

Zonal Isolation / Water Shutoff / Abandonment

High Expansion Permanent Umbrella Basket

TTS's High Expansion Permanent Umbrella Basket is designed to pass through small restrictions and set in a larger ID tubular below. It firmly anchors into place a "metal petal" umbrella that functions as a cement basket to be utilized as a base for subsequent placement (dumping) of bridging material, cement, or resin.

Features/Benefits

- ◆ Double basket supports cement column and diverts migrating fluid to vent.
- ◆ The Umbrella Basket uses overlapping spring steel petals to form a cone opening to the casing ID and provide a strong base to start the plugback operation. Metal petals are stronger than other cloth and Kevlar baskets and provide resistance to damage by corrosive wellbore fluids.
- ◆ Capable of setting in corrosion-resistant alloys and high tensile tubulars such as:
 - 13Cr, Hyper chrome
 - Inconel; and
 - Q-125, S-135
- ◆ Slip segments have been designed to hold 1600# each to improve setting and holding ability.
- ◆ The unique setting mechanism positively deploys the bottom slips approximately 12" below the end of the running sleeve.
- ◆ A tool barrier is installed above the basket to help prevent accidental damage due to wireline tool string contact.
- ◆ A pressure balanced sliding sleeve vent valve maintains equalization across plug until it is closed, which is easily accomplished using wireline.
- ◆ Each umbrella basket is manufactured to accept the addition of a TTS Bow Spring Centralizer to assist entry of the running assembly into liner tops.
- ◆ Stocked for all API casing sizes (4-1/2" thru 9-5/8"). Special tubing, casing, and open hole sizes or corrosive service (H2S, CO2) models available on request.
- ◆ Standard tool running diameter is 1.63" for 7" and smaller casing; 2" for 7-5/8" and larger casing; standard length is 13' for vented, 6' 6" for non-vented (7' 6" for 8-5/8" and larger).

Applications

- ◆ Zonal isolation or abandonment
- ◆ Straddle isolation
- ◆ Base for cement plug
- ◆ Depth control marker/base for subsequent gravel pack

Tool Series	Description
7850	Vented, Dual Basket
7803	Modular
7804	Straddle
7805	Non-Vented

*Petal baskets with custom features (e.g., length, slip range, etc.) available on order.





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Umbrella Basket Specifications

Vented Umbrella Basket				
Part Number	Pipe Size (in)	With Shot (WS)	Running Length (ft)	Running OD (in)
7850-163-450	4" / 4-1/2"	Y	13'	1.63"
7850-163-550	5" / 5-1/2"	Y	13'	1.63"
7850-163-663	6-5/8"	Y	13'	1.63"
7850-163-700	7"	Y	13'	1.63"
7850-163-763	7-5/8"	Y	13'	1.63"
7850-200-763	7-5/8"	N	13'	2"
7850-200-963	9-5/8"	N	13'	2"

Non-Vented Umbrella Basket				
Part Number	Pipe Size (in)	With Shot (WS)	Running Length (ft)	Running OD (in)
7805-163-450	4" / 4-1/2"	N	6'6"	1.63"
7805-163-550	5" / 5-1/2"	N	6'6"	1.63"
7805-163-663	6-5/8"	N	6'6"	1.63"
7805-163-700	7"	N	6'6"	1.63"
7805-163-763	7-5/8"	N	6'6"	1.63"
7805-200-963	9-5/8"	N	7'6"	2"

*Umbrella baskets with custom features (e.g., length, slip range, etc.) available on order.

A **Straddle** version is available to shut-off unwanted production or communication zone(s). This version leaves the vent valve open to allow production/communication with zones(s) below the Straddle. The annular area between the basket and the vent valve is sealed off by cement. The length of this interval is custom designed for the particular well requirements.

When zone length requires additional length, a **Modular** version is available to allow multiple sections to be assembled on location. The total length is only limited by the length of deployable wireline tool string.

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High Expansion Permanent Elastomeric Plug

The TTS High Expansion Permanent Elastomeric Plug consists of a heavy-duty anchor and an expanding steel frame covered by a high expansion elastomer. The anchor holds the plug system in place as the steel frame is expanded and engages the elastomer against the ID of the casing wall. Plug construction (seal element and anchor) is modular to allow the operator to adapt to multiple running conditions.

Features/Benefits

- ◆ Complies with API 11D1 specifications.
- ◆ Deployment of this patented plug system is accomplished using wireline or coiled tubing.
- ◆ Compatible with all wireline systems increasing setting options.
- ◆ Modular design increases operational efficiency.
- ◆ Short Overall Length increases ability to reach target zone.
- ◆ Robust design.
- ◆ Capable of setting in corrosion resistant alloys and high tensile tubulars such as:
 - 13Cr, Hyper chrome;
 - Inconel; and
 - Q-125, S-135
- ◆ Designed to run through a smaller pipe ID or tubing restriction and set in larger ID casing below
- ◆ Total run in length is a maximum of 14.5' long

Applications

- ◆ Zonal isolation or abandonment
- ◆ Base for cement plug
- ◆ Depth control marker for subsequent gravel pack



High Expansion Permanent Elastomeric Plug						
Casing Size	Weight (ppf)	ID Setting Range (working)		Tubing Size	Plug OD	Plug Length (left in hole)
		Min	Max			
3-1/2"	-	2.600"	3.340"	2-3/8"	1.81"	54.7"
4"	-	3.240"	3.640"	2-3/8"	1.81"	54.7"
4-1/2"	6.75 – 18.8	3.640"	4.216"	2-3/8"	1.81"	54.7"
5"	11.5 – 21	4.000"	4.560"	2-3/8"	1.81"	54.7"
5-1/2"	15.5 – 26	4.548"	4.960"	2-3/8"	1.81"	54.7"
4-1/2"	6.75 – 18.8	3.515"	4.216"	2-7/8"	2.19"	93.4"
5"	11.5 – 21	4.154"	4.560"	2-7/8"	2.19"	93.4"
5-1/2"	9 – 26	4.548"	5.192"	2-7/8"	2.19"	93.4"
6-5/8"	17 – 28	5.665"	6.135"	2-7/8"	2.19"	93.4"
7"	17 – 38	5.795"	6.538"	2-7/8"	2.19"	93.4"
7"	17 – 38	5.795"	6.538"	3-1/2"	2.63"	93.6"
7-5/8"	26.4 – 39	6.500"	6.969"	3-1/2"	2.63"	93.6"
7"	17 – 38	5.795"	6.538"	4-1/2"	3.41"	79.3"
9-5/8"	43.5 – 75.6	7.875"	8.755"	5-1/2"	4.25"	83.3"

The Spiral Plug can be utilized in any tubular ID that falls within the listed range.

*US Patent 7,104,323 B2

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High Expansion Pressure Rated Bridge Plug

The High Expansion Pressure Rated Bridge Plug is designed to travel through tubing ID restriction(s) and set in a larger ID tubular below. The purpose of the system is to have a mechanism for ensuring proper deployment of the slips and guarantee accurate compression of the seal elements. The High Expansion Pressure Rated Bridge Plug lower slip is not completely opened and set until the elastomer is sufficiently compressed. Proper placement and anchoring of the slips helps ensure proper retention of the elastomer seal elements in the proper position to establish and maintain a pressure tight seal.

Features/Benefits

- ◆ Complies with API 11D1 specifications.
- ◆ Designed to travel through smaller tubing ID/ restrictions and set in a larger ID tubular.
- ◆ Testing has proven it effective in holding pressure from both directions and capable of withstanding reverse pressure cycles.
- ◆ Capable of setting in corrosion-resistant alloys and high tensile tubulars such as:
 - 13Cr
 - Inconel; and
 - Q-125, S-135, Hyper chrome
- ◆ TTS is the first manufacturer to post a pressure rating on this type of plug.
- ◆ Proprietary method of attaching each slip segment to the plug body, holding the slips in a proper axial alignment.
- ◆ TTS' unique slip attachment method also reduces frictional forces created by traditional slip designs.
- ◆ Can be made out of corrosive-resistant alloys.

Applications

- ◆ Zonal isolation
- ◆ Bottom for cement
- ◆ Depth control marker for subsequent gravel pack



High Expansion Pressure Rated Bridge Plug				
OD (in)	Setting Range (in)		Tension Stud (lbs)	Δ Pressure Rating (psi)
	Min	Max		
1.480	1.610	1.995	8,000	5000 @ 1.995 I.D.
1.750	1.905	2.441	13,000	5000 @ 2.441 I.D.
1.906	2.156	2.765	13,000	5000 @ 2.441 I.D.
2.187	2.375	3.000	13,000	5000 @ 2.992 I.D.
2.281	2.441	3.343	13,000	5000 @ 2.992 I.D.
2.500	2.875	3.500	25,000	5000 @ 3.500 I.D.
2.730	3.187	4.030	25,000	3000 @ 3.920 I.D.

US Patent # 7,578,353 and US Patent # 7,743,836

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Metal-to-Metal Seal Bridge Plug

The TTS Metal-to-Metal Seal Bridge Plug provides a cost effective method to plug and isolate pipe in wellbore environments detrimental to elastomeric seals. The use of metal seals eliminates problems associated with elastomer swell and explosive decompression that may be experienced in these environments.

The plug system functions by using an expandable metal seal element and interior metal seals. The expandable element engages the pipe ID creating a high pressure seal that will be unaffected by the presence of gas over the life of the plug. It is normally conveyed into the well using wireline, but can also be deployed with coiled tubing, or jointed pipe. Available for tubing sizes 2-7/8" and 3-1/2".

Features/Benefits

- ◆ All-Metal construction
- ◆ Bi-Directional slip design provides increased anchoring

Applications

- ◆ Abandonment
- ◆ Zonal Isolation



Metal-to-Metal Seal Bridge Plug

Tubing Size	Setting Range (in)		Plug OD (in)	Plug Length (in)	ΔP (psi)
	Min	Max			
2-7/8" 6.5#	2.441	2.495	2.260	16.00	10,000
3-1/2" 9.3# - 10.2#	2.922	3.040	2.753	18.56	10,000

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Releasable High Expansion Pressure Rated Bridge Plug

The Releasable High Expansion Pressure Rated Bridge Plug has all the benefits of the patented High Expansion Pressure Rated Bridge Plug but allows the plug to be removed from the tubing without requiring a milling operation.

Features/Benefits

- ◆ Complies with API 11D1 specifications.
- ◆ Plug may be removed via wireline eliminating milling operation.
- ◆ Capable of setting in corrosion resistant alloys and high tensile tubulars such as:
 - 13Cr, Hyper chrome
 - Inconel; and
 - Q-125, S-135
- ◆ Unique locking design allows the majority of a set plug to be removed via wireline, the remainder of the plug is dropped to the bottom of the well.
- ◆ Testing and field operations have proven the Releasable High Expansion Pressure Rated Bridge Plug to be easily and reliably removed after setting.

Applications

- ◆ Zonal isolation
- ◆ Temporary abandonment
- ◆ Bottom for cement
- ◆ Wellhead Change-out
- ◆ Tubing Change-out
- ◆ Depth control marker for subsequent gravel pack



Knock Out Magna-Range Bridge Plug

OD (in)	Setting Range (in)		Tension Stud (lbs)	Δ Pressure Rating (psi)	
	Min	Max		Above	Below
1.480	1.610	1.995	8,000	2000	5000
1.906	2.156	2.765	13,000	2000	5000
2.187	2.375	3.000	13,000	2000	5000

US Patent # 9,714,554 B1

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Permanent Drillable Tubing Bridge Plug (10KPSI Rated)

The TTS Tubing Bridge Plug is designed with a few defining features that differentiate it from the conventional cast iron plugs currently on the market. It utilizes a specially designed Ecer Array elastomer system to provide structural integrity within the sealing element to withstand the differential pressure. This eliminates the fragile slotted metal backups normally employed to support the sealing element in the annular area between the plug and the pipe wall, making for a more robust plug design.

Features/Benefits

- ◆ Complies with API 11D1 specifications.
- ◆ Test validation grades from V6 – V0
- ◆ Small run-in OD, increases ability to deploy through and decreases possibility of sticking in tight spots or bends in tubing.
- ◆ Compact and dependable, the TTS Tubing Bridge Plug is easily set via wireline or pipe.
- ◆ No fragile exposed metal backups reduce chance of plug damage which could lead to sticking the plug/setting tool system during deployment.
- ◆ Capable of setting in corrosion-resistant alloys and high tensile tubulars such as:
 - 13Cr, Hyper chrome
 - Inconel
 - Q-125, S-135
- ◆ Lab testing verified ability to withstand pressure differential of 10,000 psi from both directions while subjecting plug to pressure reversal cycles.
- ◆ Available with bottom adapter Bow Spring Centralizer or other wireline tools.
- ◆ Setting force is maintained by a ratcheting lock ring on top of the Bridge Plug.
- ◆ Can be made out of corrosive-resistant alloys.

Applications

- ◆ Zonal isolation
- ◆ Permanent abandonment
- ◆ Bottom for cement
- ◆ Depth control marker for subsequent gravel pack



TTS Tubing Bridge Plug (10K)					
Tubing Size	Weight (ppf)	Plug O.D. (in)	ID Setting Range (in)		Pressure Rating (psi)
			Min	Max	
2-3/8"	4.00 – 5.95	1.71	1.759	2.107	10,000psi @ 1.995" I.D.
2-7/8"	6.40 – 9.50	2.09	2.125	2.563	V5 10,000psi @ 2.441" ID V0 3,000psi @2.441" ID
3-1/2"	12.70 – 12.95	2.50	2.530	2.810	10,000psi @ 2.750" I.D.
3-1/2"	5.75 – 10.30	2.63	2.670	3.258	V5 10,000psi @ 2.992" I.D. V0 3,000psi @2.992" ID



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Cast Iron Bridge Plug

Compact and dependable, the Cast Iron Plug is easily set via wireline or pipe. Setting force is maintained by a Ratcheting Lock Ring on top of the plug.

Features/Benefits

- ◆ Complies with API 11D1 specifications.
- ◆ Test validation grades from V3 – V0
- ◆ Rated for 300°F (Nitrile).
- ◆ Custom elastomers available upon request.
- ◆ Drillable
- ◆ Drilling out is easier due to the cast material.
- ◆ Available for tubing and casing sizes from 4" to 20".
- ◆ Can be set in grades up to P-110.
- ◆ Custom slips available to set in higher grade material up to Q-125.
- ◆ Pressure rating dependent on OD.
- ◆ Can be made out of corrosive-resistant alloys.

Applications

- ◆ Zonal isolation
- ◆ Permanent abandonment
- ◆ Bottom for cement



Cast Iron Bridge Plug					
Pipe Size	Weight (ppf)	Plug O.D. (in)	ID Setting Range (in)		ΔP Rating
			Min	Max	
4"	5.6 - 14.0	3.120	3.340	3.732	10K
4-1/2"	9.5 – 16.60	3.500	3.826	4.090	10K
4-1/2"	9.5 – 13.5	3.710	3.920	4.560	10K
5"	11.5 – 21.0	3.710	3.920	4.560	10K
5-1/2"	13.0 - 25.0	4.240	4.580	5.047	10K
5-3/4"	22.5 - 25.2	4.240	4.580	5.047	10K
6-5/8"	34.0	4.750	5.140	5.595	10K
6-5/8"	17.0 - 34.0	5.340	5.595	6.366	10K
6-5/8"	17.0 – 22.0	5.610	5.989	6.655	10K
7"	23.0 – 40.0	5.340	5.595	6.366	10K
7"	17.0 – 35.0	5.610	5.989	6.655	10K
7-5/8"	20.0 - 39.0	6.090	6.625	7.263	10K
8-5/8"	24.0 - 49.0	6.960	7.511	8.248	10K
9-5/8"	29.3 - 53.5	7.710	8.435	9.063	8K
10-3/4"	32.7 – 51.0	9.500	9.850	11.150	5K
11-3/4"	38.0 - 65.0	9.500	9.850	11.150	4K
13-3/8"	48.0 – 72.0	12.000	12.347	12.715	3K
16"	65.0 – 128.0	14.125	14.438	15.250	2K
18-5/8"	76.0 – 96.5	17.250	17.655	18.730	2K
20"	94.0 – 133.0	18.375	18.730	19.124	2K

Packers/Well Intervention

Paragon II Retrievable Bridge Plug (RBP)

The Paragon II Retrievable Bridge Plug (RBP) is based off any version of the Paragon Retrievable Tubing Packers including; Standard, High Pressure and Medium Expansion versions. It utilizes a sleeve-type equalization valve assembly which is attached to the lower end of the packer. The sleeve valve is run in the well normally closed. Upon retrieval of the RBP the sleeve valve is opened to allow pressure to equalize across the RBP prior to retrieval attempts thus preventing the RBP from being inadvertently blown up or down in the well due to pressure differentials across the set RBP when retrieving with wireline. The valve is opened by applying downward forces or jarring action to the top of the sleeve valve. This is normally accomplished through the additions of a rod assembly attached to the lower end of the packer pulling tool where downward jarring action shifts the sleeve from the closed position to the open position. Once pressure across the RBP is equalized normal retrieval is commenced using up strain or upward jarring action. The Paragon RBP is offered in versions consistent with API 11D1 V5, V3 and V0 rating of up to 7500 psi at 300 degrees Fahrenheit.

Features/Benefits

- ◆ Complies with API 11D1 specifications.
- ◆ One-trip installation, one-trip retrieve Bridge Plug.
- ◆ Jar down to equalize and pull up to release.
- ◆ Modular Gage Rings allow for optimizing seal gap.
- ◆ Pressure Equalizing Valve opens before release occurs.
- ◆ Bi-directional caged slip design located below the packing system provides increased retrievability.
- ◆ Capable of setting in corrosion-resistant alloys and high tensile tubulars such as:
 - 13Cr, Hyper chrome
 - Inconel; and
 - Q-125, S-135
- ◆ Multi-durometer packing system increases sealing ability.
- ◆ Standard external fishing neck for reliable latching.
- ◆ Release mechanism is not affected by differential pressures allowing reduction of the required release forces to aid wireline retrieving.
- ◆ Once RBP is released, the tool is locked in the release position allowing the ability to work up and down once released and not re-engage slips.

Applications

- ◆ Temporary abandonment
- ◆ Zonal Isolation
- ◆ Wellhead change out
- ◆ Deployment Plug
- ◆ Depth Locator for subsequent operations
- ◆ Selective testing/production

(See Pages 27–29)



Packers/Well Intervention

Paragon II 10K Retrievable Bridge Plug (RBP)

The TTS Paragon II 10K Retrievable Bridge Plug is deployable via coiled tubing, pipe, or wireline. It utilizes a proven multi-durometer packing system located above bi-directional slips. The differential pressure rating (V3) is 10,000 psi at 300° F. Customizations are available for special sizes, corrosive environments.

Features/Benefits

- ◆ Complies with API 11D1 specifications.
- ◆ One-trip installation, one-trip retrieval.
- ◆ Modular Gage Rings allow for optimizing annular seal gap.
- ◆ Bi-directional slip design located below the packing system provides increased retrievability.
- ◆ Capable of setting in corrosion-resistant alloys and high tensile tubulars such as:
 - 13Cr, Hyper chrome
 - Inconel; and
 - Q-125, S-135
- ◆ Smaller OD Body above Packing Elements to aid in wash over.
- ◆ Standard external fishing neck for reliable latching.
- ◆ Pressure Equalizing Valve opens after Pulling Tool is latched.
- ◆ Release mechanism is not affected by differential pressures allowing reduced release force to aid wireline retrieving.
- ◆ Straight pull to release.
- ◆ During retrieval, tool is locked in the released position allowing the ability to work up and down during retrieval without re-engaging slips.

Applications

- ◆ Temporary abandonment
- ◆ Zonal Isolation
- ◆ Wellhead change out
- ◆ Storm Choke
- ◆ Deployment Plug
- ◆ Depth Locator for subsequent operations
- ◆ Selective testing/production

Retrievable Bridge Plug (RBP)					
Tubing Size (in)	Tubing (wt)	Setting Range (in)		Plug OD (in)	Pulling Tool
		Min	Max		
2-7/8	6.4 – 6.5	2.373	2.480	2.290	2-1/2" JDS
3-1/2	9.3 – 10.2	2.919	3.047	2.725	2-1/2" JDS
4-1/2	10.5 – 15.1	3.752	4.118	3.660	3" JDS
5-1/2	15.5 – 23.0	4.578	4.976	4.470	3" JDS

NOTE: Other sizes available on request

