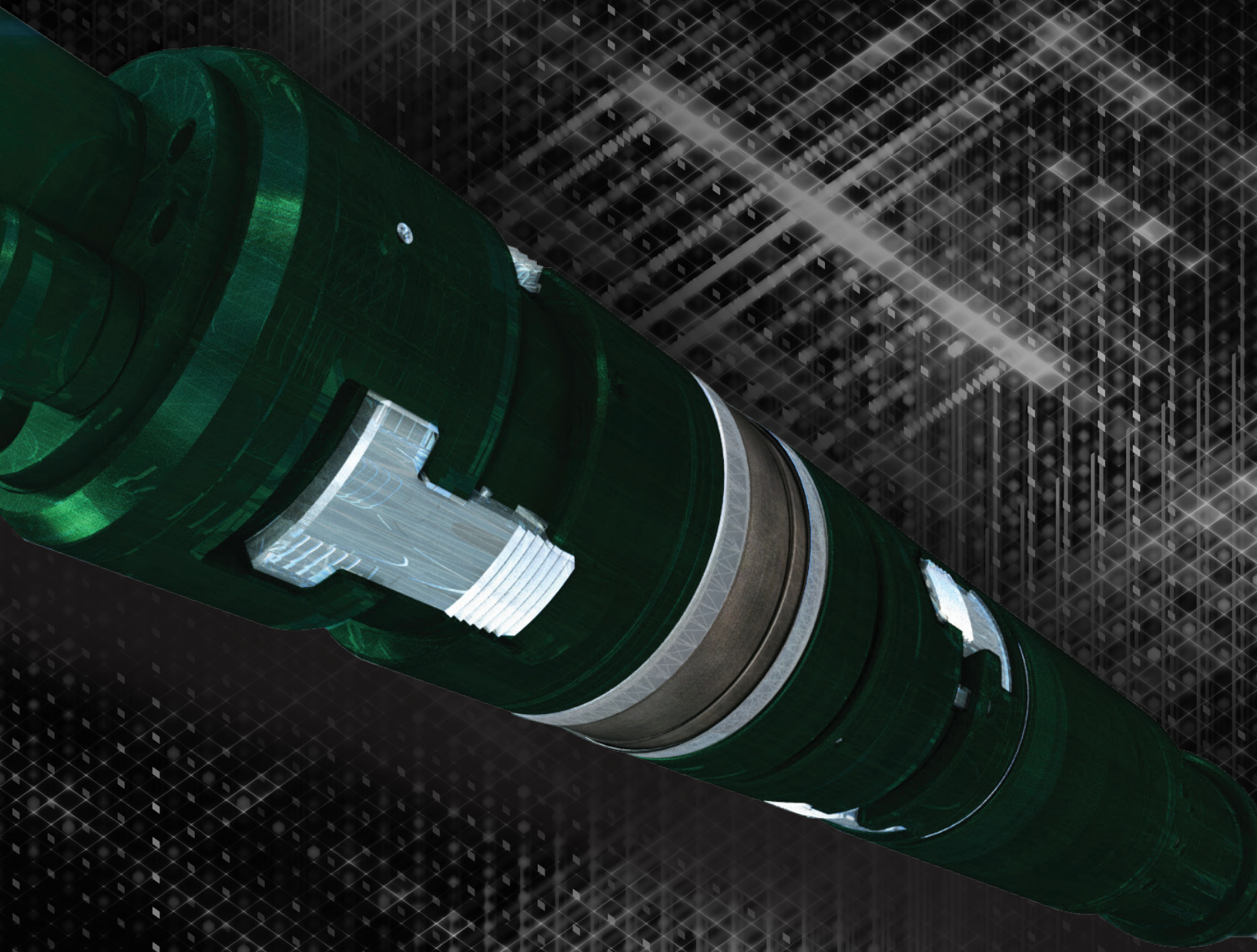
Baker Hughes

Packer Systems



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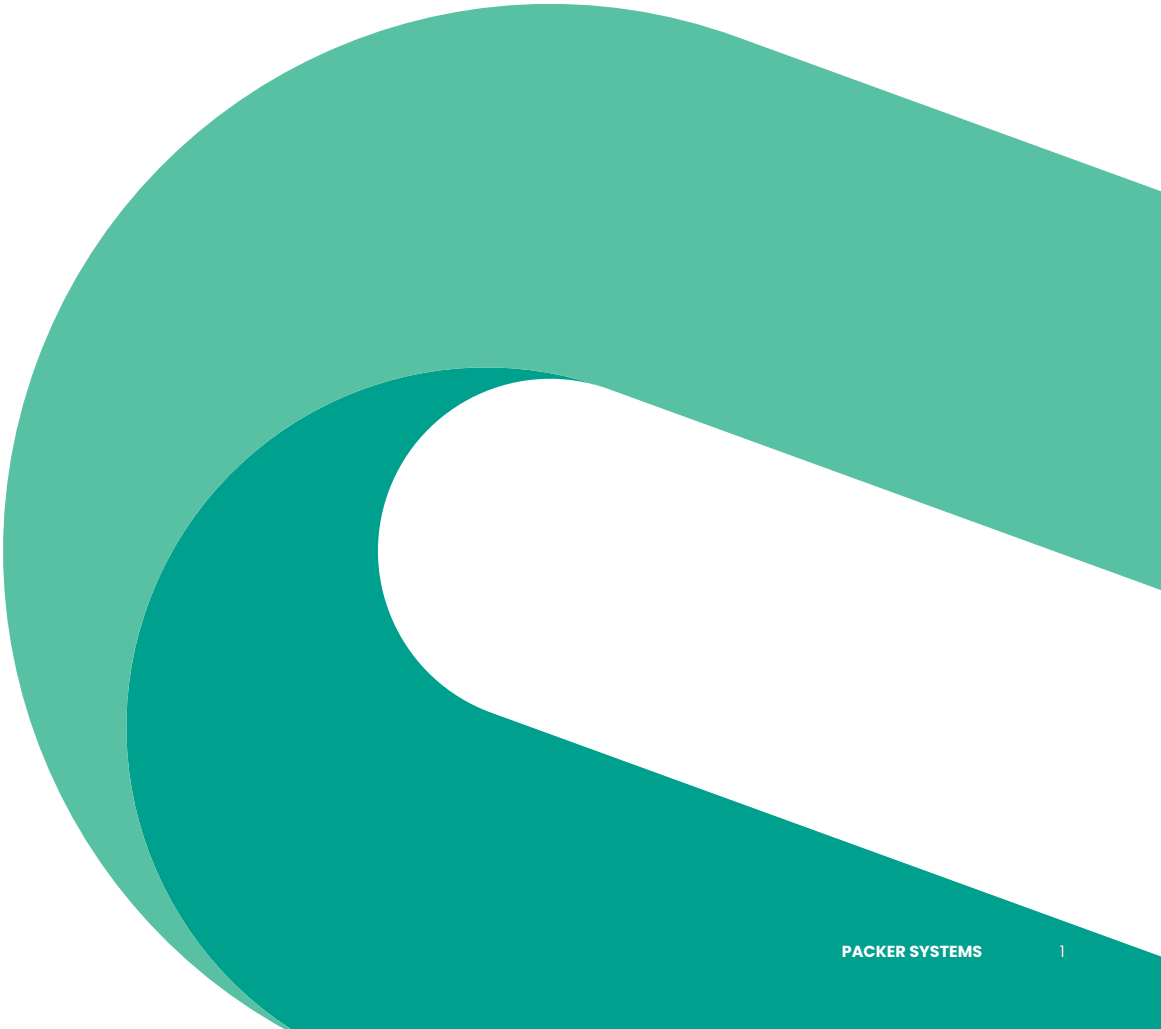
INTRO TO HANDBOOK

Baker Hughes is a leader in well completion and intervention solutions that help exploration and production companies maximize the value of their oil and gas assets by optimizing recovery while reducing capital and operating expense. Baker Hughes was founded over 100 years ago on a simple, fundamental commitment to help our customers solve their oilfield problems by bringing them the highest quality and best performing products and services. Honoring that commitment and providing flawless execution at the well site continues to distinguish us from our competitors a century later. We believe that integrity is at the heart of our organization and that teamwork leverages individual strengths and contributes to our performance culture. We also believe that learning is never finished and that we can continue to grow and improve—as individuals and as a company—through learning. These are the principles that help guide us in our actions and decisions every day. Delivering unmatched value to our customers by meeting—and sometimes exceeding—their needs and expectations is our ultimate goal. Baker Hughes is a Fortune 500 energy technology company and one of the most respected names in the oil and gas service industry. Baker Hughes companies provide best-in-class technology and services in over 120 different countries to help take energy forward.



Packer Systems

Since 1940, when we introduced the industry's first completion packer, Baker Hughes has set the standard for innovation and performance in packer technology. Today, when your projects push the edge of the completion technology envelope, you can count on our packers to reliably deliver unsurpassed service, performance, and value. Baker Hughes packer solutions cover the spectrum of applications, from single, selective, and dual completions to extreme high-pressure/high-temperature (XHP/HT), deepwater, extended-reach, multilateral, and intelligent well systems.

The Center for Technology Innovation (CTI) in Houston is our primary center of excellence for completion technology, including packers. Here, engineers and scientists create new solutions for the industry's toughest completion and production challenges. Research and development focus on cased and open-hole completion technologies, fiber optics, and downhole electronics, nanotechnology, and materials science. The CTI's four dynamic in-ground test cells are the world's highest rated for pressure and temperature, at 40,000 psi (2757 bar) and 700°F (371°C). The 75-ft (21.3-m) test cell towers make it easy to manipulate 40-ft (2.2-m) joints of large-diameter casing into and out of the bay. In addition to the CTI, and other facilities in Houston, research and engineering for completions products and services is conducted in Broken Arrow, Oklahoma, and Aberdeen, Scotland.

The Center for Technology Innovation in Houston, Texas

Permanent Packer Selection

Specification Guide

Product Application	Product Family No.	Single Bore	Alternate Bore	Setting Method			No Mandrel Movement
				Wireline/ Hydraulic Setting Tool	Hydraulic	Hydrostatic	
Signature D	H43209, H43210 and H43211	X		X			
D, DB	H43209, H43210 and H43211	X		X			
DA, DAB	H43209, H43210 and H43211		X	X			
F-1, FB-1	H43207, H43208 and H43211	X		X			
FA, FA-1, FAB, FAB-1	H43211		X	X			
FB-3	H41350	X		X			
SB-3	H40951	X			X		
SAB-3, SABL-3	H40951		X		X		
SABL-4	H40951		X		X		
SB-3H	H40932	X				X	
Granite	H40934	X	X		X		X

Signature D and DB Retainer Production Packers

Product Family Nos. H43209, H43210 and H43211

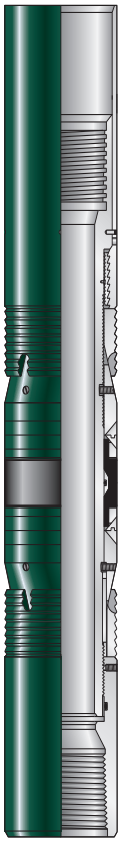
Application

The **Signature D™** and **Signature DB™ retainer production permanent packers** are among the most widely used, most versatile and highest-performing production packers available. They're also frequently used as a permanent test packer or as a bridge plug.

The Signature DB's blank or threaded (box or pin) bottom guide distinguishes it from the Signature D. The Signature DB guide can be threaded to accept a mill-out extension, seal-bore extension, or tubing.

Advantages

- Designed for ease of milling
- Proven reliability
- Greater resistance to premature impact setting
- Two opposed sets of full-circle, full-strength slips ensure packer will remain properly set
- Packing element resists swab off and allows faster running time
- Unique interlocking expandable metal backup rings contact casing, creating a positive barrier to packing element extrusion
- Composed of material suitable for H_2S service
- Big-bore version provides largest bore through any drillable packer
- Incorporates smooth, continuous ID sealing bore



Production Packer
Product Family Nos.
H43209, H43210 and H43211

Specification Guide

Casing			Packer	Range of Casing ID in which Packer May be Run				Max Tool OD		Min Bore Thru				Diameter Sealing Bore for Seal Nipples	Accessory Size
OD		Weight	Size	Min		Max				Seal Nipple		Packer			
in.	mm	(lb/ft)		in.	mm	in.	mm	in.	mm	in.	mm	in.	mm		
4½	114.3	10.5–13.5	375–268	3.92	99.6	4.052	102.9	3.75	95.2	1.937	49.2	2.688	68.3	2.688	40–26
		15.1–16.9	356–250	3.629	92.2	3.826	97.2	3.562	90.5	1.875	47.6	2.5	63.5	2.5	20–25
5	127.0	15–21.4	396–268	4.125	104.8	4.408	111.9	3.968	100.8	1.937	49.2	2.688	68.3	2.688	40–26
5½	139.7	20–23	432–268	4.578	116.3	4.811	122.2	4.328	109.9	1.968	49.9	2.688	68.3	2.688	40–26
		14–17	450–268	4.819	122.4	5.044	128.1	4.5	114.3						
6⅝ - 7	168.2 177.8	20–32 32–42.7	546–325	5.569	141.4	6.135	160.4	5.468	138.9	(80) 2.406 (81) 1.995	61.1 50.7	3.25	82.5	3.25	80–32 or 81–32
6⅝ - 7	168.2 177.8	20 23–32	568–325	5.597	142.2	6.366	161.7	5.687	144.4	(80) 2.406 (81) 1.995	61.1 50.7	3.25	82.5	3.25	80–32 or 81–32
7 - 7⅝	196.6	17–20 33.7–39	618–325	6.381	162.1	6.765	171.8	6.187	157.1	(80) 2.406 or (81) 1.995	61.1 50.7	3.25	82.5	3.25	80–32 or 81–32
7 - 7	196.6	24–33.7	637–325	6.662	169.2	7.025	178.4	6.375	161.9	(80) 2.406 or (81) 1.995	61.1 50.7	3.25	82.5	3.25	80–32 or 81–32
9⅝	244.5	36–53.5	812–325	8.405	213.5	9.001	228.6	8.125	206.4	2.406	61.1	3.25	82.5	3.25	80–32

Signature Series F Retainer Production Packers

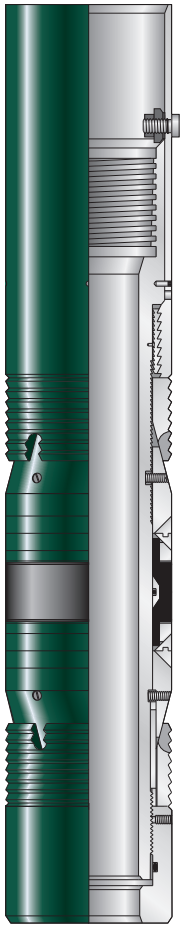
Product Family Nos. H43207 and H43208

Application

The **signature series packers** are used as production, injection, zonal isolation, and sump packers. They are also frequently used as a permanent squeeze or testing packers, or as a permanent or temporary bridge plug. The configuration with the larger sealing bore at the upper end is frequently used in complex multi-string completions, or when large tubing is run and it is necessary to maintain clearance through the packer. The big bore version is used when the largest bore inside diameter (ID) through the packer is desirable.

Advantages

- Solid construction in a slimline design enables 50% faster run in without fear of impact damage or premature setting, making significant rigtime savings possible with a history of field proven reliability
- Available H_2S compatible version composed of material suitable for H_2S service
- Designed for ease of milling
- Two opposed sets of full circle high strength slips ensure packer will remain properly set
- Packer element resists swab-off; packs off securely when packer is set
- unique interlocking, expandable, metal backup rings contact casing that creates a positive barrier to packing element extrusion
- Available big bore version provides largest bore through any drillable packer
- **AFLAS™ packing element** available in select casing weight ranges
- Fluoroelastomer packer seal increases tool temperature operating range and is stable in most well fluids



Signature Series F
Retainer Production Packers
Product Family No. H43207

PACKER SYSTEMS

Signature Series F Retainer Production Packers

Specification Guide

Casing		Packer ■	Range of Casing ID in which Packer may be run		Max. Tool OD	Minimum Bore Through*		Diameter Sealing Bore For Seal Assemblies	Accessory Size †
OD	Weight	Size	Minimum	Maximum		Seal Nipple	Packer **		
in.	lb/ft								
4½	11.6 - 16.6	359-235	3.752	4.000	3.593	1.703	2.388	2.390	20-23
						1.817			21-23
4½ - 5	9.5 - 11.6	381-300-239	4.000	4.124	3.812	2.390	2.388	3.000	20FA30
5½	20 - 30	443-300	4.625	4.811	4.438	2.375	3.000		40-30•
									42-30
	14 - 17	456-300	4.812	5.012	4.562	1.968			40-30
						2.375			42-30
6⅝ - 7	20 - 24	586-475-400	5.875	6.094	5.688	3.875	4.000	4.750	81FA-47 ●
						3.875			82FA47
						4.000			
	32 - 38	568-400				2.985		4.000	80-40
	17 26 - 29	587-475-400	6.095	6.276	5.875	3.875		4.750	81FA-47
						4.000			81FA-47
6⅝ - 7	17 26 - 29	587-400	6.095	6.276	5.875	2.985		4.000	80-40
7	20 - 23	600-400	6.277	6.456	6.000				
7	17 - 20	625-400	6.456	6.765	6.250				
7⅝	33.7 - 42.8								
7⅝	24 - 33.7	650-400	6.706	7.025	6.500				
9⅝	40 - 53.5	821-600	8.435	8.835	8.218	4.875	6.000	6.000	190-60

* If smaller bore can be used in 40 or 80 series, run a Signature D packer

** Minimum lower bore of all alternate bore version packers can also be used as sealing bore.

† Tubing Seal Assemblies, Tubing Seal and Spacer Nipples, and Flow Tubes.

‡ This accessory is the same as that used for Series 60-30 Model D Packers.

• This accessory has a 2⅜ in. ID and is used when it is desired to maintain full drift diameter for 2⅞ in. tubing through the seal assembly, as, for example, when 2⅞ in. flush joint tubing is attached to the bottom end of the seal assembly.

● This accessory is the same as that used for Series 120DA-47 packers.

■ In 4½-in. OD 11.6 lb/ft casing, the size 20 Wireline Pressure Setting Assembly is too large and the Size 10 WLPSA MUST BE used.

DV Retainer Production Packer

Product Family No. H41534

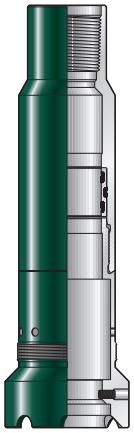
Application

The **DV™ retainer production packer** combines the advantages of the proven **D™ permanent packer** with the flexibility of the **L-10™/R-10™ on-off sealing connector**. By coupling these proven products, a lower zone can be isolated by installing a plug in the profile of the seal nipple, enabling removal of the tubing string. NACE metallurgy and non-elastomeric seal stacks can stand up to virtually all well conditions.

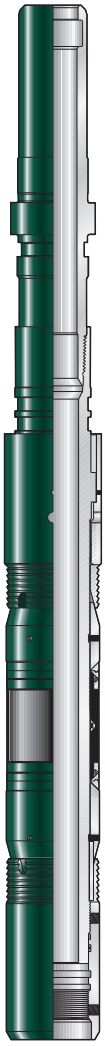
As with the conventional D packer, a prior gauge ring and junk basket are recommended to ensure unrestricted deployment to setting depth. The DV packer can be run on either E-Line, using the Baker Hughes **E4™ setting tool** or a workstring, using the **J™ hydraulic-setting tool**.

Advantages

- Permits blanking plug in seal nipple profile, improving debris removal from locks for reliable plug retrieval
- Disengagement of workstring by quarter turn provides minimal tubing manipulation, ideal for deviated wells
- Offers large IDs, particularly suited for small packer sizes
- Maintains maximum packer-to-tubing tension ratings
- Provides economical option for many HP/HT applications



L-10/R-10 On-Off Sealing Connector
Product Family Nos. H68420 and H68421



DV Retainer Production Packer
Product Family No. H41534

Specification Guide

Casing			Packer			Seat Nipple Min ID			
OD		Weight	Size	Max OD		With Profile		Blank	
in.	mm	lb/ft		in.	mm	in.	mm	in.	mm
4½	114.3	11.6–15.1	365–193	3.650	92.71	1.87	47.50	1.93	49.02
		9.5–11.6	381–193	3.812	96.83				
5	127.0	23.2	381–193	3.812	96.83	1.87	47.50	1.93	49.02
		15–21.4	397–193	3.968	100.79				
		11.5–13	425–193	4.250	107.95				
5½	139.7	20–23	433–193	4.328	109.93	1.87	47.50	1.93	49.02
			433–237			2.31	58.67	2.377	60.38
		14–17	450–193	4.500	114.30	1.87	47.50	1.93	49.02
			450–237			2.31	58.67	2.377	60.38
7	177.8	32–42.7	547–237	5.468	138.89	2.31	58.67	2.377	60.38
		23–32	569–237	5.687	144.45				
		17–20	619–237	6.187	157.15				
7⅝	193.6	33.7–39	625–237	6.250	158.75	2.31	58.67	2.377	60.38
			625–292			2.81	71.37	2.942	74.73

HE and HEA Retainer Production Packers

Product Family Nos. H42101 and H42103

Application

The **HE™ and HEA™ retainer production packers** have been developed for use in hot, hostile well environments where the packer may be subjected to high-pressure differentials. The **Aflas® and Viton® packing element system with Teflon®** and metal backup rings may be run in corrosive environments including H_2S, CO_2 and amine inhibitors at temperatures up to 450°F (232°C). The maximum pressure rating on most sizes is 15,000 psi.

The packer and accessories may be constructed of low alloy steel, various high strength or corrosion resistant alloys to meet specific customer requirements. Pressure rating may be affected. Consult your Baker Hughes representative for specific information on ratings, application and availability.

Advantages

- Maximum operating temperature is 450°F (232°C)
- Maximum operating pressure differential is normally 15,000 psi (103,35 MPa)
- Packing element is chemically inert to hostile environments (H_2S, CO_2, inhibitors)
- Unaffected by temperature cycling
- Metal-to-metal sealing eliminates o-ring seals

HE and HEA Retainer Production Packers
Product Family No. H42101

Specification Guide

Casing			Packer					Accessories			
OD	T and C Weight	ID Range (Nominal) in Which Packer May Be Run	Model	Size	Max OD	Minimum Bore Through Packer Body	Dia. of Sealing Bore	LTSA	ATSA		Minimum Bore Through Seal Assembly
								L	N	NM	
in.	lb/ft				in.			Size			
4½	10.5–12.6	3.958–4.052	HEA	375-26 x29	3.750	1.929	2.688	-		26.19	1.929
	9.5–10.5	4.044–4.090	HE	381-26	3.812	2.688		40-26		-	
5	23.2–24.2	3.958–4.052	HEA	375-26×19	3.750	1.929	2.688	-		26-19	1.929
	23.2	4.044–4.090	HE	381-26	3.812	2.688		40-26		-	
	18	4.126–4.276		396-26	3.968						
			HEA	396-26×19		1.929		-		26-19	
	11.5–15	4.408–4.670	HE	425-26	4.250	2.688		40-26		-	
			HEA	425-30×22		2.265	3.000	–		30-22	
5½	32.3-35.3	4.126-4.676	HE	396-26	3.968	2.688	2.688	40-26		-	1.926
			HEA	396-26-x19		1.929		–		26-19	
	23-28.4	4.408-4.670	HE	425-26	4.250	2.688		40-26		-	
			HEA	425-30x22		1.929	3.000	-		30-22	2.265
6⅝	32-35	5.540-5.720	HE	535-32	5.350	3.250	3.250	80-32		-	2.303
	23.2-32	5.660-6.004		546-32	5.468						
7	44-49.5	5.540-5.720	HE	535-32	5.350	3.250	3.250	80-32		-	2.303
	35-45.4	5.660-6.004		546-32	5.468						

FA and FAB Retainer Production Packers and Wireline Kits

Product Family No. H43211

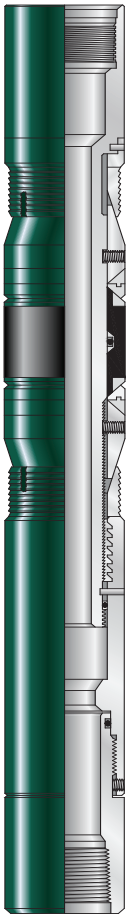
Application

The bottom-set **FA and FAB retainer production packers** have the body lock ring and setting sleeve on the lower end of the packer and incorporate an oversized seal bore in the upper end. Because size limitations prevented conversion into the top-set design, all the small size FA and FAB Packers remain bottom-set. Those older version bottom-set packers that remain in the product line are covered in this unit.

The FAB retainer production packer is a variation of the FA Packer that is equipped with a threaded bottom guide to accommodate various extensions. Available extensions include the millout extension, and seal bore extension.

Advantages

- FA retainer production packer, set with the E-4 wireline pressure setting assembly, provides a safe, fast and economical method of placing a permanent large-bore drillable packer at any predetermined point in the casing
- The smaller sizes of the FA retainer production packer are designed for tubing-less completions. They have a large upper sealing bore that allows the largest possible opening through the Packer. All sizes include a lower sealing bore that can be used if necessary
- The wireline adapter kit must be ordered specifically for the FA packer; however, all other wireline setting tools are the same as those used to set D and DA packers
- The size 43FA-36 FA packer can also be set on tubing or drillpipe using the H or J hydraulic setting assembly, being used in conjunction with a wireline adapter kit. For additional information concerning tubing setting, refer to other units within service packers



FA and FAB Retainer Production Packers
Product Family No. H43211

Specification Guide

Casing		ID Range in which Packer may be run		Packer		Max Tool OD	Min Bore Through Packer Body	Dia. Sealing Bore for Seal Nipples	Accessory Size	Min Bore Through Seal Nipples
OD	Weight	Min	Max	Model	Size					
in.	lb/ft	in.	in.			in.	in.	in.		in.
4	12.6-14	3.281	3.406	FA	13FA-25 ●	3.062	1.875 Δ	2.500 •	11FA-25	1.875
	9.5-11.6	3.406	3.563		15FA-25 ●	3.187				
4½	11.6-16.6	3.781	4.000		22FA-30	3.593	2.390 Δ	3.000	20FA-30	2.390
	9.5-11.6	4.000	4.124		24FA-30	3.718				
5½	20-23	4.625	4.811		43FA-36	4.437	3.000 Δ	3.625	40FA-36 ◇	3.000

● Sizes 13FA-25 and 15FA-25 FA Packers may be ordered with or without left-hand square threads located in the top portion of the Body. Differential pressure in favor of tubing should never exceed 5,500 psi; differential pressure in favor of annulus should not exceed 9,500 psi for 4 in. OD – 14 lb. casing, 9,000 psi for 4 in. OD – 12.6 lb. casing, 8,000 psi for 4 in. OD – 11.6 lb. casing, 7,400 psi for 4 in. OD – 11 lb. casing and 6,000 psi for 4 in. OD – 9.5 lb. casing.

Δ Minimum (lower) bore of FA Packers can also be used as a sealing bore.

• Sizes 13FA-25 and 15FA-25 with the $2^{3}/_{8}$ in. Baker Hughes left-hand square threads do not contain the 2.5 in. upper seal bore.

◇ This accessory is same as that used for Series 60DA-36 DA Packers.

FB-3 High-Pressure Retainer Production Packer

Product Family No. H41350

Application

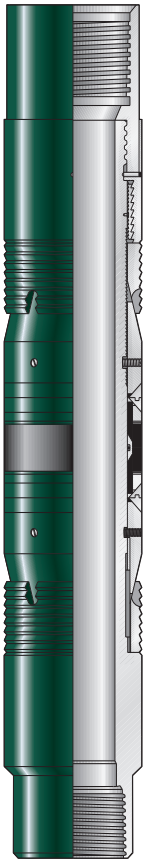
The Baker Hughes **FB-3™ high-pressure retainer production packer** is designed for the extreme hydrostatic- annulus pressures encountered during deep well tests. It's most commonly used in high-pressure DST completions, when the possible evacuation of tubing fluids, during perforating, could result in extreme loads on packers. The FB-3's non-sealing bore differentiates it from conventional **FB-1™ packers**. Seal-bore extensions attached below the packer will function as the tubing-to-packer sealing device, while the packer effects a casing seal and supports the induced loads.

In cases of extreme annulus pressure from above, the seal assembly may be spaced out to prevent contact with the locating shoulder to limit the transmission of compression into the packer.

The seal-bore sizes have been optimized, so large-diameter tubing-conveyed perforating guns can be removed after firing.

Advantages

- Packers rated for differential pressures up to 15,000 psi dependent on size
- Largest possible opening through packer for high-pressure applications
- Uniquely designed sealing element eliminates need for wire mesh in extreme applications
- One piece body with premium thread down for sealbore extension enhances reliability
- Standard slips will grip V-150 casing
- May be set with standard wireline or drillpipe setting tools



FB-3 High-Pressure Retainer Production Packer
Product Family No. H41350

Specification Guide

Casing			Model	Size	Packer Element	Packer
OD		Weight				
in.	mm	lb/ft			Type	OD
5	127.0	26.7	FB-3	22-23	Nitrile	3.594
		20.8	HE Sp	396-26		3.968
7	177.8	42.7	FB-3	82-38	Nitrile	5.500
		41 *		83-36		5.672
		38-41 *		83-40 Sp		5.691
		38		83-36		5.687
				83-40		5.691
		35		83-40 Sp	Aflas	5.770
		32		83-40 Sp	Nitrile	5.800
				83-40	Aflas	
		26		87-40		6.000
7⅝	193.6	51.2 (50.91 Plain End)	FB-3	85-40 Sp	Nitrile	5.875
		55.3		85-40	Aflas	
		47.1		87-40	Nitrile	6.000
		45.3		89-40		6.250
		42.8				
		39			Aflas	6.375

* When proposed for use in other than the casing weight range shown contact your Baker Hughes representative.
NOTE: Contact your local Baker Hughes representative for information regarding pressure and temperature ratings and elastomer availability.

SB-3 Hydraulic-Set Retainer Production Packer

Product Family Nos. H40951 and H40924

Application

Baker Hughes **SB-3™ hydraulic-set retainer production packer** is a one-trip, completion packer, that is a hydraulically set version of the **DB™ packer**.

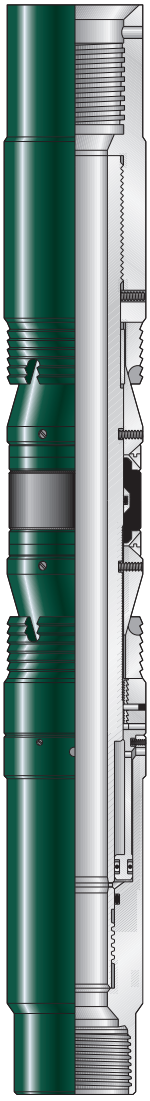
A guide for seal-bore extension can be furnished if required. The packer is also available in **S-3™** (box x pin) configuration by special order.

Packer Accessories

Sealing systems; expansion joints; plugging devices; packer bore receptacles; SB-3 retainer production packer with **B™ guide for mill-out extension**, Product Family No. H40906 (Nitrile) and Product Family No. H40924 (Aflas)

Advantages

- Slim-line design
- Solid construction enables faster run-in without fear of impact damage or premature setting, making significant rig-time savings possible
- Two opposed sets of full-circle, full-strength slips ensure packer will remain properly set
- Packing element resists swab-off and packs off securely when packer is set
- Unique interlocking, expandable, metal backup rings contact casing, creating a positive barrier to packing element extrusion
- Flanged-up completions for safety
- Setting requires no rotation or reciprocation, eliminating spacing out or landing problems
- All O-rings supported by backup rings to improve long-term seal integrity
- SB-3 Packers designed for pressure differential up to 10,000 psi
- All alloy materials within packer are suitable for H_2S service
- Seal assembly, on which packer is run, serves as a seal nipple after packer is set, providing single-run completion
- B Guide, furnished as standard equipment, enables mill-out extension or other component to be attached below the packer
- Test fixtures permit high-pressure surface testing of o-ring seals and tailpipe connections



SB-3 Hydraulic-Set Retainer Production Packer
Product Family No. H40951

SB-3 Hydraulic-Set Retainer Production Packer

Specification Guide

Casing			Packer •				Standard Seal Assembly		
OD		Weight X	Size ◇	OD		Seal Bore		Size	Min Bore Thru Seals ‡	
in.	mm	lb/ft		in.	mm	in.	mm		in.	mm
5	127.0	15–21	396-192	3.968	100.7	1.968	49.9	21–19	1.312	33.3
								20–19	0.984	24.9
5½	139.7	13–17	445-240	4.500	114.3	2.500	63.5	20–25	1.865	47.3
6⅝	168.2	17–32	546-325	5.468	138.8	3.250	82.5	80–32 or 81–32	2.406 or 1.990	61.1 or 50.5
		17–20	368-325	5.687	144.4					
7	177.8	32–38	546-325	5.468	138.8	3.250	82.5	80–32 or 81–32	2.406 or 1.990	61.1 or 50.5
		20–32	368-325	5.687	144.4					
		17–20	618-325	6.187	157.1					
7⅝	193.6	33.7–39	618-325	6.187	157.1	3.250	82.5	80–32 or 81–32	2.406 or 1.990	61.1 or 50.5
		24–33.7	638-380	6.375	161.9					
7¾	196.9	46.1–48.6	618-325	6.187	157.1	3.250	82.5	80–32 or 81–32	2.406 or 1.990	61.1 or 50.5
8⅝	219.0	24–36	750-400	7.500	190.5	4.000	101.6	80/120–40	3.000	76.2
9⅝	244.4	32.3–53.5	813-475	8.125	206.3	4.750	120.6	190–47	3.000	76.2
								191–47	2.500	63.5
								192–47	3.875	98.4
			825-605 **X**	8.250	209.5	6.150	156.2	190–60	4.875	123.8
9⅞	250.1	62.8	813-475	8.125	206.3	4.750	120.6	190–47	3.000	76.2
								191–47	2.500	63.5
								192–47	3.875	98.4
			825-605 **X**	8.250	209.5	6.150	156.2	190–60	4.875	123.8

X Includes some drillpipe and line-pipe weights

• When proposed for use in other than the casing-weight range shown contact your Baker Hughes representative

◇ For information on packer or accessory sizes not found in this specification guide refer to the Baker Hughes packer systems technical manual or your Baker Hughes representative

‡ ID listed is for commonly used **G-22™ and E-22™ seal assemblies**

SAB-3 and SABL-3 Hydraulic-Set Retainer Production Packers

Product Family No. H40951

Application

Baker Hughes **SAB-3™** and **SABL-3™ hydraulic-set retainer production packers** are the hydraulically set versions of the **DAB™** and **FAB™ packers**, respectively. These packers feature the largest possible bore through combined packer and seal accessory. The packer is run to depth, connected to the tubing with a **K™** or **KC™ anchor tubing seal nipple** and is set by applied tubing pressure. This makes the packer ideal for high-angle deviated wells, common in offshore operations.

The SAB-3 and SABL-3 packers have been designed to give maximum strength, uniformity of setting pressure and standardization of all alloy materials for H_2S service.

The SAB-3 packers offer bores comparable to the **DA™ packers** in their corresponding sizes.

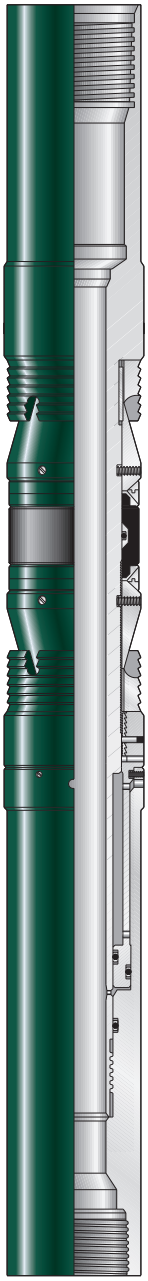
The SABL-3 (large-bore) packers offer larger bores more comparable to the **FA™ packers** and as a result carry a lower-pressure rating than the SAB-3 packer. The SABL-3 packers are only available in standard sizes.

Packer Accessories

Sealing systems; expansion joints; parallel flow systems; plugging devices; packer-bore receptacles.

Advantages

- Slim-line design
- Solid construction enables 50% faster run-in without fear of impact damage or premature setting, making significant rig-time savings possible
- Two opposed sets of full-circle, full-strength slips ensure packer will remain properly set
- Packing element resists swab-off and packs off securely when packer is set
- Unique interlocking, expandable, metal backup rings contact casing, creating a positive barrier to packing element extrusion
- **Aflas™ packing element** is available in select casing-weight ranges



SAB-3 Hydraulic-Set Retainer Production Packer with B Guide
Product Family No. H40951

PACKER SYSTEMS

SAB-3 Hydraulic-Set Retainer Production Packer

Specification Guide

Casing			Packer ◆			Packer Sealing Bore										
						Upper					Lower ·					
OD		Weight ı	Size ◆	Max OD		Seal Bore		Seal Assembly Size	Min Bore Thru Seals		Seal Bore		Seal Assembly Size	Min Bore Thru Seals		
in.	mm	lb/ft		in.	mm	in.	mm		in.	mm	in.	mm		in.	mm	
5	127.0	15–21	32SAB30 x 19	3.968	100.7	3.000	76.2	20FA30	2.390	60.7	1.968	49.9	20–19	.984	24.9	
													21–19	1.312	33.3	
5½	139.7	13–17	44SAB32 x 25	4.500	114.3	3.250	82.5	40DA32	2.500	63.5	2.500	63.5	20–25	1.865	47.3	
6⅝	168.2	17–32	82SAB40 x 32	5.468	138.8	4.000	101.3	80DA40	3.250	82.5	3.250	82.5	80–32	2.406	61.1	
		17–20	84SAB40 x 32	5.687	144.4											
7	177.8	32–44	82SAB40 x 32	5.468	138.8	4.000	101.3	80DA40	3.250	82.5	3.250	82.5	80–32	2.406	61.1	
		20–32	84SAB40 x 32	5.687	144.4											
		17–20	88SAB40 x 32	6.187	157.1											
7⅝	193.6	33.7–39	88SAB40 x 32	6.187	157.1	4.000	101.3	80DA40	3.250	82.5	3.250	82.5	80–32	2.406	61.1	
		24–39	92SAB40 x 32	6.375	161.9											
7¾	196.9	46.1–48.6	88SAB40	6.187	157.1	4.000	101.3	80DA40	3.250	82.5	3.250	82.5	80–32	2.406	61.1	
8⅝	219.0	24–36	128SAB47 x 40	7.500	190.5	4.750	120.6	81FA47	3.875	98.4	4.000	101.6	80/120–40	3.000	76.2	
9⅝	244.4	32.3–58.4	194SAB60 x 47	8.125	206.3	6.000	152.4	190DA60	4.875	123.8	4.750	120.6	191–47	2.500	63.5	
													190–47	3.000	76.2	
													192–47	3.875	98.4	
			194SAB60 x 48								4.895 ‡	124.3	-	-	-	
9⅞	250.1	62.8	194SAB60 x 47	8.125	206.3	6.000	152.4	190DA60	4.875	123.8	4.750	120.6	191–47	2.500	63.5	
													190–47	3.000	76.2	
													192–47	3.875	98.4	
			194SAB60 x 48								4.895 ‡	124.3	-	-	-	

◆ For information on packer or accessory sizes not found in this specification guide refer to the Baker Hughes packer systems technical manual or your Baker Hughes representative.

ı Includes some drillpipe and line pipe weights.

· Lower bore can be used as a seal bore, HOWEVER, strict dimensional analysis for compatibility of packer bore/sealing accessory configuration is required to assure desire performance. Compatibility is based on lower bore/seal nipple diametrical dimensions only. Final seating position of locating shoulder will very between packer sizes. Anchor mechanisms are not recommended.

◆ When proposed for use in other than the casing-weight range shown, contact your Baker Hughes representative.

‡ This is not a honed seal bore.

PACKER SYSTEMS

SABL-3 Hydraulic-Set Retainer Production Packer

Specification Guide

Casing			Packer [x]			Packer Sealing Bore								
						Upper					Lower [·]			
OD		Weight [ı]	Size [⋄]	Max OD		Seal Bore		Seal Assembly Size	Min Bore Thru Seals		Seal Bore		Seal Assembly Size	Min Bore Thru Seals	
in.	mm	lb/ft		in.	mm	in.	mm		in.	mm	in.	mm		in.	mm
5½	139.7	20–23	43SABL36 x 27	4.450	113.0	3.625	92.0	43SA36	2.780	70.6	2.780 ‡	70.6	-	-	-
6⅝	168.2	17	85SABL47 x 38	5.875	149.2	4.750	120.6	81FA47	3.875	98.4	3.875	98.4	120–38	2.500	63.5
7	177.8	26–29	85SABL48 x 4.145	5.875	149.2	4.875	123.8	80DA48	4.125	104.7	4.125 ‡	104.7	-	-	-
7⅝	193.6	24–33.7	91SABL47 x 38	6.500	165.1	4.750	120.6	81FA47	3.875	98.4	3.885	98.6	120–38	2.500	63.5
8⅝	219.0	24–36	128SABL60 x 47	7.500	190.5	6.000	152.4	190DA60	4.875	123.8	4.750	120.6	190–47	3.000	76.2
9⅝	244.4	47–58.4	194SABL73 x 60	8.250	209.5	7.375	187.3	190SA73	6.000	152.4	6.000	152.4	190–60	4.875	123.8
			194SABL73 x 6.059					190–73	6.059	153.8	6.059 ‡	153.8	-	-	-
			194SABL40 x 32	8.125	206.3	4.000	101.6	80DA40	3.250	82.5	3.250	82.5	80–32	2.406	61.1
			194SABL47 x 44			4.750	120.6	81FA47	3.875	98.4	4.400	111.7	80–44	3.500	88.9
9⅞	250.1	62.8	194SABL73 x 60	8.250	209.5	7.375	187.3	190SA73	6.000	152.4	6.000	152.4	190–60	4.875	123.8
			194SABL73 x 6.059					190–73	6.059	153.8	6.059 ‡	153.8	-	-	-
			194SABL40 x 32	8.125	206.3	4.000	101.6	80DA40	3.250	82.5	3.250	82.5	80–32	2.406	61.1
			194SABL47 x 44			4.750	120.6	81FA47	3.875	98.4	4.400	111.7	80–44	3.500	88.9
10¾	273.0	32.75–60.7	214SABL73 x 60	9.437	239.7	7.375	187.3	190SA73	6.000	152.4	6.000	152.4	190–60	4.875	123.8

[x] For information on packer or accessory sizes not found in this specification guide refer to the Baker Hughes packer systems technical manual or your Baker Hughes representative.

[ı] Includes some drillpipe and line pipe weights.

[·] Lower bore can be used as a seal bore, HOWEVER, strict dimensional analysis for compatibility of packer bore/sealing accessory configuration is required to assure desire performance. Compatibility is based on lower bore/seal nipple diametrical dimensions only. Final seating position of locating shoulder will very between packer sizes. Anchor mechanisms are not recommended.

[⋄] When proposed for use in other than the casing-weight range shown, contact your Baker Hughes representative.

[‡] This is not a honed seal bore.

SB-3H Hydrostatic Activated Retainer Production Packer

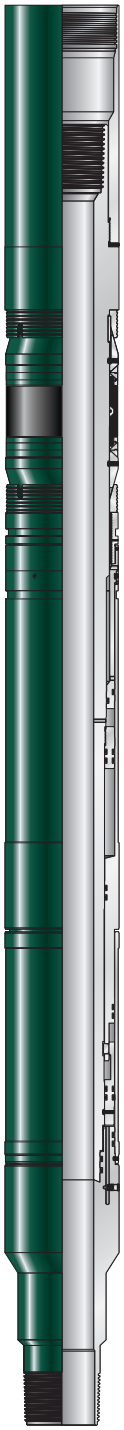
Product Family No. H40932

Application

The Baker Hughes **Model SB-3H Production Packer** is a development of the field proven **SB-3 Retainer Production Packer**. The tool is a hybrid hydrostatic and hydraulic packer with the features and advantages of both designs. It features the same reliable pack-off components as the SB-3 type tools. The tool has a primary setting mechanism actuated by absolute well pressure, so it may be set without running a plug or packer setting tool. The secondary setting mechanism is the standard hydraulic method of running a plug in the packer tailpipe and pressurizing the tubing. The model SB-3H packer has been developed for markets where remote actuation of the production packer within a completion brings added benefit and cost saving to the customer. This can be achieved by reducing rig and packer setting time and minimizing the risk associated with standard well intervention setting methods. It also reduces the need for additional well services.

Advantages

- Interventionless actuation. As the tool is actuated by absolute pressure, no running tools are required. Application of pressure to burst a rupture disc will set the tool. No additional equipment is required
- Secondary setting mechanism independent of primary method. In the event the primary method is unsuccessful, the packer may be set as per a hydraulic packer. This mechanism is totally independent of the hydrostatic chambers
- Solid, slim line construction and a packing element system that resists swaboff. This permits a fast run-in without fear of impact damage or premature setting, yet packs off securely and permanently when the packer is set
- Two opposed sets of full circle, full strength slips ensure that the packer will stay where it is set
- Interlocked, expandable metal backup rings contact the casing and create a positive barrier to packing element extrusion
- All alloy materials within the packer are suitable for H_2S service
- Components in flow path can be furnished in customer's choice of materials
- Can be tested to full tubing test pressure, without the need for additional test fixturing, other than standard bull plugs and test clamp
- No plug required in tubing, so no costly wireline or coil tubing runs, or associated risks, are necessary
- The packer is set from well hydrostatic and surface applied pressure
- Running procedures and speed as per standard SB-3 permanent packer
- Uses one-piece EBW rupture disc which is not sensitive to installation techniques



SB-3H Hydrostatic Activated Retainer Production Packer
Product Family No. H40932

R-3 Double-Grip Retrievable Casing Packer

Product Family No. H64201

R-3 Single-Grip Retrievable Casing Packer

Product Family No. H64101

Application

The **R-3™ single-grip retrievable casing packer** is a versatile production packer intended for a broad range of production applications. It is a compression-set packer, suitable for stimulation and treating applications in a double-grip configuration. Applications in which excessive bottomhole pressures have been depleted, a single-grip version can be used as an economical production packer.

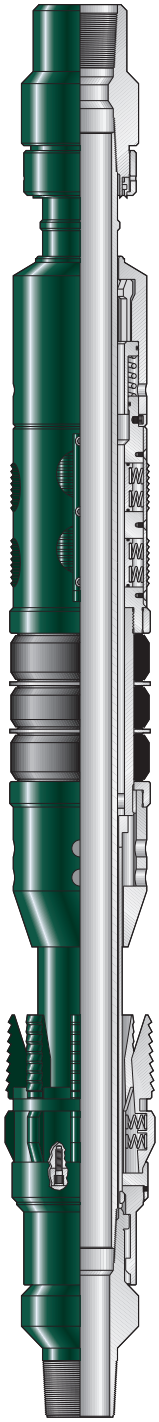
The R-3 single-grip packer is set with one-fourth-turn right-hand rotation and can be released with straight pickup.

Advantages

- Rugged rocker-type slips system
- Hydraulic button-type hold-down located below bypass valve
- Unique, built-in differential lock helps keep bypass closed
- Effective bypass design allows rapid pressure equalization and resists swab off
- Field-proven, three-piece packing element system

Specification Guide

Casing			Packer				
OD		Weight [X]	Size [I]	Nom ID		Max Gage and Guide Ring OD	
in.	mm	lb/ft		in.	mm	in.	mm
2⅞	73.0	6.4–6.5	28A	.750	19.1	2.234	56.7
			28A Hi-Temp •			2.330	51.2
		4.7–5.6	28B			2.357	59.9
3½	88.9	10.2	35A	1.375	34.9	2.782	70.7
		7.7–9.2	35B			2.844	72.2
		5.75	35C			3.038	77.2
4	101.6	9.5–11.6	41A	1.500	38.1	3.303	83.9
4½	114.3	15.1	41B	1.500	38.1	3.620	92.0
		9.5–13.5	43A	1.850	48.0	3.786	96.2
5	127.0	15–18	43B	1.850	48.0	4.140	105.2
		11.5–15	43C	1.850	48.0	4.265	108.3
5½	139.7	26	43C	1.850	48.0	4.265	108.3
		20–23	45A2	1.930	49.9	4.515	114.7
			45A2 x 2⅜	2.365	60.3		
		15.5–20	45A4	1.930	49.9	4.656	118.3
		17–20	45A4 x 2⅜	2.365	60.3		
		13–15.5	45B	1.930	49.9	4.796	121.8
			45B x 2⅜	2.365	60.3		
5¾	146.1	22.5	45B	1.930	49.9	4.796	121.8
			45B x 2⅜	2.365	60.3		



R-3 Retrievable Casing Packer Double Grip
Product Family No. H64201

PACKER SYSTEMS

Specification Guide (Continued)

Casing			Packer				
OD		Weight [x]	Size [l]	Nom ID		Max Gage and Guide Ring OD	
in.	mm	lb/ft		in.	mm	in.	mm
6	152.4	26	45B	1.930	49.9	4.796	121.8
			45B x 2⅜	2.365	60.3		
		20–23	45C	1.930	49.9	5.078	129.0
		15–18	45D			5.171	131.3
6⅝	168.3	34	45E2	1.930	49.9	5.421	137.7
		28–32	45E4			5.499	139.7
			46A2	2.406 ❖	61.0	5.490	139.5
		24–28	45EF	1.963	49.9	5.499	139.7
			46A4	2.406 ❖	61.0	5.603	142.3
		24	47A2			5.671	144.0
		17–20	47A4			5.827	148.0
		20	47A4 x 3.00	3.000	76.2		
		17	47B2 x 3.00			5.983	152.0
7	177.8	38	46A4	2.406	61.0	5.603	142.3
			47A2			5.671	144.0
		32–35	46B			5.796	147.2
			47A4			5.827	148.0
			47A4 x 3.00	3.000	76.2		
		26–29	47B2	2.406 ❖	61.0	5.939	150.9
			47B2 x 3.00	3.000	76.2		
		20–26	47B4	2.406 ❖	61.0	6.093	154.8
			47B4 x 3.00	3.000	76.2		
		17–20	47C2	2.406 ❖	61.0	6.281	159.5
			47C2 x 3.00	3.000	76.2		
7⅝	193.7	33.7–39	47C4	2.406 ❖	61.0	6.468	164.3
			47C4 x 3.00	3.000	76.2		
		24–29.7	47D2	2.406 ❖	61.0	6.687	169.9
		20–24	47D4			6.827	173.4
			47D4 x 3.00	3.000	76.2		
8⅝	219.1	44–49	49A2	3.476	88.3	7.327	186.1
		32–40	49A4			7.546	191.7
		20–28	49B2			7.796	198.0
9⅝	244.5	47–53.5	51A2	3.958	100.5	8.233	209.1
		40–47	51A4			8.453	209.1
		29.3–36	51B2			8.608	218.6

x When selecting a packer for a casing weight common to two weight ranges (same OD), choose the packer size shown for the lighter of the two weight ranges. Example: for 7-in. (177.8 mm) OD 20 lb/ft casing use packer size 47C2. Under certain circumstances the other packer size may be run, such as when running in mixed casing strings.

l Sizes 28, 32, 41 are available in this model as single-grip packers, Product Family No. H64101. For double-grip version, contact your Baker Hughes representative about the RC hydraulic-grip cementer, Product Family No. H40720.

• For use when anticipated conditions exceed 200°F (93.33°C) or 3,800 psi (26.18 MPa) differential across tool.

❖ 2.347-in. (60.0 mm) x 42 in. (1.067 mm) drift bar Repair kits, including such items as packing elements, seal rings, etc., are available for redressing retrievable packers. Contact your Baker Hughes representative. Use only genuine Baker Hughes repair parts.

A-3 and AL-2 LOK-SET Retrievable Casing Packers

Product Family Nos. H64630 and H64628

Application

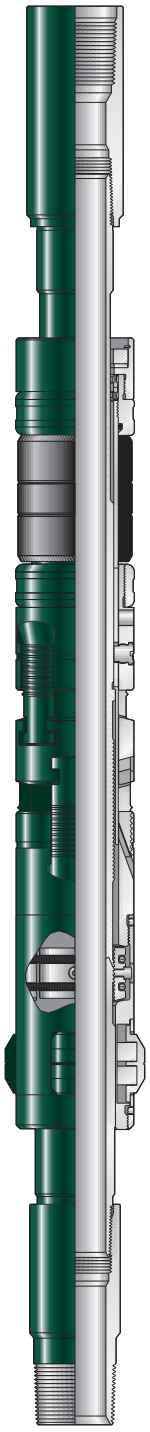
The **A-3™ LOK-SET™ retrievable casing packer** combines advantages of a retrievable packer with the features of a permanent packer. An ability to lock down tubing forces makes the A-3 suitable for a broad range of applications, including production, injection, zone isolation, and remedial operations. The **AL-2™ LOK-SET packer** is similar to the A-3, and has a larger bore.

To provide a simple and reliable injection system for retrieving an injection string without having to unseat the packer:

L-10 or L-316 on-off sealing connectors, Product Family Nos. H68420 and H68422. Baker Hughes blanking plug can be used in the seating nipple profile of the on-off sealing connector to provide a means of plugging the lower zone while the tubing is being pulled.

Advantages

- Holds pressure from above and below, without relying on set-down weight, tubing tension, or hydraulic hold down
- Provides tubing anchoring with tension applied, suitable for pumping wells or injection, controlling tubing forces related to change fluid temperatures
- Opposed, non-transferring, dovetail slips prevent packer movement associated with changing differential pressures, while allowing the landing of the tubing in tension, neutral or compression
- Right-hand tubing rotation controls setting and releasing
- Packing element compression locks in by ratcheting action of lock segments, which restricts rotation to one direction



A-3 LOK-SET Retrievable Casing Packer
Product Family No. H64630

AL-2 Large Bore LOK-SET Retrievable Casing Packer

Specification Guide

Casing			Packer						
OD		Weight ⋄	Size	Nom ID		Max Gage Ring OD		Max Diameter of Compressed Drag Block	
in.	mm	lb/ft		in.	mm	in.	mm	in.	mm
5½	139.7	20	45A2 x 2⅜	2.375	60.3	4.562	115.9	4.592	116.6
		15.5–17	45A4 x 2⅜			4.656	118.3	4.750	120.7
		13	45B x 2⅜			4.796	121.8	4.902	124.5
6	152.4	26	45B x 2⅜	2.375	60.3	4.796	121.8	4.902	124.5

⋄ When selecting a packer for a casing weight common to two weight ranges (same OD), choose the packer size shown for the lighter of the two weight ranges. Example: for 7-in. (177.8 mm) OD 26 lb/ft casing use packer size 47B4. Under certain circumstances the other packer size may be run, such as when running in mixed casing strings.

Repair kits, including such items as packing elements, seal rings, etc., are available for redressing Baker Hughes Retrievable Packers. Contact your Baker Hughes representative. Use only Baker Hughes repair parts.

A-3 LOK-SET Retrievable Casing Packer

Specification Guide

Casing			Size	Packer			
OD		Weight ⋄		Nom ID		Max Gage Ring OD	
in.	mm	lb/ft		in.	mm	in.	mm
4	101.6	9.5–12.9	41A2	1.500	38.1	3.244	82.4
4½	144.3	21.6–23.6	41A2	1.500	38.1	3.244	82.4
4	101.6	9.5	41A4	1.500	38.1	3.423	112.4
4½	114.3	18.8	41A4	1.500	38.1	3.423	112.4
		13.5–17.7	41B			3.578	90.9
		11.6–13.5	43A2	1.978	50.2	3.786	96.2
		9.5–10.5	43A4			3.786	96.2
5	127.0	15–18	43B	1.978	50.2	4.140	105.2
		11.5–15	43C			4.265	108.3
5½	139.7	26	43C	1.978	50.2	4.265	108.3
		20–23	45A2			4.515	114.7
		15.5 –20	45A4			4.656	118.3
		13–15.5	45B			4.796	121.8
6	152.4	26	45B	1.978	50.2	4.796	121.8
		20–23	45C			5.078	129.0
		15–18	45D			5.171	131.3
6⅝	168.3	34	45E	1.978	50.2	5.421	137.7
		24–32	45F			5.499	139.7
		24	47A2	2.441	62.0	5.671	144.0
		17–24	45G	1.978	50.2	5.796	147.2
		17–20	47A4	2.441	62.0	5.827	148.0
7	177.8	38	47A2	2.441	62.0	5.671	144.0
		32–35	47A4			5.827	148.0
		26–29	47B2			5.983	152.0
		23–26	47B4			6.093	154.8
		17–20	47C2			6.281	159.5
7⅝	193.7	33.7–39	47C4	2.441	62.0	6.468	164.3
		24–29.7	47D2			6.687	169.9
		20–24	47D4			6.827	173.4
8⅝	219.1	44–49	49A2	3.500	88.9	7.327	186.1
		32–40	49A4			7.546	191.7
		20–28	49B			7.796	198.0
9⅝	244.5	47–53.5	51A2	3.500	88.9	8.234	209.1
		40–47	51A4			8.452	214.7
		29.3–36	51B			8.608	218.6

⋄ When selecting a packer for a casing weight common to two weight ranges (same OD), choose the packer size shown for the lighter of the two weight ranges. Example: for 7-in. (177.8 mm) OD 26 lb/ft casing use packer size 47B4. Under certain circumstances the other packer size may be run, such as when running in mixed casing strings.

Repair kits, including such items as packing elements, seal rings, etc., are available for redressing Baker Hughes Retrievable Packers. Contact your Baker Hughes representative. Use only Baker Hughes repair parts.

HORNET Packer and HORNET EL Packer

Product Family Nos. H64682 and H64683

Application

The mechanically set **HORNET™ packer** offers ease of operation with quarter-turn right to set and release. Converting it for wireline-setting applications is simple and inexpensive. The HORNET packer provides for landing in compression, tension, or neutral positions. Every component from the jay track, to the internal bypass, to the packing-element system and the upper slip assembly has been developed to ensure the HORNET's setting and releasing reliability.

The **HORNET EL packer** is run and set on electric line using an **E-4™** (Product Family No. H43702) with a slow-set power charge or a **J™ setting tool** (Product Family No. H41371) and a special wireline adapter kit. An **L-10™ type on/off seal nipple** is run on top of the packer to connect the tubing to the packer and to house a blanking plug when the packer is used as a temporary bridge plug.

Advantages

Upper Slip Assembly:

- Thoroughly tested across API minimum to maximum casing ID tolerances for each specified casing weight, for setting and releasing reliability
- Slip-wicker configuration providing bidirectional-load support with solid upper cone to support highest tensile loads
- Staged-release action eliminates high-overpull requirement
- Minimal set-down weight required to anchor slips

Internal Bypass Seal:

- Durable bypass seal design provides sealing after unloading, under differential pressures
- No O-ring sealing system

Packing Element System:

- Fully tested to combined ratings at the API's maximum ID tolerance
- Patented enhancements to control overboost
- High-performance, three-piece element system

Lower Slip and Jay Assembly:

- Slips and drag blocks tested to maximum API tolerance ID for positive set and ease of release
- One-quarter-turn right setting and releasing action
- Packoff of packing elements with applied tension or compression
- Spacing in jay ensures opening of internal bypass, before slip releasing action begins–important to both ease of release and safety
- Automatically returns to running position

HORNET Packer Product Family No. H64682

HORNET EL Packer Product Family No. H64683

PACKER SYSTEMS

HORNET Packer and HORNET EL Packer

Specification Guide

Casing							Packer Size	Standard Thread Connection
OD		Weight	Min ID		Max ID		OD–ID	Box up x Pin Down
in.	mm		in.	mm	in.	mm		
4½	114.3	13.5–15.1	3.752	95.3	3.904	99.2	365–191	2.375 EU 8Rd
		11.6–13.5	3.853	97.9	4.069	103.4	375–191	
		9.5–10.5	3.996	101.5	4.154	105.5	388–191	
5	127.0	21.4–23.2	3.943	100.2	4.220	107.2	388–191	2.375 EU 8Rd
		15–18	4.195	106.6	4.486	113.9	410–191	
5½	139.7	20–23	4.578	116.3	4.868	123.6	450–193	2.375 EU 8Rd
							450–237	2.875 EU 8Rd
		17–20	4.696	119.3	4.976	126.4	460–193	2.375 EU 8Rd
							460–237	2.875 EU 8Rd
		14–17	4.819	122.4	5.090	129.3	472–193	2.375 EU 8Rd
							472–237	2.875 EU 8Rd
		13	4.980	126.5	5.122	130.1	486–193	2.375 EU 8Rd
5¾	146.1	19.5	4.980	126.5	5.122	130.1	486–237	2.875 EU 8Rd
6⅝	168.3	28–32	5.569	141.5	5.897	149.8	550–237	2.875 EU 8Rd
							550–292	3.500 EU 8Rd
		24–28	5.694	144.6	6.021	152.9	560–237	2.875 EU 8Rd
							560–292	3.500 EU 8Rd
		20–24	5.801	147.3	6.142	156.0	573–237	2.875 EU 8Rd
							573–292	3.500 EU 8Rd
7	177.8	35–38	5.801	147.3	6.142	156.0	573–237	2.875 EU 8Rd
		29–32	5.990	152.1	6.293	159.8	591–237	
							591–292	3.500 EU 8Rd
		23–29	6.174	156.8	6.466	164.2	600–237	2.875 EU 8Rd
							600–292	3.500 EU 8Rd
		17–23	6.239	158.5	6.570	166.9	618–237	2.875 EU 8Rd
7⅝	193.7	42.8–47.1	6.239	158.5	6.570	166.9	618–292	3.500 EU 8Rd
		33.7–39	6.510	165.4	6.882	174.8	645–237	2.875 EU 8Rd
								3.500 EU 8Rd
		26.4–29.7	6.781	172.2	7.129	181.1	670–237	2.875 EU 8Rd
								3.500 EU 8Rd

FH and FHL Hydrostatic-Set Single-String Packers

Product Family Nos. H78108 and H78120

Application

The **FH™ is the industry-standard, hydrostatic-set and shear-release single-string retrievable packer**. It can be used in the following applications: production, injection, and zonal isolation; single-string selective completions or dual-string completions with multiple packers; deviated wells or other applications when rotation for installation or removal is not beneficial; when it is beneficial to displace and set packers after the well is flanged up; when testing the tubing string before packer setting or to independently set and test individual packers in multiple-packer completions is beneficial.

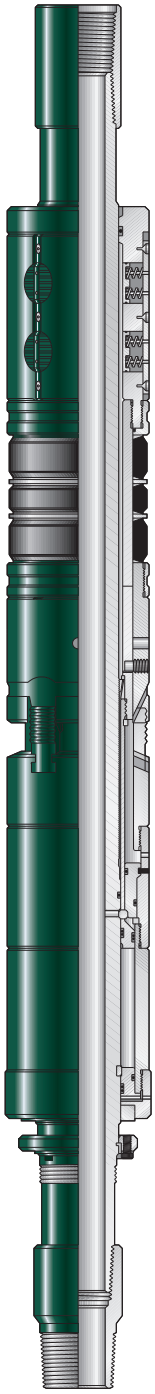
The FH packer is hydraulically activated by applying tubing pressure against a plugging device below the packer. The packer requires only straight pull to release. The **FHL™** is the large-bore version of the FH packer. Features,advantages and operational procedures are the same as those for the FH packers.

Accessories

A tubing-plugging device must be positioned below the packer for actuation: **E™ hydraulic-trip sub** (Product Family No. H79928); **CMU(D)™ sliding sleeve** (Product Family Nos. H81079 and H81080) with blanking plug; Baker Hughes flow-control seating nipple with blanking plug; Hydraulic-setting devices (Product Family Nos. H46921, H79928 and H75917)

Advantages

- Operationally simple
- Hydraulically activated, hydrostatic-set, low-pressure, rig-pump-capable activation
- Field-adjustable shear release
- Built-in unloader and bypass aids in releasing and retrieving
- Packoff is mechanically locked and constantly reinforced by hydrostatic pressure
- Triple-seal multi-durometer elements ensure pressure integrity over a wide range of temperatures and conforms easily to casing irregularities
- No mandrel movement during setting allows stacked-packer applications



FH and FHL Hydrostatic-Set
Single-String Retrievable Packer
Product Family Nos. H78108 and H78120

PACKER SYSTEMS

FH Hydrostatic-Set Single-String Retrievable Packer

Specification Guide

Casing			Packer			
OD		Weight ◆	Size	Nom ID		Max Gage Ring OD	
in.	mm	lb/ft		in.	mm	in.	mm
4½	114.3	9.5–13.5	43A	1.978	50.2	3.786	95.2
5	127.0	15–18	43B	1.978	50.2	4.140	105.2
		11.5–15	43C			4.255	108.3
5½	139.7	26	43C	1.978	50.2	4.255	108.3
		20–23	45A2			4.515	114.7
		15.5 –20	45A4			4.656	118.3
		13–15.5	45B			4.796	121.8
6	152.4	26	45B	1.978	50.2	4.796	121.8
		20–23	45C			5.078	129.0
		15–18	45D			5.171	131.3
6⅝	168.3	34	45E2	1.978	50.2	5.421	137.7
		28–32	45E4			5.499	139.7
		24–28	46A4	2.416	61.4	5.603	142.3
7	177.8	38	46A4	2.416	61.4	5.603	142.3
6⅝	168.3	24	47A2	2.416 or 2.000	61.4 or 50.8	5.671	144.0
		17–20	47A4			5.827	148.0
7	177.8	38	47A2	2.416 or 2.000	61.4 or 50.8	5.671	144.0
		32–35	47A4			5.827	148.0
		26–29	47B2			5.983	152.0
		20–26	47B4			6.093	154.8
		17–20	47C2			6.281	159.5
7⅝	193.7	33.7–39	47C4	2.416 or 2.000	61.4 or 50.8	6.468	164.3
		24–29.7	47D2			6.687	169.9
		20–24	47D4			6.827	173.4
8⅝	219.1	44–49	49A2	3.000, 2.416 or 2.000	46.2, 61.4 or 50.8	7.327	186.1
		32–40	49A4			7.546	191.7
		20–28	49B			7.796	198.0
9⅝	244.5	47–53.5	51A2	3.000, 2.416 or 2.000	46.2, 61.4 or 50.8	8.233	209.1
		40–47	51A4			8.452	214.7
		29.3–36	51B			8.608	218.6

FHL Hydrostatic-Set Single-String Retrievable Packer

Specification Guide

Casing			Packer				
OD		Weight ◆	Size	Nom ID		Max Gage Ring OD	
in.	mm	lb/ft		in.	mm	in.	mm
6⅝	168.3	24	47A2	3.000	76.2	5.671	144.0
		20	47A4			5.827	148.0
		17	47B2			5.983	152.0
7	177.8	38	47A2	3.000	76.2	5.671	144.0
		32–35	47A4			5.827	148.0
		26–29	47B2			5.983	152.0
		20–26	47B4			6.093	154.8
		17–20	47C2			6.281	159.5
7⅝	193.7	33.7–39	47C4	3.000	76.2	6.468	164.3
		24–29.7	47D2			6.687	169.9
		20–24	47D4			6.827	173.4
9⅝	244.5	47–53.5	51A2 x 4¾	4.750	120.7	8.233	209.1
			51A2	4.000	101.6		
		40–47	51A4			8.452	214.7
		29.3–36	51B			8.608	218.6

◆ When selecting a packer for a casing weight common to two weight ranges (same OD), choose the packer size shown for the lighter of the two weight ranges.

Example: for 7 in. (177.8 mm) 20 lb/ft casing use packer size 47C2. Under certain circumstances the other packer size may be run, such as when running in mixed-casing strings.

NOTE: Repair kits, including such items as packing elements, seal rings, etc., are available for redressing retrievable packers. Contact your Baker Hughes representative. Use only genuine Baker Hughes repair parts.

HS Hydraulic-Set Single-String Retrievable Packer

Product Family No. H78460

Application

The **HS™** is setting the standard for high-performance, single-string retrievable, hydraulic-set shear-release packers. Its simple and reliable design provides maximum pre-set prevention while running and has improved sealing and retrieving reliability, metallurgy and elastomer selections fit for the well environment. Other applications include: production, injection and zonal isolation; single-string selective completions or dual-string completions with multiple packers; completions that require pre-set prevention while running; deviated wells or other applications when rotation for installation or removal is not beneficial; when it is beneficial to displace and set packers after the well is flanged up. The **HS-S™** is beneficial when testing the tubing string before packer setting or to independently set and test individual packers in multiple-packer completions and stacked packer applications.

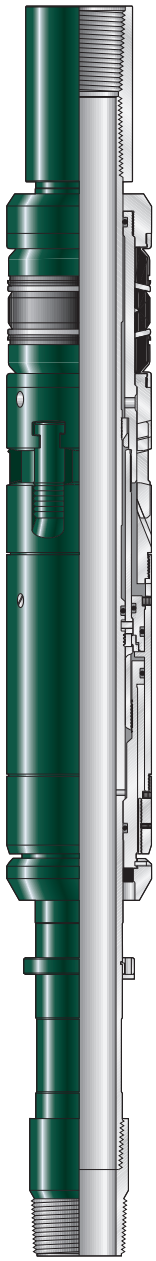
The HS-S is the selective-set version of the HS hydraulic-set single-string packer. Setting and retrieval is the same as the HS with the exception of an inner sleeve that must be shifted mechanically before the packer will set. The selective-setting mechanism prevents the packer from premature setting when high tubing-to-annulus pressure differences are encountered or when tubing- pressure tests are performed.

Accessories

A tubing-plugging device must be positioned below the packer for actuation: **E™ hydraulic-trip sub**; **CMD™ sliding sleeve** with blanking plug; flow-control seating nipple with blanking plug; hydraulic-setting devices.

Advantages

- Operationally simple
- Hydraulically set
- Shear release
- Built-in unloader and bypass, aids in releasing and retrieving
- Hydraulic interlocking system prevents preset
- Patented element system incorporates a “zero gap” backup system
- All O-rings tested during assembly of packer
- Bi-directional slips
- Short, compact design
- No mandrel movement during setting allows stacked-packer applications



HS Hydraulic-Set Single-String Retrievable Packer
Product Family No. H78460

PACKER SYSTEMS

HS Hydraulic-Set Packer

Specification Guide

Casing			Packer				
OD		Weight Range	Packer Size	Min ID		Gage OD	
in.	mm	lb/ft		in.	mm	in.	mm
5½	139.7	15.5–23	450–193	1.930	49.0	4.500	114.3
			450–237	2.373	60.3		
7	177.8	23–26	608–292	2.920	74.2	6.080	154.4
			608–237	2.373	60.3		
			608–193	1.930	49.0		
		26–29	598–292	2.920	74.2	5.980	150.1
			598–237	2.373	60.3		
			598–193	1.930	49.0		
		29–32	591–292	2.920	74.2	5.910	150.1
			591–237	2.373	60.3		
			591–193	1.930	49.0		
9⅝	244.5	40–53.5	831–193	1.930	49.0	8.310	211.1
			831–237	2.373	60.3		
			831–292	2.920	74.2		
			831–389	3.894	98.9		

NOTE: See packer rating envelopes.

HS-S Hydraulic-Set Packer

Specification Guide

Casing			Packer				
OD		Weight Range	Packer Size	Min ID		Gage OD	
in.	mm	lb/ft		in.	mm	in.	mm
7	177.8	23–26	608–281	2.813	71.5	6.080	154.4
			608–231	2.313	58.8		
		23–32	591–281	2.813	71.5	5.910	150.1
			591–231	2.313	58.8		
		26–29	598–292	2.920	74.2	5.910	150.1
			598–237	2.373	60.3		
			598–193	1.930	49.0		
		29–32	591–292	2.920	74.2	5.910	150.10
			591–237	2.373	60.3		
			591–193	1.930	49.0		

NOTE: See packer rating envelopes.

Granite No Downstroke, Hydraulic-Set Retainer Production Packer

Product Family No. H40934

Application

The **Granite™ series** is a hydraulic set retainer production packer that can be set with the applica tion of tubing pressure only. This Packer does not rely on the hydraulic stretch or boost of tubing or man drel movement to ensure that the packing element and slip system are sufficiently energized. The Packer can therefore be used in applications where packer body travel, from tubing expansion, is not possible or desirable.

The Granite packer features a tightly controlled initiation pressure and setting sequence. This feature makes the Granite Packer particularly suitable for Liner Top applications where the tubing boost cannot be utilized to pack off the element, as in conventional plugged tailpipe applications and the element system must be set from one side.

Advantages

- Two opposed sets of full circle, full strength slips ensure that the packer will stay where it is set
- Expandable metal backup rings contact the casing and create a positive barrier to packing element extrusion
- Setting requires no rotation or reciprocation, thereby eliminating the problems of spacing out, landing, etc
- All alloy materials within the packer are suitable for H_2S service
- All O-rings that separate casing and annulus pressure are supported by backup rings to improve long-term seal integrity and can be supplied to suit a particular environment
- Components in flow path can be furnished in customer's choice of materials
- Controlled initiation pressure and setting sequence allows packers to be set in tandem applications
- Can be run as a liner top packer, where downstroke during the setting sequence is severely restricted and tubing boost is consequently unavailable to assist in fully packing off the element and slips
- In tandem completions where packers are very close to each other (i.e., zone isolation purposes)

Granite No Downstroke, Hydraulic-Set Retainer Production Packer
Product Family No. H40934

Specification Guide

Casing							Packer				
OD		Weight	ID Range in which Packer may be Run				Size	OD		ID	
			Min		Max						
in.	mm	lb/ft	in.	mm	in.	mm		in.	mm	in.	mm
7	177.8	29–32	5.990	152.1	6.293	159.8	591–388	5.905	150.0	3.880	98.6
		35	5.892	149.7	6.123	155.5	560–326	5.600	142.2	3.260	82.8
9⅝	244.5	47–53.5	8.405	213.5	8.822	224.1	831–600	8.305	211.0	6.000	152.4
							812–475	8.125	206.4	4.750	120.6
10¾	273.05	60.7–65.7	9.470	240.54	9.819	249.40	934–600	9.340	237.3	6.000	152.40

Bastille Removeable Production Packer

Product Family No. H78482

Application

The **Bastille™ packer** is a hydraulic-set cut to-release removable production packer for **Ultra™ high-pressure/high temperature (HP/HT) applications**.

The Bastille packer is based upon the **Premier™ packer series** with the added benefit of being able to retrieve from the wellbore after encountering extreme performance parameters up to of 20,000 psi (1,379.0 bar) and 450°F (232.2°C). The geometry and performance envelope of the packer have been optimized to overcome the challenges of providing a safe, reliable, and retrievable production packer for deep-water Ultra HP/HT completions .

The Bastille packer utilizes the field-proven 3-piece packing element system from the Premier packer series, **FLEX-LOCK™ bi-directional slips** from Baker Hughes liner hanger series, the slip saver collet release mechanism from the **MAX™ packer**, and the slip saver segments from the HP/HT **Edge™ packer** to provide added performance and reliability.

The packer is hydraulically set by temporarily plugging the tailpipe, then applying tubing pressure. The packer and tailpipe are retrieved from the well on the production tubing by mechanically or chemically cutting the packer mandrel.

The Bastille packer is designed and tested to meet the industry's rigorous 1S0 14310:2008/API 11D1 3rd Edition V0 validation grade and Equinor TR 2385.

Advantages

- Cut-to-release design allows one-trip retrieval on tubing regardless of packer-to-tubing connection chosen
- No body movement during setting provides the same easy setting procedure for single- or multiple-packer completions
- Debris barrier protects slips from deposits/debris
- Slip-element-slip arrangement reduces stresses for efficient performance
- Double-grip FLEX-LOCK slips are field-proven technology that hold high loads, can accept axial loads both directions and have large contact ares to reduce stress on casing
- Slip saver segments and slip mechanism relieves trapped load from upper slips and rubber pressure in packing element system to aid in retrievability
- Patented, field-proven, zero extrusion backup system ensures reliable performance
- Performance rated to ISO14310: 2008/API 11D1 3rd Edition V0 results in a packer qualified for gas-tight performance
- Piston below elements gives ultimate well protection

Bastille Removeable Production Packer
Product Family No. H78482

Premier Production Packer with Feed Through Cut Release

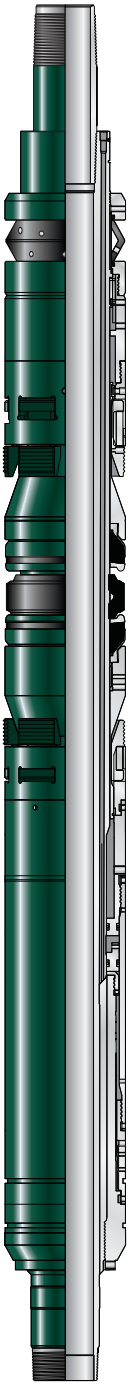
Product Family Nos. H78466, H78469, H78473 and H78474

Application

The Baker Hughes **Feed Through Premier™ Packer** is a development of the field proven Premier Packer. The Feed Through Premier Packer combines the performance and reliability of the original Premier Packer but with the addition of feed through capabilities. With the Slip-Element-Slip arrangement the Premier provides the sealing performance of a permanent packer with the 'ease of removal' of a retrievable packer. The Packer has been designed to ensure full packing element pack-off without the need for movement of the packer body. This approach ensures the tools performance when packer is set as part of either a multi-packer completion or standard completion. Packer can be supplied with different feed through options to suit all customer operating requirements. Connection of hydraulic Control Line, TEC as well as fiber optic lines can be performed at rig side. Packer design is available in two different release options, Shift-to-Release as well as cut-to-release by mechanical or chemically cutting of the packer mandrel in a specific location.

Advantages

- No body movement during setting– same easy setting procedure for single or multiple packer completions
- The slip-element-slip configuration reduces casing stresses for efficient packer performance
- Patented, field proven, zero extrusion gap retrievable packing element system
- Performance rated to V-0 in accordance with ISO specification 14310
- Control Line connections to the packer mandrel can be externally pressure tested
- Setting piston below elements for ultimate well protection
- Retrieval on production tubing by through-tubing chemical or mechanical cut, shift-to-release or shear release
- Packer can be furnished with different feed through options to suit TEC line, control line, etc. meeting all customer operating conditions



Premier Production Packer with Feed Through Cut Release
Product Family No. H78469

PACKER SYSTEMS

Premier Production Packer with Feed Through Cut Release

Specification Guide

Casing							Packer					
OD		Weight Range	Min ID		Max ID		Size	Max OD		Min ID		Temperature Range	
In.	mm	lb/ft	In.	mm	In.	mm		In.	mm	In.	mm	F	C
7	177.8	26.0-29	6.184	157.100	6.276	159.400	598-287	5.983	152.000	2.895	73.5	100-275	38-135
		29.0	6.184	157.100	6.184	157.100	598-293			2.930	74.4	100-350	38-176
7⅝	193.7	47.1	6.375	161.900	6.375	161.900	618-287	6.180	157.000	2.870	72.9	40-300	5-148
		51.2	6.251	158.800	6.251	158.800	598-287	5.985	152.000	2.875	73.0	40-275	5-135
9⅝	244.5	40-47	8.681	220.500	8.835	224.400	845-387	8.450	214.600	3.875	98.4	150-350	66-176
		47.0	8.681	220.500	8.681	220.500	831-375	8.310	211.100	3.750	95.3	70-300	22-148
		47.0-53.5	8.535	216.800	8.681	220.500	831-375						
					8.681	220.500	831-475			4.750	120.7	100-325	38-162
10¾	273.0	60.7	9.660	245.400	9.660	245.400	934-466	9.340	237.200	4.650	118.1	40-275	5-135
		60.7-65.7	9.560	242.800	9.660	245.400	934-468			4.680	118.9	150-350	66-176
11⅞	298.5	71.8	10.586	268.900	10.586	268.900	1055-375	10.550	268.000	3.750	95.3	40-200	34090

Premier Removable Production Packer

Product Family Nos. H78463, H78467 and H78468

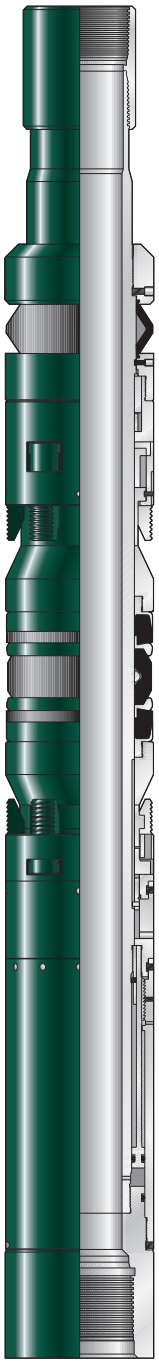
Application

The **Premier™ packer** is a hydraulic-set, large-bore, removable production packer. It combines the performance of a permanent packer with the conveniences of a retrievable packer. The Premier is ideally suited for big-bore completions and multizone stacked-packer completions. Its retrieving options offer new alternatives in high intervention cost applications.

The Premier can be threaded directly to the production string or connected with an anchor-seal assembly. One-trip setting is accomplished by pressuring up against a plugging device below the packer. Retrieval on the production string is accomplished by cutting the mandrel with a chemical or mechanical cutting tool. Shift-to-release and shear-release options are available for medium-service applications.

Advantages

- Slip-element-slip design isolates element from boost loads
- Large ID is similar to large-bore permanent packers
- Proven high performance, tested to ISO 14310 VO requirement
- Retrieval on production tubing by through-tubing chemical or mechanical cut, shift-to-release or shear release
- Retrieval on workstring by retrieving tool or milling tool
- The patented field proven zero-extrusion back up system is designed for ease of removal
- Positive debris barrier, protects slips from deposits and debris for ensured retrieval
- Multiple setting options, configurable for traditional or interventionless setting
- No body movement during setting; ideal for single- or multiple-packer completions
- Modular design suited for threaded connections or upper sealbore
- Optional low-pressure setting in certain sizes



Premier Removable Production Packer
Product Family No. H78463

Specification Guide

Casing			Packer							
OD		Weight	Size	Max OD		Optional Upper Sealbore ⋄		Min ID		Elastomers
in.	mm	lb/ft		in.	mm	in.	mm	in.	mm	
5½ •	139.7	20–23	450-(36x)239	4.500	114.3	3.625	92.1	2.390	60.7	Aflas™
7	177.8	32–35	582-(47x)387	5.820	147.8	4.750	120.7	3.875	98.4	HNBR, Nitrile and Aflas
			582-(47x)376					3.760	95.5	
			582-(36x)287			3.625	92.1	2.870	72.9	
		29–32	591-(47x)387	5.910	150.1	4.750	120.7	3.875	98.4	
			591-(47x)376					3.760	95.5	
			591-(36x)287			3.625	92.1	2.870	72.9	
		26–29	598-(47x)387	5.983	152.0	4.750	120.7	3.875	98.4	
			598-(47x)376					3.760	95.5	
			598-(36x)287			3.625	92.1	2.870	72.9	
7⅝	193.6	33.7–39	645-(47x)387	6.450	163.8	4.750	120.7	3.875	98.4	HNBR, Nitrile and Aflas
			645-(47x)376					3.760	95.5	
		29.7–33.7	659-(47x)387	6.590	167.4			3.875	98.4	
			659-(47x)376					3.760	95.5	
9⅝	244.5	47–53.5	831-(60x)490	8.310	211.1	6.000	155.8	4.900	124.5	HNBR, Nitrile and Aflas
			831-(60x)475					4.750	120.7	
			831-(47x)387			4.750	120.7	3.875	98.4	
		40–47	845-(60x)490	8.450	214.6	6.000	155.8	4.900	124.5	
			845-(60x)475					4.750	120.7	
			845-(47x)387			4.750	120.7	3.875	98.4	
10¾	273.1	60.7–65.7	934-(73x)600	9.345	237.3	7.375	187.3	6.000	155.8	HNBR, Nitrile and Aflas
			934-(60x)475			6.000	155.8	4.750	120.7	
13⅜	339.7	68	1209x850	12.090	307.1	10.183	258.6	8.500	215.9	Nitrile
		72								
13⅝	338.5	88	1209x850	12.090	307.1	10.183	258.6	8.500	215.9	Nitrile

⋄ When upper sealbore is used, the packer can be retrieved on the workstring using the Premier workstring retrieving tool (POWER), Product Family No. H78464. • 5½ is V3 rated.

Premier Removable Production Packer with Striker

Product Family Nos. H78465, H78474, H78477, H78493 and H78494

Application

The **Premier™ packer with Striker™ interventionless packer setting system** is a proven product for interventionless actuation of the Premier packer. It is the new class of "removable" packers designed for wells that demand the sealing performance of a permanent packer and the flexible workover options of a traditional retrievable packer. Because the Premier can be remotely actuated, rig time/cost is reduced and risks associated with standard well intervention setting methods, are minimized. This results in a cost-savings benefit for the operator.

Accessories

The Striker system is a device that generates packer setting force from hydrostatic well pressure. As a secondary or contingent setting method, it can also be set by hydraulic pressure. The Striker modular design is a derivation of the innovative and successful **SB-3H™ hydrostatic/ hydraulic retainer production packer**. It can be removed on the production string by cutting the mandrel with a chemical or mechanical cutting tool. The Premier system offers unique high-performance and multiple-removal options for high-cost intervention completions.

Advantages

- Slip-element-slip grips slips isolated from high pressure
- Large IDs similar to large-bore permanent packer
- High performance, tested to ISO 14310 VO requirement
- Multiple removal on production tubing, through-tubing chemical or mechanical cut
- The patented field proven zero-extrusion back up system is designed for ease of removal
- Positive debris barrier protects slips from deposits and debris for ensured retrieval
- No body movement during setting, ideal for single–or multiple-packer completions
- Modular design; packer suited for threaded connections or upper sealbore
- Interventionless actuation eliminates wireline, slick-line, and coiled-tubing interventions and associated risk
- Proven actuation systems; primary and fully-independent secondary setting mechanisms
- Retrieval on production tubing by through-tubing chemical or mechanical cut, shift-to-release or shear release
- Packer can be furnished with different feed through options to suit TEC line, control line, etc. meeting all customer operating conditions

Premier Removable Production Packer with Striker Product Family No. H78465

Specification Guide

OD		Weight	Size	Max OD		Min ID	
in.	mm	lb/ft		in.	mm	in.	mm
7	177.8	38	561-287	5.61	142.5	2.875	73.0
7⅝	200.0	47.1	618-371	6.18	157.0	3.71	94.2
7⅝	200.0	29.7-33.7	659-356	6.59	167.4	3.565	90.6
		39	645-356	6.45	163.8		
7¾	196.6	46.1					
9⅝	244.0	47-53.5	831-460/463	8.31	211.1	4.6	116.8
9⅞	251.0	62.8	831-387			3.88	117.6
10¾	273.0	60.7	934-475	9.34	237.2	4.75	120.7
		65.7	934-588			5.88	149.4

Premier NXT Removable Production Packer

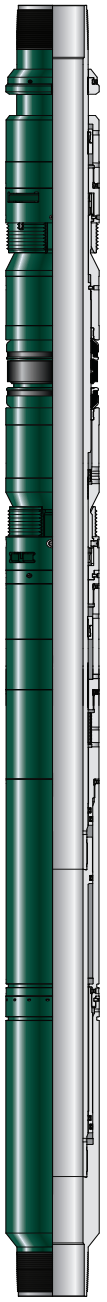
Product Family No. H78459

Application

The **Premier™ NXT™ packer** is a removable packer based on Premier packer technology. It delivers many of the advantages found in the industry recognized Premier packer at a highly competitive price. The hydraulic-set Premier NXT removable production packer combines the performance and reliability of the S series retainer production packers with the retrievability of the Reliant series packers. With appropriate completions design, this large bore packer and its tail pipe assembly are retrieved from the well on the production tubing by mechanically cutting the packer mandrel. The Premier NXT packer is supplied with premium threads up and down in pin x pin configuration, which allows threading the packer directly to the tubing. The Premier NXT is designed and tested to meet the industry's rigorous ISO14310:2008/API 11D1 3rd Edition V0 validation grade.

Advantages

- Cut-to-release design allows one-trip retrieval on tubing regardless of packer-to-tubing connection chosen
- No body movement during setting provides the same easy setting procedure for single- or multiple-packer completions
- Available Aptum™ packing element is chemically resistant in high pH fluids, and resists swell in oil-based fluids
- Slip-element-slip arrangement reduces packer stresses for efficient performance
- Patented, field-proven, zero extrusion backup system ensures reliable performance
- Performance rated to ISO14310: 2008/API 11D1 3rd Edition V0 results in a packer qualified for gas-tight performance
- Piston below elements gives ultimate well protection



Premier NXT Removable Production Packer
Product Family No. H78459

Specification Guide

Tool OD		ID Range		Weight	Size	Min. ID		Max OD		Temp Range		Seal Diameter	
in.	mm	in.	mm	lb/ft		in.	mm	in.	mm	°C	°F	in.	mm
7	177.8	5.990-6.381	152.1-162.1	26-32	593-387	3.875	98.4	5.930	150.6	100-350	38-176	4.500	114.3
										40-350	5-176		
9⅝	244.5	8.405-8.822	213.5-224.1	47-53.5	831-379	3.793	96.3	8.310	211.1	200-400	93-204	4.500	114.3
					831-387	3.875	98.4						

Premier Extreme Performance Production Packer

Product Family Nos. H78491, H78494 and H78495

Application

The **Premier™ packer** is a new class of removable packers for wells that demand the sealing performance of a permanent packer and the flexible workover options of a traditional retrievable packer. The tool is a hybrid hydrostatic and hydraulic packer with the features and advantages of both designs. The tool has a primary setting mechanism actuated by absolute well pressure,so it may be set without running a plug or packer setting tool. The secondary setting mechanism is the standard hydraulic method of running a plug in the packer tailpipe and pressurizing the tubing.

The Premier packer with Striker has been developed for markets where remote actuation of the production packer within a completion brings added benefit and cost savings to the customer. This savings can be achieved by reducing rig and packer setting time and minimizing the risk associated with standard well intervention setting methods. It also reduces the need for additional well services. In addition to the cost savings, the Premier packer with Striker and its tailpipe assembly are removed from the well on the production tubing by mechanically or e-line cutting the packer mandrel.

The Premier packer with **Striker™** comes in two basic configurations: 1) Premium thread,box x pin, or 2) Left-hand square thread with sealbore x premium pin. The first configuration allows threading the packer directly to the tubing, while the second configuration provides workover flexibility so the tubing can be disconnected via an anchor type seal assembly from the upper sealbore of the packer. With the appropriate completion design, either configuration can be removed on the production tubing using a specialized Baker Hughes chemical cutter. Alternatively the second configuration can be removed on the work string using a Premier workover string retrieving tool (**POWER™**).

Advantages

- Retrieval on production tubing by through-tubing chemical or mechanical cut or shift-to-release
- No body movement during setting provides the same easy setting procedure for single- or multiple-packer completions
- Slips below the packing element let the upper element protect the slips from deposits/debris
- Low setting pressure provides operational flexibility in under balanced completions
- Modular design has the packer configurable for threaded or upper sealbore connection
- Interventionless actuation by absolute pressure, no running tools are required. Application of pressure to burst a rupture disk will set the tool. No additional equipment is required
- In the event the primary method is unsuccessful, the packer may be set as per a hydraulic packer. This mechanism is totally independent of the hydrostatic chambers
- Patented, field-proven, zero extrusion gap retrievable packing element system enhances seal performance and achieves ISO14310/API 11D1 Grade V0 rating, eliminating swabbing during retrieval
- Simple, robust **Reliant series** design uses proven technologies from Reliant series M mechanical set retrievable packer with WL wireline set retrievable packer
- Slip-element-slip reduces triaxial stresses for efficient performance
- Setting piston below elements gives ultimate well protection
- No plug required in tubing for actuation, so no costly wireline or coil tubing runs, or associated risks, are necessary

Premier Extreme Performance Production Packer
Product Family No. H78494

Specification Guide

Tool OD		Weight Range	Size	Max OD		Min ID	
in.	mm	lb/ft		in.	mm	in.	mm
7	177.8	41	561-270	5.610	142.5	2.700	68.58
9.875	250.8	66.4	831-434	8.310	211.1	4.340	110.2
10	254	68.7	831-446			4.460	113.3

Premier Workstring Retrieving Tool

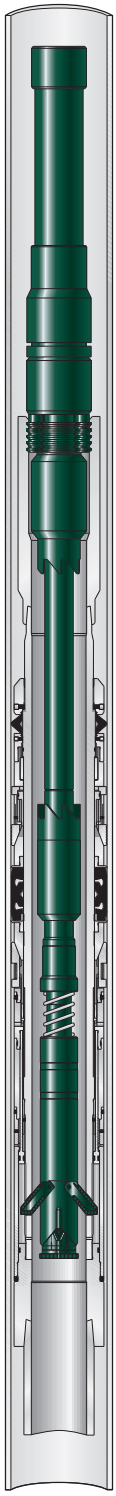
Product Family No. H78464

Application

The **Premier™ workstring retrieving tool (POWER tool)** is designed for a one-trip removal of a Premier packer on a workstring. The POWER tool combines the field-proven components of a S-1 retrieving tool and the DB underreamer run in on a work string consisting of jars, drill collars, or- if rotation of the pipe is not possible- with a downhole motor.

Advantages

- High-tensile strength throughout the retrieving tool enables removal of the packer and long lengths of tailpipe below the packer
- Suitable for use with mud motor; in applications with upper extended-length polished-bore receptical, the POWER tool can be adjusted with spacer subs and mud motor to allow retrieval of the entire completion assembly
- Clutch mechanism allows emergency disengagement of POWER tool with tension and right-hand rotation
- Customized design; bearing below top sub allows underreamer to rotate and cut-packer mandrel



POWER Tool Premier Workstring Retrieving Tool
Product Family No. H78464

PACKER SYSTEMS

Premier Workstring Retrieving Tool

Specification Guide

Casing			Packer							POWER
OD		Weight	Size	Max OD		Upper Sealbore		Min ID		Size
in.	mm	lb/ft		in.	mm	in.	mm	in.	mm	
5½	139.7	20–23	450-(36x)239	4.500	114.3	3.625	92.1	2.390	60.7	450-36x239
7	177.8	32–35	582-(47x)387	5.820	147.8	4.750	120.7	3.875	98.4	582/591/598-47x387/376
			582-(47x)376					3.760	95.5	
			582-(36x)287			3.625	92.1	2.870	72.9	582/591/598-36x287
		29–32	591-(47x)387	5.910	150.1	4.750	120.7	3.875	98.4	582/591/598-47x387/376
			591-(47x)376					3.760	95.5	
			591-(36x)287			3.625	92.1	2.870	72.9	582/591/598-36x287
		26–29	598-(47x)387	5.983	152.0	4.750	120.7	3.875	98.4	582/591/598-47x387/376
			598-(47x)376					3.760	95.5	
			598-(36x)287			3.625	92.1	2.870	72.9	582/591/598-36x287
7⅝	193.6	33.7–39	645-(47x)387	6.450	163.8	4.750	120.7	3.875	98.4	645-47x387/376
			645-(47x)376					3.760	95.5	
		29.7–33.7	659-(47x)387	6.590	167.4			3.875	98.4	659-47x387/376
			659-(47x)376					3.760	95.5	
9⅝	244.5	47–53.5	831-(60x)490	8.310	221.1	6.000	155.8	4.900	124.5	831/845-60x490
			831-(60x)475					4.750	120.7	831/845-60x475
			831-(47x)387			4.750	120.7	3.875	98.4	831/845-47x387
		40–47	845-(60x)490	8.450	214.6	6.000	155.8	4.900	124.5	831/845-60x490
			845-(60x)475					4.750	120.7	831/845-60x475
			845-(47x)387			4.750	120.7	3.875	98.4	831/845-47x387

Premier packer must be equipped with upper sealbore for POWER tool to latch into.

Octopus Multi-String Hydraulic Retrievable Packer

Product Family No. H78580

Application

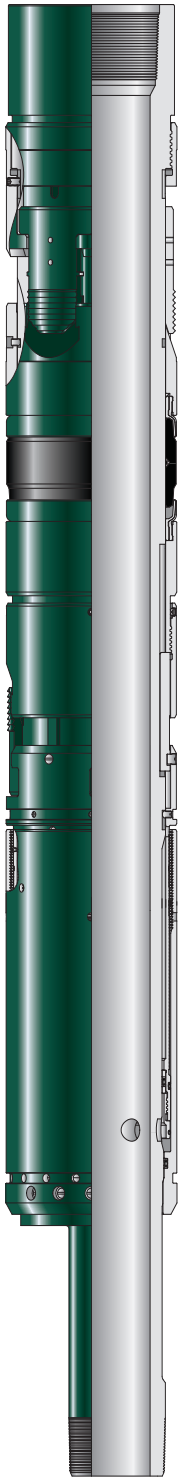
The **Octopus™ hydraulic set, shear release packer** is designed to facilitate the use of an electrical submersible pump (ESP), multiple production strings, and/or control line feedthroughs by allowing for multiple offset bores through the packer. The packer is set by applying pressure to the primary string.

The Octopus is designed with slips on each side of the packing element which allows for higher pressure ratings and larger bore sizes through the packer. The packer uses **Premier™ packer** style threaded backup rings to prevent extrusion of the packing element. The packer is hydraulically set by temporarily plugging the production string below the packer, then applying tubing pressure. The packer can set and perform even in applications where body movement is restricted. The packer is retrieved by pulling tension on the tubing to shear screws.

The Octopus packer is designed and tested to meet the industry's rigorous ISO 14310:2008/API 11D1 3rd Edition V3 validation grade.

Advantages

- Innovative design allows higher pressure differential and larger bore sizes and is cost effective
- Proven slip-element-slip uses patented metal backup system for optimum differential performance
- Power feedthrough capabilities accepts industry standard electrical penetrators
- No relative movement between the tubing and electrical cable eliminates strain or damage to the cable during setting and retrieval
- Simple hydraulic set and retrieving operation are mechanically locked in place. Retrieved with straight pull release
- Shear release value adjustable without disassembly force to shear release is easily adjustable to meet a wide range of applications
- API/ISO tested fully to ISO 14310:2008/ API 11D1 3rdEdition V3 validation grade
- HNBR packing element and o-rings seals in a wide array of environmental conditions
- Flow-wetted components can be manufactured to meet a wide range of requirements



Octopus Multi-String
Hydraulic Retrievable Packer
Product Family No. H78580

PACKER SYSTEMS

Octopus Multi-String Hydraulic Retrievable Packer

Specification Guide

Casing							Packer								
OD		Weight	Min ID		Max ID		Size	Max OD		Min OD		Seal Dia.		Temp Range	
in.	mm	lb/ft	in.	mm	in.	mm		in.	mm	in.	mm	in.	mm	°F	°C
7	177.8	26-32	5.990	152.1	6.381	162.1	593-237	5.983	150.8	2.375	60.3	2.875	73.0	100-300	37.8-148.9
9⅝	244.5	47-53.5	8.405	213.5	8.822	224	835-295	8.350	212	2.953	74.9			100-300	38-148
							835-385			3.858	98				
							835-390			3.903	99.1				
							835-394			3.940	100				
		43.5-47	8.562	217.5	8.900*	226.1	845-390	8.450	214.6	3.900	99.1	4.500	114.3	150-250	65.6-121.1
							845-295			2.950	74.9	3.500	88.9		
							845-394			3.943	100.2	4.500	114.3		
							845-388			3.883	98.6				
		40-47					845-390			3.900	99.1				
							845-295			2.950	74.9	3.500	88.9		
							845-394			3.943	100.2	4.500	114.3		
							845-388			3.883	98.6				

* The packer is not validated in the maximum casing ID for 9⅝, 40 lb/ft casing which is 8.968 in.

GT Dual-String Retrievable Packer

Product Family Nos. H78509 and H78510

Application

The **GT™** is the standard for high-performance, dual-string, retrievable, hydraulic-set and shear-release packers. It offers maximum pre-set prevention while running and has improved sealing and retrieving reliability and the utmost flexibility in custom applications. The simple and reliable design incorporates a versatile packing element system that is ideally suited for high-pressure gas wells.

The **GT-S™** is the selective-set version of the GT. Setting and retrieval is the same as the GT with the exception of an inner sleeve that must be shifted before the packer will set. The selective-set optional module prevents the packer from premature setting when high tubing-to-annulus pressure differentials are encountered or when tubing-pressure tests are performed.

Additional GT Applications

- Production, injection, and zonal isolation
- As an upper packer when the bottom packer is a single-bore packer or as the upper or intermediate packer in tandem or selective-tandem dual completions
- Horizontal, extended-reach, or other completions when maximum pre-set prevention while running is preferred
- Deviated wells or other applications when no rotation for installation or removal is wanted
- When there is a need to displace and set the packers after the well is flanged up
- With selective-set versions, applications when it is preferable to test the tubing string before packer setting or to independently set and test individual packers in multiple-packer completions

Accessories

Parallel head with snap latch or anchor latch seal assembly, Product Family Nos. H70032, H70703 and H70711; selective head and seal nipple, Product Family Nos. H78351 and H70373

To facilitate making tubing connections and to aid with space-out: adjustable and telescoping subs, Product Family Nos. H44120 and H44125

Advantages

- Operationally simple; install and retrieve multiple packers on the production string without tubing manipulation or well intervention
- Hydraulically set
- Shear release allows packer to be released by simply pulling on either tubing string
- Built-in bypass aids in releasing and retrieving
- Hydraulic interlocking system prevents preset, all components are mechanically locked to mandrel during run-in
- Reliable performance; defined by performance envelopes which graphically describe simultaneous effects of load and pressure
- Patented element system incorporates a “zero gap” backup system
- Superior O-ring and backup design allow testing of all O-rings during assembly of packer
- Bi-directional slip eliminates extra leak paths associated with hydraulic hold-down buttons
- Unique arrangement of shear rings improves retrieving reliability and flexibility
- Short, compact design
- No mandrel movement during setting allows stacked-packer applications
- Selective setting achieved by adding a selective setting module with minimal effort

GT Dual-String Retrievable Packer
Product Family No. H78509

GT Hydraulic-Set Dual-String Packer

Specification Guide

Casing			Packer					
OD		Weight Range	Packer Size	Non-Ported		Ported		Max Gage OD	
in.	mm	lb/ft		in.	mm	in.	mm	in.	mm
7	177.8	26–32	47C2	1.939	49.3	1.939	49.3	5.937	150.8
		20–26	47C4					6.120	155.4
7⅝	193.7	33.7–39	47D2	1.939	49.3	1.939	49.3	6.470	164.3
		26.4–33.7	47D4					6.625	168.3
9⅝	244.5	47–53.5	51A	2.939	74.7	2.939	74.7	8.350	212.1
		40–47	51B					8.500	215.9

Parallel Head

Product Family No. H70032

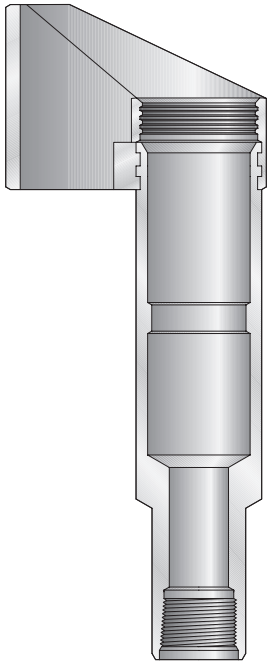
Application

The Baker Hughes **parallel head assembly** for the GT dual-string packer comprises a scoophead, sealbore receptacle, and other components needed to modify the standard pin x-pin packer into a short-or long-string set configuration. This module allows independent running of the short string above the packer. This module may also be recommended when retrieval of the short string, without releasing the packer, is necessary during the life of the completion.

GT with Parallel Head

Specification Guide

Packer Size	Min Bore Thru Seal Nipple	
in.	in.	mm
47C2 2⅜ x 2.68	1.968	50.0
47C4 2⅜ x 2.68	1.968	50.0
47D2 2⅜ x 2.68	1.968	50.0
47D4 2⅜ x 2.68	1.968	50.0
51A 3½ x 3.25	2.375	60.3
51A 3½ x 3.75	3.000	76.2
51B 3½ x 3.25	2.375	60.3
51B 3½ x 3.75	3.000	76.2



Parallel Head
Product Family No. H70032

Premium ElecPaK Electrical Submersible Pump Hydraulic Retrievable Pump Packer

Product Family No. H78575

Application

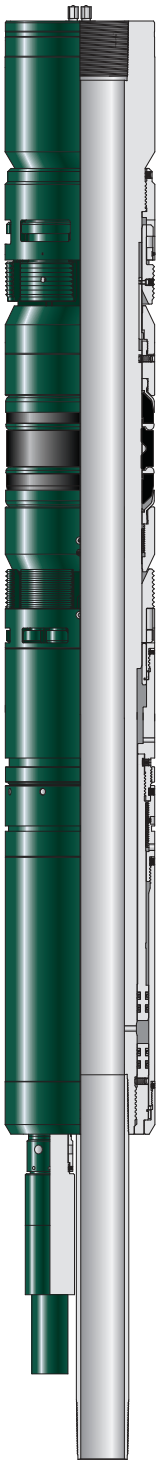
The **Premium ElecPaK™ electrical submersible pump (ESP) hydraulic retrievable pump packer** is a single string hydraulic set packer with twin electrical cable bypass and two control line feedthroughs.

The packer is set with tubing pressure against a plug below it and can hold pressure from both above and below. The packer is released by cutting the lower mandrel. The Premi um ElecPaK ESP packer comes with a premium connection top and bottom for connection into the main tubing string. It also has two control line feed through ports.

It is specifically designed to provide electrical feed through to electrical submersible pumps positioned below the pack er. It achieves this via two electrical cable bypass ports through the main body.

Advantages

- Field-proven pack-off system is a three-piece element system with integral metal backup system to conform to irregular casing profiles. Provides a ISO 14310 VO rating
- The cut-to-release design of the tool is simplified by being only cut-to-release
- No body movement during setting procedure for single or multiple packer completions and eliminates cable strain
- Single setting piston mechanism reduces potential leak paths
- Solid mandrel construction enables simple, reliable packing element, setting piston and slip system to be utilized
- Two cable bypass ports are suitable for two bottom feed testable adjustable penetrators to permit cable spacing when running in
- Antivibration control line fittings helps dampen vibration before it reaches the metal sealing point on the control line



Premium ElecPaK ESP Hydraulic Retrievable Pump Packer
Product Family No. H78575

PACKER SYSTEMS

Premium ElecPaK Electrical Submersible PumpHydraulic Retrievable Pump Packer

Specification Guide

Casing							Packer						
OD		Weight Range	Min. ID		Max. ID		Size	Min. ID		Max. ID		Temperature Range	
in.	mm	lb/ft	in.	mm	in.	mm		in.	mm	in.	mm	°F	°C
9⅝	244.5	47-53.5	8.681	220.5	8.535	216.8	831-241	8.31	211.1	2.413	61.3	100-300	38-148
							831-289			2.89	73.4		
10¾	173	60.7-65.7	9.66	245.4	9.56	242.8	934-385	9.34	237.2	3.875	98.4	40-260	5-126
		65.7	9.56	242.8			934-332	9.345	237.4	3.317	84.3	50-255	40-123
13⅜	399.7	72	12.347	313.6	12.647	313.6	1209-458	12.09	307.1	4.587	116.5	40-250	5-121

Mudline Tubing Hanger

Product Family No. H79101

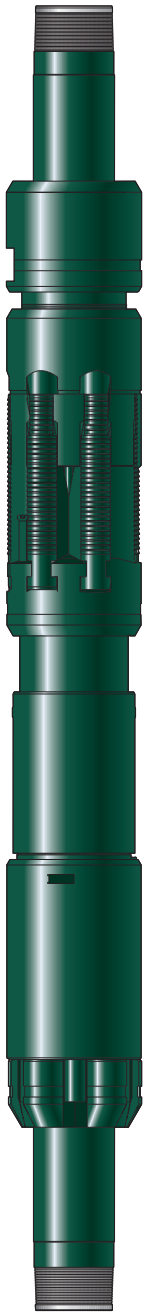
Application

The Baker Hughes **mudline tubing hanger (MLTH)** is used to manage riser/vessel loading for offshore completions. It is designed to handle the extremely high-tensile loads that unsupported casing is subjected to when used in deepwater completions, on tension leg platforms.

The MLTH is set with control line and incorporates a special multi-use re-setting feature, which allows the MLTH to be repositioned in order to improve tubing space-out. Once the correct setting location has been achieved, a final pressure application to a higher, pre-determined value will lock the MLTH into the set position. If ordered with a burst-disc option, further pressure increase will burst the disc, permitting well displacement above the MLTH.

Advantages

- Easily set with control line
- Multi-use resetting feature
- Shear released/cut-to-release
- Extremely high tubing tension capabilities
- Fluid displacement feature available
- Multiple control line bypass capability for chemical injection, TEC and/or SCSSV control lines
- Slip design for symmetrical loading of unsupported casing
- Control-line bypass between slips; no feed-throughs or splices necessary



Mudline Tubing Hanger
Product Family No. H79101

Specification Guide

Casing OD		Casing Weight	Size	Max Gage Ring OD		Min ID through L.S. Body		Max Hanging Weight ⋄		Max Casing Pressure	
in.	mm	lb/ft		in.	mm	in.	mm	lb	kg	psi	bar
7	177.8	32–38	47A	5.695	144.6	2.912	73.9	300,000	136.000	8,000	550
7⅝	193.6	29.7–39	47D	6.400	162.5	2.912	73.9	250,000	113.000	8,000	550
8⅝	219.0	40–44	49A	7.300	185.0	3.853	98.0	130,000	58.900	8,000	550
9⅝	244.0	47–53	51A	8.38	213.0	3.680	93.0	300,000	136.000	5,000	345
9⅞	251.0	62.8	51A	8.38	213.0	3.680	93.0	350,000	158.700	8,000	550
10¾	273.0	60.7	53	9.400	238.7	4.578	116.3	500,000	226.000	8,000	550

⋄ Maximum hanging weight is dependent upon casing grade, weight and casing pressure

FLX Packoff Tubing Hanger

Product Family Nos. H79085, H79086 and H79088

Application

The Baker Hughes **FLX™ Packoff tubing hanger (POTH)** with multiple feedthrough penetrations is a double-grip retrievable packer designed to anchor the tubing string in the casing at a point below the wellhead. The FLX POTH seals the area between the casing ID and tubing OD. The FLX can withstand considerable tensile or compressive loads from above and below and thus can be used in a variety of completions where a second controllable annular barrier is required.

The bi-directional slip design used in the FLX POTH has been thoroughly field-proven on **FLEX-LOCK™ liner hanger systems** and features large, evenly spaced casing contact for use in unsupported production casing. These features minimize casing stress levels and allow the hanger to support high combined axial and hydraulic loads. Custom features may be incorporated to satisfy specific requirements, such as: one- or two-trip set, annulus or tubing set, multiple **i-Wire™ bypass**, chemical injection line bypass, top end workover facility, concentric or poppet annular safety valve and dual-bore capability.

Baker Hughes has developed a comprehensive subsurface annulus safety system (SASS) capable of acting as a secondary subsurface wellhead. The SASS shuts in the annulus and tubing flow should a disaster at the surface result in loss of the wellhead. Commonly, the SASS comprises of a packoff tubing hanger, annulus safety valve, tubing safety valve, concentric tubing anchor and calibrated tensile safety joint. Contact your local Baker Hughes representative for sizes and performance ratings.

Advantages

- Field-proven element and slips
- Offers redundant wellhead or annulus protection system capability
- High-tubing tension capability
- No body movement
- Multiple feed-through for chemical injection, TEC, and control lines
- Suitable for multiple thermal cycles
- Available in single and dual bore
- Fitted with up to eight internally and externally tested feed-through fittings
- Available in 9⅝ in. (244.5-mm) and 10¾ in. (273.1-mm) sizes
- High-pressure versions available
- Contingency retrieval methods available

FLX Packoff Tubing Hanger
Product Family No. H79085

J and B-2 Hydraulic Setting Tools

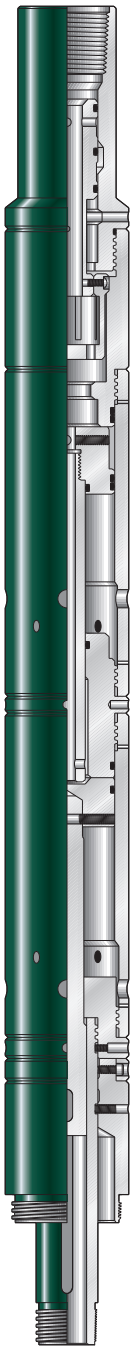
Product Family Nos. H41371 and H41574

Application

Baker Hughes **D™** and **DA™, F-1™, FA-1™, HE™** and **HEA™** and **SC-2™** and their respective B versions **DB™** and **DAB™**, can be set on tubing or drillpipe using a **B™ wireline adapter kit** and a **J™ hydraulic setting assembly**. These setting assemblies are particularly useful for setting permanent packers in high-angle, deviated wells such as those drilled offshore.

The **J hydraulic setting assembly and packer** are run to setting depth on the tubing string and a ball is dropped to the ball seat in the setting tool. Sufficient tubing pressure is then applied to set and pack off the packer. The pressure or combined pressure and tubing tension, parts the release stud in the adapter kit and frees the setting assembly from the packer for retrieval.

The **B-2™ setting tool** can be used to set packers in sizes 23 and larger. This setting tool is designed to withstand high-tensile loads and may be run with high-temperature seals rated at 550°F (288°C). After the packer is run to setting depth, a tripping ball is dropped and seats in the setting tool. A combination of pressure and tension may be used to set the packer. Before disengaging the B-2 setting tool from the packer, the annulus may be pressurized to confirm the packer has been set successfully. Right-hand rotation disengages the setting tool from the packer.



J Hydraulic Setting Assembly
Product Family No. H41371

B-2 Hydraulic Setting Tool
Product Family No. H41574

BH and BHH Setting Tools

Product Family Nos. H41576 and H41577

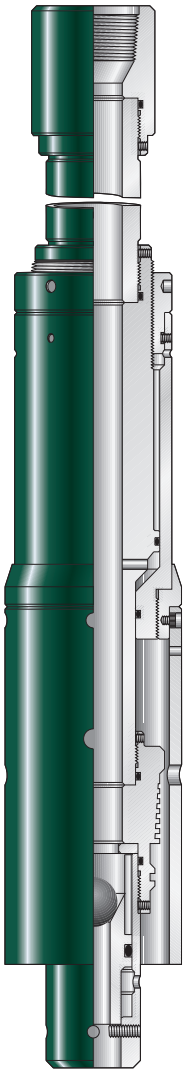
Application

Baker Hughes **BH™** and **BHH™ setting tools** are designed to enable the setting of Baker Hughes **D™, DA™, F™** and **FA™ type packers** on drillpipe. Both can develop a force of up to 126,000 lb (57 152 kg) and a 10-in. (3.05 m) stroke.

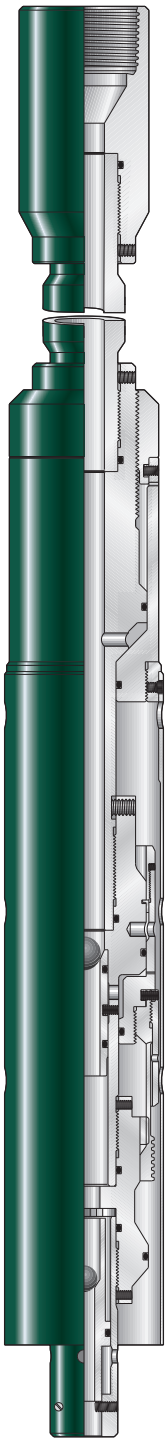
The BH and BHH setting tools are attached directly to the packer by the setting nut (of the BH) and latch (of the BHH), which screw into the left-hand thread at the top of the packer. The tool is actuated by differential tubing or drillpipe pressure. The BH and BHH can be rotationally released. While the BH setting tool consists of a solid setting nut, the modified setting-latch mechanism of the BHH allows for three distinct methods of release: hydraulic, shear, or rotational release.

Advantages

- Drillpipe connection supplied as standard
- Tool is fitted with tubular extension for gripping in tongs, slips and elevators
- 10-in. stroke ensures setting of slips on a complete range of products
- Pressure testing can be done before releasing from the packer
- Tensile load capacity of 150,000 lb (68 038 kg)
- Pressure rating of 10,000 psi (689.5 bar) in burst and collapse
- Special shear feature prevents the setting nut (of the BH) and latch (of the BHH) from being made up too tightly



BH Setting Tool
Product Family No. H41576



BHH Setting Tool
Product Family No. H41577

Locator Tubing-Seal Assembly

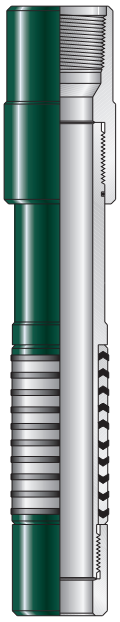
The **locator tubing-seal assembly** is the most basic packer-sealing system for packers incorporating a sealing bore. It is run in the well on the production tubing string until its no-go shoulder locates on the top of the packer. This positions one or more seal stacks in the packer's sealbore and establishes a seal between the packer and tubing. When a locator tubing-seal assembly is landed in a packer, the tubing is normally set in compression to compensate for any contraction of the tubing during treating operations. However, it is not always possible or desirable to slack off sufficient weight, particularly in deep deviated wells. In such cases, additional length must be added to the packer's sealbore using sealbore extensions and to the locator tubing-seal assembly using a combination of spacer tubes and additional seal units.

K and N Locator Tubing Seal Nipples

Product Family No. H44253

Application

K™ and N™ locator tubing seal nipples are used for sealing the upper bore of alternate-bore sealbore packers. One seal stack is used on this seal nipple. No upward movement can be tolerated, therefore sufficient set-down weight must be available to prevent movement.



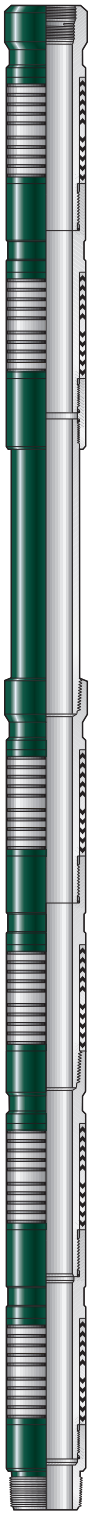
K-22 Locator Tubing Seal Nipple
Product Family No. H44253

G Locator Tubing Seal Assembly with Spacer Tube

Product Family No. H44280

Application

The **G™ locator tubing seal assembly** is designed for installations requiring tubing movement, this seal assembly should only be used with packers that have sealbore extensions or with retrievable packer-bore receptacles. Like all locator tubing seal assemblies, it should be landed with sufficient set-down weight to prevent seal movement. When used in a properly designed system, this seal assembly will give long service life even if movement occurs.



G-22 Locator Tubing Seal Assembly with Seal Units
Product Family No. H44280

G Locator Tubing Seal Assembly

Product Family No. H44234

Application

The **G™ basic assembly** includes two seal stacks. Any number of seal units or spacer tubes can be added for increased length. It is designed for use in single-bore sealbore packers. They are also compatible with the lower sealbore in most sizes of alternate-bore sealbore packers. Production tubes, tailpipe or other accessories with ODs compatible with packer bore can be attached to the bottom of this seal assembly.

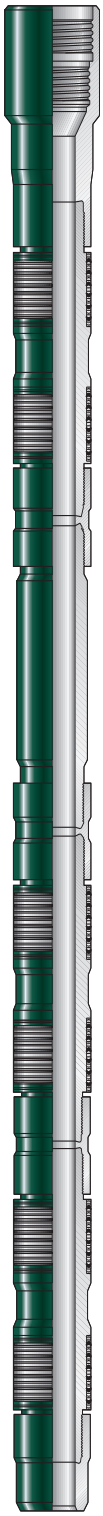
G-22 Locator Tubing Seal Assembly
Product Family No. H44234

L Locator Tubing Seal Assemblies with Spacer Tube

Product Family No. H44601

Application

L™ locator tubing seal assemblies are similar to the G locator tubing seal assembly with spacer tube but are designed for use in the extremely hostile environments of **D™, F-1™, HE™, SB-3™,** and **SC-2™ sealbore packers**. They are normally furnished with three seal stacks and three debris barriers. The L features metal-to-metal internal connections and is used with premium seal stacks. The LM also features a compression energized metal-to-metal packer-to-tubing seal.



L-22 Locator Tubing Seal Assembly with Seal Units
Product Family No. H44601

Anchor Tubing Seal Assembly

The **anchor tubing seal assembly** is used as an alternative to set-down weight; it prevents seal movement or is used when it is preferable to land the tubing in tension. The anchor tubing seal assembly or anchor tubing seal nipple is run in on the production string. Set-down weight causes the anchor's threaded latch to engage the corresponding threads in the top of the packer. Once engaged, the anchor and tubing are securely locked in place. Any tubing contraction will cause a tensile load to be applied to the tubing string. Care must be taken to ensure tensile forces that develop will not part the tubing whenever an anchor is used. To release the anchor, it must be rotated to the right 10 to 12 turns at the packer.

Many variations to the anchor tubing seal assembly exist to fulfill special requirements, such as: snap-latch, latch-in shear release, snap-in/snap-out set-down activated-shear release, annular pressure release (not shown) and tubing pressure release (not shown), solid-nut (not shown) and punch release. for further information about anchor tubing assemblies in special applications, contact your Baker Hughes representative.

E and EC Anchor Tubing-Seal Assemblies

Product Family No. H44344

Application

E™ and **EC™ basic assemblies** includes two seal stacks and is designed for use in sealbore packers. Production tubes, tailpipe or other accessories that have ODs compatible with the packer bore can be attached to the bottom of this seal assembly. The EC features metal-to-metal internal connections for hostile environments.

E-22 Anchor Tubing Seal Assembly
Product Family No. H44344

M Anchor Tubing-Seal Assembly

Product Family No. H44701

Application

Similar to the E anchor tubing seal assembly, the standard assembly includes two seal stacks. The **M™ anchor tubing-seal assembly** features metal-to-metal internal connections and is used with premium seal stacks.

M-22 Anchor Tubing Seal Assembly
Product Family No. H44701

K, KC, KC-1 and KC-2 Anchor Tubing-Seal Nipples Seal Assemblies

Product Family No. H44338

Application

K™, KC™, KC-1™ and **KC-2™ anchor tubing-seal nipples** are used for sealing in the upper bore of alternate-bore sealbore packers. It is supplied with one seal stack and blank or half-mule shoe bottom sub, which will not accommodate tailpipe or production tubes. The KC, KC-1 and KC-2 anchors feature metal-to-metal internal connections for hostile environments. The KC-2 anchor tubing seal assembly is to be used exclusively with the **SABL-4™ packer** in the North Sea-standard completion

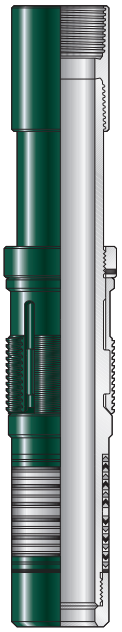
K-22 Anchor Tubing Seal Assembly
Product Family No. H44338

N and NM Anchor Tubing Seal Assemblies

Product Family No. H44751

Application

N™ and **NM™ anchor tubing seal assemblies** are similar to the K anchor tubing seal nipple, but are designed for use in extremely hostile environments in the alternate bore of sealbore packers. The NM features metal-to-metal internal connections and premium seal stacks. The NM also features a compression-energized metal-to metal, packer-to-tubing seal.



N-22 Anchor Tubing
Seal Assembly
Product Family No.H44751

E Snap-Latch Seal Assembly

Product Family No. H44344

Application

Snap-latch seal assemblies are similar to shear-release anchor seal assemblies because they are latched in place with set-down weight and released with tension. However, unlike shear-release anchors, snap-latch seal assemblies may be snapped into and out of, a packer many times. Initially, 8,000 to 12,000 lb (3 628 to −5 443 kg) of tension is required to remove the snap-latch from the packer's bore. Snap-latch seal assemblies are used in installations that require a mechanical snap-in, snap-out to verify the seal assembly is properly positioned in the packer's bore. Typical applications include sump packers in gravel packs and lower packers in tandem completions that cannot be pressure-tested.

E Snap-Latch Seal Assembly
Product Family No. H44344

Hydraulic Punch Releasable Anchor

Product Family No. H44757

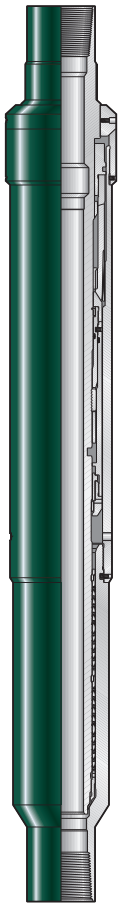
Application

The Baker Hughes **hydraulic punch releasable anchor** is a unique anchor and packer-bore receptical (PBR) assembly designed specifically for applications where rotation for release is not available, such as deepwater wells.

Release of the anchor is performed with a punch tool originally developed for use in safety valves, which opens a shifting port. Pressurizing the tubing positively releases the anchor for retrieval.

Advantages

- Single-trip completion
- Permits removal of tubing string without rotation or chemical cut–adding workover flexibility to deep wells or applications with high-alloy tubing
- Metal-to-metal nose seal available
- Proven Baker Hughes punch communication tool technology for activating release mechanism
- PBR is retrievable with the packer by drillpipe workstring and retrieving tool
- Packer-anchor assembly can be internally pressure-tested in the field
- Applying low tubing pressure actuates releasing mechanism, tensile load shear-releases the anchor assembly from the PBR
- Control line-cutter mechanism available for feedthrough applications



Hydraulic Punch Releasable Anchor
Product Family No. H44757

E, K and N Latch-In Shear Release Anchor Tubing Seal Assemblies

Product Family No. H44370

Application

A **latch-in shear-release anchor tubing seal assembly** may be used for those installations when anchored seal assemblies are preferable, but the tubing cannot be rotated to release the anchor. Set-down weight is used to latch the shear-release anchor into the packer and tension is used to release it. The shear value of the latch-in shear-release anchor tubing seal assembly may be specified to suit the application.

E Latch-In Shear Release Anchor Tubing Seal Assembly
Product Family No. H44370

Snap-In/Snap-Out, Set-Down-Activated, Shear-Release Anchor

Product Family No. H44387

Application

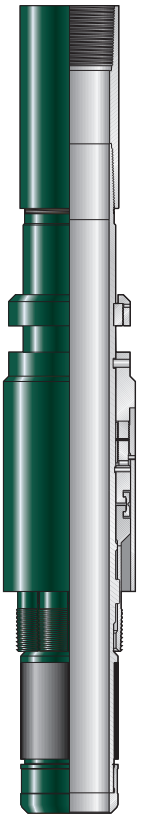
The **snap-in/snap-out, set-down-activated, shear-release anchor** is an anchoring and sealing device that connects the retrievable tubing string to the upper sealbore and thread of an alternate-bore permanent packer. Alternatively the anchor can be connected to a retrievable packer that incorporates the profile of a permanent packer.

Before committing to full engagement of the anchor, the snap-in/snap-out facility allows accurate positioning or space-out of the tubing string at surface in relation to a tubing hanger. As long as the predetermined set-down weight is not exceeded, the tool will continue to have the ability to snap-in and snap-out of the packer body without committing to its fully locked-in tensile-carrying condition.

CAUTION: *The snap-in/snap-out set-down-activated shear-release anchor requires an extended upper sealbore from the standard packer bore. Contact your local Baker Hughes representative to confirm anchor/packer compatibility.*

Advantages

- Snap-in/snap-out facility at the packer allows operator to accurately land tubing string at surface
- A predetermined set-down load activates anchor to full-tensile carrying capacity
- Set-down sleeve protects upper sealbore of packer from debris intrusion
- Emergency release facility, by means of right-hand torque and an overpull at surface, will disconnect anchor from packer
- Left-hand square threads on latch are coated with **Bakertron™**, reduces galling of mating threads in high-chromium applications



Snap-In/Snap-Out, Set Down Activated, Shear Release Anchor
Product Family No. H44387

Ratcheting Muleshoe

Product Family No. H44408

Application

The new **ratcheting muleshoe** offers a simple and reliable alternative for landing-seal assemblies in sealbore packers when tubing rotation is either impossible or objectionable. The ratcheting mule shoe indexes automatically one-eighth turn each time the top of the packer is tagged or until the half-mule shoe bottom positions itself properly to enter the packer bore. The mule shoe features a short, compact design and rugged construction. It is indispensable for spacing out and landing seals in the lower sealbore packer of a dual-string hookup when tubing rotation is impractical. It is especially suitable when tubing-mounted safety valves are being run to avoid damage to the control lines.

Ratcheting Muleshoe
Product Family No. H44408

Seal Stacks

Standard Seal Stacks
Made up of nitrile chevron seals and steel spacer rings. Should remain in sealbore during service.

Bonded Seal Stack
Two nitrile or Viton seals are bonded to each metal insert. These inserts are separated by steel spacers. Bonded seals should be used when seals cannot be prevented from moving out of the sealbore while holding differential pressure. Also recommended for sealing low-pressure gas at low temperatures.

V-RYTE Seal Stack
Made up of Viton chevron seals with Teflon and Ryton* backup rings, Ryton front-up rings and steel separators. Should remain in sealbore during service.

A-RYTE Seal Stack
Made up of Aflas chevron seals with Teflon and Ryton backup rings, Ryton front-up rings and steel separators. Should remain in sealbore during service.

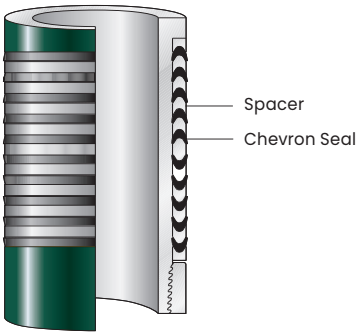
A-HEET Seal Stack
Made up of Aflas chevron seals with Teflon and HEET backup rings, HEET front-up rings and steel separators. Should remain in sealboreduring service.

RYTE Seal Stack
Made up of PS006 chevron seals with Teflon and Ryton backup rings, Ryton front-up rings and steel separators. Should remain in sealbore during service.

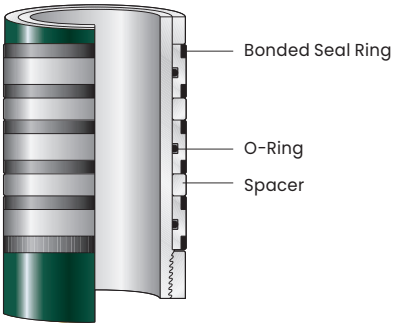
Seal-RYTE Seal Stack
Made up of Perfluoroelastomer chevron seals with Teflon and Ryton backup rings, Ryton front-up rings and steel separators. Should remain in sealbore during service.

K-RYTE and K-HEET Seal Stacks
Made up of KALREZ brand Perfluoroelastomer chevron seals with Teflon and Ryton or HEET backup rings, Ryton or HEET front-up rings and steel separators. Should remain in sealbore during service.

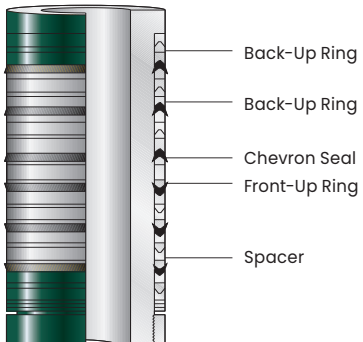
Debris Barrier Stack
Made up of Teflon and Ryton backup rings and Ryton front-up rings and steel separators. Used as a wiper to prevent debris from damaging KRYTE, K-HEET, A-HEET or Seal-RYTE seal stacks when seals are moved after being placed in service.



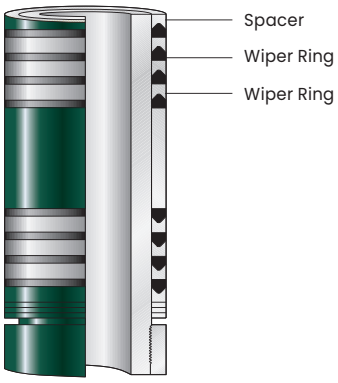
Standard Seal Stack



Bonded Seal Stack



_ - RYTE and _ - HEET



Debris Barrier Stack

** Ryton is a registered trademark of ChevronPhillips chemical company.*

Packer-to-Tubing Packing Unit

Specification Guide

Seal Type	Pressure Differential				Temp. Range		Environmental Compatibility ❖					
	Non-Unloading		Unloading				H_2S	Oil Base Completion	Light Brine Completion	Bromide Completion	High pH Completion pH > 10	Amine Inhibitors
	PSI	MPa	PSI	MPa	°F	°C						
Nitrile Chevron	10,000	68.9	NO	NO	32–300	0–149	NO	OK	OK	$CaBr_2/NaBr_2$ OK to 250°F $ZnBr_2$ NO	NO pH >10 OK to 250°F pH <10	OK to 200°F
70 Hard Nitrile Bonded	5,000	34.4	5,000	34.4	32–200	0–93	NO	OK	OK	$CaBr_2/NaBr_2$ OK to 250°F $ZnBr_2$ NO	NO pH >10 OK to 250°F pH <10	OK to 200°F
90 Hard Nitrile Bonded	10,000	68.9	5,000	34.4	32–300	0–149	NO	OK	OK	$CaBr_2/NaBr_2$ OK to 250°F $ZnBr_2$ NO	NO pH >10 OK to 250°F pH <10	OK to 200°F
95 Hard Viton Bonded	10,000	68.9	5,000	34.4	32–250	0–121	5%	OK	OK	OK	NO	OK to 200°F
HN-Ryte™	10,000	68.9	NO	NO	32–350	0–177	2%	OK	OK	$CaBr_2/NaB_2$ OK to 250°F $ZnBr_2$ NO	OK	OK
V-Ryte™	15,000	103.3	NO	NO	32–300 32–400	0–149 0–204	15% 5%	OK	OK	OK	NO	OK to 200°F
A-Ryte™	15,000	103.3	NO	NO	80–300 80–450	27–149 27–232	20% 7%	NO	OK	OK	OK	OK
A-HEET™	15,000	103.3	NO	NO	80–300 80–450	27–149 27–232	20% 15%	NO	OK	OK	OK	OK
K-Ryte™	15,000	103.3	NO	NO	100–450	38–232	7%	OK	OK	OK	OK	OK
K-HEET™	15,000	103.3	NO	NO	100–550	38–288	■	OK	OK	OK	OK	OK
Seal-Ryte™	15,000	103.3	NO	NO	40–450	4–232	7%	OK	OK	OK	OK	OK
Seal-HEET™	15,000	103.3	NO	NO	40–450	4–232	■	OK	OK	OK	OK	OK
R-Ryte™	10,000	68.9	NO	NO	325–450 ●	163–232	7%	OK	OK	OK	OK	OK
Molyglass	10,000	68.9	NO	NO	125–300	52–149	15%	OK	OK	OK	OK	OK

❖ Explosive decompression is both chemical and mechanical in nature related to the solubility of gas in elastomer and strength of the elastomer. The elastomeric seals in these units may be susceptible to explosive decompression, however, explosive decompression does not usually occur while seals are in service.

● Refer to the Baker Hughes' packer systems technical manual, Unit No. 8218-3, for complete temperature range information.

■ There are no known H_2S limitations below 500°F (200°C).

Retrievable Packer Bore Receptacle

Product Family No. H68319

Application

Baker Hughes **retrievable packer bore receptacle (PBR) systems** are installed in wells as part of a completion to accommodate expansion and contraction of production tubing, while maintaining pressure integrity.

The retrievable PBR is run as an integral part of the production tubing above the completion packer. The most common completion method is to run the PBR as pictured with the seal assembly fully inserted into the receptacle. After reaching the desired depth, sufficient tension is applied to shear the screws or shear ring. The well can then be spaced out as desired.

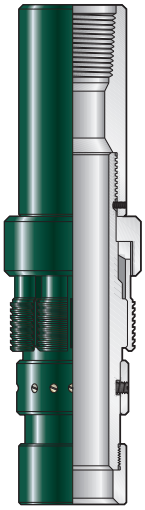
When combined with the hydraulic-set packer such as the **Premier™, SB-3™ and SAB-3™**, the completion can be run in and set on the production tubing string in one trip. If desired, the well can be flanged up and the tubing string displaced before setting the packer. A retrieving tool (H68396) is used to retrieve the PBR.

Advantages

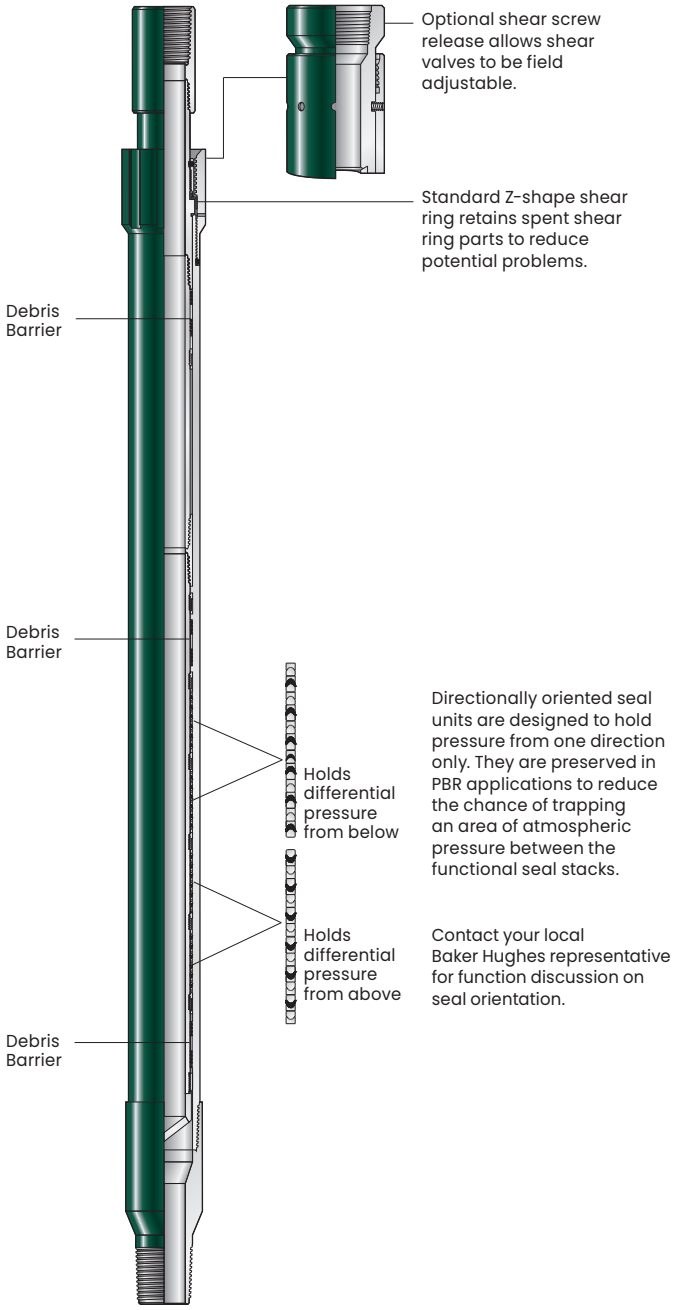
- Accommodates expansion and contraction of tubing
- Seals can be removed and replaced without unsetting packer
- Largest possible ID through completion
- Seals fully protected during run in
- Seal unit configuration reduces risk of hydrostatic lock
- Available in custom lengths

Specification Guide

Tubing Size		Tool Size
in.	mm	
2⅜	60.3	40–26
2⅞	73.0	20–30
		20–32
		80–32
3½	88.9	80–40
4½	114.3	80–47
		80–48
5½	139.7	190–60
		192–60
6⅝	168.2	190–71
7	177.8	190–73



Retrievable PBR
Retrieving Tool
Product Family No. H68396



Non-sealing debris barriers serve two important functions: they keep well solids or trash from setting in the annular area between the honed bore and seal assembly which may impede the movement of the seal assembly. They also clean the sealing area before functional working seals contact the sealbore.

Retrievable PBR with seal assembly (may be pre-spaced for upward and downward movement) Product Family No. H68319.

Tubing Stability Latch (TSL)

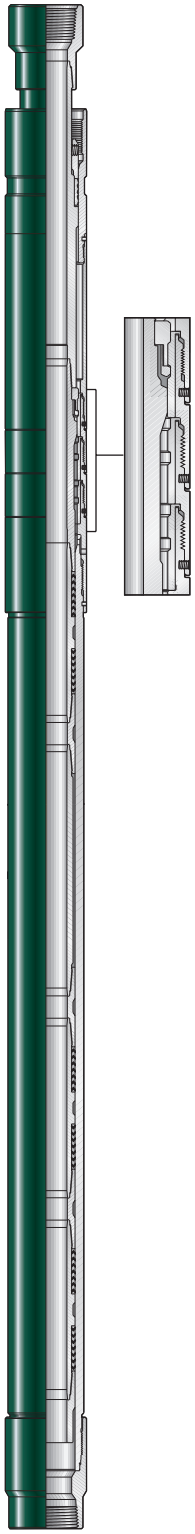
Product Family No. H68347

Application

The **tubing stability latch (TSL)** consists of a special latch designed to be used with a packer bore receptical (PBR). The primary function of the TSL is to keep the seals static in the PBR during all well conditions, except extreme treating/stimulation operations. During such conditions, the TSL automatically releases the latch and allows the seals to float. The latch automatically re-engages after the extreme tubing load event, retaining the seals in the static condition. The TSL is a valuable aid to life of well seal integrity.

Advantages

- PBR seals are static during long-term well operations until triggered by extreme treating/ stimulation operations
- Increases seal life and reliability
- Reduces tubing-string costs when compared to an anchor-based completion design
- Reduces high compressive load requirements when compared to a traditional floating seal design
- Reduces tubing stress
- Metal-to-metal seals on all threaded connections



Tubing Stability Latch (TSL)
Product Family No. H68347

E Tubing Expansion Joint

Product Family No. H44145

Application

The Baker Hughes **E™ tubing expansion joint** is designed for use above packers in well completions, to compensate for tubing movement during treating and injections operations. The E joint contains standard chevron seals or bonded seals.

The E joint is also a swivel joint, unless extended to its full stroke when a clutch engages and allows torque to be transmitted through the joint. It commonly provides 9 ft (2.74 m) of movement.

Advantages

- Rotational lock in extended position transmits torque when needed
- Extra-long seal area provides adequate sealing in case of side load
- Temperature rating up to 325°F (163°C)

E Tubing Expansion Joint
Product Family No. H44145

Specification Guide

Tubing Size	Max OD		Min OD		Stroke Length		Fully Collapsed Length	
in.	in.	mm	in.	mm	ft	m	in.	mm
2⅜	3.750	92.5	1.968	50.0	9	2.74	167.5	4.255
2⅞	4.500	114.3	3.690	93.7	9	2.74	167.5	4.255
3½	5.000	127.0	3.880	98.6	9	2.74	150.7	3.828
4½	5.500	139.7	4.880	124.0	12	3.66	208.0	5.283

M Expansion Joint

Product Family No. H44162

Application

The **L™** and **M™ expansion joints** are slim-line tools primarily designed for use in dual-string completions. The L expansion joint can be pre-spaced, using the **Model A™ positioning tool,** to allow upward and downward movement. The L is ideal for one-trip flanged up dual completions when extreme tubing movement is anticipated. Once the packer has been set, the Model A positioning tool is retrieved on wireline permitting movement. The M expansion joint does not permit pre-spacing.

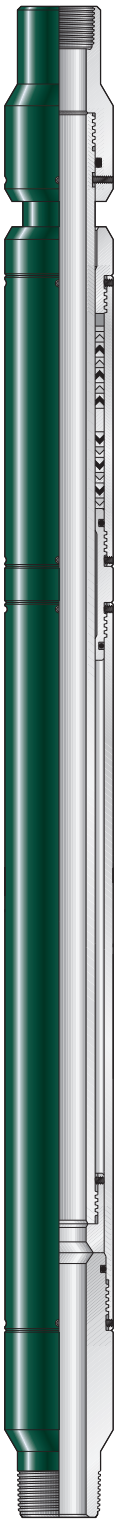
Advantages

- Full-opening ID compatible with tubing ID
- OD of tool compatible with dual-string applications
- Standard stroke lengths up to 20 ft (6.1 m) (M expansion joint) and 16 ft (4.9 m) (L expansion joint); other lengths available upon request
- Functions as a swivel until stroked out; available with optional rotational clutch
- V-Ryte seals are standard, other sealing materials are available upon request
- Suitable for H_2S Service per NACE Standard MR-01-75l

Specification Guide

Tubing Size		Max Tool OD				Min Tool ID			
		Model L		Model M		Model L ❖		Model M	
in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
2⅜	60.3	3.505	89.0	3.250	82.5	1.937	49.2	1.939	49.2
2⅞	73.0	4.005	101.7	3.765	95.6	2.374	60.3	2.374	60.3
3½	88.9	4.260	108.2	4.260	108.2	2.840	72.1	2.890	73.4
4½	114.3	-	-	5.390	136.9	-	-	3.895	98.9
5½	139.7	-	-	7.070	179.5	-	-	4.830	122.6

❖ ID required to accommodate Model A positioning tool, Product Family No. H44165



M Expansion Joint
Product Family No. H44162

N Splined Expansion Joint

Product Family No. H44163

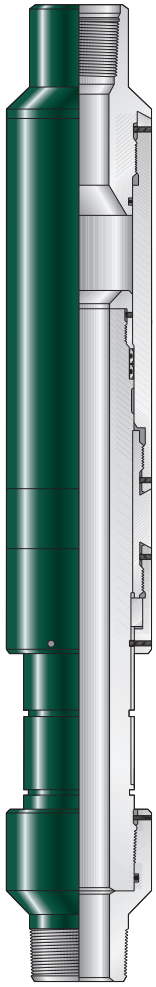
Application

The Baker Hughes **N™ splined expansion joint** is designed for use in both single- and multiple-string completions to compensate for tubing movement. The tool provides 10 ft (3.045 m) of movement and uses rugged bonded seals for reliable continuous service. The telescoping action permits the tool to be used as a bumper sub or jar when retrieving the installation.

Shear screws may be installed to initially position the expansion joint in its extended, collapsed, or mid-position. A rotation lock lets the operator rotate through the expansion joint in any position.

Advantages

- Shear screws easily added or removed to adjust shear value
- Tool locks in fully extended, fully collapsed or mid-stroke position with shear screws
- Full-length keys provide transmission of torque through full length of travel
- Metal goods suitable for H_2S service per NACE Standard MR-01-75



N Splined Expansion Joint
Product Family No. H44163

Specification Guide

Tubing Size	Max OD		Min OD		Extended Length		Fully Collapsed Length		Torque Rating	
in.	in.	mm	in.	mm	in.	mm	in.	mm	ft-lb	kg-m
2⅜	3.688	93.6	1.930	49.0	273	693.4	157	396.7	2,000	277
2⅞	4.531	115.0	2.441	62.0	283	718.8	162	411.4	2,500	346
3½	4.906	124.6	2.875	73.0	276	701.0	156	396.2	3,500	484
4½	6.531	165.8	3.875	98.4	278	706.1	158	401.3	5,000	691

L-10, R-10, L-316 and R-316 On-Off Sealing Connector Family

Product Family No. H68420

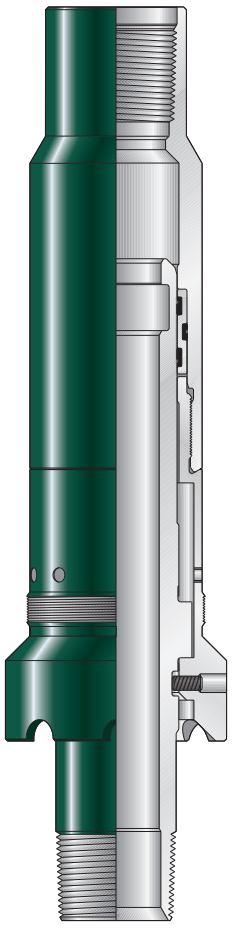
Application

The **on-off sealing connector** has the capability to simply and reliably retrieve the production string without disturbing the companion packer below. Its sealing system allows the tubing to be disconnected for fluid circulation, while ensuring seal integrity when reconnected.

A seating nipple profile is available in the top of the seal nipple to permit plugging of the lower zone, while the tubing is removed. Besides the left-hand releasing L-10 version, a right-hand releasing R-10 version is also available, enabling remedial or stimulation work above the packer. The plug can then be removed with conventional wireline methods, allowing production of the well to resume. The L-316 has all the design features built into the L-10, but it is designed specifically for CO_2 and waterflood applications. It uses 316 Stainless Steel flow path material while maximizing load capacity. The tubing pressure rating of 4,500 psi (310.2 bar) is available with bonded (40°F–275°F) (4°C–135°C) or non-elastomeric (40°F–325°F) (4°C–163°C) seals.

Advantages

- Short, compact design
- Superior sealing system
- Available with bonded or non-elastomeric seals
- Orientation of seals eliminates need for o-rings
- Fit for environment
- Metallurgies–standard service or NACE service
- Elastomers–nitrile or thermoplastic non-elastomeric
- Rated to 10,000 psi (689.5 bar) at 275°F (135°C) with bonded seals and 12,000 psi (827.4 bar) at 350°F (135°C) with nonelastomeric seals
- Fully tested in gas at maximum temperature with multiple pressure reversals
- Tensile rating compatible with L-80 tubing in NACE trim
- Tensile rating compatible with P-105 tubing in standard material
- Only top sub and seal nipple are exposed to flow
- No welded parts
- Can be set to shear up or down
- Automatic re-engagement with set-down weight



L-10 On-Off Sealing Connector Family
Product Family No. H68420

LEEJ Expansion Joint Non-Splined and Splined

Product Family Nos. H44167 and H44168

Application

The non-splined and splined versions of the **LEEJ™ expansion joint**, Product Family Nos. H44167 and H44168, are designed for use above packers in well completions to compensate for tubing movement during treating and/or injecting operations.

When rotation through the tool is required, the design of the splined version of the LEEJ allows torque to be applied through the tool in any position; it does not have to be fully extended or fully collapsed for rotation through the tool. The non-splined version does not permit the transmittal of torque through the tool.

Advantages

- Rotational lock in any position transmits torque when required (splined version only)
- Tool can be pinned at 1-ft intervals from closed to fully stroked position (splined version only)
- Shear value adjustable by varying number of shear screws (splined version only)
- Premium **V-Ryte™ seal stack** is standard
- 10-ft stroke standard (both nonsplined and splined versions)
- Both versions can be supplied with non-standard stroke lengths as an additional option
- ID compatible with tubing ID
- Standard VAM pin connection down (with crossover to required customer thread, if different, as an additional option)
- Box connection up to customer's specification
- Standard-base material AISI 4130 carbon steel (both non-splined and splined versions); both versions can be supplied in other materials as an additional option

LEEJ Expansion Joint
Product Family Nos. H44167 and H44168

Specification Guide

Size		OD		ID		Overall Length		Stroke Length	
in.	mm	in.	mm	in.	mm	in.	mm	ft	m
2⅜	60.3	3.250	82.6	1.929	49.0	148	3.759	10	3.05
2⅞	73.0	3.765	95.6	2.374	60.3	148	3.759	10	3.05
3½	88.9	4.300	109.0	2.915	74.0	158	4.013	10	3.05

Adjustable Spacer Sub with Rotational Lock

Product Family No. H44125

Application

The **adjustable spacer sub with rotational lock** is used below a dual packer to facilitate making tubing connections and spacing out between two retrievable packers. The spacer sub has 24 in. (609.6 mm) of travel and when adjusted to the desired length, it is locked to prevent telescoping or rotational movement.

Specification Guide

Size	Max OD		Nom ID	
	in.	mm	in.	mm
1.900	2.531	64.29	1.563	39.70
2 1/16	2.531	64.29	1.656	42.06
2 3/8	3.094	78.59	1.969	50.01
2 7/8	3.719	94.46	2.375	60.33
3 1/2	4.281	108.74	3.000	76.20

Adjustable Spacer Sub with Rotational Lock
Product Family No. H44125

Telescoping Swivel Sub

Product Family No. H44120

Application

The **telescoping swivel sub** was developed for use in multiple-string completions as a union to facilitate running additional tailpipe below a dual-string retrievable packer. The telescoping action of the sub provides 24 in. (609.6 mm) of travel to compensate for inaccuracies in measurement and to relieve the strain on threads while making up tailpipe between two dual packers. The swivel feature makes it possible to connect both long- and short-string tailpipe to the lower end of the packer. Even if the tailpipes are strapped together, it bears the weight of the tubing hanging in the slips, while the connection between tubing and packer is being made up.

Specification Guide

Size	Max OD		Nom ID	
	in.	mm	in.	mm
1.315	1.906	48.41	1.000	25.40
1.660	2.250	57.15	1.313	33.35
1.900	2.531	64.29	1.563	39.70
2 3/8	3.094	78.59	1.969	50.01
2 7/8	3.719	94.46	2.375	60.33
3 1/2	4.281	108.74	3.000	76.20
4 1/2	5.281	134.14	3.938	100.03

Telescoping Swivel Sub
Product Family No. H44120

Telescoping Space-Out Joint (TSOJ)

Product Family No. H68376

Application

The **telescoping space-out joint (TSOJ)** is a high-performance device used for spacing out an upper completion into a liner top or lower completion in a deepwater or subsea well. The TSOJ allows the lower completion to be tagged multiple times with the tailpipe of the upper completion, before the tubing is landed in the tubing hanger.

The TSOJ provides a positive indication of the downhole position that has been achieved before landing the subsea tubing hanger. Sufficient slack-off (compressive) load activates the tool and allows the tailpipe to stroke, thereby reducing the length of the bottomhole assembly. In subsea and deepwater applications, this allows the tubing hanger to be landed without adjusting the length of the production tubing. In an ESP application this allows the bottomhole assembly to tag and space-out against a sump packer. There is no compression left in the tailpipe after the tubing hanger is landed. And, the mechanism may be reactivated a total of three times.

Advantages

- Entire upper completion hook-up run in one trip
- Avoids pulling up to space out in subsea/deepwater
- Avoids dummy runs
- No expensive PBR required
- Single- or multiple-shear activation available (3x standard)
- Simplifies space-out procedures
- Telescoping action
- Seals in extended position (optional)
- No seal when collapsed
- Rotationally locks in extended position (optional)
- Based on highly reliable patented TSL multiple shear TSOJ

Telescoping Space-Out Joint (TSOJ)
Product Family No. H68376

S Snap-Latch Seal Nipple

Product Family No. H70703

Application

The **S™ snap-latch seal nipple** is used to connect the short strings into multiple-string retrievable packers. The snap-latch provides a positive surface indication when the nipple snaps into the sealing bore.

Options

- **SA™** and **SD™** (Product Family Nos. H70704 and H70709) are variations that add increased length or diameter
- **SAM™** (Product Family No. H70705) is a muleshoed version of the SA seal nipple
- **SW™** (Product Family No. H70760) provides a locking sleeve that can be shifted downward, preventing it from being pumped out of the sealbore

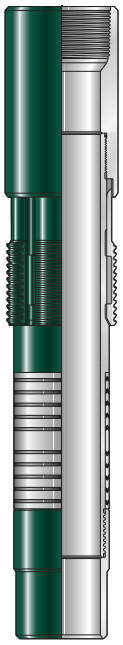
S Snap-Latch Seal Nipple
Product Family No. H70703

K Parallel Anchor Seal Nipple

Product Family No. H70311

Application

The **K™ parallel anchor seal nipple** is used with the **A-5™, AL-5™** or **GT™** dual-string packer in conjunction with the parallel head (Product Family No. H70032) to anchor short-string seals in the packer, thereby eliminating possible pump out.



K Parallel Anchor Seal Nipple
Product Family No. H70311

Shear-Out Safety Joint

Product Family No. H44130

Application

The **shear-out safety joint** is used between packers in dual completions and in selective completions using hydraulic/hydrostatic single-string packers. When run above the upper packer in a single-string completion, however, the shear value should be adjusted to compensate for any hydraulic conditions that exist when the string is landed or that are created by well treating operations.

Specification Guide

Size	Max OD		Nom ID	
	in.	mm	in.	mm
1.900	2.510	63.75	1.620	42.42
2⅛	2.510	63.75	1.620	42.42
2⅜	2.905	73.79	1.990	50.55
2⅞	3.781	96.04	2.313	58.75
3½	4.531	115.09	2.938	74.63

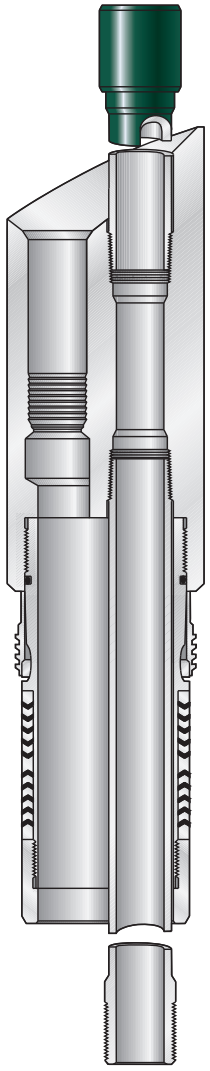
Shear-Out Safety Joint
Product Family No. H44130

Model A Full-Opening Parallel Flow Tube

Product Family No. H70001

Application

The **Model A™ full-opening parallel flow tube** is a locator-type tubing seal assembly containing two parallel flow paths. It is used in the upper packer of a two-packer parallel string installation. The long-string side is threaded both up and down and the short-string side contains a sealbore. The head is machined to a funnel shape with the axis in line with the sealbore so the parallel seal nipple can be guided into the bore. Since any seal movement would cause the seal to leave the bore, sufficient set-down weight must be available to prevent movement of the parallel flow tube. The Model A anchor parallel flow tube is intended for use as a locator-type parallel flow tube but is used when well conditions require the tubing to be landed in tension or when insufficient tubing weight is available to prevent movement.



Model A Full-Opening Parallel Flow Tube
Product Family No. H70001

E Hydro-Trip Sub

Product Family No. H79928

Application

The **E™ Hydro-Trip Sub** is used below a hydraulically actuated tool, such as a hydraulic-set packer, to provide a means of applying the required tubing pressure for tool activation. The unique sub uses a ball that seals on the seat. After the packer is set, increased pressure forces the ball seat down until the fingers snap back into a groove. This fully opens the sub and the ball passes on down the tubing. The E is available for use with 1.900 to 4.500-in. (48.3-mm to 114.3-mm) size tubing strings.

Specification Guide

Size	Ball Size		Ball Seat ID			
			Before Shifting		After Shifting	
	in.	mm	in.	mm	in.	mm
1.900	1⁷⁄₁₆	25.4	1.250	31.8	1.516	38.5
2⅜	1½	38.1	1.375	34.9	1.860	47.2
	1¾	44.5	1.625	41.3	1.906	48.4
2⅞	2⅛	53.0	2.000	50.8	2.375	60.3
3½	2½	63.5	2.312	58.7	2.781	70.6
	2¾	69.9	2.500	63.5	2.953	75.0
4½	3⅛	77.8	2.734	69.4	3.615	91.8
	3⅜	85.7	2.985	75.8	3.865	98.2

E Hydro-Trip Sub
Product Family No. H79928

C Tubing Testing Sub

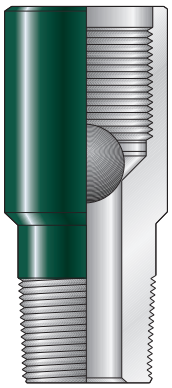
Product Family No. H59921

Application

The **C™ tubing testing sub**, along with a Bakerlite ball, may be used to test any tubing string. The sub's design includes a machined, 45-degree, tapered ball seat. The Bakerlite ball may be reverse-circulated out of the tubing string after a test. In the event the tubing is faulty, the ball can be left in position and the tubing tested as it is withdrawn from the well. The C is available for use with 2⅜-in. to 4½-in. (60.3-mm to 114.3-mm) size tubing strings.

Specification Guide

Size	Ball Size		Max OD		Nom ID	
	in.	mm	in.	mm	in.	mm
2⅜	1⁷⁄₁₆	36.5	3.094	78.5	1.281	32.5
	1¾	44.4			1.500	38.1
	1⅞	47.6			1.781	45.2
2⅞	1⁷⁄₁₆	36.5	3.719	94.4	1.281	32.5
	1¾	44.4			1.500	38.1
	2⅛	53.9			1.750	44.4
3½	2½	63.5	4.531	115.0	2.125	53.9
4½	3½	88.9	5.594	142.0	3.250	82.5



C Tubing Test Sub
Product Family No. H59921

Silhouette Packer Setting Tool

Product Family No. H41586

Application

The **Silhouette packer setting tool** is designed for interventionless setting of hydraulic packers.

The Silhouette tool has an upward opening flapper allowing self-filling of the tubing string during deployment.

The Silhouette flapper is opened by applying pressure down the tubing string. This pressure will shear a shear ring. Pressure may still be applied to the flapper to the required hydraulic packer setting pressure. The flapper will permanently open once applied pressure is bled off. A spring loaded inner sleeve pushes the flapper open and permanently locks it open.

Advantages

- Allows interventionless packer setting
- Uses proven Baker Hughes flapper technology from our **OCRE™ portfolio**
- Mechanical closing, hydraulic opening
- Provides self-filling of tubing string during completion deployment
- Shear value can be adjusted, depending on the application
- Provides large flow for reverse circulating
- Provides full ID when flapper is opened
- Sandy service qualified 5½ in. (139.7mm) tubing size currently available
- Other sizes currently in the development process. Please consult your Baker Hughes representative for further details

Silhouette Packer Setting Tool
Product Family No. H41586

Mill-Out Extension

Product Family No. H49941

Application

A **mill-out extension** can be run directly below a sealbore packer or sealbore extension. For permanent packers, the mill-out extension is required to accommodate the mandrel and catch sleeve of the **CJ™ packer milling tool** during packer milling. In the case of a retrievable sealbore packer, the mill-out extension will accommodate the mandrel and catch sleeve of the retrieving tool.

Mill-Out Extension
Product Family No. H49941

Sealbore Extension

Product Family No. H49940

Application

Sealbore extensions can be run below a sealbore packer. A sealbore extension is run to provide additional sealing when a long seal assembly is run to accommodate considerable tubing movement. The sealbore extension has the same ID as the corresponding packer sealbore it is run with, thus all seals of a long seal assembly seal off in the sealbore extension. If extreme tubing movement is anticipated, it is advisable to incorporate some blank sections in the seal assembly to minimize the friction of the seals inside the sealbore extension.

Sealbore Extension
Product Family No. H49940

Wireline Entry Guide with Pump-Out Plug, Shear-Out Ball Seat, and Shear-Out Ball Seat Sub

Product Family Nos. H46921 and H79927

Application

The **wireline entry guide** is designed to be run on the bottom of the tubing string. It will aid wireline tools' re-entry into the tubing. The wireline entry guide with pump-out plug, wireline entry guide with shear-out ball seat and the shear-out ball seat sub are installed on the bottom end of the tubing to allow the tubing string to be pressured. When the differential pressure at the tool reaches a predetermined value, the plug or ball and seat, are pumped out of the tool. After the plug or ball seat have been pumped out, these subs allow unrestricted access from the tubing into the casing below the tubing string. These products are available in a variety of configurations.

Options include a muleshoe guide to facilitate easy entry when running the tubing through the top of a liner or into a sealbore packer and expendable check valves. The shear-out ball seat sub (Product Family No. H79927) can be furnished in a box x pin configuration for those applications where it is necessary to run additional tubing or completion equipment below the shear-out ball seat sub. Since each of these tools expends a plug or ball and ball seat during their operation, it is necessary to ensure those parts will safely pass through all equipment that is located below them.

Wireline Entry Guide
Product Family No. H46921

Wireline Entry Guide
with Pump Out Plug
Product Family No. H46921

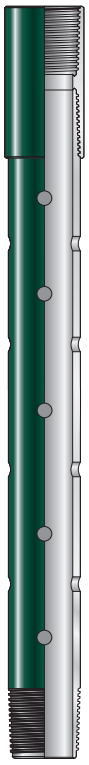
Wireline Entry Guide
with Shear-Out Ball Seat Sub
Product Family No. H79927

Perforated Spacer Tube

Product Family No. H45743

Application

The **perforated spacer tube** is used at the end of a tubing string to provide an alternate flow path when wireline measuring devices are used.



Perforated Spacer Tube
Product Family No. H45743

SOFTWARE PROGRAMS

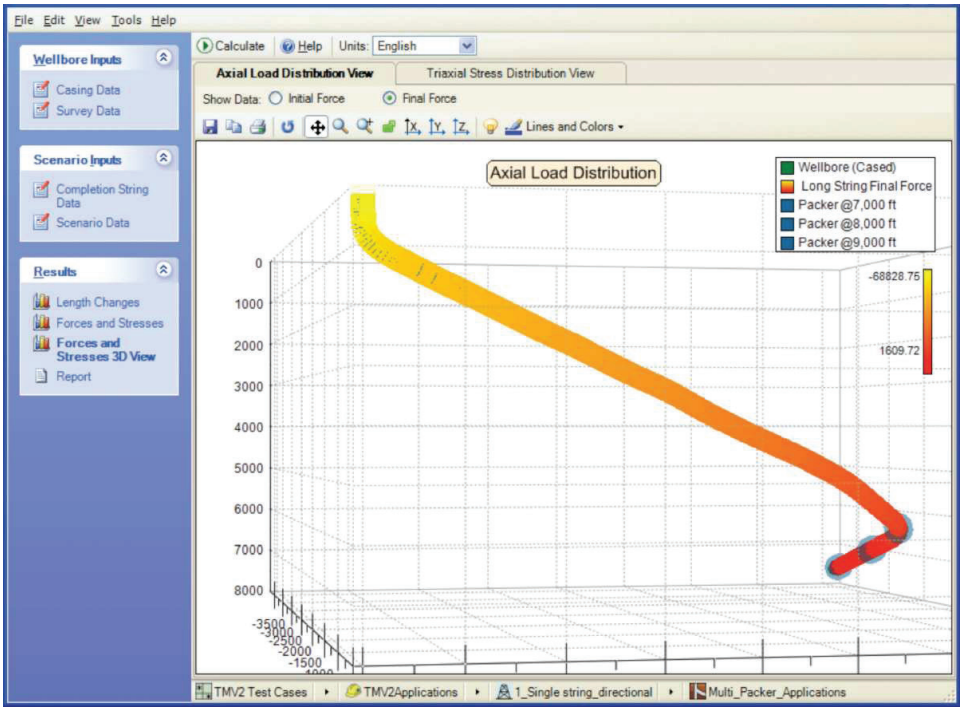
InQuest TUBEMOVE 2.0 Program

Application

The **InQuest TUBEMOVE™ program** is a user-freindly, efficient means of producing tubing movement calculation reports.

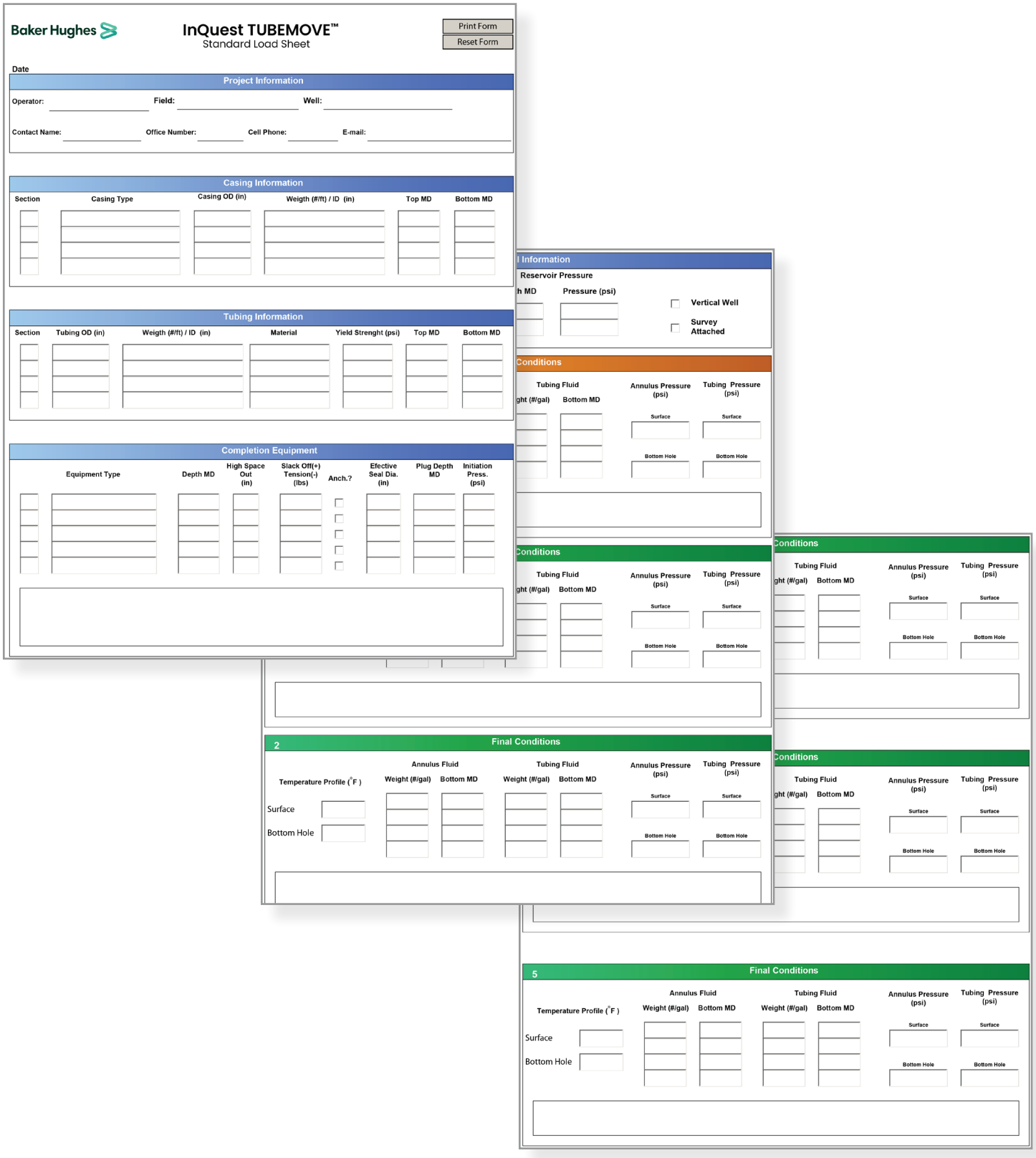
The software preforms a series of calculations that allow the user to determine the magnitude of forces, stresses, and changes in length of tubulars suspended in wells. Advantages of using this program stem from the ability to properly design a completion using the appropriate Baker Hughes equipment. The program enables the user to select the method of setting the packer, pick between single or dual string completions, import survey data, and generate three dimensional representations of the well.

Version 2.0 of TUBEMOVE gives the ability to export the results from different scenarios and plot into approved packer envelopes using the new InQuest Sentry program. There are also new 3D graphics and an updated calculation package leveraging the most recent industry reserach including enhanced buckling calculations and the ability to incorporate friction factors.



SOFTWARE PROGRAMS

TUBEMOVE Load Sheet



SOFTWARE PROGRAMS

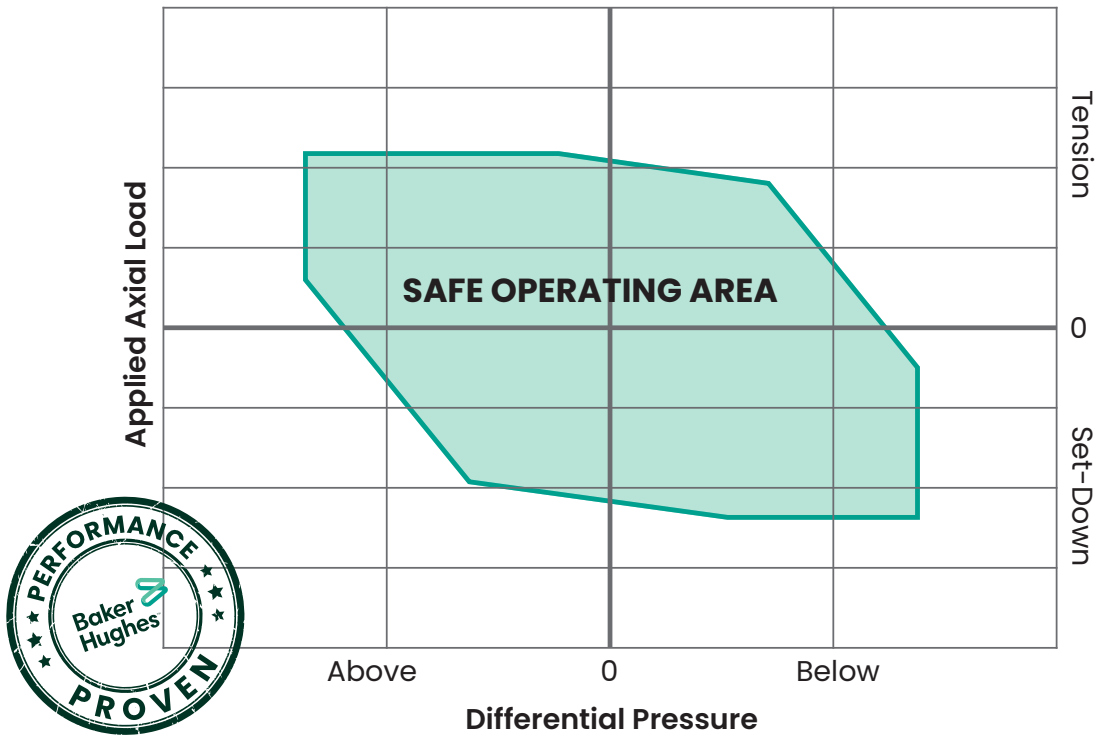
PERFORM Permanent Packer Rating Envelopes

The successful performance of any packer includes recognizing that the combined effects of varying differential pressure or applied forces cannot be considered independently. Rating a production packer in terms of the differential pressure alone does not sufficiently describe the packer's performance limits. To accurately measure and compare the performance of various packers, an understanding of the simultaneous effects of differential pressure and axial loading is required.

Baker Hughes has developed the industry's first means of describing a packer's performance capabilities, under all possible loading conditions. The analytical system combines computer modeling, sophisticated numerical stimulation techniques, including finite element analysis, exhaustive laboratory testing, and field verification. To apply this technology, a graphical solution is used to provide an accurate and useful definition of a packer's safe operating region.

The system, known as **PERFORM™**, is used to validate if permanent and retrieveble packers are compatible with the demands of today's critical completions. Ensuring all load combinations fall inside the region formed by the curves confirms that the equipment is adequate for the combined loading conditions. This area is called the "safe performance envelope". In those instances where one or more sets of loading conditions fall outside the safe performance envelope, a detailed evalution of all aspects of the proposed completion system is required to upgrade its performance. Some conditions outside the safe performance envelope adversely affect the packer's ability to maintain its sealing integrity. Others may prevent the packer from functioning as designed, while retaining pressure integrity.

PERFORM Envelope



SOFTWARE PROGRAMS

Advantage Torque & Drag

Application

The Baker Hughes Advantage Software System is a cross product line, cross divisional support platform for both wellsite and office based services. A fully integrated suite of Engineering applications enabling drilling engineers to simulate all phases in the wellbore construction process including Torque & Drag.

Whether applied in the planning phase, during operational execution or in post well mode, Torque & Drag helps to analyze and improve drill- string design, optimize well paths and tune drilling parameters.

Advantages

Torque & Drag prediction

- Drill strings, casing/liner/completion strings and coiled tubing
- Rotary and/or slide drilling, rotating off bottom, RIH and POOH including backreaming
- Single or multiple depths

Effortless analysis

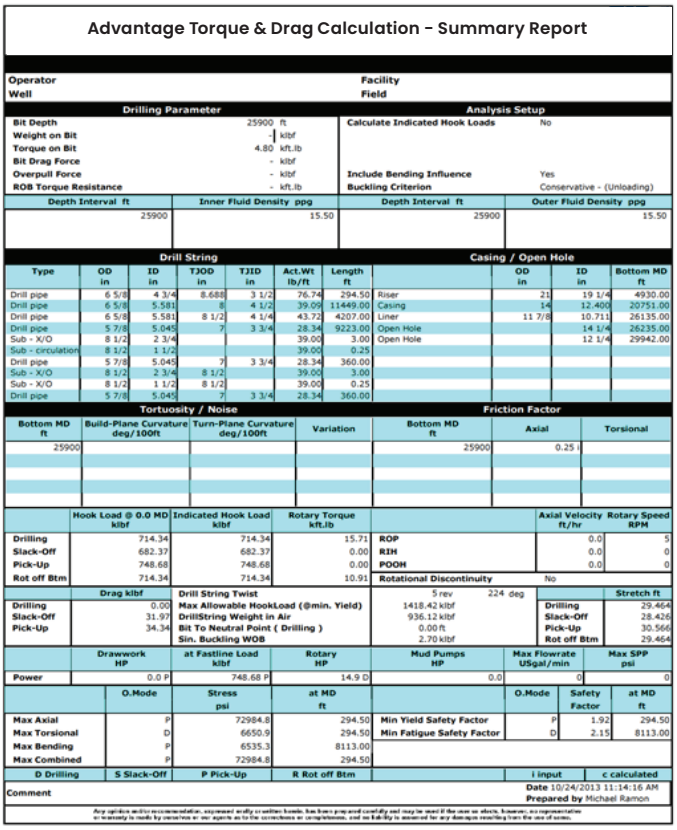
- Loads and deflections along the string (stiff string model)
- Surface torque and indicated hookloads; consideration of frictional losses in the hoisting system
- Determination of buckling onset and observation of post buckling behavior (hysteresis)
- Stress analysis including safety factors against yielding and fatigue
- Drillstring stretch and twist determination
- Prediction of cased and open hole friction factors
- Calibrated tortuosity/noise model
- Casing Wear analysis mode
- Rotational and axial stuck point analysis
- Casing floating modelling capability
- Bit drag/bit overpull force analysis m
- Consideration of non rotating drill pipe protectors or torque reduction subs

Integration in Advantage

- Data sharing with other Advantage Engineering modules such as TubeMove, hydraulics or SwabSurge. Analyze wellsite data entered through advantage reporting to rapidly perform engineering studies
- Real-time Torque & Drag service including features such as Friction Factor logs and buckling or load transfer displays

Field proven reliability

- Case histories have documented the reliability of this software tool



Advantage Torque & Drag Calculation - Summary Report

Operator / Facility
Well / Field

Drilling Parameter

Bit Depth	25900 ft
Weight on Bit	- klbf
Torque on Bit	4.80 kft.lb
Bit Drag Force	- klbf
Overpull Force	- klbf
ROB Torque Resistance	- kft.lb

Analysis Setup

Calculate Indicated Hook Loads	No
Include Bending Influence	Yes
Buckling Criterion	Conservative - (Unloading)

Depth Interval ft	Inner Fluid Density ppg	Depth Interval ft	Outer Fluid Density ppg
25900	15.50	25900	15.50

Drill String

Type	OD in	ID in	TJOD in	TJID in	Act.Wt lb/ft	Length ft
Drill pipe	6 5/8	4 3/4	8.688	3 1/2	76.74	294.50
Drill pipe	6 5/8	5.581	8	4 1/2	39.09	11449.00
Drill pipe	6 5/8	5.581	8 1/2	4 1/4	43.72	4207.00
Drill pipe	5 7/8	5.045	7	3 3/4	28.34	9223.00
Sub - X/O	8 1/2	2 3/4			39.00	3.00
Sub - circulation	8 1/2	1 1/2			39.00	0.25
Drill pipe	5 7/8	5.045	7	3 3/4	28.34	360.00
Sub - X/O	8 1/2	2 3/4	8 1/2		39.00	3.00
Sub - X/O	8 1/2	1 1/2	8 1/2		39.00	0.25
Drill pipe	5 7/8	5.045	7	3 3/4	28.34	360.00

Casing / Open Hole

	OD in	ID in	Bottom MD ft
Riser	21	19 1/4	4930.00
Casing	14	12.400	20751.00
Liner	11 7/8	10.711	26135.00
Open Hole		14 1/4	26235.00
Open Hole		12 1/4	29942.00

Tortuosity / Noise

Bottom MD ft	Build-Plane Curvature deg/100ft	Turn-Plane Curvature deg/100ft	Variation
25900			

Friction Factor

Bottom MD ft	Axial	Torsional
25900	0.25	

	Hook Load @ 0.0 MD klbf	Indicated Hook Load klbf	Rotary Torque kft.lb
Drilling	714.34	714.34	15.71
Slack-Off	682.37	682.37	0.00
Pick-Up	748.68	748.68	0.00
Rot off Btm	714.34	714.34	10.91

	Axial Velocity ft/hr	Rotary Speed RPM
ROP	0.0	5
RIH	0.0	0
POOH	0.0	0
Rotational Discontinuity	No	

	Drag klbf
Drilling	0.00
Slack-Off	31.97
Pick-Up	34.34

Drill String Twist	5 rev	224 deg
Max Allowable HookLoad (@min. Yield)	1418.42 klbf	
DrillString Weight in Air	936.12 klbf	
Bit To Neutral Point (Drilling)	0.00 ft	
Sin. Buckling WOB	2.70 klbf	

	Stretch ft
Drilling	29.464
Slack-Off	28.426
Pick-Up	30.566
Rot off Btm	29.464

	Drawwork HP	at Fastline Load klbf	Rotary HP	Mud Pumps HP	Max Flowrate USgal/min	Max SPP psi
Power	0.0 P	748.68 P	14.9 D	0.0	0	0

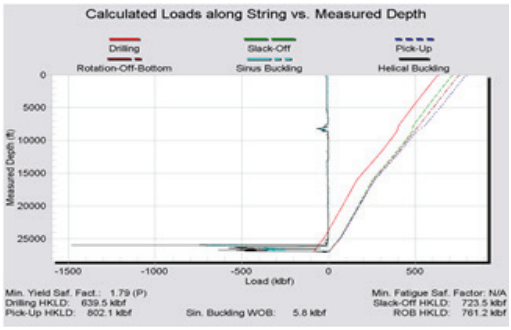
	O.Mode	Stress psi	at MD ft
Max Axial	P	72984.8	294.50
Max Torsional	D	6650.9	294.50
Max Bending	P	6535.3	8113.00
Max Combined	P	72984.8	294.50

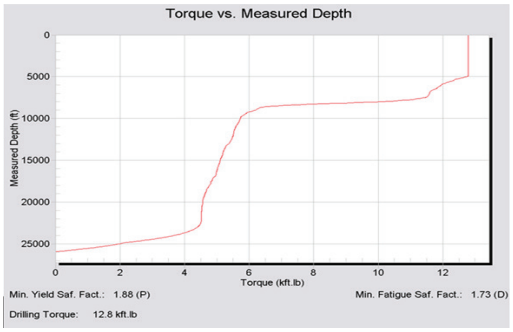
	O.Mode	Safety Factor	at MD ft
Min Yield Safety Factor	P	1.92	294.50
Min Fatigue Safety Factor	D	2.15	8113.00

D Drilling	S Slack-Off	P Pick-Up	R Rot off Btm	i input	c calculated

Comment

Date 10/24/2013 11:14:16 AM
Prepared by Michael Ramon





Design Basis Well Environment Data for Material Recommendations

Baker Hughes

Customer:		Date:	
Well Name or Location:		Requester Name/Company:	
		Phone:	
Well Type:	☐Gas ☐Oil ☐Injection/Disposal*:	☐Other:	

For injection/disposal wells, **provide a report listing all liquids and gases injected. If well will initially be used as a producer, fill out two forms. **Oxygen ppb is critical for injection wells**.*

Casing/Tubing Selections					
Tubing OD:		Tubing Grade (e.g. L80/13Cr):	/	Tubing ID Coated:	☐Y ☐N
Casing OD:		Casing Grade (e.g. L80/13Cr):	/	Tubing Coating Type:	

*****List units of measure for ALL data below*****

Applicable Equipment Type		Depth (ft, m)	Exposure time to Produced Fluids/Total Well Life
Packer:			/ (yrs, days)
SSSV:			/ (yrs, days)
BFC:			/ (yrs, days)
Liner Hanger:			/ (yrs, days)
Other (specify):			/ (yrs, days)

Downhole Conditions						
Location	Max. Temperature		Min. Temperature		Bubble point (for oil wells) or Max. Pressure	
@ Reservoir		**(°F, °C)**		**(°F,°C)**		**(psi, KPa)**
@ Wellhead		**(°F, °C)**		**(°F,°C)**		**(psi, KPa)**

Reservoir **Depth**:	**(ft, m)**
Gas Phase CO_2 @ **(reservoir** or **WH)**:	**(psia, mole %, ppm)**
Gas Phase H_2S @ **(reservoir** or **WH)**:	**(psia, mole %, ppm)**
Elemental Sulfur:	**(None or g/l)**
Design max. **Water Production (Gas)**:	**(bbl/MMSCF, m^3/m^3)**
Design max. **Water Cut (Oil)**:	**(%)**
Design (max.) **Chlorides**:	**(ppm, mg/l)**
Bicarbonate Ion Concentration:	**(ppm, mg/l)**
Organic Acid Concentration:	**(ppm, mg/l)**

Production Inhibitors:	(continuous, batch, none)	Inhibitor type:	(e.g. amine)
Annulus/completion fluid:	(e.g. $CaCl_2$)	Inhib/type:	/
Other fluid exposure/ concentration/time:	(e.g. mud acid, 15% HCl, xylene, toluene, methanol, caustic, >9 pH mud, scale inhibitor)		

Note: Request water and gas analysis reports and include with this form.