

Thru-Tubing Intervention

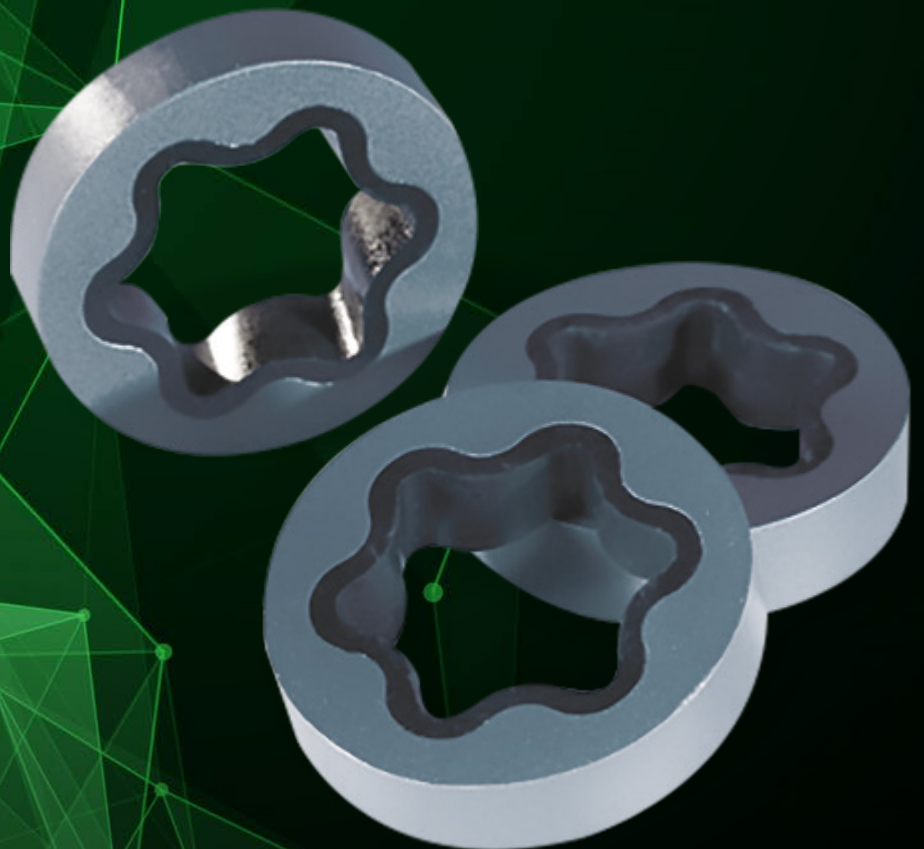


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STANDARD TOOLS

Motorhead Assembly

Product Family No. HI3203

Application

The **motorhead assembly** combines the main tool components used in coiled tubing operations in modular form. The combined tool length has been greatly reduced to allow ease of handling and deployment in the well and also to effectively reduce the bending stresses in the bottomhole assembly. The motorhead assembly consists of the coiled tubing connector, dual back pressure valve, hydraulic disconnect, dual circulation sub, and optional lockable swivel.

Advantages

- High tensile strength
- Full torque-through capabilities
- Shorter overall length
- Full internal pressure integrity
- Standardized connections for ease of use

Specification Guide

Tool OD		Tool ID [◇]				Coiled Tubing OD	Tensile Rating	Standard Connection
in.	mm	Disconnect		Circulating Sub				
		in.	mm	in.	mm	in.	lb	
1.69*	42.9	0.56	14.1	0.44	11.2	1.50	21,000	1-in. AMMT
1.69	42.9	0.56	14.1	0.44	11.2	1.25	26,000	1-in. AMMT
2.13	54.1	0.68	17.2	0.56	14.1	1.25	45,600	1½-in. AMMT
2.13	54.1	0.68	17.2	0.56	14.1	1.50	47,000	1½-in. AMMT
2.25	57.2	0.68	17.2	0.56	14.1	1.75	47,000	1½-in. AMMT
2.88	73.2	0.81	20.4	0.68	17.2	1.50	123,000	2¾-in. PAC DSI
2.88	73.2	0.81	20.4	0.68	17.2	1.75	80,000	2¾-in. PAC DSI
2.88	73.2	0.81	20.4	0.68	17.2	2.00	84,000	2¾-in. PAC DSI
3.50	88.9	1.31	33.3	1.19	30.1	2.00	158,000	2⅞-in. PAC DSI
3.50	88.9	1.31	33.3	1.19	30.1	2.38	157,000	2⅞-in. PAC DSI
3.50	88.9	1.31	33.3	1.19	30.1	2.88	89,000	2⅞-in. PAC DSI

* Internal coiled tubing connector

◇ Minimum ID sizes specified are maximum piston IDs possible. Smaller piston sizes are available on request.



Motorhead Assembly
Product Family No. HI3203

STANDARD TOOLS

Coiled Tubing Connector

Product Family No. H13200

Application

Coiled tubing connectors provide a means of attaching a tool string to the end of the coiled tubing. The connectors, when installed correctly, provide a reliable, strong sealed connection to the coiled tubing. All of the connectors have been designed with either a fishing neck or a slick profile on the OD of the top sub. This will accommodate standard external fishing overshots should the need arise. Coiled tubing connectors have been designed for most sizes of coiled tubing. The coiled tubing connectors are of the slip type or collet type design. The slip type connectors are also equipped with set screws to rotationally lock them from spinning when used in conjunction with tools that create torque such as coiled tubing workover motors.

The connectors use o-ring seals to seal off the coiled tubing in order to maintain pressure integrity for the tool string.

Advantages

- High tensile strength
- High torsional strength for motor applications
- Large ID for maximum flow rates and pump through of actuation balls
- Manufactured with fishing profile on top of connector high pressure/high temperature tools rated to 10,000 psi (689 bar) and 400°F (204°C)



Coiled Tubing Connector
Product Family No. H13200

STANDARD TOOLS

Coiled Tubing Connector

Specification Guide							
Coiled Tubing OD		Tool OD		Tool ID		Tensile Rating	Standard Connection
in.	in.	mm	in.	mm	lb		
1.00	1.69	42.9	0.75	19.1	31,000	1-in. AMMT	
1.00	2.13	54.1	0.88	22.4	94,000	1-in. AMMT	
1.25	1.69	42.9	0.75	19.1	25,000	1-in. AMMT	
1.25	2.13	54.1	0.81	20.4	63,000	1-in. AMMT	
1.50	2.13	54.1	0.75	19.1	49,000	1-in. AMMT	
1.50	2.88	73.2	1.12	28.4	123,000	2 $\frac{3}{8}$ -in. PAC DSI	
1.50	3.13	79.5	1.00	25.4	123,000	2 $\frac{3}{8}$ -in. Reg	
1.75	2.25	57.2	1.00	25.4	49,000	1 $\frac{1}{2}$ -in. AMMT	
1.75	2.50	63.5	1.00	25.4	50,000	1 $\frac{1}{2}$ -in. AMMT	
1.75	2.88	73.2	1.50	38.1	80,000	2 $\frac{3}{8}$ -in. PAC DSI	
1.75	3.13	79.5	1.00	25.4	80,000	2 $\frac{3}{8}$ -in. Reg	
2.00	2.50	63.5	1.00	25.4	53,000	1 $\frac{1}{2}$ -in. AMMT	
2.00	2.88	73.2	1.50	38.1	78,000	2 $\frac{3}{8}$ -in. PAC DSI	
2.00	3.13	79.5	1.00	25.4	134,000	2 $\frac{3}{8}$ -in. Reg	
2.38	2.88	73.2	1.50	38.1	53,000	2 $\frac{3}{8}$ -in. PAC DSI	
2.38	3.38	85.7	1.00	25.4	156,000	2 $\frac{3}{8}$ -in. Reg	
2.38	3.50	88.9	1.50	38.1	155,900	2 $\frac{7}{8}$ -in. PAC DSI	
2.88	3.38	85.7	1.50	38.1	71,000	2 $\frac{7}{8}$ -in. PAC DSI	

Not all coiled tubing connectors are listed here. Additional sizes available upon request.

STANDARD TOOLS

Back Pressure Valve

Product Family No. H13204

Application

The **back pressure (BP) valve** is a flapper-type valve that allows flow down the tubing, but stops flow coming back up the tubing. The back pressure valve has two flappers and flapper seals. The second flapper is redundant to the first and can be run where redundant seals are required. The flapper is designed so that a ball can be pumped through it at minimum fluid flow rate.

The back pressure valve is normally run directly below the coiled tubing connector in CT operations and at the top of the bottomhole assembly in snubbing operations. The back pressure valve is run as a well control measure to prevent wellbore pressure from entering the workstring. No pipe manipulation or pressurization sequence is required to operate the tool.

Advantages

- Dual flapper valves
- Field-proven bonded nitrile flapper valve seats
- Short length
- Large ID
- High pressure/high temperature tools rated to 10,000 psi (689 bar) and 400°F (204°C)

PACE Back Pressure Valve

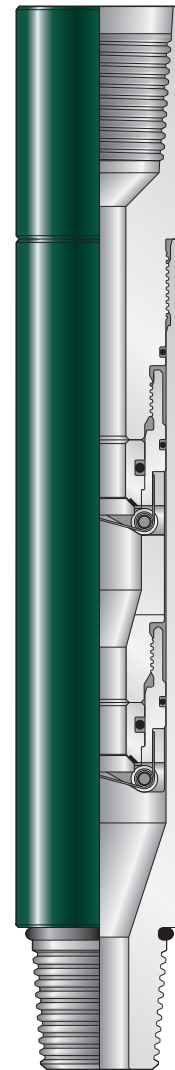
Product Family No. H33091

Application

The primary purpose of the **Pressure actuated compensating equalizing (PACE) back pressure (BP) valve**, is as a safety precaution on live wells to prevent flow back up through the tubing. The tool is equipped with two flappers as a redundant safety system. The pace BP is also equipped with an equalizing feature that allows the pressure below the flappers to be vented to the annulus if the pressure compensating volume in the tool is completely used.

Advantages

- Dual flapper configuration with floating flapper design
- Downhole equalizing feature vents pressure to annulus
- Field proven nitrile bonded valve seats
- Large ID allows for high flow rates
- Full ID opening for ball drops



Back Pressure Valve
Product Family No. H13204

STANDARD TOOLS

Back Pressure Valve and PACE Back Pressure Valve

Specification Guide							
Tool OD		Tool ID		Make Up Length		Tensile Rating	Standard Connection
in.	mm	in.	mm	in.	mm	lb	
1.69	42.9	0.69	17.5	18.13	460.5	31,000	1-in. AMMT
1.69*	42.9	0.69	17.5	31.63	803.4	22,900	1¼-in. 8 'P' Acme
2.13	54.1	0.81	20.4	16.56	420.6	72,000	1½-in. AMMT
2.13*	54.1	0.81	20.4	31.94	811.3	32,100	1¾-in. 6 'P' Acme
2.50	63.5	0.81	20.4	16.94	430.3	140,000	1½-in. AMMT
2.88	73.2	1.00	25.4	23.32	592.3	100,000	2⅝-in. PAC DSI
3.13	79.4	1.00	25.4	18.82	478.0	150,000	2¾-in. Reg
3.50	88.9	1.00	25.4	24.69	627.1	330,000	2⅞-in. PAC DSI
3.75	95.3	1.00	25.4	32.94	836.7	250,000	2⅞-in. Reg

* PACE back pressure valve

STANDARD TOOLS

Dual-Actuated Circulating Valve

Product Family No. H13218

Application

The **dual-actuated circulating valve** is designed to allow a circulation path above a mud motor from tubing to annulus. When the motor service is complete, fluids may need to be pumped for several hours to clean or displace the wellbore. The use of this valve can save unnecessary wear on the mud motor during this operation.

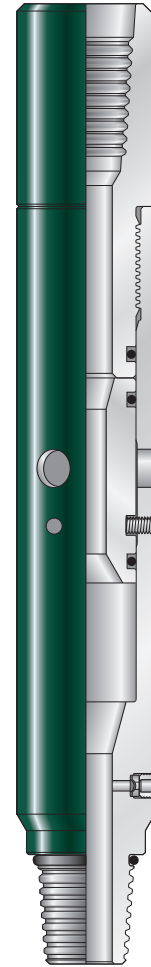
The dual-actuated circulating valve is ball actuated and is normally run below the hydraulic disconnect and above the downhole motor. The primary means of actuation is accomplished by pumping a ball which will shift the piston sleeve, exposing circulation ports. The secondary means of actuation is through a rupture disc. In the unlikely event that the bottomhole assembly becomes plugged, increased pressure from the surface will rupture the disc and allow circulation of an actuation ball.

Advantages

- Saves wear on the mud motor
- Large ID permits maximum flow rates
- Predetermined values on shear screws and secondary rupture disc
- Balanced piston

Specification Guide

Service	Tool OD		Tool ID		Make Up Length		Tensile Rating	Standard Connection
	in.	mm	in.	mm	in.	mm	lb	
Dual	1.69	42.9	0.41	10.4	11.06	280.9	47,000	1-in. AMMT
Dual	2.13	54.1	0.44	11.2	12.13	308.1	84,000	1½-in. AMMT
Dual	2.50	63.5	0.44	11.2	12.38	314.5	115,000	1½-in. AMMT
Dual	2.88	73.2	0.44	11.2	11.63	295.4	172,000	2⅜-in. PAC DSI
Dual	3.13	79.5	0.56	14.1	14.25	326.0	178,000	2⅜-in. PAC DSI
Dual	3.50	88.9	0.56	14.1	15.50	393.7	178,000	2⅞-in. PAC DSI



Dual-Actuated Circulating Valve
Product Family No. H13218

STANDARD TOOLS

Annular Circulation Valve

Product Family No. H13287

Application

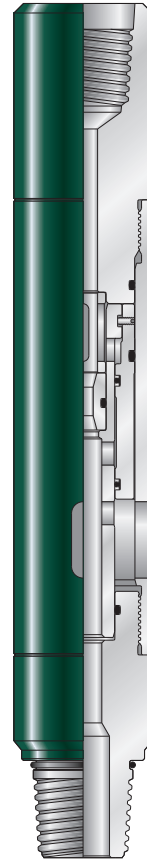
The **annular circulation valve** is designed to allow communication of fluid from the tool ID to the annulus. The annular circulation valve is typically run in tubing cutting applications. When circulation is required during running in the hole, fluid is circulated through the flow ports, eliminating the potential for rotation of the motor or function or the DB cutter.

The inflation valve (product family no. H33078) is typically run with retrievable and permanent bridge plugs. An important function of the inflation valve is to equalize pressure from bridge plug ID to casing while going in the hole. This prevents damage to the packing element and insures that the poppet is not seated too tight in the poppet housing due to hydrostatic pressure while tripping in the hole.

When the tool is to be set a ball is landed in the seat on either valve which closes off communication to below the valve and to the circulating ports. Pressure applied to the coiled tubing then shifts a sleeve that closes ports to the annulus and also opens a communication path around the ball to the desired tool configuration below.

Advantages

- Allows the tool string to remain balanced while running in the hole
- Large circulation ports
- Short, simple design
- No pipe manipulation required for operation of the tool



Annular Circulation Valve
Product Family No. H13287

Specification Guide							
Tool OD		Tool ID		Make Up Length		Tensile Rating	Standard Connection
in.	mm	in.	mm	in.	mm	lb	
1.69	42.9	0.31	7.9	14.80	375.9	30,000	1-in. AMMT
2.13	54.1	0.44	11.2	16.57	420.9	59,000	1½-in. AMMT
2.88	73.2	0.56	14.2	18.00	457.2	123,000	2⅝-in. PAC DSI
3.13	79.5	0.56	14.2	17.50	444.5	205,000	2⅝-in. REG

STANDARD TOOLS

TJB Hydraulic Disconnect

Product Family No. H13238

Application

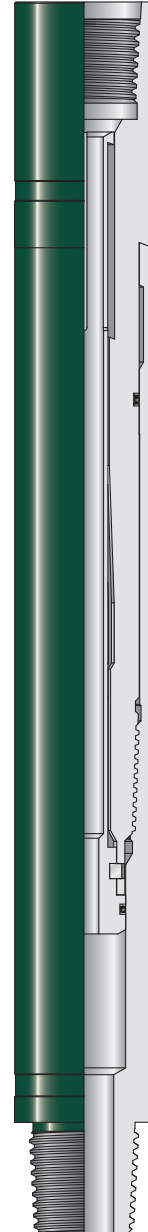
The **TJB hydraulic disconnect** is designed to be used with coiled tubing to provide a method of disconnecting from the tools run below the disconnect. This allows the coiled tubing to be pulled from the well if the tool string becomes stuck. The TJB disconnect is usually run just below the coiled tubing connector and back pressure valve(s). The tool is rotationally locked so it is compatible with tools that create torque such as coiled-tubing workover motors.

The TJB hydraulic disconnect are ball operated devices which require tubing pressure for activation. Once the ball has seated in the tool, pressure is applied to the coiled tubing, which shears the screws within the tool allowing the top section of the disconnect to unlatch from the lower section. The tubing may now be pulled from the well and an internal fishing neck profile is exposed on the section left in the well which facilitates subsequent fishing operations.

The TJB hydraulic disconnect design is made for applications that involve the use of Hipp-Tripper and designed for high axial loading such as those encountered in fishing operations utilizing a jarring assembly. The design is good for cyclic side loading and torque encountered in operations using workover motors such as underreaming and cutting.

Advantages

- Hydraulic ball drop activation
- Provides controlled method of disconnecting from lower portion of bottomhole assembly
- Internal GS profile fishing neck
- Accommodates standard GS fishing tools
- Pressure balancing feature prevents accidental hydraulic release
- Torsional locking mechanism provides tool compatibility with workover motor applications
- Large inside diameter (ID) permits circulation of actuation balls below the tool



TJB Hydraulic Disconnect
Product Family No. H13238

ACCESSORY TOOLS

Type B Boot Basket

Product Family No. H13016

Application

Boot baskets are used to trap cuttings which are too large to circulate out of the hole during drilling, milling, or junk fishing operations. The design of the boot basket traps junk by producing a sudden decrease in annular velocity when the cuttings pass the larger OD of the boot reaching the smaller OD of the body and top connection.

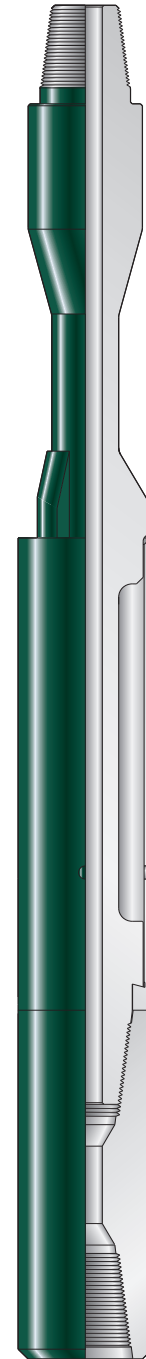
The boot basket should be run as close as possible to the mill, bit, or junk basket. Milling procedures are carried out as usual with normal circulation.

Additional boot baskets may be run in tandem to increase the junk catching capacity.

Advantages

- Simple design and operation
- Constructed from AISI 4140 heat-treated alloy steel
- Can be run in tandem
- Box down, pin up design so that boot basket may be run directly above a mill or bit
- May be ordered with 18-in. (45.7 cm) or 36-in. (94.1 cm) long baskets
- Boot can be removed for inspection of the entire tool
- Excellent torsion and buckling strength

Specification Guide								
Tool OD		Tool ID		Make Up Length		Tensile Rating	Standard Connection	
in.	mm	in.	mm	in.	mm	lb		
2.13	54.1	0.81	20.6	41.40	1051.6	61,000	1½-in. AMMT	
2.50	63.5	0.81	20.6	41.40	1051.6	69,000	1½-in. AMMT	
2.88	73.2	0.81	20.6	52.40	1331.0	201,900	2¾-in. PAC DSI	
3.13	79.5	1.00	25.4	52.40	1331.0	202,000	2¾-in. Reg	
3.50	88.9	1.00	25.4	52.40	1331.0	202,000	2¾-in. Reg	
3.75	95.3	1.25	31.8	51.90	1318.3	313,000	2¾-in. Reg	
4.25	108.0	1.25	31.8	51.90	1318.3	313,000	2¾-in. Reg	



Type B Boot Basket
Product Family No. H13016

ACCESSORY TOOLS

Single- and Double-Knuckle Joint

Product Family Nos. H13230, and H13231

Application

The **single- and double-pivot knuckle joints** are used in fishing operations in deviated wellbores or in any situation requiring centralization of the catch tool in the casing. The knuckle joints are used in conjunction with a hydraulic or mechanical centralizer in order to allow centralization of the catch tool without having to overcome the weight of the workstring against the bottom side of the casing. The hydraulic or mechanical centralizer therefore, only has to support the weight of itself and the catch tool run below.

The knuckle joints design allows fluid flow through the tool, so it can be used in washover operations. The knuckle joints may be used in either tubing or wireline fishing applications. The standard knuckle joints are not sealed, but the tolerances are such that at a sufficient flow rate, the knuckle joint seals between the ball sub and the ball retainer to activate any hydraulic actuated tools below the knuckle joint.

Advantages

- Less force required to centralize bottom-hole assembly
- Pump through capabilities
- Torque-through capabilities



Single-Knuckle Joint
Product Family No. H13230

Specification Guide

Type	Tool OD		Tool ID		Make Up Length		Tensile Rating	Standard Connection
	in.	mm	in.	mm	in.	mm	lb	
Single-Sealed/Torque-Through	1.69	42.9	0.56	14.1	9.75	247.7	39,000	1-in. AMMT
Double-Sealed/Torque-Through	1.69	42.9	0.56	14.1	19.00	482.6	39,000	1-in. AMMT
Single-Sealed/Torque-Through	2.13	54.1	0.81	20.4	10.00	254.0	46,000	1½-in. AMMT
Double-Sealed/Torque-Through	2.13	54.1	0.81	20.4	20.25	514.4	46,000	1½-in. AMMT
Single-Sealed/Torque-Through	2.88	73.2	1.00	25.4	13.38	339.9	74,000	2¾-in. PAC DSI

ACCESSORY TOOLS

Hydraulic Bent Sub

Product Family No. H13236

Application

The **hydraulic bent sub** (knuckle joint) is designed to provide a means of hydraulically kicking over a bottomhole assembly (BHA) for entry into laterals or for fishing applications (i.e., side pocket mandrels or fish lying high-side in the completion or liner).

The tool is generally run below an indexing tool to allow full radial rotation. The BHA is run in the well to depth and the flow rate is increased to activate the hydraulic knuckle joint. As the flow rate is cycled the indexing tool rotates allowing the fishing tool or entry device to find the fish or lateral. The maximum kick over angle is determined by selection of the appropriate anvil from a minimum of two to a maximum of ten degrees in two degree increments. The hydraulic bent sub requires hydraulic pressure to operate.

Either a choke sub or a nozzle below the tool can generate this pressure. The nozzle size can be predetermined to allow maximum kick over force at the tool. The hydraulic pressure can also be generated by a hydraulic release fishing overshot or spear which already uses a nozzle for activation. The tool can also be used with a boost piston to lift larger loads or where only low flow rates are available.

Advantages

- Easily adjusted for deflection of two to ten degrees
- Anvil establishes predetermined deflection angle
- Kick over force easily controlled by hydraulic pressure differential
- Positive rotational control when used with indexing tool



Hydraulic Bent Sub
Product Family No. H13236

ACCESSORY TOOLS

Mechanical Bow Spring Centralizer

Product Family No. H13224

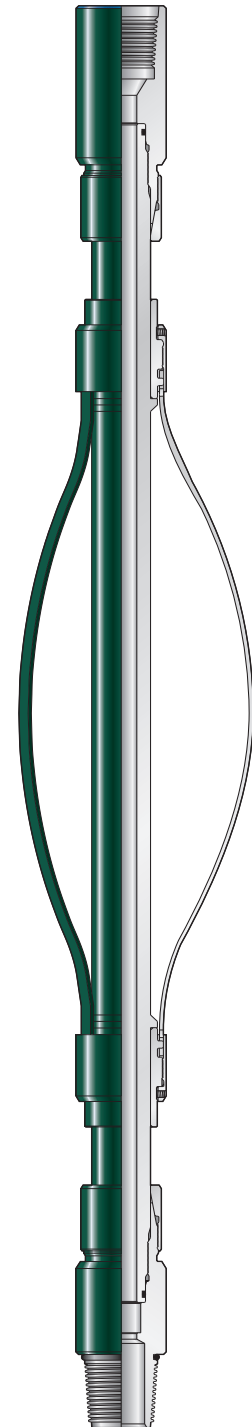
Application

The **mechanical bow spring centralizer** offers the ability to centralize a fishing tool string in the casing during thru-tubing fishing operations. The mechanical bow spring centralizer can also be used in underreaming applications to stabilize the bottomhole assembly from excessive side loading incurred with coiled tubing applications.

Advantages

- Up to 8 in. (203.2 mm) maximum expansion
- No actuation required
- Available in most thru-tubing

Specification Guide							
Tool OD		Tool ID		Make Up Length		Tensile Rating	Standard Connection
in.	mm	in.	mm	in.	mm	lb	
1.69	42.9	0.47	11.9	41.50	1054.1	24,000	1-in. AMMT
1.81	46.0	0.47	11.9	42.00	1066.8	32,000	1-in. AMMT
2.13	54.1	0.81	20.6	43.00	1092.2	45,000	1½-in. AMMT
2.88	73.2	1.00	25.4	48.25	1225.6	12,000	2¾-in. PAC DSI



Mechanical Bow Spring Centralizer
Product Family No. H13224

ACCESSORY TOOLS

Hydraulic Centralizer and Hydraulic Drilling Centralizer

Product Family Nos. H13220, and H13221

Application

The **hydraulic actuated centralizer** offers the ability to centralize a fishing tool string in the casing during thru-tubing fishing operations. The centralizer is run in the hole with the bow springs in a retracted position, thus allowing easy passage through the production tubing. Once fishing operations begin, flow through the centralizer extends the springs to contact the casing wall and centralize the fishing string in the hole.

Advantages

- Centralizes tool strings in highly deviated wells
- Large flow throughout tool is possible without activating centralizing springs by changing choke size
- Large expansion rating with small run-in diameter
- Collapsible spring allows normal run in hole
- Adjustable sleeve allows running in different casing sizes without changing springs

Specification Guide

Tool OD		Tool ID		Make Up Length		Tensile Rating	Standard Connection
in.	mm	in.	mm	in.	mm	lb	
1.69	42.9	0.47	11.9	45.50	1155.7	22,000	1-in. AMMT
2.13	54.1	0.63	16.0	63.63	1616.2	48,000	1½-in. AMMT
2.88	73.2	0.63	16.0	42.50	1079.5	48,000	2¾-in. PAC DSI
3.13	79.5	1.00	25.4	40.63	1032.0	50,000	2¾-in. Reg



Hydraulic Centralizer
Product Family No. H13220

ACCESSORY TOOLS

Sleeve-Type Non-Rotating Stabilizer

Product Family No. HI7130

Application

The **sleeve-type non-rotating stabilizer** provides maximum centralization during milling, cutting, and fishing operations. The stabilizer consists of a mandrel, top sub, and sleeve. The stabilizer blades are manufactured from mild steel to reduce the risk of damage to nipple profiles. The stabilizer is usually run directly above the workover motor or directly below the disconnect in a fishing string.

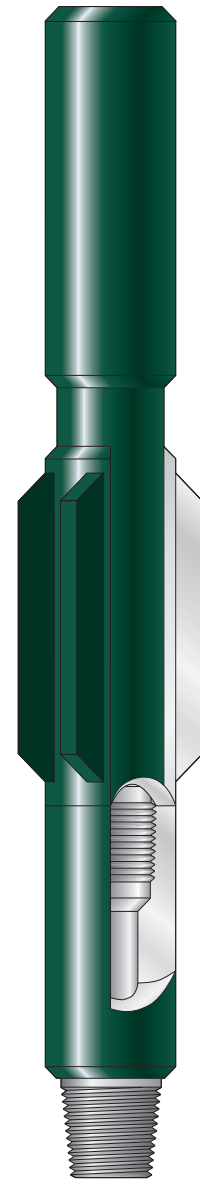
The sleeve-type non-rotating stabilizer is normally run in the string immediately above the fishing assembly. Two stabilizers are recommended to improve centralization. Sleeve rotation begins as string rotation causes the sleeve's mild steel blades to meet the resistance of the casing walls.

Advantages

- Provides maximum control for cutting and milling operations
- Non-rotating sleeve reduces vibration
- Reduces shock load on cutter knives for longer cutting life
- Sleeves made from mild steel to minimize wear on tubing or casing
- Easily field dressed to accommodate different tubing IDs
- Available in all standard thru-tubing connections and sizes

Specification Guide

Tool OD		Tool ID		Make Up Length		Tensile Rating	Standard Connection
in.	mm	in.	mm	in.	mm	lb	
2.13	54.1	0.75	19.1	16.38	416.1	75,800	1½-in. AMMT
2.88	73.2	1.06	26.9	17.78	451.6	120,700	2¾-in. PAC DSI
3.13	79.5	1.00	25.4	18.25	463.6	130,600	2¾-in. Reg



Sleeve-Type Non-Rotating Stabilizer
Product Family No. HI7130

ACCESSORY TOOLS

Nipple Profile Locator

Product Family No. H13225

Application

The **nipple profile locator** is a simple means of locating a known position downhole, allowing for more accurate positioning of the tool string. This is especially important with a coiled tubing workstring due to the variation in tubing elongation.

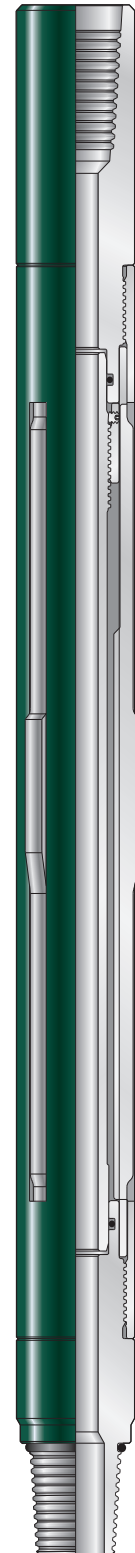
The nipple profile locator consists of three leaf springs retained in a housing. An upset in the middle of the springs is at an expanded diameter greater than the maximum ID of the nipple profile it is intended to locate; however, the spring can collapse enough to allow the locator to pass through the nipple. The contour of the spring allows the tool to move through restrictions easily but with sufficient force to be detected at surface when passing through a restriction. To overcome the effects of hole drag in deviated wells, the adjustment sleeve allows the tension on the spring to be changed so there will be greater or less drag required to pass through the restriction.

Advantages

- Simple design
- Adjustable drag force
- Will locate in most nipples
- Mechanically operated

Specification Guide

Tool OD		Tool ID		Make Up Length		Tensile Rating	Standard Connection
in.	mm	in.	mm	in.	mm	lb	
1.69	42.9	0.69	17.5	22.00	558.8	28,000	1-in. AMMT
2.13	54.1	0.81	20.6	25.13	638.3	42,000	1½-in. AMMT
2.50	63.5	0.88	22.4	32.75	831.9	48,000	1½-in. AMMT
3.00	76.2	0.94	23.9	38.89	987.8	59,000	2¾-in. PAC DSI
3.38	85.9	1.25	31.8	38.00	965.2	56,000	2¾-in. Reg



Nipple Profile Locator
Product Family No. H13225

ACCESSORY TOOLS

Single- and Dual-Swivel

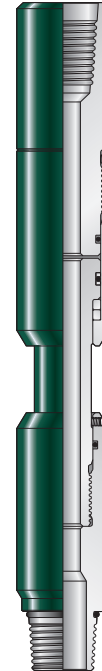
Product Family Nos. H13264 and H13263

Application

A **single- and dual-swivel** are used to allow the tool string below the swivel to remain stationary, while turning the connection above. This eliminates the need to turn the whole string of tools in order to make up the top tools. The single-swivel has a bearing for tension only. The dual-swivel has bearings for both tension and compression.

The standard swivel is normally assembled in the tool string just below the coiled tubing connector.

Once assembled in the tool string it provides a swivel point below the tubing connector for the purpose of making up tools. The single- and dual-swivels are a typical swivel design with friction type thrust bearing. The mandrel and bottom sub are free to turn with respect to the top sub and housing. The dual-swivel has friction type thrust bearings on top as well as on the bottom, so that the tool can rotate when set-down weight is applied.



Single-Swivel
Product Family No. H13264

Lockable Swivel

Product Family No. H13265

Application

The **lockable swivel** is designed to perform the same features as a standard swivel when making up the tool string. When the tool string is ready to be run in the hole, a lockable swivel's clutch will engage to torque lock the tool. When the tool string is broken down coming out of the hole the lockable swivel's clutch can be disengaged to allow the swivel to turn for ease in breaking down the tools.

Advantages

- Used for deployment of long tool strings
- Pressure deployment applications
- Rotationally locked



Lockable Swivel
Product Family No. H13265

ACCESSORY TOOLS

Single-, Dual- and Lockable-Swivels

Specification Guide								
Service	Tool OD		Tool ID		Make Up Length		Tensile Rating	Standard Connection
	in.	mm	in.	mm	in.	mm	lb	
Single	1.69	42.9	0.69	17.5	12.54	318.5	27,000	1-in. AMMT
Lockable	1.69	42.9	0.69	17.5	13.64	346.5	28,000	1-in. AMMT
Single	2.13	54.1	0.81	20.6	14.23	361.4	49,000	1½-in. AMMT
Lockable	2.13	54.1	0.75	19.1	15.51	394.0	39,000	1½-in. AMMT
Lockable	2.88	73.2	1.00	25.4	19.73	501.1	111,000	2¾-in. PAC DSI
Lockable	3.13	79.5	1.00	25.4	19.23	488.4	118,000	2¾-in. Reg



ACCESSORY TOOLS

Spinning Wash Tool

Product Family No. H13266

Application

The high-flow **spinning wash tool** is used to efficiently wash sand and debris from the wellbore. Fluid is pumped through a rotating nozzle that directs the flow to the bottom and sides of the hole.

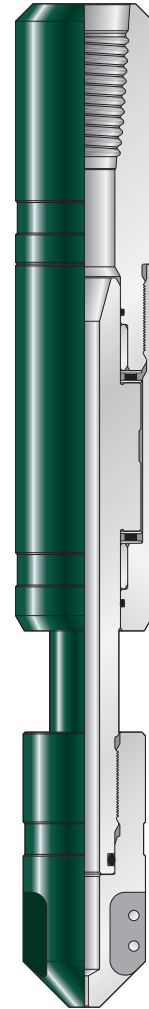
The spinning wash tool has a high speed wash head running on two sets of bearings. The two jetted blades efficiently clear loose scale, sand, and debris- reducing drag on tubing during running in and out of the well. This increases working depth capabilities, particularly in highly deviated wellbores.

Additionally, this tool may be used to impregnate scales with acid or other inhibitors. Also many different corrosives, neutralizers, and other fluids may be circulated, as the bearing assemblies are isolated.

The tool is capable of withstanding pressures commonly used with coiled tubing and snubbing operations and has adequate strength to withstand spudding techniques typically used in sand washing.

Advantages

- High speed rotation
- Sealed bearings
- May be run with a variety of fluids
- Can be run on coiled tubing or conventional threaded pipe



Spinning Wash Tool
Product Family No. H13266

Specification Guide				
Tool OD		Make Up Length		Standard Connection
in.	mm	in.	mm	
1.44	36.6	15.69	398.5	¾-in. CS Hydril
1.69	42.9	14.69	373.1	1-in. AMMT
1.75	44.5	14.69	373.1	1-in. AMMT
2.13	54.1	16.97	431.0	1½-in. AMMT
2.25	57.2	16.21	411.7	1½-in. AMMT

ACCESSORY TOOLS

Reverse-Circulating and Jetting Tool

Product Family No. HI3288

Application

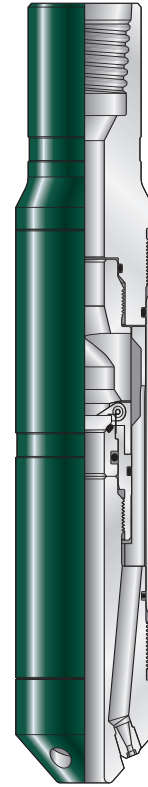
The **reverse-circulating and jetting tool** is used to clean sand from the hole by reverse circulating. It is used when velocities are not sufficient to carry sand to the surface in the annulus. Sand is retrieved through a large bore in the tool and up the coiled tubing.

The tool can also be used as a jetting sub to break up the sand bridges. In forward circulating mode a flapper closes off the through bore diverting flow to four jet nozzles. The nozzles have tapered carbide inserts for efficient, long-wearing performance and can be redressed in various sizes.

The reverse-circulating and jetting tool is capable of withstanding pressures and flows common with coiled tubing operations.

Advantages

- Full large bore through tool
- Carbide nozzle inserts
- Swirl pattern jetting coverage
- Uses field-proven flapper system



Reverse-Circulating and Jetting Tool
Product Family No. HI3288

Specification Guide						
Tool OD		Tool ID		Make Up Length		Standard Connection
in.	mm	in.	mm	in.	mm	
2.88	73.0	0.81	20.6	16.90	429.3	2 3/8-in. PAC DSI
3.50	88.9	1.00	25.4	21.49	546.8	2 3/8-in. PAC DSI

ACCESSORY TOOLS

Deployment/Spacer Bar

Product Family No. H16055

Application

The **deployment/spacer bar** is used to provide a safe means of handling coiled tubing (CT) or small threaded pipe bottomhole assembly (BHA) at surface in applications where the BHA that is run in hole or retrieved from the hole is longer than the riser height available.

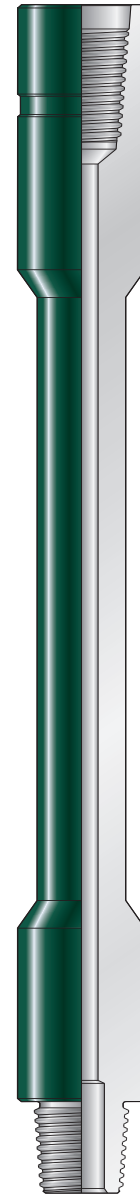
The deployment/spacer bar is used to hang and seal off parts of a BHA. The deployment/spacer bar OD is the same as the CT or threaded pipe used to deploy the BHA in the hole.

The deployment/spacer bar has high tensile and torsion capabilities and the most commonly used small diameter connections.

Advantages

- Increase safety when handling lengthy BHAs
- Available in all standard CT sizes
- High tensile and torsional strength

Specification Guide													
Tool OD		Tool ID		Make Up Length		Available for CT Size (in.)						Standard Connection	
in.	mm	in.	mm	in.	mm	1	1¼	1½	1¾	2	2¾		
1.69	42.9	0.50	12.7	50.50	1282.7	x							1-in. AMMT
1.69	42.9	0.75	19.1	50.50	1282.7		x	x					1-in. AMMT
2.13	54.0	0.50	12.7	50.00	1270.0	x							1½-in. AMMT
2.13	54.0	0.75	19.1	50.00	1270.0		x	x					1½-in. AMMT
2.13	54.0	1.00	25.4	50.00	1270.0				x				1½-in. AMMT
2.88	73.2	0.50	12.7	49.50	1257.3			x					2¾-in. PAC DSI
2.88	73.2	0.75	19.1	49.50	1257.3				x				2¾-in. PAC DSI
2.88	73.2	1.00	25.4	49.50	1257.3					x	x		2¾-in. PAC DSI
3.13	79.4	0.50	12.7	49.00	1244.6			x					2¾-in. Reg
3.13	79.4	0.75	19.1	49.00	1244.6				x				2¾-in. Reg
3.13	79.4	1.00	25.4	49.00	1244.6					x	x		2¾-in. Reg
3.13	79.4	0.50	12.7	49.50	1257.3			x					2⅞-in. PAC DSI
3.13	79.4	0.75	19.1	49.50	1257.3				x				2⅞-in. PAC DSI
3.13	79.4	1.00	25.4	49.50	1257.3					x	x		2⅞-in. PAC DSI



Deployment/Spacer Bar
Product Family No. H16055

FISHING TOOLS

Continuous Tubing Overshot

Product Family No. H13332

Application

The **continuous tubing overshot** has been designed to allow fishing of coiled tubing (CT) that has been lost in the hole. The continuous tubing overshot has a catch or anchoring mechanism that washes over the top of the coiled tubing which has been left in the hole.

The continuous tubing overshot uses hardened grapple segments to catch the outside of the coiled tubing. These grapples slide over the coiled tubing when washing over and bite into the tubing when tension is applied to the workstring. Leaf springs attached to each grapple section hold the grapple in the expanded position away from the coiled tubing when the continuous tubing overshot is being moved down over the tubing to prevent wear on the grapple teeth. Once the grapple is engaged with the coiled tubing it can be pushed farther down the tubing to get a bite lower on the string.

Advantages

- Wide catch range
- May be run on threaded or coiled tubing
- Tensile yield equal to top connection



Continuous Tubing Overshot
Product Family No. H13332

Specification Guide

Tool OD		CT Size		Catch Diameter (in.)		Make Up Length		Tensile Rating	Standard Connection
in.	mm	in.	mm	max	min	in.	mm	lb	
1.858	47.2	1.25	31.8	Coil OD + 0.093	Coil OD - 0.063	24.75	628.7	42,000	1½ in. CS Hydril
2.250	57.2	1.25	31.8	Coil OD + 0.093	Coil OD - 0.063	24.75	628.7	62,000	1½ in. CS Hydril
2.625	66.7	1.25	31.8	Coil OD + 0.093	Coil OD - 0.063	23.63	600.2	80,000	1½ in. CS Hydril
2.625	66.7	1.50	38.1	Coil OD + 0.093	Coil OD - 0.063	23.63	600.2	80,000	1½ in. CS Hydril
3.375	85.7	1.00	25.4	Coil OD + 0.093	Coil OD - 0.063	23.34	592.8	14,000	2⅞ in. CS Hydril
3.375	85.7	1.25	31.8	Coil OD + 0.093	Coil OD - 0.063	23.34	592.8	14,000	2⅞ in. CS Hydril
3.375	85.7	1.50	38.1	Coil OD + 0.093	Coil OD - 0.063	23.34	592.8	14,000	2⅞ in. CS Hydril
3.375	85.7	1.75	44.5	Coil OD + 0.093	Coil OD - 0.063	23.34	592.8	14,000	2⅞ in. CS Hydril
3.375	85.7	2.00	50.8	Coil OD + 0.093	Coil OD - 0.063	23.34	592.8	14,000	2⅞ in. CS Hydril

FISHING TOOLS

Hydraulic-Releasing GS Spear and Slick Catch Spear

Product Family Nos. H13311 and H13310

Application

The **hydraulic-releasing GS spear**, specifically designed for thru-tubing fishing operations, is engineered to withstand the high tensile and compressive stresses encountered during jarring operations. These spears are designed to engage standard GS fish necks. The **hydraulic-releasing slick catch spear**, also engineered to withstand high tensile and compressive stresses, is used to engage slick ID fish necks.

A flow path is provided through the tool to allow circulation while running in the hole. Once the profile/slick ID fish is encountered, the flow path can be used to create a jetting action to wash debris from the profile/slick ID fish.

To engage the profile or the slick ID of a fish, minimal set-down weight is applied which moves the collets into the release position allowing it to enter the fish ID. Once the spear has adequately entered this ID, the collets or slip will snap into the catch position. To release from the fish or GS profile, increased flow rate will move the collet or slip into the release position.

Advantages

- Maximum ID on collets or slips
- High tensile strength
- Pump through capabilities
- No shear screws
- Minimized stress on collets or slips
- Tool can be released and re-latched repeatedly without tripping to surface



Hydraulic-Releasing GS Spear
Product Family No. H13311

FISHING TOOLS

Hydraulic-Releasing GS Spear

Specification Guide							
Tool OD		Fishing Neck Size		Make Up Length		Tensile Rating	Standard Connection
in.	mm	in.		in.	mm	lb	
1.44	36.6	1.50 GS		21.88	555.8	23,000	¾ in. CS Hydril
1.69	42.9	2.00 GS		18.11	460.0	30,000	1 in. AMMT
1.81	46.0	2.00 GS		18.11	460.0	30,000	1 in. AMMT
2.13	54.1	2.50 GS		20.60	523.2	50,000	1½ in. AMMT
2.25	57.2	2.50 GS		20.35	516.9	50,000	1¼ in. Reg
2.25	57.2	2.50 GS		20.35	516.9	50,000	1¼ in. AMMT
2.25	57.2	2.50 GS		20.35	516.9	50,000	1¼ in. AMMT (LH)
2.25	57.2	2.50 GS		20.35	516.9	50,000	1½ in. AMMT
2.70	68.6	3.00 GS		23.91	607.3	63,000	1¼ in. Reg
2.70	68.6	3.00 GS		24.03	610.4	63,000	1½ in. AMMT
2.88	73.0	3.00 GS		24.91	632.7	63,000	2¾ in. PAC DSI
3.00	76.2	3.50 GS		22.13	562.1	77,000	2¾ in. PAC DSI
3.00	76.2	3.50 GS		22.13	562.1	77,000	2¾ in. Reg
3.13	79.4	3.00 GS		25.03	635.8	63,000	2¾ in. PAC DSI
3.13	79.4	3.00 GS		25.03	635.8	63,000	2¾ in. Reg
3.50	88.9	4.00 GS		22.63	574.8	95,000	2¾ in. PAC DSI
3.50	88.9	3.50 GS		22.63	574.8	95,000	2¾ in. PAC DSI
3.50	88.9	4.00 GS		22.63	574.8	95,000	2¾ in. Reg
3.50	88.9	3.50 GS		22.63	574.8	95,000	2¾ in. EU 8rd
4.50	114.3	5.00 GS		23.46	595.9	122,000	2¾ in. PAC DSI
4.50	114.3	5.00 GS		23.46	595.9	122,000	2¾ in. Reg

Slick Catch Spear

Specification Guide							
Tool OD		Fishing Neck Size		Make Up Length		Tensile Rating	Standard Connection
in.	mm	in.	mm	in.	mm	lb	
1.81	46.0	1.343 - 1.500	34.1 - 38.1	18.40	467.4	30,400	1 in. AMMT
2.00	50.8	1.440 - 1.625	36.5 - 41.3	18.40	467.4	30,400	1 in. AMMT
2.00	50.8	1.590 - 1.780	40.4 - 45.2	18.40	467.4	30,400	1 in. AMMT
2.25	57.2	1.750 - 1.970	44.5 - 50.0	20.42	518.7	66,400	1½ in. AMMT
2.25	57.2	1.938 - 2.156	49.2 - 54.8	20.42	518.7	66,400	1½ in. AMMT
2.70	68.6	2.113 - 2.279	53.7 - 57.9	22.03	559.6	97,700	1½ in. AMMT
2.70	68.6	2.206 - 2.489	56.0 - 63.2	22.03	559.6	97,700	1½ in. AMMT
3.00	76.2	2.460 - 2.810	62.5 - 71.4	22.63	574.8	99,000	2¾ in. Reg
3.38	85.7	2.794 - 3.080	71.0 - 78.2	24.13	612.9	99,000	2¾ in. Reg
3.38	85.7	2.900 - 3.190	73.7 - 81.0	24.13	612.9	99,000	2¾ in. Reg
3.50	88.9	3.125 - 3.375	79.4 - 85.7	24.13	612.9	149,600	2¾ in. Reg

FISHING TOOLS

Hydraulic-Releasing Overshot and Slick Catch Overshot

Product Family Nos. H13330 and H13331

Application

The **hydraulic-releasing overshot** is used to catch external JDC type fish necks and the **slick catch overshot** is used to catch slick OD profiles.

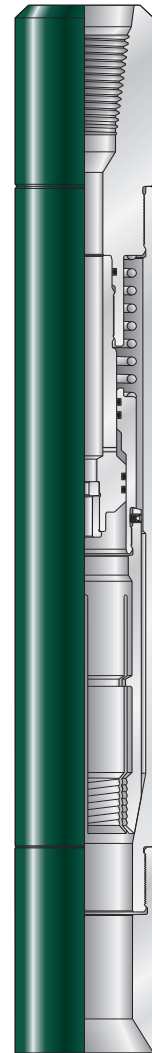
The tools are engineered to withstand high tensile and compressive stresses encountered during jarring operations. The overshot is engaged by applying slight set-down weight at the tool. A flow path is provided through the tool for circulation while running in the hole; this path can also be used to wash debris from the top of the fish or profile. In the event that retrieval is not possible, increased flow rate through the tool will allow release from the fish neck or profile ensuring no additional tools are left in the well.

Advantages

- High-strength
- Can be used for jarring operations
- Flow path permits washing debris from the top of the fish or profile
- No shear screws
- Design minimizes stress on the grapple section
- Tool can be released and re-latched repeatedly without tripping to surface

Slick Catch OD Overshot

Specification Guide							
Tool OD		Catch Size OD		Make Up Length		Tensile Rating	Standard Connection
in.	mm	in.	mm	in.	mm	lb	
1.81	46.0	0.88	22.2	19.68	499.9	37,000	1 in. AMMT
1.81	46.0	0.94	23.8	19.68	499.9	37,000	1 in. AMMT
1.81	46.0	1.00	25.4	19.68	499.9	37,000	1 in. AMMT
1.81	46.0	1.06	27.0	19.68	499.9	37,000	1 in. AMMT
1.81	46.0	1.13	28.6	19.68	499.9	37,000	1 in. AMMT
1.81	46.0	1.19	30.2	19.68	499.9	37,000	1 in. AMMT
1.81	46.0	1.25	31.8	19.68	499.9	37,000	1 in. AMMT
2.13	54.1	1.13	28.7	19.25	489.0	60,000	1½ in. AMMT
2.13	54.1	1.25	31.8	19.25	489.0	60,000	1½ in. AMMT
2.25	57.2	1.38	35.1	20.42	518.7	80,000	1½ in. AMMT
2.63	66.8	1.25	31.8	20.94	531.9	87,000	1½ in. AMMT
2.63	66.8	1.50	38.1	20.94	531.9	87,000	1½ in. AMMT
2.63	66.8	1.75	44.5	20.94	531.9	87,000	1½ in. AMMT
3.00	76.2	2.00	50.8	24.25	616.0	107,000	1½ in. AMMT
3.00	76.2	2.13	54.1	24.25	616.0	107,000	1½ in. AMMT
3.00	76.2	2.25	57.2	22.63	574.8	107,000	1½ in. AMMT
3.50	88.9	2.25	57.2	24.42	620.3	182,000	2¾ in. Reg
3.50	88.9	2.38	60.5	24.42	620.3	182,000	2¾ in. Reg
3.50	88.9	2.50	63.5	24.42	620.3	182,000	2¾ in. Reg
3.75	95.3	2.88	73.0	23.62	599.9	155,000	2¾ in. Reg



Slick Catch OD Overshot
Product Family No. H13330

FISHING TOOLS

Hydraulic-Releasing Overshot

Specification Guide							
Tool OD		External Fishing Neck Size		Make Up Length		Tensile Rating	Standard Connection
in.	mm	in.	in.	mm	lb		
1.44	36.6	0.88	16.00	406.4	15,000	¾ in. CS Hydril	
1.44	36.6	1.00	16.00	406.4	17,000	¾ in. CS Hydril	
1.63	41.4	1.19	16.00	406.4	19,000	¾ in. CS Hydril	
1.81	46.0	0.88	17.38	441.5	12,000	1 in. AMMT	
1.81	46.0	1.00	17.38	441.5	19,000	1 in. AMMT	
1.81	46.0	1.19	17.38	441.5	24,000	1 in. AMMT	
1.81	46.0	1.38	17.38	441.5	24,000	1 in. AMMT	
2.13	54.1	1.38	13.38	351.3	28,000	1½ in. AMMT	
2.25	57.2	1.00	18.63	473.2	16,000	1½ in. AMMT	
2.25	57.2	1.19	18.63	473.2	21,000	1½ in. AMMT	
2.25	57.2	1.38	18.63	473.2	28,000	1½ in. AMMT	
2.28	57.9	1.75	19.19	487.4	24,000	1½ in. AMMT	
2.63	66.8	1.19	18.00	457.2	20,000	1½ in. AMMT	
2.63	66.8	1.38	18.00	457.2	30,000	1½ in. AMMT	
2.63	66.8	1.75	18.00	457.2	54,000	1½ in. AMMT	
2.75	69.9	1.75	18.60	472.4	54,000	1½ in. AMMT	
2.80	71.1	2.31	18.60	472.4	41,000	1½ in. AMMT	
2.88	73.0	2.00	24.00	609.6	46,000	2¾ in. PAC DSI	
3.00	76.2	1.19	22.25	565.2	24,000	2¾ in. PAC DSI	
3.00	76.2	1.38	22.25	565.2	32,000	2¾ in. PAC DSI	
3.00	76.2	1.75	22.25	565.2	41,000	2¾ in. PAC DSI	
3.00	76.2	2.31	22.25	565.2	59,000	2¾ in. PAC DSI	
3.38	85.7	1.19	22.25	565.2	27,000	2¾ in. PAC DSI	
3.38	85.7	1.38	22.25	565.2	34,000	2¾ in. PAC DSI	
3.38	85.7	1.75	22.25	565.2	63,000	2¾ in. PAC DSI	
3.38	85.7	2.31	22.25	565.2	86,000	2¾ in. PAC DSI	
3.50	88.9	1.19	22.25	565.2	27,000	2¾ in. PAC DSI	
3.50	88.9	1.38	22.25	565.2	34,000	2¾ in. PAC DSI	
3.50	88.9	1.75	22.25	565.2	63,000	2¾ in. PAC DSI	
3.50	88.9	2.31	22.25	565.2	86,000	2¾ in. PAC DSI	
3.75	95.3	2.69	28.88	733.6	101,000	2¾ in. PAC DSI	
3.75	95.3	2.75	29.00	736.6	117,000	2¾ in. PAC DSI	
4.00	101.6	2.75	22.00	558.8	103,000	2¾ in. Reg	
4.00	101.6	3.13	22.00	558.8	116,000	2¾ in. Reg	
4.50	114.3	2.88	38.38	974.9	89,000	2¾ in. Reg	

FISHING TOOLS

Snipper Overshot

Product Family No. H13334

Application

The **snipper overshot** has been designed to allow cutting and retrieval of a section of coiled tubing (CT) that has been left in a well. The snipper overshot has a catch and cutting mechanism which washes over the top of the coiled tubing. Once the recommended amount of coiled tubing is swallowed by the overshot, the fishing string will cut the tubing by applying overpull. The coiled tubing above the cut will be retrieved in the same trip.

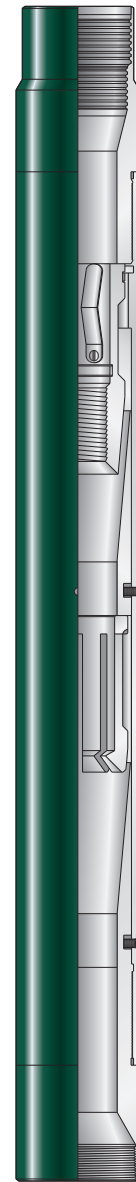
The snipper overshot uses hardened grapple segments to catch the outside of the coiled tubing. These grapples slide over the coiled tubing when washing over and bite into the tubing when tension is applied to the workstring. Once the grapple is engaged with the coiled tubing it can be pushed farther down the tubing to get a bite lower on the string providing the cut has not been made.

Advantages

- Modular design for multiple sizes of coiled tubing
- Retrieves coiled tubing above cut in same trip
- High tensile strength
- Bowl and slip design for cutting and retrieval

Specification Guide

Tool OD		CT Size		Catch Diameter (in.)		Make Up Length		Tensile Rating	Standard Connection
in.	mm	in.	mm	max	min	in.	mm	lb	
1.858	47.2	1.25	31.8	Coil OD + 0.093	Coil OD - 0.063	26.60	675.6	40,000	1½ in. CS Hydril
2.250	57.2	1.25	31.8	Coil OD + 0.093	Coil OD - 0.063	34.97	888.2	62,000	1½ in. CS Hydril
2.625	66.7	1.25	31.8	Coil OD + 0.093	Coil OD - 0.063	35.63	905.0	78,000	1½ in. CS Hydril
2.625	66.7	1.50	38.1	Coil OD + 0.093	Coil OD - 0.063	35.63	905.0	78,000	1½ in. CS Hydril
2.625	66.7	1.50	38.1	Coil OD + 0.093	Coil OD - 0.063	35.63	905.0	78,000	2¼ in. CS Hydril
3.375	85.7	1.25	31.8	Coil OD + 0.093	Coil OD - 0.063	37.30	947.4	154,000	2⅞ in. CS Hydril
3.375	85.7	1.50	38.1	Coil OD + 0.093	Coil OD - 0.063	37.30	947.4	154,000	2⅞ in. CS Hydril
3.375	85.7	1.75	44.5	Coil OD + 0.093	Coil OD - 0.063	37.30	947.4	154,000	2⅞ in. CS Hydril
3.375	85.7	2.00	50.8	Coil OD + 0.093	Coil OD - 0.063	37.30	947.4	154,000	2⅞ in. CS Hydril



Snipper Overshot
Product Family No. H13334

FISHING TOOLS

High-Pressure Pack-Off

Product Family No. H13333

Application

The **high-pressure pack-off** is designed to be used in conjunction with the continuous tubing and snipper overshot. The high-pressure pack-off is run directly above the overshot and provides a high-pressure seal [5,000 psi (344.7 bar)] between the coiled tubing (CT) being fished and the workstring. This allows efficient circulation capability down through the coiled tubing being fished, which may provide sufficient solids removal at the stuck point to free the tubing. The pressure tight seal between the coiled tubing and the workstring also allows a hydraulic release device to be operated in the bottomhole assembly which may allow the workstring to be pulled from the well if the stuck tubing could not be retrieved.

Advantages

- Allows high pressure circulation through a fish
- Packing rings are pressure energized
- May be manufactured with most tubing threads



High-Pressure Pack-Off
Product Family No. H13333

Specification Guide										
Tool OD		CT Size		Max CT OD	Max Burst Pressure	Make Up Length		Tensile Rating	Standard Connection	
in.	mm	in.	mm	in.	min	in.	mm	lb		
1.858	47.2	1.25	31.8	Coil OD + 0.031	10,000	12.77	324.4	52,000	1 ¼ in. CS Hydril	
2.250	57.2	1.25	31.8	Coil OD + 0.031	18,000	12.77	324.4	62,000	1 ½ in. CS Hydril	
2.625	66.7	1.25	31.8	Coil OD + 0.031	18,000	13.50	342.9	62,000	1 ½ in. CS Hydril	
2.625	66.7	1.50	38.1	Coil OD + 0.031	18,000	13.50	342.9	108,000	1 ½ in. CS Hydril	
2.625	66.7	1.50	38.1	Coil OD + 0.031	20000.0	13.50	342.9	108,000	2 ⅞ in. CS Hydril	
3.375	85.7	1.25	31.8	Coil OD + 0.031	32,000	10.49	266.5	154,000	2 ¾ in. CS Hydril	
3.375	85.7	1.50	38.1	Coil OD + 0.031	32,000	10.49	266.5	154,000	2 ¾ in. CS Hydril	
3.375	85.7	1.75	44.5	Coil OD + 0.031	32,000	10.49	266.5	154,000	2 ¾ in. CS Hydril	
3.375	85.7	2.00	50.8	Coil OD + 0.031	32,000	10.49	266.5	154,000	2 ¾ in. CS Hydril	

FISHING TOOLS

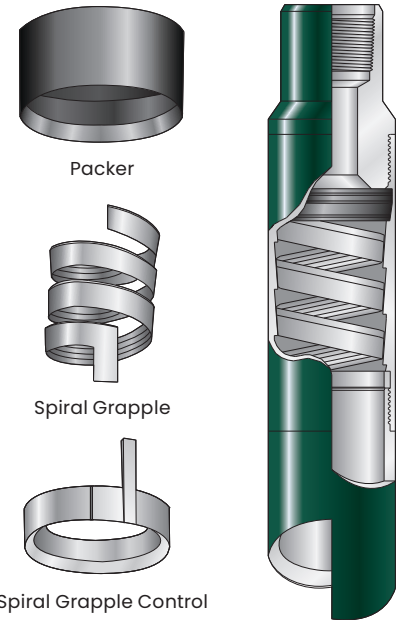
Series 150 Overshot

Product Family No. H11507

Application

The **Series 150 overshots** provide the strongest tool available to externally engage, pack-off and pull a fish. The basic simplicity and rugged construction with which it is designed have made it the standard of all external catch fishing tools. The Series 150 overshot has gained worldwide acceptance for fishing by means of external engagement of a fish. Each overshot is a carefully engineered unit. In service, it takes a positive grip over a large area of fish and is therefore capable of withstanding extremely heavy pulling, torsional and jarring strains without damage or distortion to either the tool or the fish.

Overshots are expertly constructed of the highest quality material and continually developed to new standards of strength and efficiency. Each Series 150 overshot is a compact unit designed to engage, pack off and pull a specific size of tubing, pipe, coupling, tool joint, drill collar or smooth OD tool. Through the installation of proper undersize parts, they may be adapted to engage and pack off any smaller size.



Series 150 Overshot with Spiral Grapple
Product Family No. H11507

Series 70 Short Catch Overshot

Product Family No. H11230

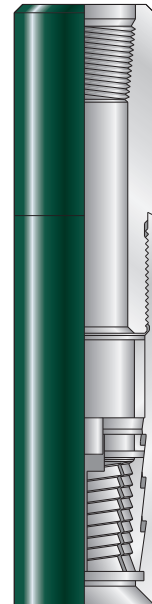
Application

The **Series 70 short catch overshot** is specifically designed to engage the exposed portion of a fish too short to be engaged with conventional catch overshots and where conditions prevent lowering the overshot past the fish. This tool will firmly engage a very short fish.

The four pieces comprising the assembly cannot be incorrectly assembled. This tool is simple and rugged.

Each assembly is designed to catch a specific maximum OD and each assembly may be dressed with an undersize grapple to engage any diameter smaller than maximum.

The operation of the Series 70 short catch overshot is identical to that of the well known Series 150 overshot: engagement is effected by slowly lowering the assembly over the fish while maintaining slow right hand rotation; release is accomplished by bumping down heavily and then slowly elevating the fishing string while simultaneously rotating slowly to the right.



Series 70 Short Catch Releasing Overshot
Product Family No. H11230

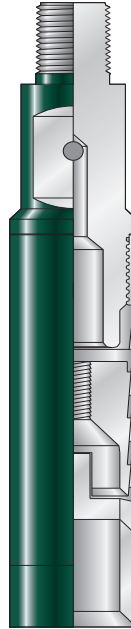
FISHING TOOLS

Series 10 Sucker Rod Overshot

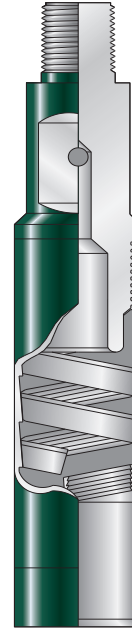
Product Family No. H11210

Application

The **Series 10 sucker rod overshot** is the best available tool for engaging and retrieving sucker rods, couplings, and similar items from inside tubing strings. The Series 10 overshot is available in sizes to engage up to 2 in. OD inside of 2 $\frac{1}{8}$ in. tubing and up to 1 $\frac{1}{8}$ in. OD inside 2 $\frac{3}{8}$ in. tubing. The Series 10 overshot consists of a top sub, a bowl, a spiral grapple and a control guide. When a basket grapple is used in the Series 10 assembly, a basket grapple control and a plain guide are required.



Series 10 Overshot
with Basket Grapple
Product Family No. H11210



Series 10 Overshot
with Spiral Grapple
Product Family No. H11210

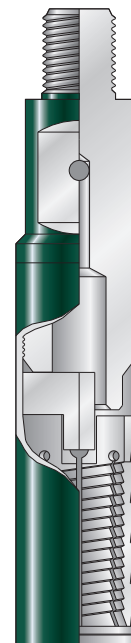
Series 20 Short Catch Sucker Rod Overshot

Product Family No. H11220

Application

The **Series 20 short catch sucker rod overshot** is designed to catch sucker rods, couplings, and the exposed portions of other items which are too short to be engaged by the Series 10 or other conventional overshots. The Series 20 overshot consists of a top sub, a bowl, a grapple control and a basket grapple. It differs from the Series 10 in that there is no guide and the grapple control is above the basket grapple, permitting the basket grapple to be placed at the lowest position in the bowl.

Operation of the Series 20 short catch overshot is identical to that of the Series 10 overshot.



Series 20 Short Catch Sucker Rod Overshot
Product Family No. H11220

FISHING TOOLS

Itco-Type Spear

Product Family No. H12210

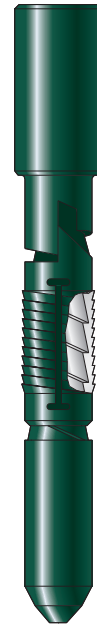
Application

Itco-type spears provide a dependable, inexpensive, and simple means of engaging a fish internally.

The itco-type spear consists of a mandrel, grapple, release ring and nut. The Mandrel may be obtained in either a flush type or a shoulder type. Mandrel top connections are furnished to order. The nut can be obtained as a plain bull-nose guide or with a pin connection for the attachment of other tools below the spear.

Advantages

- Simple, strong and reliable design
- Proven, industry standard for decades
- Easy release
- Available in full range of ID to catch all manner of fish and lost tubulars



Itco-Type Spear
Product Family No. H12210

Rope Spears

Product Family Nos. H12028, H12128, H12228, and H12229

Application

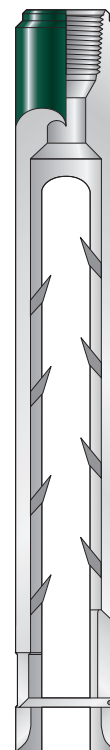
Rope spears are wireline fishing tools designed for fishing wire through restrictions or wire that has become balled up.

The tools are manufactured from high tensile steel so that the prongs may be forced down into or around a reasonably compacted ball of wire. The design incorporates barbs on the ID only so that wire on the outside of the tools may be easily pulled down rather than having to yield the wire creating smaller unfishable pieces.

Similar spears are manufactured without the latch in two and three prong designs.

Advantages

- Tools will fish wire through restrictions
- Tools will fish balls of wire without creating smaller broken pieces of wire
- Manufactured from AISI 4140 heat-treated alloy steel



Latch Jack Spear
Product Family No. H12228

FISHING TOOLS

Center Prong and Crankshaft Rope Spear

Product Family Nos. H12028 and H12229

Application

The **crankshaft rope spear** is a reliable and efficient wireline and wire rope retrieval tool. The rope spear retrieves all sizes of electric wireline, slick line, braided line or other types of wire rope that have been left downhole. It can also be used to retrieve control line or ESP cable that has been left downhole. This tool has been very successful in recovering these items in cased or open hole.

Note: It is recommended that a wire pusher always be run above the tool. It is recommended not to run this tool out of the bottom of the tubing end.

Advantages

- One of the industry's most reliable, efficient tools for retrieving wireline
- Proven track record of hundreds of successful runs and many years of maintenance free service
- Retrieves cut wireline and rope still attached to a tool stuck downhole



Center Prong Rope Spear
Product Family No. H12028

Crankshaft Rope Spear
Product Family No. H12229

FISHING TOOLS

Bulldog Overshot

Product Family No. H11107

Application

The **bulldog overshot** is designed for straight pick-up only of a fish with ODs too large to be caught by any other method. The overshot is a simple design, which incorporates a C grapple. The overshot can be manufactured in one or two pieces. The bulldog overshot is not releasable and has limited tensile and torsional strengths.

Advantages

- Smallest ratio of fish OD to overshot OD
- Simple design

Specification Guide

Tool OD		Maximum Catch OD		Make Up Length		Tensile Rating	Standard Connection
in.	mm	in.	mm	in.	mm	lb	
1.875	47.6	1.000	25.40	9.00	228.6	36,650	1¼ in. CS Hydril
1.906	48.4	1.000	25.40	10.00	254.0	35,420	1½ in. CS Hydril
2.000	50.8	0.875	22.23	8.30	210.8	26,600	2⅞ in. CS Hydril
2.125	54.0	1.250	31.75	23.60	599.4	31,700	2⅞ in. CS Hydril
2.797	71.0	1.500	38.10	23.60	599.4	30,800	2⅞ in. CS Hydril
3.375	85.7	2.875	73.03	13.50	342.9	48,000	2⅞ in. Reg
3.640	92.5	3.125	79.88	14.25	362.0	26,500	2⅞ in. Reg



Bulldog Overshot
Product Family No. H11107

ROTATIONAL SERVICES

Navi-Drill ULTRA Workover Motor

Application

The **Navi-Drill™ ULTRA workover motor** series incorporates a PDM design with modular capabilities and fit for purpose power section configurations. The Navi-Drill ULTRA can be configured and aligned to suit a wide range of thru-tubing applications.

The Navi-Drill ULTRA is a versatile design incorporating separate stator, top sub and bearing housing to allow plug and play of new modular power sections, tailored to suit specific work over applications. The modular design allows the use of proprietary fluid and air power section technology that addresses most well bore temperature ranges and compatibility with well bore fluids. The air power sections specifically address single and two-phase flow applications with nitrogen. A new design 30% higher strength drive sub also increases the ability of the motor to withstand the most severe cyclic and bending stresses encountered during operations.

The operating pressures and flow rates required to run the Navi-Drill ULTRA are aligned with coiled tubing and slim pipe to achieve optimum horsepower. Slower rotational speeds improve performance of milling and cutting products and increase reliability during workover operations such as milling, underreaming, cutting, wash over, or any other operation requiring rotation of a down hole assembly.

Advantages

- Modular design for customized operations
- Controlled rotational speeds protects cutting matrix
- Increased reliability in high end applications, (i.e., window milling)
- Proprietary stator technology
- May be powered by fluid/air/foam
- Capable of operating in temperatures over 300°F (149°C)

Peak Performance Specification Guide

OD		Power Section	Maximum Torque		Maximum ΔP	
in.	mm		ft/lbs	Nm	psi	bar
1.69	42.9	MIV	105	145	650	45
1.69	42.9	MIADV	95	130	380	26
2.13	54.0	MIV	225	305	1025	70
2.13	54.0	MIADV	190	255	380	26
2.88	73.0	MIV	670	910	1280	88
2.88	73.0	MIADV	470	635	380	26
3.38	85.7	MIW2	1150	1560	1390	95
3.38	85.7	MIADM	1	16	28	705

Operating Specification Guide

OD		Power Section	Standard Connection	Make Up Length		Flow Rate		Speed	Differential Pressure		Torque	
in.	mm			in.	mm	gpm	lpm		rpm	psi	bar	ft-lb
1.69	42.9	MIV	1 in. AMMT Box x Box	9.37	2.86	12-50	45-190	155-640	400	28	66	90
		MIADV						100-410	230	16	59	80
2.13	54.1	MIV	1½ in. AMMT Box x Box	11.38	3.47	17-74	65-280	160-700	640	44	140	190
		MIADV						70-300	230	16	120	160
2.88	73.2	MIV	2¾ in. PAC DSI Box x Box ♦	11.98	3.65	25-120	100-450	95-440	800	55	420	570
		MIADV						40-185	290	20	360	490
3.38	85.8	MIW1	2¾ in. PAC DSI Box x 2¾ in. API Reg Box	16.78	5.11	80-160	300-600	130-365	800	55	720	975
		MIADM						65-125	290	20	710	960

♦ Also available as 2¾ in. API Reg Box x Box

ROTATIONAL SERVICES

Navi-Drill X-treme Workover Motor

Product Family No. HI3283

Application

The **Navi-Drill™ X-treme™ workover motor** is the new generation, reduced length workover motor that lowers customer well intervention costs by applying new equidistant power section technology which provides unmatched performance at lower operating pressures than any other workover motor.

The Navi-Drill X-treme is operated as a positive displacement motor, which can operate in temperatures up to 392°F (200°C).

Proprietary equidistant power section technology provides the motor with greatly increased torque and optimum RPM at lower operating pressures. This also allows the motor to be run in more hostile and higher temperature environments. The Navi-Drill X-treme has a similar modular design to the existing **Navi-Drill VIP™**, offering a broad operating range.

The Navi-Drill X-treme can be configured for fluid, foam, or gas (low torque/high speed, high torque/low speed, high torque/high speed). Components such as the bearing package and drive shaft have been designed to allow the motor to run under higher stress applications such as window milling. The overall motor length can be reduced to suit short riser deployment applications when required.

The X-treme workover motor; the power behind delivering what matters for thru-tubing milling and cutting solutions:

- Equidistant stator technology for increased on bottom performance and reliability
- Ideal for hostile and high temperature environments
- Faster rate of penetration

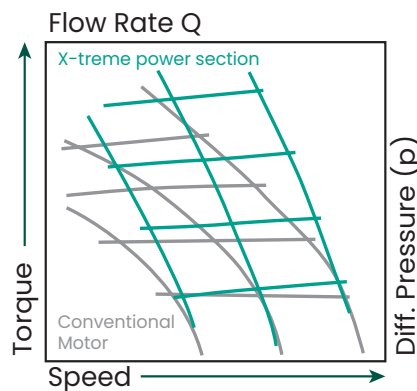
Three different types of X-treme motors address different application requirements: For restricted riser height applications - the X-treme XS motor is a reduced length motor that provides optimum performance output for short rig-up heights. For reduced on-bottom milling times - the X-treme X motor is a standard length motor with significantly higher operational torque output than conventional workover motors. For foam, nitrogen or air operations - the X-treme AD motor is designed for use with foam or gas (nitrogen or air) for underbalanced well intervention applications. However, when operated with fluid the motor will provide ultra-high torque/low speed.

Advantages

- Increased performance
- Modular design for customized operations
- Increased reliability in high stress applications
- Short length
- May be powered by fluid/air/foam
- Capable of operating in temperatures up to 392°F (200°C)



Navi-Drill X-treme Workover Motor
Product Family No. HI3283



ROTATIONAL SERVICES

Navi-Drill X-treme Workover Motor

Operating Specification Guide														
OD		Power Section	Standard Connection	Make Up Length		Flow		Speed	Op. ΔP ◊		Op. Torque ◊		Temperature	
in.	mm			in.	mm	gpm	lpm	rpm	psi	bar	ft-lb	Nmw	°F	°C
1.69	42.9	XS	1 in. AMMT	5.51	1.68	50	190	640	435	30	75	105	392	200
		X		7.64	2.33	50	190	640	870	60	150	205	392	200
		AD		8.33	2.54	40	150	350	725	50	180	245	392	200
2.13	54.1	XS	1½ in. AMMT	5.94	1.81	65	250	600	435	30	105	145	392	200
		X		8.17	2.49	65	250	600	1,015	70	250	340	392	200
		AD		9.55	2.91	45	175	300	1,015	70	350	475	392	200
2.88	73.2	XS	2¾ in. API Reg or 2¾ in. PAC DSI	7.80	2.38	120	450	490	580	40	310	420	392	200
		X		10.63	3.24	120	450	490	1,160	80	620	845	392	200
		AD		12.60	3.84	85	325	250	1,160	80	885	1,200	392	200

◊ Operating pressure and operating torque are the maximum values the motor should be run at for continuous operation.

Note: XS = short; X = standard length (mud); AD = air motor

Peak Performance Specification Guide										
OD		Power Section	Maximum Torque ◊		Maximum ΔP ◊		Stall Torque		Stall ΔP ◊	
in.	mm		ft/lbs	Nm	psi	bar	ft-lb	Nm	psi	Bar
1.69	42.9	XS	95	130	545	37.5	115	155	655	45
		X	190	260	1,090	75	230	310	1,305	90
		AD	225	305	905	62.5	270	365	1,090	75
2.13	54.1	XS	135	180	545	37.5	160	220	655	45
		X	315	425	1,270	87.5	375	510	1,525	105
		AD	440	595	1,270	87.5	525	710	1,525	105
2.88	73.2	XS	390	530	725	50	470	635	870	60
		X	830	1,125	1,450	100	935	1,270	1,740	120
		AD	1,105	1,500	1,450	100	1,330	1,800	1,740	120

◊ Maximum pressure and maximum torque are the maximum values the motor can be operated at for a short period of time, taking increased wear rates into account.

ROTATIONAL SERVICES

METAL MUNCHER Carbide Insert

Application

In 1985 the fishing industry changed with the introduction of the **METAL MUNCHER™ carbide insert**. This insert and its patented application for milling tools have increased penetration rates and mill life by as much as 1000%. METAL MUNCHER buttons, as they are referred to, are made by pressing tungsten carbide powder into a mold and heating them in a furnace. The design of the button allows downhole milling similar to what is done using a machine shop lathe.

METAL MUNCHER cutting structures are used primarily on turbo scale mills, step mills, window mills, and junk mills. With the controlled cutting angle and chip breaking features, these mills can be effective on high content chrome steels and are engineered to cut the metal away instead of grinding it. METAL MUNCHER mills produce small, uniform cuttings which eliminate bird nesting and make it easier to circulate the cuttings out of the well. Using this technology, the weight on the mill required can be significantly reduced making it an ideal cutting structure for coiled tubing applications.



METAL MUNCHER Carbide Insert

Opti-Cut Cutters

Application

Opti-Cut™ cutters is an improvement over the traditional SUPERLOY randomly crushed carbide cutters currently in use today. In some very specialized applications they may also be used in place of the METAL MUNCHER insert. The cutters are designed to act much like SUPERLOY, but are no longer randomly shaped. Each piece has identical geometry optimized so that no matter how the cutter is placed on the body of the cutting or milling edge, there is always a sharp cutting edge and/or point looking down.

As the cutter is worn down, new cutting edges and points are exposed. The new cutter has a total of sixteen cutting points and eight cutting edges.

Applications for Opti-Cut are similar to the applications for SUPERLOY and are extremely effective in removing composite material as well as milling junk in the hole.



Opti-Cut Cutters

ROTATIONAL SERVICES

Diamonds

Application

The application of synthetic polycrystalline diamond compact (PDC) and surface set diamonds for milling tools provides an alternative for cutting and milling operations involving hard material or hard formations. PDC inserts are used in underreaming operations where hard formation or long sections are to be underreamed. Mills and shoes are dressed with surface set diamonds to meet special applications involving hard material or where extra long mill life is required. Diamond speed mills are commonly used to cut hard material and formation together. Diamond rotary shoes are commonly used to cut over stuck bottomhole assembly with hardened or insert type stabilizers.

What is polycrystalline diamond?

Polycrystalline diamond consists of a layer of diamond integrally bonded to a carbide substrate. The diamond layer provides high hardness and abrasion resistance, whereas the carbide substrate improves the toughness and weldability.

Polycrystalline diamond is a synthesized, extremely tough, intergrown mass of randomly orientated diamond particles in a metal matrix. It is produced by sintering together selected diamond particles at high pressure and temperature. The sintering process is rigidly controlled within the diamond stable region and an extremely hard and abrasion resistant structure is produced.



PDC Insert Bit

Natural Diamond Bits

Application

Diamond speed mills (DSM) have a long track record of successful use in coiled tubing casing exits. These unique designs allow the DSM to smoothly cross the casing wall as it moves off the whipstock and into the formation. The durable natural diamond cutting structure works well with the high RPM and low WOB characteristic of coiled tubing applications. Baker Hughes provides many sizes and types of natural diamond drill bits for slim-hole, hard formation drilling.



Natural Diamond Bits

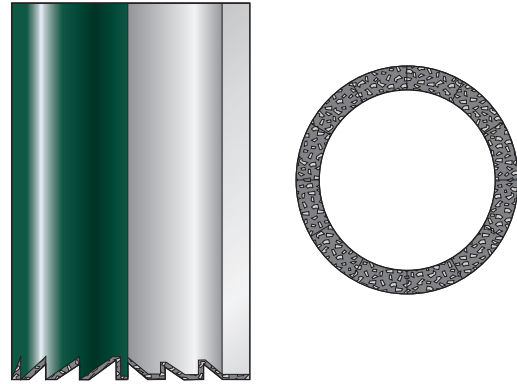
ROTATIONAL SERVICES

Baker Hughes Rotary Shoes

Product Family Nos. H15008, H15010, H15013, and H15014

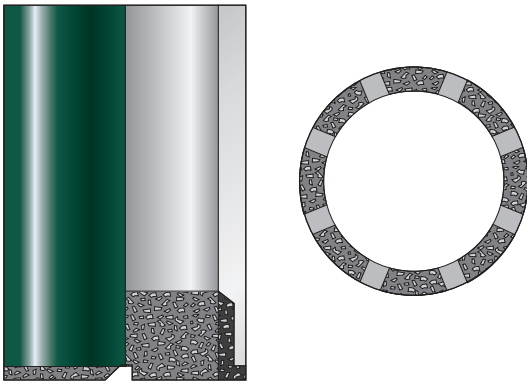
Application

Baker Hughes rotary shoes are made from heat-treated alloy steel and dressed with SUPERLOY, METAL MUNCHER, or Opti-Cut. They are used on the bottom of washpipe in washover or milling operations. The specific application will dictate the type shoe best suited for the job.



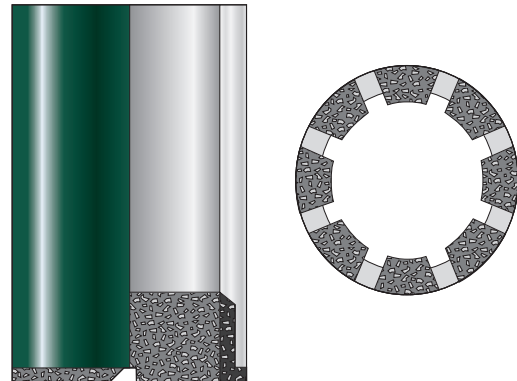
Type B Rotary Shoe (Tooth Type)

The **Type B rotary shoe** is used for washing over. Mill tooth design permits maximum circulation consistent with limited clearances. This shoe cuts on the bottom only.



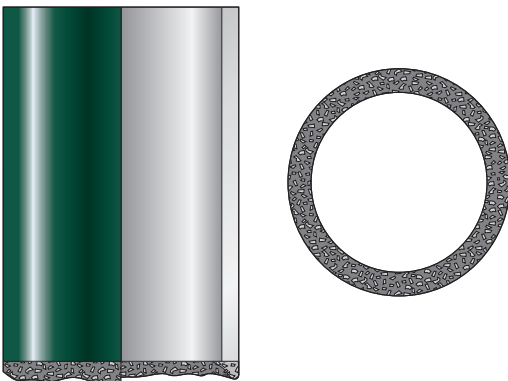
Type C Rotary Shoe (Flat Bottom)

The **Type C rotary shoe** is used to cut metal on the fish where clearances are small. This shoe cuts on the inside and bottom only.



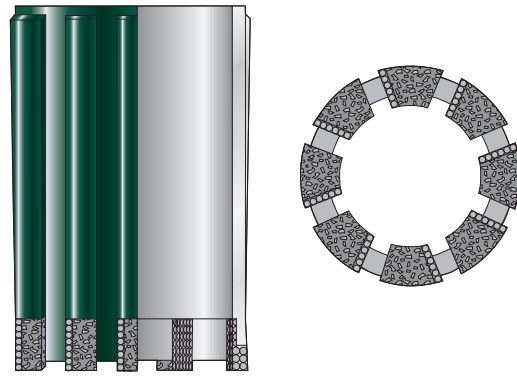
Type D Rotary Shoe (Flat Bottom)

Similar to Type C shoe, the **Type D rotary shoe** has an internal upset for use where clearance permits. This shoe cuts on the inside and bottom only.



Type K Rotary Shoe (Scallop Bottom)

The **Type K rotary shoe** is used to wash over and cut on the bottom face only. Does not cut on the ID or OD.



METAL MUNCHER Rotary Shoe (Crown Type)

The **METAL MUNCHER rotary shoe** is used to wash over and cut on the bottom face and ID only.

ROTATIONAL SERVICES

Bladed Junk Mill

Product Family No. H15106

Application

Bladed junk mills dressed with Opti-Cut junk offered by Baker Hughes are designed for the milling of debris where milling inserts are considered too aggressive. These mills operate very well in the removal of composite bridge plugs such as the QUIK Drill™. Opti-Cut dressed mills use the patented Opti-Cut star shaped insert that is ideal for use on workover motor operations since it creates small cuttings and does not need high set down weight to perform optimally. Baker Hughes offers a variety of sizes and configurations accommodating all common casing and tubing sizes.

Advantages

- Increased mill life
- Smaller cuttings
- Accommodates motor operations



Bottom View



Bladed Junk Mill with SUPERLOY
Product Family No. H15106

ROTATIONAL SERVICES

Turbo Scale Mill

Product Family No. H15101

Application

The **turbo scale mill** is designed for the removal of scale using a coiled tubing deployed workover motor. The unique mill face design proves to be extremely effective and has been used for the economical removal of any scale type, including barium sulfate and other hard scales. The design allows for only a small contact area which results in low torque consumption to reduce stalling of the motor. Stabilizers on the body behind the milling matrix reduce the risk of damaging the tubing or casing wall. The turbo scale mill has been built in various sizes and configurations.

Advantages

- Unique mill face design
- Multiple cutting matrices available
- Small contact area for low torque consumption
- Non-aggressive to tubing wall through stabilization



Turbo Scale Mill
Product Family No. H15101

METAL MUNCHER Step Mill

Product Family No. H15113

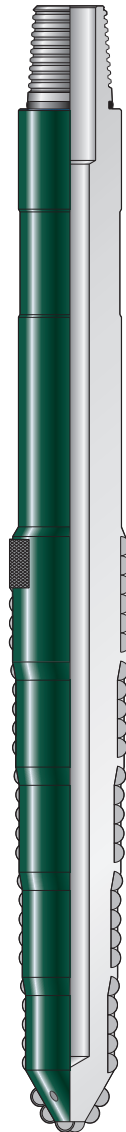
Application

The **METAL MUNCHER™ step mill** is designed for the removal of nipple profiles using a coiled tubing deployed workover motor. The design proves to be extremely effective and has been used for the economical removal of any ID restriction, including barium sulfate and other scales. The design allows for only a small amount of cutting per OD increase in the mill. The step feature not only keeps torque and cutting size to a minimum, but also leaves a machine like finish on the surface milled. Wear pads at the largest OD of the mill reduce risk of damage to the tubing or casing string.

The step mill has been built in sizes ranging from 1½ in. (38.1 mm) – 8½ in. (215.9 mm) OD. The mill may be manufactured with a pilot for additional stabilization.

Advantages

- Low torque requirements for milling
- Machine like finish left on milled surface
- Longer mill life
- Will not damage outer string



METAL MUNCHER Step Mill
Product Family No. H15113

ROTATIONAL SERVICES

METAL MUNCHER Junk Mill

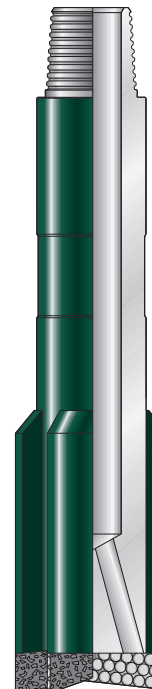
Product Family No. H15102

Application

The **METAL MUNCHER™ junk mill** is designed for the milling of several types of obstructions and loose debris. The METAL MUNCHER junk mill uses the patented METAL MUNCHER cutting technology for maximum rate of penetration and extended mill life. The mill design is ideal for motor operations because of low weight, high speed operations. There are a variety of designs which will meet most milling applications, with special designs manufactured on request. Baker Hughes maintains a large and varied inventory which will accommodate most casing and tubing sizes.

Advantages

- Increased penetration rates
- Increased mill life
- Smaller cuttings
- SUPERLOY backing



METAL MUNCHER Junk Mill
Product Family No. H15102

Hydraulically Optimized (HO) Style Mill

Product Family No. H13350

Application

The **HO style mill** is used in conjunction with the Navi-drill™ series workover motor to form an optimized coiled tubing deployed system for the efficient removal of composite frac plugs from the wellbore. The primary characteristics of the HO Mill are two-fold. Firstly the flow ports are hydraulically optimized to create agitation, greatly improving sand removal from ahead of the mill during milling. In addition the mill is dressed with durable Glyphalloy™ AMT inserts, the most durable on the market. The mill can be dressed with several different concave, non-aggressive face configurations to accommodate a variety of milling environments.

This combination of design features delivers highly efficient milling operations with good ROP and longevity to consistently mill all frac plugs from the wellbore in a single trip.



HO Style Mill
Product Family No. H13350

ROTATIONAL SERVICES

DB Underreamer/Cutter

Product Family No. H15097

Application

The **DB underreamer/cutter** was designed to underream scale or cement from cased- or openhole with or without the need for a pilot hole and also designed to cut pipe, tubing and Baker Hughes cut to release premier packers. The tool incorporates three blades that are forced outwards by either weight on bit or applied pressure, which assist in centralizing the tool in the hole during operation.

The back pressure achieved by flow rate through sized orifices in the tool forces the knives out and locked open making the tool ideal for backreaming when used as an underreamer.

When performing a cutting operation, the force required to open the knives is provided by means of pressure only. A variety of knife styles and insert configurations are available to provide a fit for purpose cutting solution for standard or exotic material such as 13% chrome, 25% super duplex chrome, SM2535, and inconel 718.

The tool is available in three different versions: the standard DB with one internal adjustable orifice, the DB with adjustable orifices for the flow ports that spray over the knives, and the DB with a bit box which gives the ability to attach a mill for desired milling matrix.

Advantages

- Maximum flow after tool is opened
- Blades designed with METAL MUNCHER matrix
- Sturdy construction for downhole reliability
- Positive indication when blades reach full gauge
- Adjustable nozzles for all flow ports

Standard DB Underreamer/Cutter

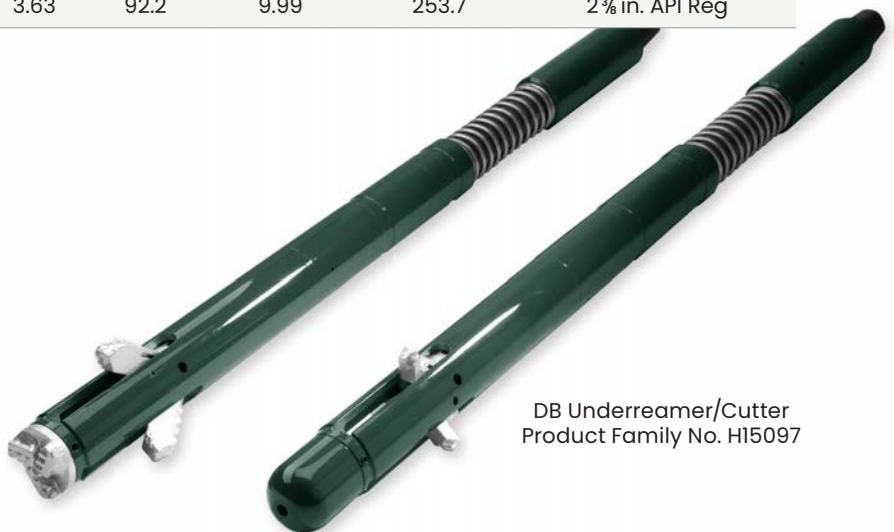
Specification Guides				
Tool OD		Maximum Open Gauge		Standard Connection
in.	mm	in.	mm	
2.13	54.1	6.23	158.2	1½ in. AMMT
2.25	57.2	6.23	158.2	1½ in. AMMT
2.63	66.8	8.12	206.2	1½ in. AMMT
3.00	76.2	8.60	218.4	2¾ in. PAC DSI
3.63	92.2	9.99	253.7	2¾ in. API Reg

DB Underreamer/Cutter with Adjustable Nozzles

Specification Guide				
Tool OD		Maximum Open Gauge		Standard Connection
in.	mm	in.	mm	
2.63	66.8	8.12	206.2	1½ in. AMMT
3.00	76.2	8.60	218.4	2¾ in. PAC DSI
3.63	92.2	9.99	253.7	2¾ in. API Reg

DB Underreamer/Cutter with Bit Box

Specification Guide				
Tool OD		Maximum Open Gauge		Standard Connection
in.	mm	in.	mm	
2.63	66.8	8.12	206.2	1½ in. AMMT
3.00	76.2	8.60	218.4	2¾ in. PAC DSI
3.63	92.2	9.99	253.7	2¾ in. API Reg



DB Underreamer/Cutter
Product Family No. H15097

ROTATIONAL SERVICES

Hydraulic Tubing Cutter

Product Family No. H17003

Application

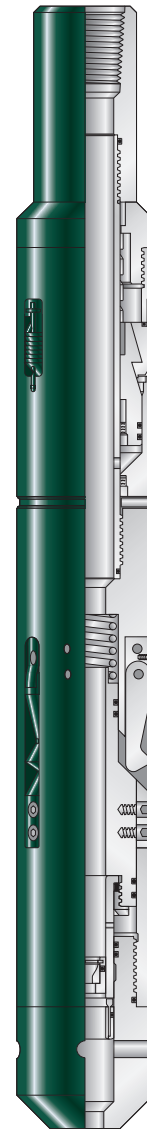
The **hydraulic tubing cutter** is a pressure-activated internal cutter designed to cut small diameter pipe and tubing. The tool provides a safe alternative to chemical and explosive cutters. The cutters are recommended in high-angle holes where friction and drag may restrict mechanical or wireline cutter operations.

Advantages

- Knives are extended by hydraulic pressure and do not require mechanical slips
- A three-knife design stabilizes the cutter and reduces the risk of missed cuts
- Provides safe alternative to explosive or chemical cutters
- Recommended for high-angle holes where friction and drag may restrict mechanical and wireline type cutters
- Bottom subs with ID and check valve are available
- Can be deployed on threaded or coiled tubing workstring

Specification Guides

Tool OD		Tubing Range		Maximum Knife Swing		Make Up Length		Standard Connection
in.	mm	in.	mm	in.	mm	in.	mm	
1.88	47.8	2.375	60.3	3.625	92.1	32.00	812.8	1 in. AMMT
2.13	54.0	3.500	88.9	4.375	111.1	29.00	736.6	1½ in. AMMT
2.50	63.5	3.500	88.9	4.875	123.8	33.00	838.2	1½ in. AMMT



Hydraulic Tubing Cutter
Product Family No. H17003

ROTATIONAL SERVICES

SR2 Underreamer

Product Family No. H15028

Application

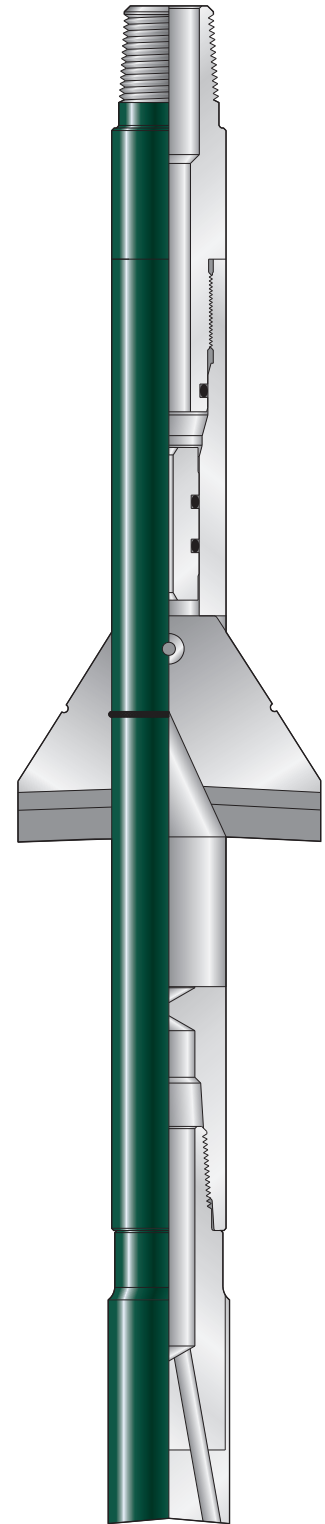
The **SR2™ underreamer** (simple robust and reliable) is designed to pass through small diameter production tubing and underream to full gauge in the casing below the tubing. The underreamer allows removal of sand, cement, scale, cast iron, and composite bridge plugs without pulling the production tubing. The SR2 Underreamer is a 2-bladed underreamer provided with a bit box, which gives the ability to attach a mill with the desired milling matrix.

The SR2 underreamer is used in conjunction with a positive displacement motor and can be deployed on either coiled tubing or small threaded pipe.

The blades of the SR2 underreamer are actuated by flow; a pressure drop through the tool will activate the piston that pushes out the knives. A flow path is provided through the tool body for circulation through the mill.

Advantages

- Small OD
- Large expanded gauge
- Simple design
- Flow path through the mill
- Interchangeable mill
- SR2 underreamers can be run in tandem



SR2 Underreamer
Product Family No. H15028

ROTATIONAL SERVICES

Hydraulic/Mechanical Tubing Anchor

Product Family No. H13226

Application

The **hydraulic/mechanical tubing anchor** is used to anchor the bottomhole assembly inside the tubing during cutting operations.

The hydraulic/mechanical tubing anchor uses a cone and collet to anchor the tool to the tubing. The collet is attached to a piston so that hydraulic pressure is used to activate the tool. Mechanical downward force then holds the anchor while other operations are performed.

The tool is designed so that the top sub and bottom sub can be reversed. This allows the tool to be run reversed using tension to hold the anchor.

Advantages

- Hydraulically activated
- Will eliminate movement of coiled tubing while cutting
- Can be run in conjunction with a workover mud motor
- Optimum slip design
- Can be run reversed for upward anchoring use

Specification Guide

Service	Tool OD		Tool ID		Max Catch ID		Make Up Length		Tensile Rating	Standard Connection
	in.	mm	in.	mm	in.	mm	in.	mm	lb	
Standard	1.69	42.9	0.47	11.9	1.99	50.5	21.88	555.8	21,800	1 in. AMMT
Sour	1.69	42.9	0.47	11.9	1.99	50.5	21.88	555.8	15,855	1 in. AMMT
Standard	2.06	52.4	0.63	15.9	2.44	62.0	31.13	790.7	43,850	1½ in. AMMT
Sour	2.06	52.4	0.63	15.9	2.44	62.0	31.13	790.7	31,891	1½ in. AMMT
Standard	2.50	63.5	0.63	15.9	3.54	89.9	31.13	790.7	43,850	1½ in. AMMT
Sour	2.50	63.5	0.63	15.9	3.54	89.9	31.13	790.7	31,891	1½ in. AMMT
Standard	3.13	79.4	1.00	25.4	4.09	103.9	35.35	897.9	83,000	2¾ in. PAC DSI
Sour	3.13	79.4	1.00	25.4	4.09	103.9	35.35	897.9	83,000	2¾ in. PAC DSI
Standard	3.50	88.9	1.00	25.4	4.89	124.2	35.35	897.9	83,000	2¾ in. PAC DSI
Sour	3.50	88.9	1.00	25.4	4.89	124.2	35.35	897.9	83,000	2¾ in. PAC DSI
Standard	5.25	133.4	1.00	25.4	6.27	159.3	35.35	897.9	83,000	2¾ in. PAC DSI



Hydraulic/Mechanical Tubing Anchor
Product Family No. H13226

ROTATIONAL SERVICES

Hydraulic Indexing Tool

Product Family No. H13260

Application

The fishing **hydraulic indexing tool** offers the ability to orient a fishing tool string in the casing during thru-tubing fishing operations.

The hydraulic indexing tool is designed so that all the shifting parts are internal. Thus, the tool length remains the same while indexing the tool. Once washing over or fishing begins, flow through the indexing tool rotates the tools below the indexing tool in 30° increments. The indexing tool can also be used with bent subs and centralizers to help locate fish that are on the high side of the wellbore. In most applications when running hydraulic retrieving tools below the indexing tool, the indexing tool is actuated using back pressure created by pumping through the hydraulic retrieving tools.

Advantages

- Hydraulically actuated
- Large ID
- All shifting parts are internal

Set-Down Indexing Tool

Product Family No. H13259

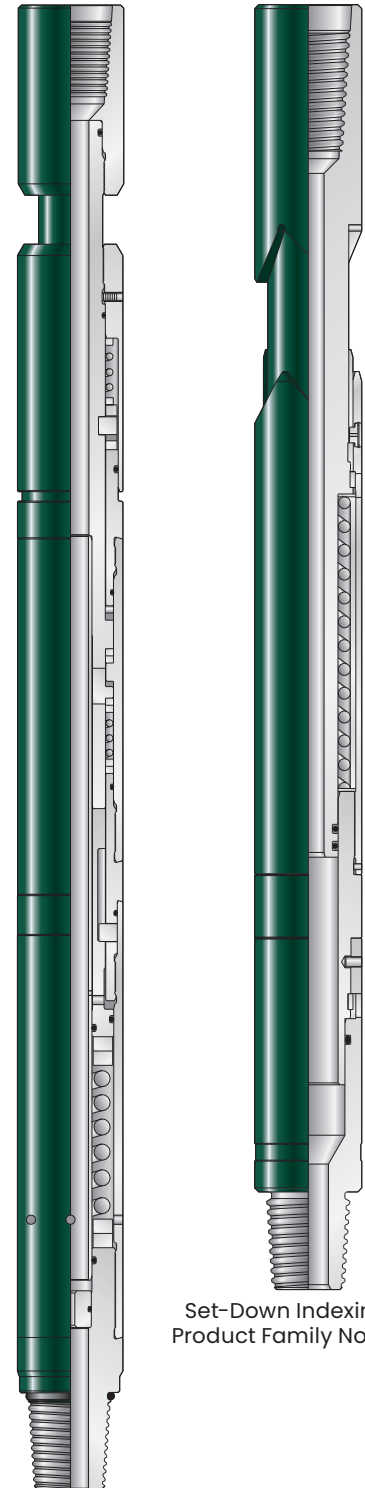
Application

The **set-down indexing tool** offers the ability to orient a fishing tool string in the casing during thru-tubing fishing operations by applying set-down weight.

The set down indexing tool is designed such that it will provide 120° of rotation every time it is activated. Once resistance is met, such as shouldering on the top of a liner or the top of a fish, any additional set-down weight applied actuates the set down indexing tool. The tool does not allow the tool string to rotate while resetting.

Advantages

- Indexes 120° when applying set-down weight
- No hydraulic activation needed
- Safe to use with hydraulic activated fishing tools
- Can be used with conventional fishing tools that require rotation to be released
- Tool will reset when weight is released



Hydraulic Indexing Tool
Product Family No. H13260

Set-Down Indexing Tool
Product Family No. H13259

IMPACT SERVICES

HB-3 Selective Shifting Tool

Product Family No. H81198

Application

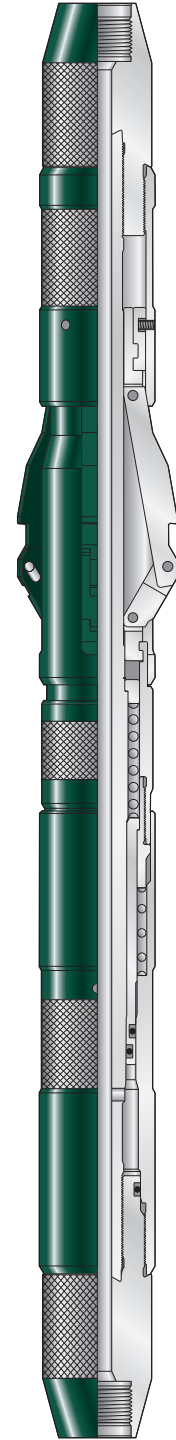
The **HB-3™ hydraulic shifting tool** is designed for shifting the Baker Hughes Type HL™ or CM™ series sliding sleeve on coiled tubing. Flow passage allows washing with tubing while running in the well. After washing past the sleeve, an increase of pump pressure causes a piston to compress a spring, allowing a second spring to extend a set of linkage arms extending out. The sliding sleeve can be shifted either by directly pushing or pulling on the coiled tubing or by use of an impact tool. After the sleeve is shifted, the shifting tool will automatically release. A decrease in pump pressure once again retracts the linkage arms and allows unimpeded movement up and down the hole.

Advantages

- Fully selective operation, can be run or retrieved through multiple sliding sleeves without manipulating the sleeve
- Application of internal hydraulic pressure down the coiled tubing will allow linkage arms to expand
- Low actuation pressure required to expand linkage
- Linkage system exerts maximum radial force when extended and latched into sleeve insert
- Small run in OD
- Wash ports under linkage arms allow debris to be washed away
- Can be run in tandem to shift up and down in one trip

Specification Guides

Tool Size		Tool OD		Shifts Sleeve Sizes	
in.	mm	in.	mm	in.	mm
3.50	88.9	2.50	63.5	2.56	65.0
3.50	88.9	2.50	63.5	2.75	69.8
3.50	88.9	2.50	63.5	2.81	71.3
4.50	114.3	3.00	76.2	3.43	87.1
4.50	114.3	3.00	76.2	3.68	93.4
4.50	114.3	3.00	76.2	3.75	95.2
4.50	114.3	3.00	76.2	3.81	96.7



HB-3 Selective Shifting Tool
Product Family No. H81198

IMPACT SERVICES

HIPP-TRIPPER Si-Di Impact Drill

Product Family No. H13400

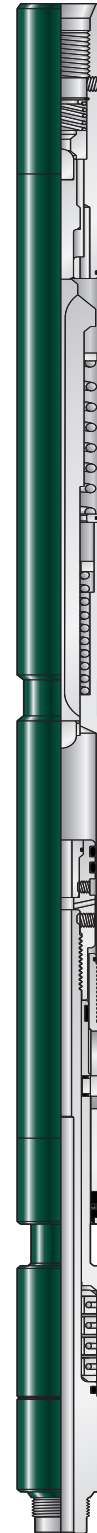
Application

The **HIPP-TRIPPER™ single-directional (Si-Di)** is a rotating impact drill that can be powered by most types of fluids including foam and nitrogen. The drill components are not affected by xylene, oil or diesel. The tool can also be run in acid or high H₂S environments using the extreme service tool which uses higher grade materials. This tool is available in various sizes to suit a range of completions.

The Si-Di impact drill is powered by fluid pumped through the coiled tubing workstring to produce a reciprocating action as well as rotation. The frequency of the stroke of the tool is dependent on the amount of weight applied to the tool and the volume of fluid being pumped through the tool. The drill will not begin operating until the bit has met resistance. This permits circulation while tripping in and out of the well without damage to the tool or tubing wall. It is always recommended to run the specially designed HIPP-TRIPPER accessories with this tool. Common applications for the Si-Di impact drill are scale milling, cement milling, resin sand removal, gravel removal, breaking KOIV discs, chasing junk downhole, and shifting sleeves (with the rotation feature removed). Although the drill may be run with or without an intensifier, it is always recommended that an intensifier be run where surface testing of the tool is required, working at depths above 600 ft (182.55 m) or working with 1¾ in. OD coiled tubing or larger.

Advantages

- Activated using pump pressure which eliminates cycling of the coiled tubing
- Operates on most fluid mediums including nitrogen
- Temperature rated up to 600°F (315°C)
- Extreme service tools are available
- Does not operate until resistance is met
- Provides rotation as well as impact energy
- Various bits available to use with tool
- Tool is self tightening
- High pressure pulse at bits with each blow
- Allows circulation at all times
- Can be run with or without rotation
- Not recommended for metal milling



HIPP-TRIPPER Si-Di Impact Drill
Product Family No. H13400

IMPACT SERVICES

HIPP-TRIPPER Si-Di Impact Drill

Specification Guide												
Tool OD		Operating Pressure		Pump Rate		Frequency	Make Up Length		Maximum Pull ◊		Set-Down Weight	
in.	mm	in.	mm	in.	mm	Hz	in.	mm	lb	kg	lb	kg
1.375	34.9	500-2,000	34-138	11-30	42-114	3-17	30.75	781	26,000	11,793	400-1,000	181-454
									18,000	8,165		
									26,000	11,793		
1.688	42.9	600-2,000	41-138	11-70	42-265	3-17	36.40	925	40,000	18,144	800-1,500	363-680
									27,000	12,247		
									40,000	18,144		
									27,000	12,247		
2.125	54.0	400-2,100	28-145	11-70	42-265	3-17	43.63	1108	53,000	24,040	800-2,400	363-1,088
									32,000	14,515		

IMPACT SERVICES

HIPP-TRIPPER Accelerators

Product Family No. H13420

Application

The **HIPP-TRIPPER™ accelerator** is used in conjunction with the single-directional impact drill or bi-directional vibratory jar in applications where the pipe that the tool is deployed on is too stiff for the tool to operate. The accelerator also amplifies the impact blows. The accelerator consists of two telescoping tubes, biased downward by means of a coil spring.

It is recommended that a mechanical accelerator always be used when operating above depths of 600 ft (182.55 m) or when working with heavy wall coiled tubing or threaded pipe. The single directional impact drill and the bi-directional vibratory jar will continue to run with the accelerator in the bottomed-out position if the depth of operation provides the required flexibility in the coiled tubing. When this condition occurs, the operator should notice a decrease in the frequency of blows.

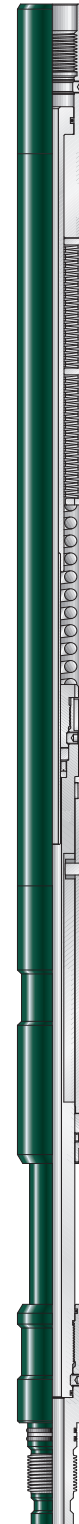
Advantages

- Variable spring rate
- Impact drill and vibratory jar will continue to run with accelerator bottomed-out
- Allows the tool to operate on surface and at shallow depths
- Simple operation and construction
- Designed to be used with HIPP-TRIPPER products

Specification Guides

Tool OD		Stroke		Working Load ♦		Make Up Length		Standard Connection
in.	mm	in.	mm	lb	kg	in.	mm	
1.688	42.88	5	127.0	1,600	726	60.75	1,543	1 in. AMMT Box x 1½ in. UNF Pin
2.125	53.98	7	178.0	2,400	1089	56.95	1,447	1½ in. AMMT Box x Pin

♦ Maximum applied set-down weight when run in conjunction with a single directional impact drill.



HIPP-TRIPPER Accelerators
Product Family No. H13420

IMPACT SERVICES

Block and Blast Tool

Product Family No. H13425

Application

The **block and blast tool** provides drilling with impact and the ability to jet-wash tubing in one operation. Until now drilling and acid washing required separate trips.

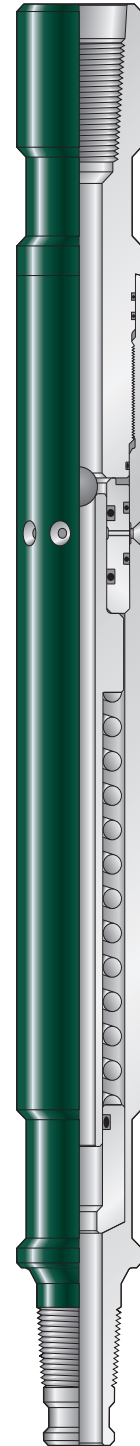
The tool has been designed to be used in conjunction with a single direction HIPP-TRIPPER. The block and blast tool should be run directly above the single-direction HIPP-TRIPPER. Once the HIPP-TRIPPER Bottomhole assembly is run to the desired depth, drop the specified ball to shift the sleeve to the open position. This allows the block and blast tool to block off the single-direction HIPP-TRIPPER and use all the energy to side blast the tubing, casing or perforations.

The blasting should begin from the bottom of the well, slowly pulling up the hole so no solids fall below the bit.

Advantages

- Used with HIPP-TRIPPER single direction impact drill
- Steel ball operated
- Able to acid wash
- Made out of nickel alloy 925 material
- Capable of handling hostile fluids

Specification Guides								
Tool OD		Tool ID		Overall Length		Standard Connection		
in.	mm	in.	mm	in.	mm	Top	Bottom	
1.69	42.9	0.38	9.5	18.25	463.5	1 in. AMMT Box	1½ in. UNF Pin	
1.69	42.9	0.44	11.1	18.25	463.5	1 in. AMMT Box	1½ in. UNF Pin	



Block and Blast Tool
Product Family No. H13425

DEBRIS CATCHER

Venturi Jet Junk Basket

Product Family No. H13051

Application

The **venturi jet junk basket** is used to remove various types of high-density debris and formation particles within small diameter cased and open wellbores that are too heavy to be circulated to surface. Flow in the top of the tool passes to the outside via adjustable jets. The jets cause a pressure drop on the inside of the venturi basket, which acts as suction at the bottom inlet of the tool. Fill is stirred up by the flow coming down the outside of the tool. With the suction at the bottom inlet, the fill is then carried through finger cages into the tool's internal filter. The strained fluid then passes out at the top with the pumped fluid.

The fill is then trapped between the filter above and the finger cages below. Extensions increase the amount of fill dirt that can be brought to surface on each trip. Venturi jet junk baskets can be fitted with a dressed shoe and can be run below workover motors to break up and retrieve debris which may be compacted.

Advantages

- Fully closed finger or flutter catchers
- Can be run with any type of dressed shoe
- Have adjustable reservoir through extensions

Specification Guides						
Tool OD		Standard Connection	Minimum Flow Rate		Maximum Flow Rate	
in.	mm		gpm	lpm	gpm	lpm
1.69	42.9	AW Rod Pin	12.5	46.8	85	319
2.06	50.8	AW Rod Pin	12.5	46.8	85	319
2.63	66.6	1¼ in. API Reg Pin	12.5	46.8	120	450
3.13	79.3	2¾ in. API Reg Pin	12.5	46.8	135	506



Venturi Jet Junk Basket
Product Family No. H13051

Thru-Tubing Inflatables History



Baker Hughes pioneered the research and development of the oil and gas industry's first thru-tubing inflatable tools in 1985. These tools were designed to offer the highest available expansion characteristics with the greatest available differential pressure ratings.

These thru-tubing tools were initially designed to be run on coiled tubing and snubbing pipe, allowing for the inherent advantages of working over a well in a live condition, without removing the completion.

The first tool design was a service packer for selective acid stimulation. Since that time, a wide range of tools have been developed that include not only packers, but also permanent and retrievable bridge plugs, permanent cement retainers, straddle systems, and our unique and highly successful ISAP™ (inflatable straddle acidizing packer) system.

In 1989, Baker Hughes introduced the first-ever setting tool to allow for electric wireline conveyance of inflatable products. Concurrently, Baker Hughes has developed a suite of coiled tubing, wireline running, and retrieving tools that are part of a comprehensive solution. Combined with custom software and expert service, this systems approach allows Baker Hughes to continue its philosophy of providing flawless execution at the wellsite.

What are thru-tubing inflatables?

Thru-tubing inflatables are small diameter well intervention tools designed to run through a restriction in the wellbore and set in a larger diameter below. These inflatable tools are designed with a nitrile-based inflatable packing element that is expanded by the means of hydraulic pressure. These tools are capable of expansions up to 350% of their original run-in diameter while being able to use a variety of fluids with which to inflate the element.

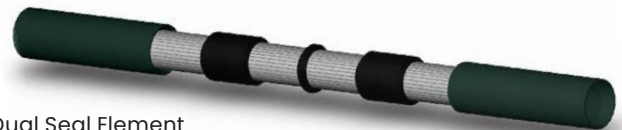
Unlike more traditional mechanical tools, an inflatable tool can be conveyed through a wellbore restriction and deployed in the larger diameter below. A unique advantage of the inflatable element is in its ability to create an effective seal in irregular or eccentric profiles such as open hole, perforations, screens, and slotted liners.

INFLATABLE SYSTEMS

Within the thru-tubing inflatable product line there are three main cover configurations that are used. Each configuration is designed for setting in different environments.



Dual seal elements are designed to have exposed ribs on either end of the element with the nitrile based elastomer outer seal nearer the middle. The exposed ribs provide the greatest metal-to-metal contact area to the casing/tubing wall, resulting in the highest anchoring capability. This style of element is the most common cover configuration used within the product line and is primarily deployed inside blank tubing/casing. The constructed of the dual seal element makes it idea to within stand pressure differentials from both directions.



Dual Seal Element

Modified full cover elements, barring a very small portion of exposed ribs at each end sleeve are completely covered in a nitrile-based outer seal and is normally used for setting in open hole, perforation, slotted liner, sliding sleeves, etc. The expanse of outer elastomer provides an excellent sealing surface that also anchors the element due to the irregularities in the open hole environment. Due to the lack of exposed metal of the ribs this style of element the element is not recommended for cased hole applications.



Modified Full Color Element

INFLATABLE SYSTEMS

Thru-Tubing Inflatable Element

Rating Table															
Hole Size Element is to be Set In [in. (mm)]															
OD	2.375	2.875	3.500	4.000	4.500	5.000	5.500	6.625	7.000	7.625	8.625	9.625	10.750	11.750	13.375
ID	1.995 (51)	2.441 (62)	2.992 (76)	3.548 (90)	3.958 (101)	4.276 (109)	4.892 (124)	5.921 (150)	6.094 (155)	6.765 (172)	7.511 (191)	8.681 (221)	9.760 (248)	10.772 (274)	12.415 (315)
Maximum Applied Differential Pressure [psi (bar)]															
Maximum Temperature [°F (°C)]															
1.69 (42.9)	5,500 (379)	5,500 (379)	4,600 (317)	3,200 (221)	2,600 (179)	2,200 (152)	1,700 (117)								
	300 (149)	300 (149)	300 (149)	300 (149)	300 (149)	250 (121)	250 (121)								
2.13 (54.1)		6,000 (414)	6,000 (414)	5,500 (379)	4,300 (297)	3,600 (248)	2,600 (179)	1,600 (110)	1,500 (103)	1,000 (69)					
		300 (149)	300 (149)	300 (149)	300 (149)	300 (149)	300 (149)	280 (138)	280 (138)	280 (138)					
2.50 (63.5)			6,500 (448)	6,500 (448)	6,300 (434)	5,500 (379)	4,200 (290)	2,500 (172)	2,300 (159)	1,800 (124)	1,550 (107)	1,300 (90)			
			300 (149)	300 (149)	300 (149)	300 (149)	300 (149)	300 (149)	280 (138)	280 (138)	260 (127)	240 (116)			
3.000 (66.8)				8,000 (552)	8,000 (552)	8,000 (552)	8,000 (552)	4,900 (338)	4,500 (314)	3,400 (234)	2,500 (172)	1,600 (110)			
				300 (149)	300 (149)	300 (149)	300 (149)	300 (149)	300 (149)	280 (138)	260 (127)	240 (116)			
3.380 (85.9)				8,500 (586)	8,500 (586)	8,500 (586)	8,500 (586)	6,500 (448)	6,200 (428)	4,900 (338)	3,700 (255)	2,450 (169)	1,700 (117)		
				300 (149)	300 (149)	300 (149)	300 (149)	300 (149)	300 (149)	300 (149)	280 (138)	280 (138)	275 (135)		
4.250 (108.0)							8,500 (586)	8,500 (586)	8,500 (586)	6,550 (452)	4,900 (338)	3,300 (228)	2,350 (162)		
							300 (149)	300 (149)	300 (149)	300 (149)	280 (138)	280 (138)	280 (138)		
5.380 (136.7)							8,500 (586)	8,500 (586)	8,500 (586)	8,100 (559)	5,950 (410)	4,700 (324)	3,800 (262)	2,850 (197)	
							300 (149)	300 (149)	300 (149)	300 (149)	300 (149)	280 (138)	280 (138)	260 (127)	
5.750 (146.1)							8,500 (586)	8,500 (586)	8,500 (586)	8,500 (586)	6,850 (472)	5,350 (369)	4,350 (300)	3,200 (221)	
							300 (149)	300 (149)	300 (149)	300 (149)	300 (149)	280 (138)	280 (138)	260 (127)	

Reduce pressure ratings by 20% for H₂S service elements. Standard service elements use high strength alloys but are susceptible to stress corrosion cracking (SCC) in H₂S and other highly corrosive environments. H₂S service elements use nickel alloy materials that meet the requirements of NACE MR0175. For element ratings in different IDs in different IDs from above, contact your local Baker Hughes representative.

INFLATABLE SYSTEMS

Permanent Bridge Plug

Product Family No. H34001

Application

The Baker Hughes portfolio of Thru Tubing Inflatable bridge plugs are designed as high expansion well isolation devices. The sealing and anchoring characteristics of these isolation devices are created by means of a high expansion inflatable sealing element that is hydraulically actuated to set.

The bridge plugs are developed to be utilized in Live Well operations and can be deployed coiled tubing, electric wireline, slickline or threaded tubing. When deployed on coiled or threaded tubing the bridge plug is inflated by applying pressure down through the tubing string.

The **Thru-Tubing Inflatable permanent bridge plug (TTPBP)** provides a means of permanently plugging off the bottom of a well without the necessity of pulling the production tubing or killing the well.

For deployment on electric wireline or slickline, Baker Hughes has developed a suite of downhole setting tools. For inflation on electric wireline the use of the Baker Hughes electric wireline setting tool (product family no. H43714) is required and for slickline deployment the Baker Hughes SWIFT system (product family no. H43728) is needed.

Advantages

- Inflatable packing element allows large expansion ratios so the tool can be set below the production tubing
- Set on either coiled tubing, electric wireline or slickline allowing the well to be worked over "live" and reduce operational costs
- Does not require a rig on location, reducing operating costs



Permanent Bridge Plug
Product Family No. H34001

INFLATABLE SYSTEMS

Permanent Bridge Plug

Specification Guides																						
Tool OD		Chassis OD		Tool Length		Tool Length with Running Tool		Tensile Rating Above Inflatable		Tensile Rating Through Mandrel		Fish Neck Size and Style	Max. Pressure Rating*		Max. Temp. Rating		Max. Expansion ID		Max. Restriction to Pass Through		Serv.	API 11D1 Validation
in.	in.	mm	in.	ft	in.	ft	lb	kg	in.	mm	in.	psi	bar	°F	°C	in.	mm	in.	mm			
1.69	1.69	43	48	4	78.5	6.54	89.44	7.45	9,000	4,091	1.188 External	5,500	379			4.892	124	1.75	44	Standard and H ₂ S	V6	
2.13												6,000	414			6.765	172	2.19	56			
2.50												6,500	448					2.56	65			
3.00					102.50	8.54	57,000	25,909				8,000	552			8.681	221	3.06	78			
3.38	2.13	54	66.13	5.51					18,700	8,500	1.375 External			300	149			3.44	87			
4.25																		4.31	109			
5.38					105.06	8.76						8,500	586					5.44	138			
5.75					104.56	8.71										12.415	315	5.81	148			

*This pressure is rated at minimal expansion. Pressure ratings decrease as element expansion increases.

INFLATABLE SYSTEMS

Retrievable Bridge Plug

Product Family No. H34010

Application

The Baker Hughes portfolio of Thru Tubing Inflatable bridge plugs are designed as high expansion well isolation devices. The sealing and anchoring characteristics of these isolation devices are created by means of a high expansion inflatable sealing element that is hydraulically actuated to set.

The bridge plugs are developed to be utilized in Live Well operations and can be deployed coiled tubing, electric wireline, slickline or threaded tubing. When deployed on coiled or threaded tubing the bridge plug is inflated by applying pressure down through the tubing string.

The **Thru-Tubing Inflatable retrievable bridge plug (TTRBP)** provides a means of temporarily plugging off a well without the necessity of pulling the production tubing or killing the well.

The retrievable bridge plug has been designed to be equalized and retrieved in a single trip regardless of the retrieval methodology.

For deployment on electric wireline or slickline, Baker Hughes has developed a suite of downhole setting tools. For inflation on electric wireline the use of the Baker Hughes electric wireline setting tool (product family no. H43714) is required and for slickline deployment the Baker Hughes SWIFT system (product family no. H43728) is needed.

Advantages

- Inflatable packing element allows large expansion ratios so the tool can be set below the production tubing
- Set on either coiled tubing, electric wireline or slickline allowing the well to be worked over "live" and reduce operational costs
- Single trip to set and release enables more efficient equalization and retrieval
- Does not require a rig on location, reducing operating costs



Retrievable Bridge Plug
Product Family No. H34010

INFLATABLE SYSTEMS

Retrievable Bridge Plug

Specification Guides																									
Tool OD	Chassis OD		Inflatable Element Length		Tool Length		Tool Length with Running Tool		Tensile Rating Above Inflatable		Tensile Rating Through Mandrel		Fish Neck Size and Style	Max. Pressure Rating*		Max. Temp. Rating		Max. Expansion ID		Max. Restriction to Pass Through		Service API 11DI Validation			
	in.	in.	mm	in.	ft	in.	ft	in.	ft	lb	kg	in.		mm	in.	psi	bar	°F	°C	in.	mm		in.	mm	
1.69	1.69	43	48	4	96.96	8.08	109.00	9.10	11,700	5,306	8,000	3,628	1.188 External	5,500	379	300	149	4.892	124	1.75	44	Standard and H ₂ S V6			
2.13														6,000	414					6.765	172		2.19	56	
2.50															6,500			448						2.56	65
3.00															8,000			552			8.681		221	3.06	78
3.38	2.13	54	66.13	5.51	132.47	11.04	157.80	13.15	25,700	11,655	15,900	7,211	1.375 External							3.44	87				
4.25																			9.760	248	4.31		109		
5.38															8,500	586					5.44		138		
																			12.415	315	5.81		148		
5.75																									

*This pressure is rated at minimal expansion. Pressure ratings decrease as element expansion increases.

INFLATABLE SYSTEMS

Electric Wireline Setting Tool

Product Family No. H43714

Application

The **electric wireline setting tool (EWST)** is an electric downhole pump powered from the surface by means of conventional electric wireline. The EWST uses fluid from either the wellbore or a reservoir carrying system to inflate and pressurize inflatable packing elements.

The setting tool incorporates a magnetic casing collar locator to allow for accurate depth control. The setting tool is powered through the electric wireline with a surface DC power supply which requires AC voltage or a minimum 6kW generator to operate. The operation of the system is tracked at surface by monitoring the amperage draw of the tool on the power supply. When used in conjunction with an inflatable packing element, fluid is drawn into the setting tool and filtered before entering the pump section. The pump section forces the fluid into the inflatable element, where it is trapped by a poppet style check valve. At a predetermined pressure, the setting tool hydraulically disconnects from the inflated tool allowing retrieval of the EWST and wireline to surface.

Advantages

- Allows for the setting of inflatable tools without the cost of a workover rig or coiled tubing unit
- Provides for accurate depth control by means of a built-in casing collar locator
- Can be used with any electric wireline unit
- Decreases the amount of time required for inflatable tool operation



Specification Guides											
Tool Size		OD		Overall Length		Makeup Length		Output Pressure		Thread Up	Tread Down
in.	mm	in.	mm	in.	mm	in.	mm	psi	bar		
1.690	42.9	1.687	42.9	100.04	2541.0	97.54	2477.4	2,700	186	1.187 in. N 12 TPI	1.25 in. Acme
1.81	46.0	1.812	46.0	86.81	2205.0	84.23	2139.4	3,200	221	1.187 in. N 12 TPI	1.50 in. Acme
2.125	54.0	2.125	54.0	86.81	2205.0	84.23	2139.4	3,200	221	1.187 in. N 12 TPI	1.50 in. Acme

Electric Wireline Setting Tool
Product Family No. H43714

INFLATABLE SYSTEMS

Belleville Washer Secondary Pull Release

Product Family No. H33080

Application

The **Belleville washer pull release** is a secondary disconnect tool designed to be used in conjunction with inflatable tools conveyed via the electric wireline setting tool (EWST). The tool provides a secondary method of disconnecting the setting tool from the inflatable tool in the event that the primary hydraulic release mechanism should fail to operate. By using Belleville washers rather than shear screws, the force required to disconnect is more dependable and is repeatable. Compression of the washers allows the movement required to release the disconnect. The washers act as a buffer and are not affected by shocks while running in and out of the hole. The effects of these shocks can cause fatigue and failure of shear screws on designs that rely on shear screws to carry the load of the assembly.

Advantages

- Belleville washer pull release is not susceptible to premature release caused by fatigue of shear screws during running procedures
- Adjustable release force by means of rotation of an external adjusting sleeve
- Small seal diameter to keep pressure generated forces to a minimum prevents hydraulic release
- Standard 1.375 in. (34.9 mm) external wireline fishing neck after activation



Belleville Washer
Secondary Pull Release
Product Family No. H33080

Specification Guides

Tool Size		OD		ID		Overall Length		Make Up Length		Fishing Neck Size and Type		Thread Up	Thread Down
in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	psi	bar		
1.690	42.9	1.690	42.9	0.25	6.35	17.25	438.2	15.00	381.0	1,183	30.1	1.25 in. Acme	1.25 in. Acme
2.125	54.0	2.125	54.0	0.25	6.35	17.65	448.1	14.38	365.3	1,375	34.9	1.50 in. Acme	1.75 in. Acme

INFLATABLE SYSTEMS

Permanent Cement Retainer

Product Family Nos. H34020 and H34021

Application

The **Thru-Tubing Permanent Cement Retainer (TTCR)** allows for permanent isolation and cementation of a lower zone without the necessity of pulling the production tubing. The cement retainer seals with a high expansion inflatable element that can pass through the production jewelry and seal in the casing/liner below.

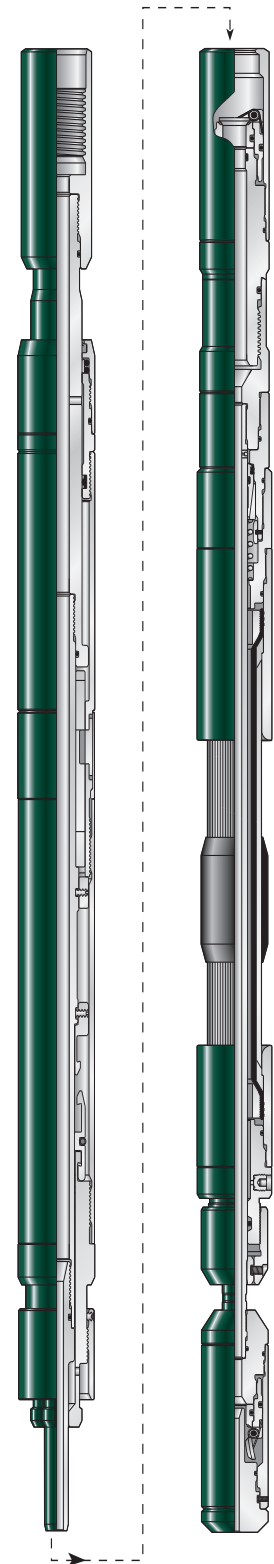
The cement retainer is set with hydraulic pressure, and can be deployed on coiled tubing and threaded pipe. The inflatable element can be set in most IDs including blank pipe, perforations, slotted liners, sand screens and open hole.

The tool is run with the retrievable spotting valve (product family no. H34021), which provides for a means of spotting the cement to the retainer after an injection test negating the requirement to pump unwanted fluids into the formation. The hydraulic lock mechanism on the spotting valve carries the load of the cement retainer while running in the hole preventing the shear screws in the spotting valve from being preloaded.

The retainer incorporates two opposing flapper valves. The bottom flapper valve is held open by the ball seat and is free to close against pressure from below once the seat has been sheared. The top flapper closes against pressure from above when the spotting valve is disconnected from the retainer. Once closed, the flapper valves prevent any fluid movement across the set retainer.

Advantages

- Inflatable packing element allows large expansion ratios so the tool can be set below the production tubing
- Set on either coiled tubing, electric wireline or slickline allowing the well to be worked over "live" and reduce operational costs
- Does not require a rig on location, reducing operating costs
- Built in retrievable spotting valve allows cement to be spotted to the retainer - wellbore fluids are not pumped into formation
- Positive seal flapper valves prevent flow from either direction when spotting valve is retrieved - remove hydrostatic from squeeze



Permanent Cement Retainer
Product Family No. H34020

INFLATABLE SYSTEMS

Permanent Cement Retainer

Specification Guides																				
Tool OD	Chassis OD		Tool Length		Tool Length with Spotting Valve		Tensile Rating		Setting Ball Size	Fish Neck Size and Style	Max. Pressure Rating*		Max. Temp. Rating		Max. Expansion ID		Max. Restriction to Pass Through		Service	
	in.	in.	mm	in.	ft	in.	ft	lb	kg	in.	in.	psi	bar	°F	°C	in.	mm	in.		mm
1.69	1.69	43	93.70	7.81	140.45	11.70		21,000	9,545	0.375	1.50 GS Internal	5,500	379			4.892	124	1.75	44	Standard and H ₂ S
2.13												6,000	414			6.765	172	2.19	56	
2.50												6,500	448					2.56	65	
3.00												8,000	552			8.681	221	3.06	78	
3.38	2.13	54	102.50	8.54	159.41	13.28		37,000	16,818	0.500	2.0 GS Internal			300	149			3.44	87	
4.25																9.760	248	4.31	109	
5.38												8,500	586					5.44	138	
5.75																12.415	315	5.81	148	

*This pressure is rated at minimal expansion. Pressure ratings decrease as element expansion increases.

INFLATABLE SYSTEMS

Retrievable Packer

Product Family No. H33001

Application

The **pull to equalize retrievable packer with hydraulic lock** provides a means of performing remedial and stimulation operations in wells without pulling the production tubing. An inflatable packing element on the packer is sized to pass through the production tubing, pack off the casing below and then return back to its original size when deflated so the packer can be retrieved back through the production tubing. The Packer operates with tubing pressure and a limited amount of tubing manipulation so it can be run on coiled tubing as well as threaded tubing.

The packer has a hydraulic lock mechanism that carries the load of the packer while going into the hole preventing the shear screws from being loaded. When pressure is applied to set the packer the Hydraulic Lock is released allowing for the manipulation of the packer mandrel to the equalizing position and onto the release position. The packer can be run without the hydraulic lock if desired.

The packer features a pull equalization function generally used prior to deflation. When it is desired to equalize across the packer, tension is applied to the tubing to shear the screws to open ports above the packer. After equalization has occurred, setdown weight is applied to the packer and then tension re-applied to the packer to the shear releasing sleeve shear screws in order to deflate and retrieve the packer.

Advantages

- Inflatable packing element allows large expansion ratios so the tool can be set below the production tubing
- Single trip to set, treat and release enables more efficient operation
- Does not require a rig on location, reducing operating costs



Retrievable Packer
Product Family No. H33001

INFLATABLE SYSTEMS

Retrievable Packer

Specification Guides																			
Tool OD	Chassis OD		Inflatable Element Length		Tool Length		Tensile Rating Above Inflatable		Tensile Rating Through Mandrel		Max. Pressure Rating*		Max. Temp. Rating		Max. Expansion ID		Max. Restriction to Pass Through		Service
	in.	in.	mm	in.	ft	in.	ft	lb	kg	in.	mm	psi	bar	°F	°C	in.	mm	in.	
1.69	1.69	43	48	4	108.36	9.03	18,700	8,500	5,300	2,410	5,500	379			4.892	124	1.75	44	Standard and H ₂ S
2.13											6,000	414			6.765	172	2.19	56	
2.50											6,500	448					2.56	65	
3.00											8,000	552			8.681	221	3.06	78	
3.38	2.13	54	66.13	5.51	142.80	11.90	34,250	15,568	14,900	6,773			300	149			3.44	87	
4.25															9.760	248	4.31	109	
5.38											8,500	586					5.44	138	
5.75															12.415	315	5.81	148	

*This pressure is rated at minimal expansion. Pressure ratings decrease as element expansion increases.

INFLATABLE SYSTEMS

Inflatable Straddle Acidizing Packer (ISAP)

Product Family No. H35003

Application

The thru tubing **Inflatable Straddle Acidizing Packer (ISAP™)** is designed to allow the operator to precisely inject acid or chemical treatments into a short section of the formation. This feature eliminates the use of other less effective methods used in the past for selective placement of treating fluids, such as ball sealers or chemical diverters. The ISAP is designed to run primarily on coiled-tubing work strings, thus the tool operates within the safe tension, set-down and pressure limits of the coiled tubing.

The tool requires only a slight amount of tension and no set-down weight for operation. This makes the tool ideal for horizontal or highly deviated wellbore applications. Utilizing coiled-tubing conveyance allows the ISAP to be run in a live well condition, eliminating the need for killing the well prior to running the tool. This prevents possible formation damage due to heavy weight kill fluid in the well.

The ISAP system has been designed from the coiled-tubing connector on down to provide overall system compatibility, and also allow safe coiled tubing operations. As with all inflatable systems, Baker Hughes recommends using only specialized designed equipment in the ISAP tool string to guarantee system compatibility.

Advantages

- Inflatable packing element allows large expansion ratios so the tool can be set below the production tubing
- Adjustable straddle spacing ensures pin point placement of treatment fluids
- Dual inflatable elements designed to maintain fluids at required interval
- No rotation required making it ideal for coiled tubing operations
- Built in injection control valve enables the tools to function in low fluid level or bottom hole pressure wells while maintaining control over expensive treatment fluids
- Lower drain valve allows for equalization and full deflation of inflatable elements.



Inflatable Straddle Acidizing Packer (ISAP)
Product Family No. H35003

INFLATABLE SYSTEMS

Inflatable Straddle Acidizing Packer (ISAP)

Specification Guides																						
Tool OD	Chassis OD		Inflatable Element Length		Tool Length*		Max. Recom. Flow Rate Through Tool		Min. Spacing Between Elements		Max. Spacing Between Elements		Max. Pressure Rating**		Max. Temp. Rating		Max. Expansion ID		Max. Restriction to Pass Through		Serv.	
	in.	in.	mm	in.	ft	in.	ft	bpm	gpm	in.	ft	in.	ft	psi	bar	°F	°C	in.	mm	in.		mm
2.13														6,000	414			5.90	150	2.19	56	Standard, Acid or H ₂ S
2.50								15 with 2.13 in. Chassis	63 with 2.13 in. Chassis									6.27	159	2.56	65	
3.00	2.13	54	48	4	401.40	33.45		40 with 3.0 in. Chassis	168 with 3.0 in. Chassis	96.36	8.03	480	40	6,500	448	300	149	6.70	170	3.06	78	
3.38																		6.94	176	3.44	87	

* Length of complete ISAP tool string (from top of PCBPV to bottom guide) with minimum spacing between elements

**This pressure is rated at minimal expansion. Pressure ratings decrease as element expansion increases.

Rating Table													
Hole Size Element is to be Set In [in. (mm)]													
ID	2.50 (64)	3.00 (76)	3.50 (89)	4.00 (102)	4.50 (114)	5.00 (127)	5.50 (140)	6.00 (152)	6.27 (159)	6.50 (165)	6.70 (170)	6.94 (176)	
Maximum Applied Differential Pressure [psi (bar)] Maximum Temperature [°F (°C)]													
2.13 (54.1)	6,000 (414)	6,000 (414)	6,000 (414)	5,000 (345)	3,650 (252)	3,000 (207)	2,500 (172)	2,000 (138)					
	300 (149)	300 (149)	300 (149)	300 (149)	300 (149)	300 (149)	300 (149)	280 (138)					
2.50 (63.5)		6,500 (448)	6,500 (448)	6,500 (448)	5,600 (386)	4,500 (310)	3,700 (255)	3,000 (207)	2,850 (197)				
		300 (149)	300 (149)	300 (149)	300 (149)	300 (149)	300 (149)	300 (149)	300 (149)				
3.000 (66.8)			6,500 (448)	6,500 (448)	6,500 (448)	5,700 (393)	4,650 (321)	4,000 (276)	3,500 (241)	3,200 (221)	3,000 (207)		
			300 (149)	300 (149)	300 (149)	300 (149)	300 (149)	300 (149)	300 (149)	300 (149)	300 (149)		
3.380 (85.9)				6,500 (448)	6,500 (448)	6,500 (448)	6,500 (448)	6,500 (448)	6,500 (448)	4,000 (276)	3,650 (252)	3,400 (234)	
				300 (149)	300 (149)	300 (149)	300 (149)	300 (149)	300 (149)	300 (149)	300 (149)	300 (149)	

INFLATABLE SYSTEMS

SWIFT System

Product Family No. H43714

Application

The Baker Hughes **SWIFT system** is a modular, non-ballistic downhole setting tool designed to deploy and set through tubing inflatable bridge plugs on standard or braided wireline. It uses fluid from either the wellbore or a fluid reservoir carrying system to inflate and pressurize the inflatable packing element, rather than depending on a battery-operated downhole motor to fill the element.

These isolation devices typically have been deployed on coiled or threaded tubing or on electric wireline. However, the goal of reducing costs has resulted in more interventions being performed with slickline services. Slickline is effective for high-speed mechanical deployment, manipulation, and retrieval of well plugging applications in all types of wells. Using slickline to selectively place, activate, or retrieve through-tubing, high expansion bridge plugs has both cost and operational advantages because of its smaller footprint, lower weight and cost, and ease of use.

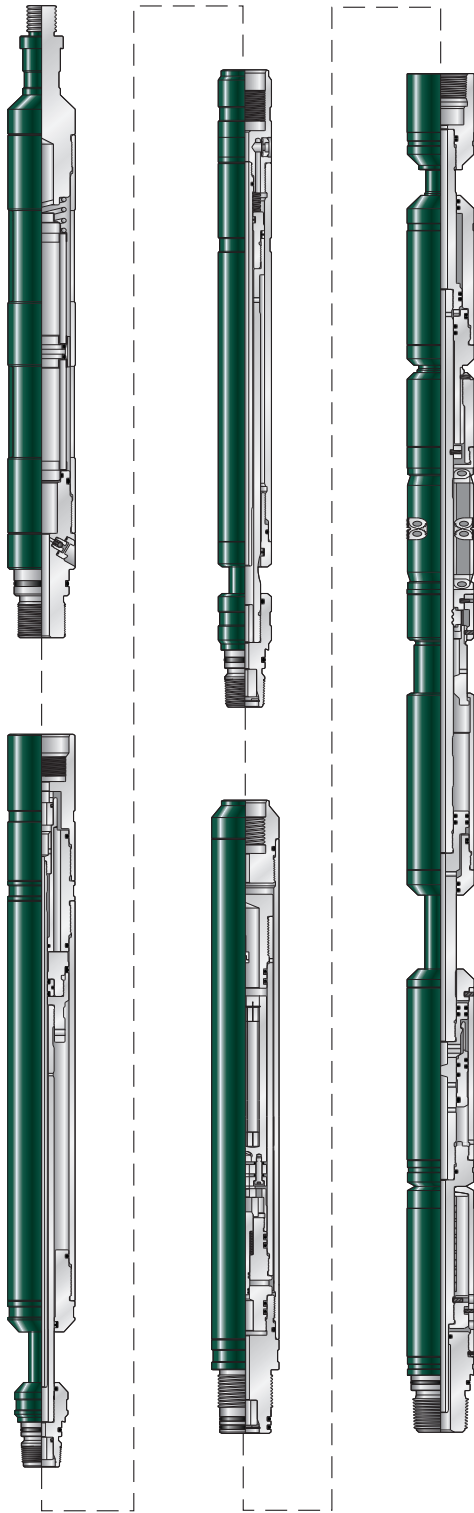
Advantages

- Hydrostatic-set anchor to steady the tool during inflation process
- Dual-speed pumps manipulated via reciprocation of the wireline
- Simple programming through USB interface to laptop computer
- Trigger failsafe electrical lock preventing premature activation downhole
- Multiple slip subassemblies for ease of redress across tubing/casing range

Specification Guides

Top connection	3/8-in. 10 UN pin (1/2-in. sucker rod)
Fish neck	1.375-in. OD (2 in. JDC)
Bottom connection	1.750-in. OD - 6 TPI ACME pin
Max tool OD	2.130 in. [54.1 mm]
Toolstring length - extended	19.880 ft
Toolstring length - compressed	16.690 ft
Tensile	25,000 lb
Temperature rating	300°F
Casing setting range	2 1/8 in. (6,400 - 8,600 lb/ft) 3 1/2 in. (9,200 - 16,700 lb/ft) 4 1/2 in. (9,500 - 15,200 lb/ft) 5 in. (15,000 - 21,400 lb/ft) 5 1/2 in. (15,500 - 23,000 lb/ft) 6 5/8 in. (65,800 lb/ft) 7 in. (20,000 - 35,000 lb/ft) 7 1/2 in. (26,400 - 39,000 lb/ft)

INFLATABLE SYSTEMS



SWIFT System
Product Family No. H43714

The system comprises five modular tools:

Filter section: Eliminates wellbore debris from plugging the setting tool

Low-pressure pump: Low-pressure, high-volume output pump designed to inflate/fill the inflatable packing element

High-pressure pump: Low-volume output pump with high-pressure capability, designed to pressurize and set the bridge plug

Trigger system: Time-delay system designed to open a flow path to the toolstring, allowing well pressure to initiate the setting of the hydrostatic anchor

Anchor: Hydrostatically activated anchor designed to lock the bottomhole assembly in place, allowing for manipulation of the dual pump system

INFLATABLE SYSTEMS

Test Pressure Equalizing Valve

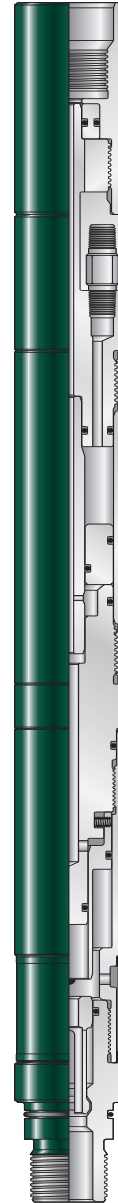
Product Family No. H33082

Application

The **test pressure equalizing valve (TPEV)** has been developed to be used with the electric wireline setting tool (EWST). The TPEV is used to prevent accidental inflation of the inflatable bridge plug during the bleed off of pressure in the wireline lubricator after an aborted run in the well. During a lubricator test or while running in the hole, the fluid that enters the tool string may contain gas. In the event that the lubricator is subsequently bled down with the tool string inside, any gas pressure may be trapped in the tool string below the setting tool check valves. The test pressure equalizing valve eliminates the possibility of setting the inflatable element in the lubricator by keeping the ID of the tool string equalized with the annulus until the setting process begins.

Advantages

- Equalizes bridge plug to wellbore during deployment
- Eliminates premature inflation of element during lubricator testing
- Does not require setting tool to be stopped and restarted again
- Adjustable pressure relief valve setting



Test Pressure Equalizing Valve
Product Family No. H33082

INFLATABLE SYSTEMS

Pressure Extender

Product Family No. H33083

Application

The **pressure extender** is run with the electric wireline setting tool (EWST) to improve the set of inflatable elements by increasing the time that pressure is held on the inflatable packing element during the inflation sequence. Without the extender, the element is filled with fluid at low pressure and then the running tool disconnects very quickly as pressure builds up. Experience has shown that inflatable elements achieve a more efficient set when the element has sufficient square off time at pressure to conform better to the ID in which it is set. The tool operation is simple. At a predetermined inflation pressure, less than the final element inflation pressure, a relief valve is opened which allows for fluid to be displaced by means of a piston. During the displacement time of the fluid, the element is not being inflated and is being allowed to square off and conform. Once all the fluid has been displaced, the piston creates a seal and applied pressure is then again directed to the inflatable element.

Advantages

- Extended inflation time - allows element to conform to ID of wellbore
- Does not require setting tool to be stopped and restarted again
- Adjustable pressure relief valve setting

Specification Guides

Tool Size		OD		ID		Overall Length		Makeup Length		Tensile Strength		Ext. Period	Threads
in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	psi	bar		
2.125	54.0	2.125	54.0	0.19	4.8	49.63	1260.6	47.25	1200.2	78,000	35380	Circa 6 Minutes	1.50 in. Acme



Pressure Extender
Product Family No. H33083

INFLATABLE SYSTEMS

Positive Fluid Separation Reservoir System

Product Family No. H43715

Application

The Baker Hughes electric wireline setting tool (EWST) is a downhole pump powered through conventional electric line. It uses wellbore fluids to inflate, hydraulically pressurize, and disconnect from inflatable tools. The pump in this setting tool is designed to pump fluids with very low solids content, viscosity, and compressibility. These favorable conditions do not exist in some applications; such as running in gas wells, low fluid wells, heavy brines, and muds.

The purpose of the **positive fluid separation reservoir system** for the electric line setting tool is to provide a source of clean inflation fluid for the EWST in wells where there is no fluid or where the fluid is undesirable for inflation. The reservoir is made in four sizes 2.13 in. (54.1 mm), 2.50 in. (63.5 mm), 2.875 in. (73 mm) and 3.25 in. (82.6 mm) OD.

The reservoir essentially consists of several 10 ft (3.1 m) long housings screwed together above a special housing that encloses the EWST. These housings contain a volume of inflation fluid and enclose a standard EWST. A length of 7/32 diameter electromechanical cable runs inside these housings and through a fluid separator dart to electrically connect the EWST with a CCL above the reservoir. The fluid separator dart is only run in applications where the wellbore fluid is incompatible with the EWST due to solid content. Here the separator dart prevents undesirable well bore fluid from mixing or displacing the inflation fluid contained in the reservoir.

Advantages

- Provides improved reliability; experience has shown that most EWST problems are related to the fluid the tool is pumping; dirty or sandy fluid can damage the pump before the job is complete; gas or gas cut fluid will not permit the EWST to inflate a bridge plug or will make inflation long and difficult
- Permits operations in environments a standard EWST tool could not operate; this would include drilling mud and gas wells
- Provides a benign inflation fluid for improved long-term inflatable bridge plug performance; some well fluids are detrimental for long term performance of inflatable elastomers; high aniline point oils or sour gas are examples; the reservoir fluid isolates the internal surfaces of the inflatable element from these type fluids
- This reservoir system is operated downhole in an identical fashion as a standard EWST and can use all the same accessories as those on a standard TTI EWST job



Positive Fluid Separation
Reservoir System
Product Family No. H43715

INFLATABLE SYSTEMS

Positive Fluid Separation Reservoir System

Specification Guides				
Description	Size and Material Numbers			
	H437152103	H437152503	H437152903	H437153203
	2.13	2.50	2.875	3.25
Thread Up	1.187 OD GO Pin			
Thread Down	1.500 OD Stub Acme			
Make Up Length (per BoM) ♦ (ft) (m)	55.8 (16.8)	46.1 (14.1)	36.4 (11.1)	36.4 (11.1)
Housing Tensile Strength (lb) (kg)	7,800 (3,538)	13,000 (5,897)	33,000 (14,696)	40,000 (18,144)
Housing OD (in.) (mm)	2.130 (54.1)	2.500 (63.1)	2.875 (73.0)	3.250 (82.6)
Housing ID (in.) (mm)	1.875 (47.6)	2.250 (57.2)	2.441 (62.0)	2.750 (69.9)
Inter-Housing Connection	2.045 Stub Acme	2.400 Stub Acme	2.688 Stub Acme	3.046 Stub Acme
Housing Volume (gal/ft)	0.14	0.20	0.24	.031
Compatible EWST Size	1.69	2.13	2.13	2.13
Compatible EWST Size	1.81	2.13	2.13	2.13

♦ This length provides enough fluid volume for inflation in 7 in. (177.8) casing applications.

INFLATABLE SYSTEMS

Washover Retrieving Head

Product Family No. H34011

Application

The **washover retrieving head** provides a means to allow the circulation of debris or fill off of the top of a fishing neck before latching up. An optional tool is available with a flow release facility that will allow for releasing from the fishing neck should it be required. The tools are designed in that the bottom guides are interchangeable in order that the optimum OD of the guide can be selected to safely pass the minimum restriction yet still allow the largest catch range possible. Both styles of washover retrieving tools incorporate a profile to shift the bridge plug equalizing sleeve prior to engaging the fishing neck.

Advantages

- Tool allows the circulation of debris or fill from the top of fishing neck before latching on to retrieve an inflatable bridge plug
- Designed to equalize the inflatable bridge plug before engagement of the deflating mechanism
- Interchangeable bottom guide configurations for optimum catch range

Wireline Retrieving Tool

Product Family No. H34013

Application

There are two different designs for both the 2.13 in. (54.1 mm) and 3.00 in. (76.2 mm) chassis bridge plugs. The 2.13 in. (54.1 mm) OD tool is a modified washover retrieving head with a standard 1.375 in. (34.9 mm) OD wireline fishing neck made up into the top connection. The rest of the wireline retrieving string is then attached to the retrieving head with a jar down type wireline catch tool. The 3.00 in. (76.2 mm) tool is supplied with a sucker rod pin connection for attachment to the **wireline retrieving string** and the jar down catch tool is housed within the retrieving guide itself. The retrieving tool incorporates a profile in order to shift the bridge plug equalizing sleeve prior to latching the fishing neck.

Advantages

- Uses wireline conveyance for quick retrieval of inflatable bridge plugs
- Designed to equalize the inflatable bridge plug before engagement of the deflate mechanism
- Interchangeable bottom guide configurations for optimum catch range



Washover Retrieving Head
Product Family No. H34011



Wireline Retrieving Tool
Product Family No. H34013

INFLATABLE SYSTEMS

Hydraulic Disconnect/Running Tools

Product Family No. H33072

Application

The purpose of the hydraulic running tool is to connect the conveyance string (be it threaded pipe, coiled tubing, or electric wireline) to the inflatable element being run. For bridge plugs and certain straddle configurations, a **hydraulic disconnect/running tool** is used which is designed to release the running string from the set inflatable tool at a predetermined pressure.



3.00 in. OD (76.2 mm) hydraulic disconnect/running tool with circulating sub

Used as the primary disconnect when setting a 3.00 in. (76.2 mm) OD or larger retrievable bridge plug conveyed on coiled tubing. Has an integral circulating sub to allow for CT circulation while running in the hole. This circulating sub is activated for setting the RBP by the use of a 0.5 in. (12.7 mm) drop ball.



1.69 in. OD (42.9 mm) hydraulic disconnect/running tool

Used for both 1.69 in. (42.9 mm) OD permanent and retrievable bridge plugs (RBP).



3.00 in. OD (76.2 mm) hydraulic disconnect/running tool

Used as the primary disconnect when setting a 3.00 in. (76.2 mm) OD or larger retrievable bridge plug conveyed on electric wireline.



2.13 in. OD (54.1 mm) hydraulic disconnect/running tool

Used as the primary disconnect on both 2.13 in. (54.1 mm) OD permanent and retrievable bridge plugs and as a ball operated emergency disconnect on a 2.13 in. (54.1 mm) OD retrievable packer.



3.00 in. OD (76.2 mm) hydraulic disconnect/running tool

Used as the primary disconnect on a 3.00 in. (76.2 mm) OD permanent bridge plug and as an emergency ball operated disconnect on a 3.00 in. (76.2 mm) OD retrievable packer.

REMEDIAL COMPLETIONS

FLOGARD Straddle Packer System

Product Family No. H81970

Application

The Baker Hughes **FLOGARD™ single-trip packoff** is a one-trip wireline or slickline set retrievable straddle packoff that is modular in design. This allows variable lengths of wellbore tubular to be isolated dependant on customer requirements.

The single-trip packoff is a straddle system that has two packoffs, one above and one below the section of tubing/casing to be isolated. The system utilizes one set of slips below the lower packoff to anchor the system in place. The system is set using an E-4 20/10 wireline pressure setting assembly (WLPSA) and a wireline assembly kit (WLAK). Setting rods run through the bore of the assembly connecting the E04 20/10 and the WLAK.

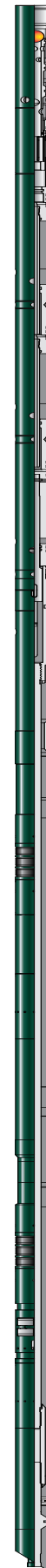
After the tool has been set, the release stud shears, allowing the E-4 20/10 setting tool and WLAK to be retrieved to the surface. The set straddle system is left in place.

The system can be easily retrieved with a GS spear run on coil tubing, which when run, is located in the internal fishing neck of the receptacle within the tool, which when jarred up shears the shear ring within the tool, allowing for retrieval.

Advantages

- Single Trip System: One-trip setting of the system reduces running times and running costs
- Provides straddle packoffs, one above and one below a tubing communication point
 - Upper and lower sealing allows the system to straddle required areas of communication
- Modular system with premium connections
 - Greater flexibility for the space out to be determined by the district
- Ability to be pressure tested prior to setting
 - Tubing integrity can be confirmed at the rig site when the required spacer tubing has been assembled
- Set using the Baker Hughes E-4 or J-hydraulic setting tool
 - Straddle system can easily be set and setting tool retrieved using standard industry equipment
- Retrieved using GS spear run on coil tubing or SB/SR with slickline
 - Straddle system can be easily retrieved using standard industry equipment

Specification Guides									
Tool Size	Maximum OD		Elastomer Type	Maximum ID		Temperature Rating		Fishing Neck Size	Standard Connection
	in.	mm		in.	mm	°C	°F		
5½	4.530	115	Nitrile	2.875	73	70 - 250	21 - 121	4	Vam ST-L Flush Joint Connections
4½	3.780	94		2.562	65			4	
4½	2.780	70.6		1.812	46			3	



FloGard Straddle Packer System
Product Family No. H81970

REMEDIAL COMPLETIONS

Vent Screen Plus

Product Family No. H33099

Application

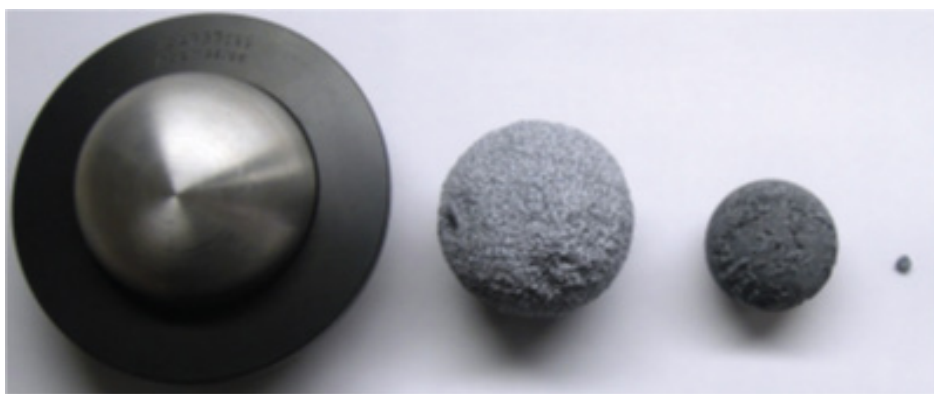
The **Vent Screen Plus system** is utilized on vent screen applications to allow production through the tubular rather than through an upper screen section. The vent screen plus system can also be combined with a variety of pack off solutions where required. The upper In-Tallic ball is utilized to prevent gravel from entering the screen sections during squeeze operations therefore, limiting the number of runs required. An In-Tallic ball seat can also be used which will in turn maximize the potential flow area of the system.

The vent screen plus system can be deployed on coiled tubing, slickline or electric wireline providing complete versatility and allowing our customers to conduct operations in the most cost effective way possible. Additionally, the system can be combined with the Baker Hughes SnapScreen and Snap-Latch systems so that the solution can be deployed in to a live well environment without being limited by available riser length.

The system can also include the Baker Hughes **Hydro-Trip Sub** which acts as a sand height control valve. The hydro-trip sub will shear at a pre-determined differential from above to below and provide positive indication of sand out. The tripping ball can be provided in In-Tallic for additional assurance of retaining full tubing ID.

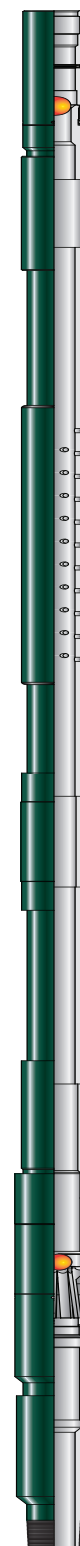
Advantages

- Maintains access through ID of system
- Includes a sand height control valve
- Removes the need for an additional run to recover vent screen plug
- Versatility in deployment methods
- Can be deployed in modular sections



IN-Tallic™ disintegrating frac balls

Specification Guides						
Tool Size	Maximum OD		Maximum ID		Tensile Rating	Service
	in.	mm	in.	mm	lbs	
187	1.871	47.523	1.150	29.210	45,000	Standard
231	2.317	58.851	1.505	38.227	65,000	
240	2.410	61.214	1.600	40.640	75,000	



Vent Screen Plus
Product Family No. H33099

REMEDIAL COMPLETIONS

Thru-Tubing Autonomous Inflow Control Device (AICD)

Product Family No. H33099

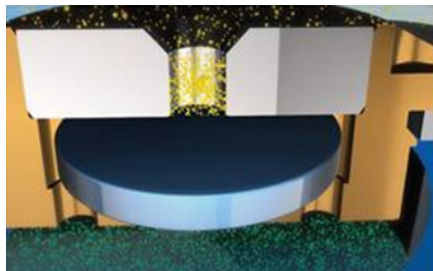
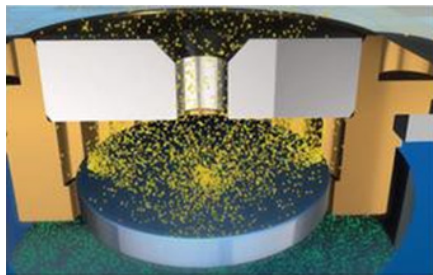
Application

The Thru-Tubing **EQUALIZER LIFT™ autonomous inflow control device (AICD)** features a unique floating disc that kinetically strangle the flow of unwanted free-gas and water pre/post-breakthrough. When it is properly distributed along well bore in heterogeneous formations, equalizes the In/out-flow pattern, promotes uniform formation drainage, improves productivity and reduces surface installations costs associated to unwanted fluids encroachment.

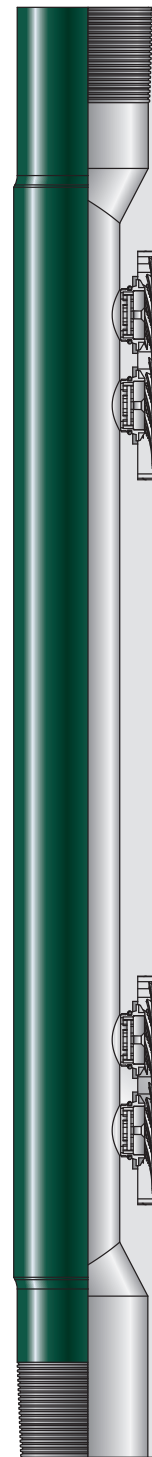
The EQUALIZER LIFT AICD responds to changing flow rates and fluid properties. When low-viscosity fluids pass through the device at high rates, the local-pressure drops drastically generating an imbalance force that lifts the disc to squeeze the flowing fluid up to instantaneously blocks the source. At that instance, the pressure rebuilds up inside the nozzle creating a sudden force pushing back the disc up to a maximum gap at which the imbalance force reverses attracting back the disk. The process is repeated generating for instance a distinguishable knocking sound that fades/disappears for viscous fluids. The overall result is a significant restriction in gas/water that saves costs and reduces risks of handling gas at surface while promoting an improved oil recovery.

Advantages

- Floating inflow control disc restricts gas and low viscosity fluids
- Slows higher viscosity fluids to pass through to the production string
- Shuts off flow when gas or water breaks through
- Autonomous operation requires no interaction from the surface
- Compact, flexible design allows installation of up to four devices per joint of pipe
- Offers full compatibility with broad range of sand screens
- Robust construction resists erosion
- Provides reliable flow control for the life of the well



When the EQUALIZER LIFT AICD detects the flow of gas (yellow), its floating disc shifts up and either chokes or shut off flow to prevent breakthrough while oil (green) continues to flow.



Thru-Tubing AICD
Product Family No. H33099

REMEDIAL COMPLETIONS

SnapScreen Advanced Live-well Deployment System

Product Family No. H13239

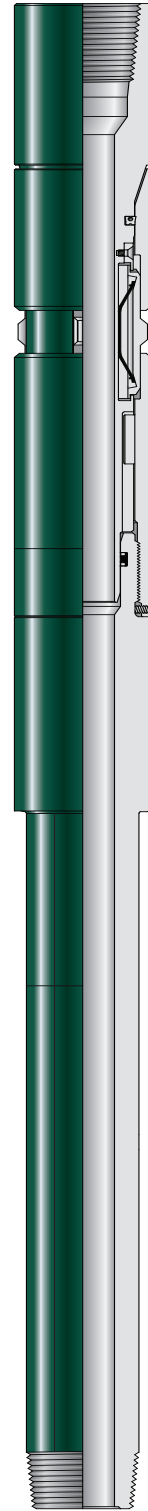
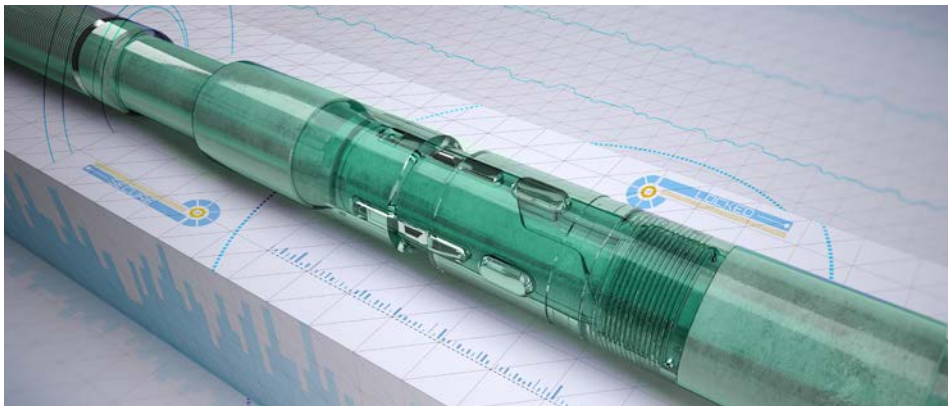
Application

The **SnapScreen™ advanced live-well deployment system** combines specially designed screen connectors, a running tool, a surface stack, and a standard blowout preventer (BOP) to run sand control screens without having to kill the well. Installing screens in live-well conditions saves time, cuts costs, and eliminates formation damage and impaired production caused by kill-weight fluids.

Advantages

- Remedial sand screen deployment
- Onshore and offshore environments
- Live-well deployment method
 - Enables well to be placed back on production immediately after screen installation
 - Eliminates the cost of kill-weight fluids
 - Reduces risk of formation damage and production losses that can be caused by well-kill operations
 - Has a proven track record with no associated non-productive time
- Flexible system design
 - Can be deployed using coiled tubing and snubbing units
 - Operates in free-standing and standard rig environments
- J-style latching mechanism
 - Enables connectors to mate without manipulating the string
 - Eliminates rotation, splines, and unnecessarily complicated latch types
 - Resists debris
 - Reliably connects pipe joints and screens

Connector Specifications											
OD		ID		Weight		Length		Pressure Rating		Torque rating	
in.	mm	in.	mm	lb	kg	in.	mm	psi	bar	ft/lb	m/kg
4.20	107	2.25	57	100	45	48	1219	20,000	1379	3,100	429
3.75	95	1.85	47	90	41	32	813				



SnapScreen Advanced Live-well Deployment System
Product Family No. H13239

REMEDIAL COMPLETIONS

Snap-Latch Connector

Product Family No. H33099

Application

The **snap-latch connector** is a system used for running and deploying tubulars and connected together downhole. These systems can be deployed on coiled tubing, wireline or slickline through the surface riser section allowing separate assembly's to be positioned downhole to cover a long section of the wellbore.

The snap-latch systems enables the deployment of assemblies into a live well without the need to kill the well. The sanp-latch systems can be combined with several isolation devices to fit almost any application.

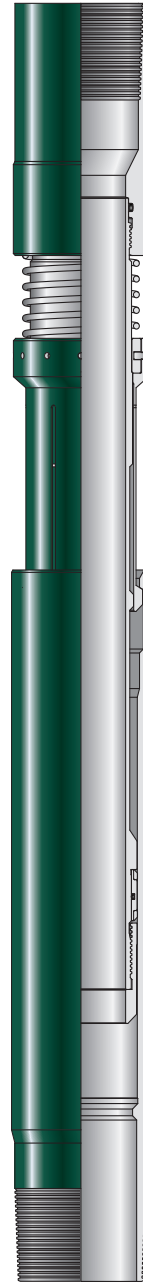
The snap-latch connector can also be recovered from the wellbore in manageable, modular assemblies via a shear pin configuration.

Advantages

- Can be deployed on coiled tubing, electric wireline or slickline
- Ideal system to deploy assemblies into a live well environment
- Simple robust design
- Significant successful track record
- Adaptable to several tubular sizes
- Can be retrieved from a live well environment

Specification Guides

Size	Max OD		Tensile Rating		Overall Length in.	Standard Connection	Service
	in.	mm	lbs	kg			
270-163	2.70	58.5	45,000	20,400	35	2 3/8 ST-L	Standard
370-236	3.70	94			32		



Snap-Latch Connector
Product Family No. H33099

REMEDIAL COMPLETIONS

BakerMesh Premium Screen

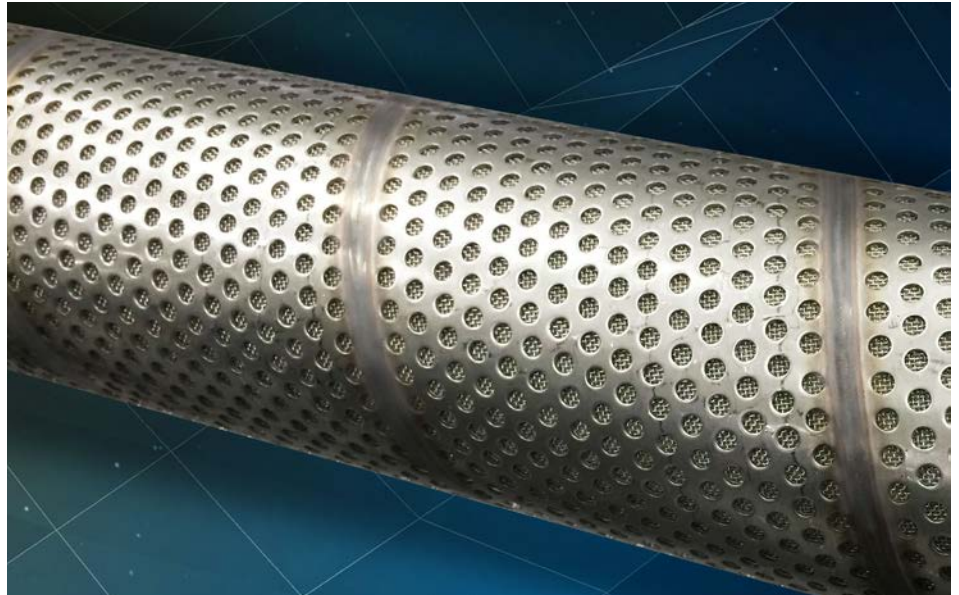
Product Family No. H48600

Application

BakerMesh™ premium screen is a premium downhole sand exclusion device with a superior sand retention capability and enhanced mechanical strength. BakerMesh employs a proven manufacturing process enabling the individual components to act as one creating a stronger, more durable and economical solution to sand control challenges.

Advantages

- Multilayer filtration design provides superior drainage and resists plugging
- The protective shroud allows for a placement without worrying about the screen's integrity once in place. This field proven design also provides flow diversion during production which increases the screens longevity by minimizing erosion effects from formation material
- The uniform pore openings of the weave allow for a stringent sizing quality control during the manufacturing process and greater accuracy in selecting the proper weave size for a variety of formation particle sizes
- Single-operation assembly process fuses the screen layers firmly to each other creating a high strength design at an economical price point
- Available in a variety of micron ratings and metallurgy to optimize performance in a wide range of well environments



Specification Guides

Base Pipe OD		Base Pipe ID		Base Pipe Weight		Base Pipe Holes per Foot	Base Pipe Hole per Foot		Open Area of Base Pipe Holes		Screen OD	
in.	mm	in.	mm	lbm/ft	kg/m		in.	mm	in. ² /ft	cm ² /m	in.	mm
1.315	33.4	1.049	26.7	1.70	2.6	30	0.375	9.65	5.1	107.9	1.65	41.9
1.660	42.2	1.380	35.1	2.30	3.5	36	0.375	9.65	6.0	127.1	2.04	51.8
1.900	48.3	1.610	40.9	3.75	4.1	42	0.375	9.65	4.6	97.4	2.32	58.7
2.063	52.4	1.751	44.5	3.25	4.9	42	0.375	9.65	4.6	97.4	2.42	61.8

REMEDIAL COMPLETIONS

EXCLUDER2000 Premium Screen

Product Family No. H48690

Application

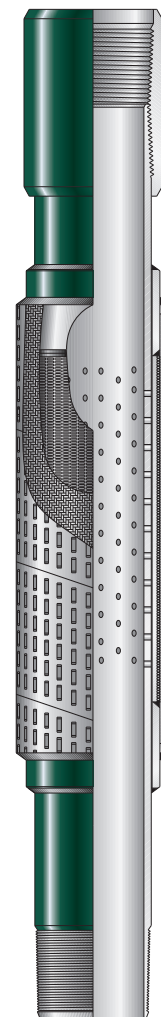
The **EXCLUDER2000™ premium screen** is a high tier premium sand control screen with high mechanical strength and durability. Its erosion resistant louvered protective shroud makes it ideal for high rate applications where erosion is concern. Louvered design reduces the flow velocity on the weave significantly minimizing erosion risks. Superior mechanical strength and performance are built into every EXCLUDER2000 screen through a unique swaging process that causes the individual components to behave as a single layer. The EXCLUDER2000 screen is ideal for challenging environments; including long open hole horizontals, short radius wells, re-entries, and it offers added protection for virtually any gravel pack/frac-pack application.

Advantages

- Swaging all the screen layers uniformly anchors the weave filtration later to distribute stress more evenly along the weave; as a result, high burst pressure capacity is achieved.
- Swaging makes it possible to produce screen without welding the weave; weld-free weave means superior corrosion resistance which is particularly advantages in HP/HT corrosive environments.
- Wire wrap jacket underneath the filtration layer provides drainage for maximum inflow performance and also support to the filtration layer increasing the mechanical strength of the screen.
- The louvered vector shroud – a tough outer layer that protects against damage from wellbore fragments during installation, then redirects production inflow to reduce the flow velocity and minimize erosion.
- EXCLUDER2000 is available in a variety of micron ratings and metallurgy.

Specification Guides

Pipe Size	Weight	Pipe ID	Coupling OD	Fine/ Medium Screen OD	Course/ Super Course Screen OD	Hole Size	Number of Holes per Foot
in.	lbs/ft	in.	in.	in.	in.		Std
2.375	4.60	1.995	2.875	3.170	3.220	0.375	48
2.875	6.40	2.441	3.500	3.720	3.720		54



EXCLUDER2000
Premium Screen
Product Family No. H48690

REMEDIAL COMPLETIONS

BAKERWELD Wire Wrap Screen

Product Family No. H48605

Application

The **BAKERWELD™ wire wrap screen** is a slip-on jacket type wire wrap screen to provide a reliable and effective method of preventing sand from entering the wellbore while allowing production fluid to flow into the well. It can be used either stand alone or in Gravel/Frac Pack applications.

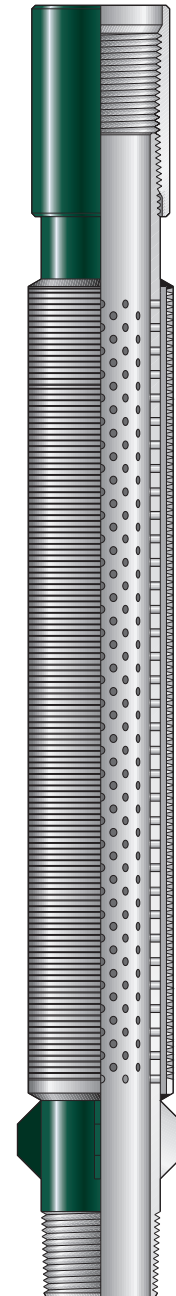
BAKERWELD screens offer superior fishability and millability. Because the wrap is welded at each point of contact with the rib wire, it does not separate when pulled and does not “bird nest” when milled.

Advantages

- The screen can be used in oil, gas, waterflood, steamflood, water, and disposal wells
- Manufactured for quality and dependability each screen consists of continuously wrapped keystone shaped wire which allows for self-cleaning, greater flow and less chance of plugging
- Premium, fit for purpose thread that provides faster field makeup, tighter bending radius, and higher torque resistance
- The screen is designed to have up to 30 times more effective inlet area than a slotted pipe of the same gauge for high-rate gas or oil wells
- The screen is available in sizes from 1.050 in. to 6.625 inches

Specification Guides

Pipe Size in.	Weight lbs/ft	Pipe ID in.	Coupling OD in.	Number of Holes per Foot				Hole Size 0.375	BAKERWELD 105 Screen OD	BAKERWELD 140 Screen OD
				Std 105	HiFlo 105	Std 140	HiFlo 140		in.	in.
1.050	1.14	0.824	1.313	30	60	30	60	1.50	1.64	
1.315	1.70	1.049	1.660					1.76	1.90	
1.660	2.30	1.380	2.054	36	72	60	72	2.11	2.25	
1.900	2.75	1.610	2.200	42	84	42	84	2.35	2.49	
2.063	3.25	1.751	2.500					2.51	2.65	
2.375	4.60	1.995	2.875	48	96	48	96	2.82	2.96	
2.875	6.40	2.441	3.500	54	108	54	108	3.32	3.46	



BAKERWELD Wire Wrap Screen
Product Family No. H48605

REMEDIAL COMPLETIONS

Slim-Pak Pre-packed Screen

Product Family No. H48619

Application

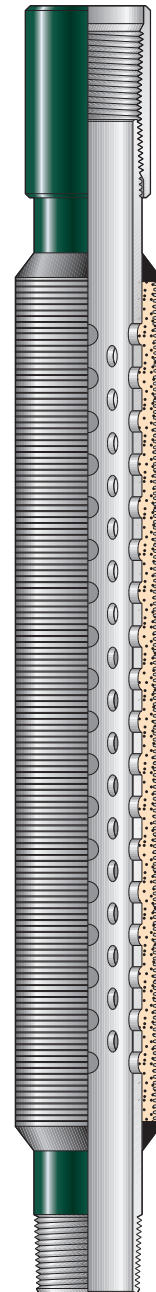
Slim-Pak™ pre-packed screen provides the benefits of a pre-packed screen without sacrificing critical OD or ID dimensions. The screen system makes gravel packed completions more reliable without dimensional restrictions or performance limitations. The Slim-Pak consists of a wire cloth wrapped around a perforated pipe base, a pre-cured layer of Bakerbond and a Bakerweld screen jacket welded to a perforated pipe base. The surfaced cured Bakerbond layer offers maximum permeability and compressive strength to properly inhibit formation sand production through annular pack imperfection making it particularly well suited for frac pack and difficult gravel placement applications.

Advantages

- The Slim-Pak provides sand control across voids in incomplete packs
- The Bakerbond is surface cured after assembly to ensure maximum permeability and compressive strength
- The Slim-Pak is particularly well suited for long intervals and highly deviated or horizontal applications where thru tubing pumping operations are limited
- The slender construction eases passage through tight spots and doglegs

Specification Guides

Pipe Size in.	Weight lbs/ft	Pipe ID in.	Coupling OD in.	Screen OD in.	Number of Holes per Foot		Hole Size	Flow Area (in. ² /ft)	
					Std	High Flow		Std	High Flow
1.050	1.14	0.824	1.313	1.50	30	60	0.375	3.31	6.62
1.315	1.70	1.049	1.660	1.76					
1.660	2.30	1.380	2.054	2.11	36	72		3.98	7.96
1.900	2.75	1.610	2.200	2.35	42	84		4.64	9.28
2.063	3.25	1.751	2.500	2.51					
2.375	4.60	1.995	2.875	2.82	48	96		5.30	10.60
2.875	6.40	2.441	3.500	3.32	54	108		5.96	11.92
3.250	8.00	2.7501	3.563	3.70	60	120		6.63	13.25



Slim-Pak Pre-packed Screen
Product Family No. H48619

REMEDIAL COMPLETIONS

Reactive Element Packer (REPacker)

Product Family No. H30187

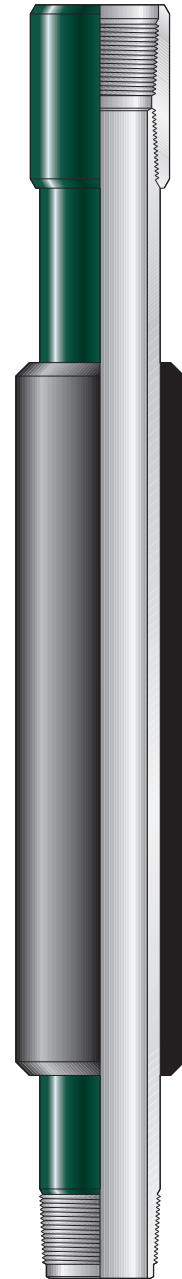
Application

The **reactive element packer (REPacker)** uses elastomeric polymer sealing elements that react with oil or water to swell and isolate zones in either open or cased hole, without the need for cement, special trips, running tools or specialized rigsite personnel. REPackers are run in the well and begin to swell when they come into contact with oil or water. As the packers swell, they seal off the annulus between the liner/casing and the open hole to provide isolation between zones with different pressures or to simply shut off flow in the annulus and prevent fines migration along the wellbore.

The REPacker is manufactured by bonding and wrapping a rubber element onto a joint of casing. Baker Hughes offers a wide array of options in element length and diameter. Additionally, the casing joint can match the mechanical properties of the proposed liner string. As a result, installing the REPacker within the string can be as simple as torquing another joint of pipe.

Advantages

- Self-energizing swelling rubber element
- Available in water or oil swell elements
- Matches mechanical properties of the liner used in the well
- Designed for high differential pressure
 - Oil REPacker up to 15K psi up to 400°F
 - Water REPacker up to 13K psi up to 300°F
- 100% customizable (swell element OD and length, threads)
 - According on wellbore conditions/ customer request
- Available with feed through capabilities for IPS
- Short delivery time



Reactive Element Packer
(REPacker)
Product Family No. H30187

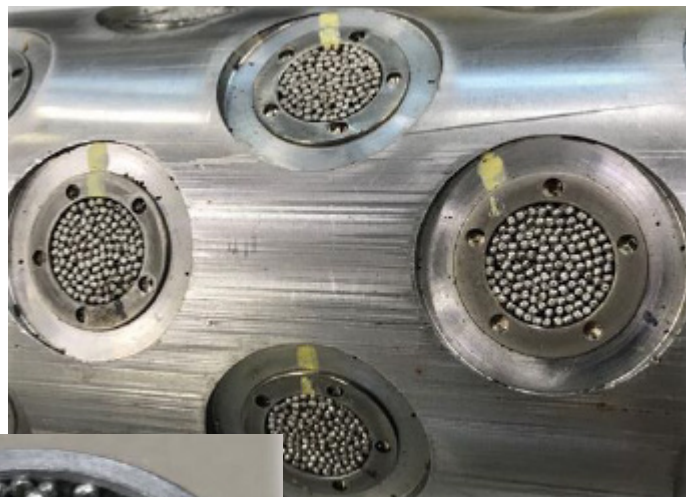
REMEDIAL COMPLETIONS

Bonded BeadScreen for Formation Sand Control

Over the years, the industry has developed screens with good sand retention efficiency. However, the robustness of these screens is often found lacking in situations where high velocity flow and corrosive fluids can damage the screen filtration medium.

BeadScreen™ technology is a corrosion and erosion-resistant porous medium designed to provide an alternative erosion-resistant sand control screens, with a burst and collapse rating that is >5,000 psi. The screen inserts are installed within the wall of the pipe base, providing a flush OD screen.

The proposed new screen incorporates mono-sized stainless steel or Inconel spheres, tightly bonded as a porous structure in an insert. Several bead sizes are available enabling optimum sand control performance in different ranges of formation sand sizes. Bonded beads meet the API requirement for gravel/frac pack sand with over 0.9 roundness and sphericity. BeadScreen is available in 316L SS or 825I/625I material.



REMEDIAL COMPLETIONS

Bonded BeadScreen Sizing

Application

A well accepted feature of wire wrapped and sintered laminate screens is their self-cleaning features whereby the filtration surface used in the screen offers the smallest available pore size. As a result, a solid particle going through this filtration surface will not be stopped downstream because all other pore openings are larger than the surface openings.

BeadScreen has similar self-cleaning characteristics that is achieved by using different packing structures to yield different pores sizes. This feature is achieved by a proprietary process that yields a pack of metal beads bonded together tightly at the surface (rhombohedral packing) and more loosely underneath to create pores of increasing sizes. Controlling the packing within the BeadScreen leads to a self-cleaning porous media.

When compared with conventional and premium screens, the BeadScreen shows superior resistance to pressure build up during slurry testing with well sorted formation sand. All samples tested provided good sand control, however the results show that the 22 US mesh bonded beads allowed the least amount of sand through and all material that passed was less than 43 m.

The 14 US mesh bonded BeadScreen provided comparable sand control to other screens with the lowest differential pressure, suggesting that it would be an excellent stand alone screen alternative for similar formations.



REMEDIAL COMPLETIONS

Bonded BeadScreen Sizing

Erosion Resistance

Its superior erosion resistance is what differentiates the BeadScreen from the other screen alternatives. Gas erosion testing was performed to compare the performance of BeadScreen with the other conventional screen types. Tests simulated standalone screen completion in 7 in. cased hole and were performed at around 600 ft/sc flow velocity and 1-2 lbs/min sand (quartz) loading through perforations.

Wire wrap screen failed after pumping 15 lbs of sand (Slot opened from 12 to 13ga). At similar test conditions a premium screen with perforated shroud failed after pumping 30 lbs of sand. Test results show that the louvered shroud of Excluder premium screen helps reduce the erosion considerably compared to a typical premium screen with a perforated shroud. Failure was observed after pumping 153 lbs of sand. BeadScreen showed superior performance compared to all the other screen types tested. No failure was observed after pumping 450 lbs of sand at similar test conditions. Results demonstrate that BeadScreen can be a reliable sand control solution in high erosive environments where conventional wire wrap and premium screens fail easily.

Specification Guides							
Base Pipe	Bonded Bead Pack Diameter	Screen OD	Base Pipe Perforations per Foot	Joint Length	BeadScreen Coverage	Handling Length	Thread
in.	in.	in.		ft	ft	ft	
2 ½	0.875	2.500	12	20	17	1.5	VAM FJL
2 ¾	0.875	2.875	12	20	17	1.5	VAM FJL
3 ½	0.875	3.500	12	20	17	1.5	VAM FJL
4 ½	0.875	4.500	15	39	35	2.0	VAM FJL
5 ½	0.875	5.500	21	39	35	2.0	VAM FJL

CASING EXIT

Thru-Tubing Casing Exits

Application

Baker Hughes thru-tubing whipstock systems are the most innovative and technically advanced drill bit manufacturer, provides the highest quality window in the industry today.

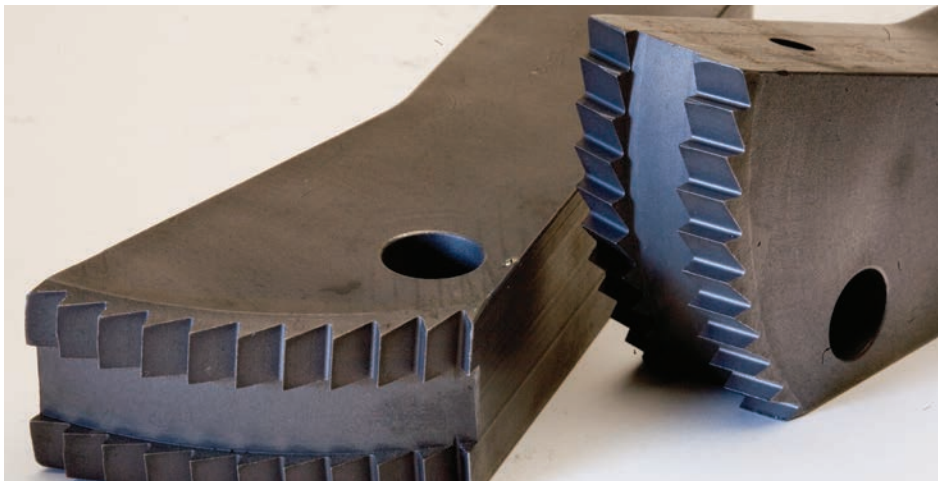
After the efficient creation of a superior window the advantage of employing Baker Hughes is further exemplified with the use of state-of-the-art coiled tubing drilling systems.

Why use a thru-tubing casing exit?

- Bypassed reserve recovery
- Extend well life
- Collapsed or damaged casing
- Multilateral drilling applications
- Slot recovery
- Loss of bottomhole assembly (BHA) resulting in obstruction to planned drilling trajectory

Advantages

- Window can be cut without pulling existing completion or production tubing
- One-trip orientation and setting on electric line, coiled tubing or threaded pipe
- Ability to set on either the high or low side of the casing ensures the optimal exit point
- Whipstock can be retrieved
- Large bypass flow area allows for continued production from the main bore below
- Single or dual exit possible
- Multiple exit sizes available
- Integral anchor system reduces trips and wellbore restrictions



Advanced anchoring systems allow for anti-vibratory management and stability axis control even during casing exits in exotic materials



CASING EXIT

Delta Exit System

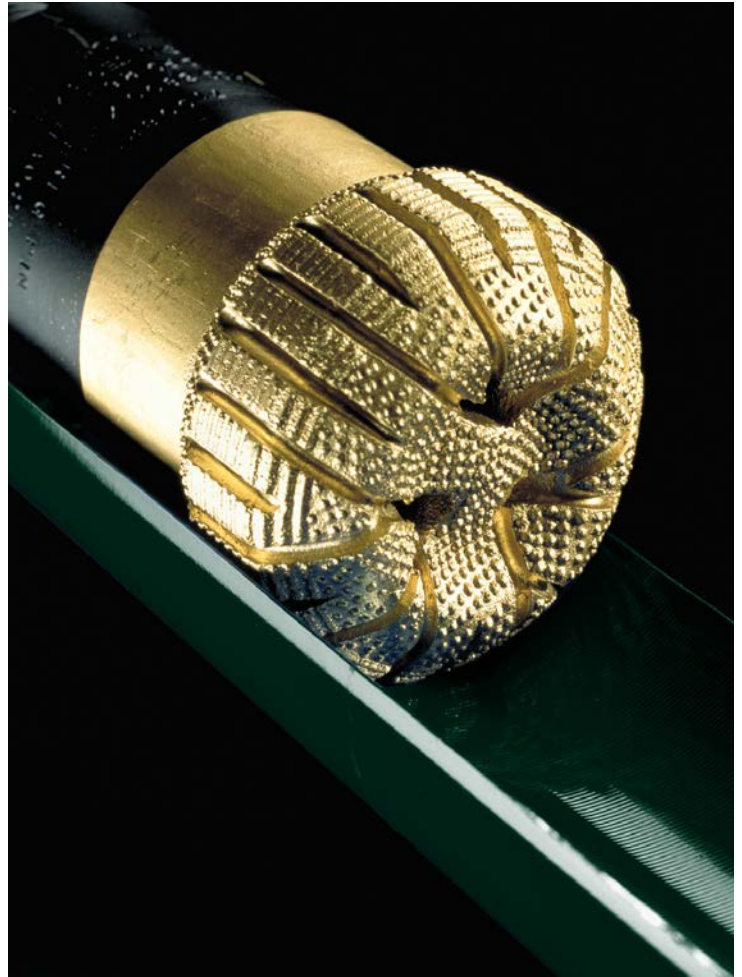
Product Family No. H15150

Application

The **Delta Exit System™** allows the operator to mill a window in the casing in a restricted wellbore environment using coiled tubing deployed mills and motors. The Delta Exit System can be run and set in a live well environment without the necessity of removing the completion equipment eliminating the requirement for a workover rig and negating the need for kill weight fluids. Since the Delta Exit System is designed to be run and set on either electric wireline or coiled tubing, it is ideally suited for restricted bore access and allows the window to be milled below the completion. The whipstock anchor is firmly set by using a Size 10 Baker Hughes E-4™ wireline pressure setting assembly (product family nos. H43702 and H43720) or a Size 10 Baker Hughes J™ hydraulic setting tool (product family no. H41371).

Advantages

- System can be run through the existing completion and set in up to 7⁵/₈ in. casing
- Can be retrieved from the wellbore for multi-zone applications
- One-trip setting on either electric wireline or coiled tubing
- One-trip window milling
- Accommodates a wide range of mill styles for efficient window cutting in a variety of formation and casing conditions
- Offset whipstock top allows easier access to openhole section
- Can be set for either high- or low-side exits
- Can be dressed for different casing sizes by changing a minimal number of parts



CASING EXIT

Delta Exit System

Specification Guides									
Casing Size	Casing Weight	Nominal ID	Drift ID	Dogleg Severity (deg.)	Material No. (2 in. Radius Scoop for 3.8 Mill Dia.	Material No. (2 1/8 in. Radius Scoop for 4.3 Mill Dia.	Material No. (2 5/8 in. Radius Scoop for 4.5 Mill Dia.	Material No. (2 1/2 in. Radius Scoop for 4.5 Mill Dia.	Conversion Kit
5,500 (in.)	28.4	4.440	4.315	10.1	H151-50-5501	N/A	N/A	N/A	10175587
	26.8	4.500	4.375	10.3					
	26.0	4.548	4.423	10.4					
	23.8	4.626	4.501	10.6	H151-50-5502	N/A	H151-50-5504	N/A	10175588
	23.8	4.626	4.501	10.6					
	23.0	4.670	4.545	10.7					
	20.0	4.778	4.653	11.0					
	17.0	4.892	4.767	11.3	H151-50-5503	H151-50-5507	H151-50-5505	H151-50-5506	10175583
	15.5	4.950	4.825	11.4					
	14.0	5.012	4.887	11.6					
7,000 (in.)	38.0	5.920	5.795	13.9	H151-50-7001	N/A	H151-50-7004	MonH151-50-7007	10175589
	35.0	6.004	5.879	14.1					
	32.0	6.094	5.969	14.4					
	29.0	6.184	6.059	14.6	H151-50-7002	N/A	H151-50-7005	H151-50-7008	10175584
	26.0	6.276	6.151	14.8					
	23.0	6.366	6.241	15.1					
	20.0	6.456	6.331	15.3					
17.0	6.538	6.413	15.5	H151-50-7003	N/A	H151-50-7006	H151-50-7009	10175590	
7,625 (in.)	39.0	6.625	6.500	15.7	H151-50-7601	N/A	H151-50-7603	H151-50-7605	10175585
	33.7	6.765	6.640	16.1					
	29.7	6.875	6.750	16.4					
	29.7	6.875	6.750	16.4	H151-50-7602	N/A	H151-50-7604	H151-50-7606	10175601
	26.4	6.969	6.877	16.6					
	24.0	7.025	6.900	16.8					

CASING EXIT

Coiled Tubing–Set Monobore Whipstock

Product Family No. H15042

Application

The **coiled tubing–set monobore whipstock** is designed to mill a window exit in the completion or production tubing, liner or casing; eliminating the expense of a costly workover rig. The anchor mechanism is an integral part of this whipstock system, thus reducing the number of trips required to complete the window. The whipstock can be set with either the Baker Hughes E-4™ wireline pressure setting tool or a J™ hydraulic setting tool. When using E-Line, the whipstock is oriented with eccentric weight bars. When run in on coiled tubing, the whipstock can be oriented using an MWD or gyro survey. Once the anchor assembly is set the window is milled using a coiled tubing workstring, mud motor, watermelon mill, and diamond speed mill.

Advantages

- Window can be cut without pulling existing completion or production tubing
- One-trip to set whipstock on wireline or coiled tubing
- Uses diamond speed mill technology for efficient window cutting
- Anchor is an integral part of the whipstock

Specification Guides

Tubing/Casing OD		Whipstock OD		Exit Size	
in.	mm	in.	mm	in.	mm
3½	88.9	2.625	66.7	2.800	71.1
4½ - 5	114-127	3.625	92.1	3.800	96.5



Coiled Tubing–Set Monobore Whipstock
Product Family No. H15042

CASING EXIT

String and Watermelon Mills

Product Family No. H15109

Application

String and watermelon mills are designed to clean and dress casing windows during a coiled tubing window milling operation and are a critical component to the Delta Exit System™ (product family no. H15150) and the coiled tubing set monobore whipstock (product family no. H15042). Each string mill and watermelon mill is specifically sized according to the casing exit application to effectively clean and dress the casing exit for subsequent completion operations including successive drilling bottomhole assemblies and liners.

Advantages

- Light-duty liner hanger/packer
- Ideal for running uncemented or slotted liners in vertical or horizontal wells
- Hydraulic set and release
- Most sizes rated to 1,000 psi (68.9 bar) at 250°F (121°C)
- Adjustable straight-pull release



String and Watermelon Mills
Product Family No. H15109

Fishing Calculation Software

Application

Thru-tubing **fishing calculation software** is available to assist in gathering and computing data for an efficient and cost effective job. The software is easy to use and can be easily adapted for PDAs.

To avoid over speeding the motor during a nitrogen operation, a software package has been developed to optimize the motor selection parameters. With the input of well data and motor selection criteria, the output from the workover motor equivalent flow calculator provides accurate RPM and equivalent fluid flow through the motor.

Advantages

- Standard and metric units
- 21 different unit conversions
- Fishing data tables
- Wash pipe and overshot information
- 16 essential fishing calculations


SOFTWARE/INFORMATION

INFLATEDESIGN

Application

INFLATEDESIGN™ is our propriety software design program developed to help in the information gathering, engineering, execution and post job reporting phases of an isolation planned with thru-tubing inflatable technology.

Pre-Job Information Sheets



THRU-TUBING INTERVENTION

Coiled Tubing INFLATEDESIGN™
Thru-Tubing Inflatable Pre-Job Information Request
 To be completed by Baker Hughes Sales/Operations Engineer during planning stage and checked on location by Baker Hughes Service Supervisor prior to execution.

Where ever you see this symbol () on the spreadsheet, place your cursor over the cell and a full explanation of the required cell input will be given.
 Note: Do nto type in the units (in., ft, degrees, etc.) with figures

1. General Information

Operator	Thru-Tubing Intervention Catalog		
Contact Name	Baker Hughes		
Tel / Fax / Email	713-849-6094	713-466-2314	firstname.lastname@bakerhughes.com
District / Field /Well	Houston	Target	Number 1
Well Type	Oil Producer		
Anticipated Start Date	September 3, 2019		

2. Well Information

Tubing [OD (in.) and Weight (lb/ft)]	3.50	9.2
Casing / Liner [OD (in.) and Weight (lb/ft)]	7.000	32
Setting Depth ID (in.)	6.094	
Condition (Scale, Corrosion, etc.)	New	
Min. Restriction [ID (in.) /Type/Depth (ft)]	2.750	Nipple Profile 12,800
Maximum Well Deviation (°)	45	
Setting Depth Deviation (°)	45	

3. Well Data

Bottom Hole Pressure (psi)	Static	5050	Flowing		Inject	
Wellhead Pressure (psi)	Static	1750	Flowing		Inject	
Temperature at Setting Depth (°F)	Static	257	Flowing		Inject	
Perforation Intervals (ft)	17,500					
Crossflow (psi/bpd/direction)	0					


4. Well Fluids Information

Description	Fresh Water Mud	
Density (p.p.g.)	8.7	
Fluid Level (ft)	Full	
Inflation Fluid [Type/Densisty (p.p.g.)]	Fresh Water Mud	
Treatment Fluid [Type/Densisty (p.p.g.)]	Fresh Water Mud	
CO ₂ /H ₂ S (%)	0	

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For more information please contact your local Baker Hughes representative.

Performance Envelope



THRU-TUBING INTERVENTION

Coiled Tubing INFLATE^{DESIGN}™
Thru-Tubing Inflation Element Performance Envelope.

Customer	TTI Catalog	Tool Type	Permanent Cement Retainer
Field	Target	Chassis Size	2.13
Well	Number 1	Prepared By	Name
Rec. Element Size	2500		

Note: The recommended element size is based on the minimum restriction and not on the setting depth ID

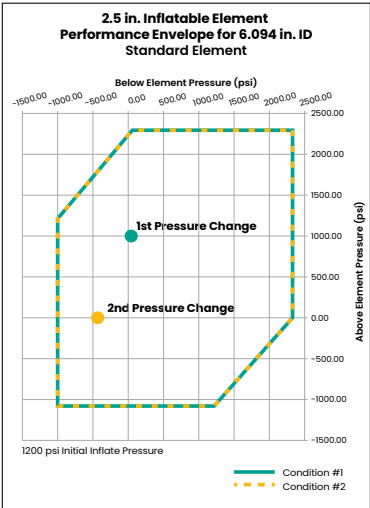
Element OD Size (in.)	2500
Element Service Type	Standard
Mandrel OD (in.)	1.00
Inflation Fluid Type	Water
Setting Depth ID (in.)	6.094
Element Inflation Pressure	1200
Bottom Hole Pressure (psi)	5050

First Pressure Change

Above Pressure Change	1000
Below Pressure Change	0
Temperature Change (°F)	0
Effective Inflate Pressure	1200

Second Pressure Change

Above Pressure Change	0
Below Pressure Change	-500
Temperature Change (°F)	0
Effective Inflate Pressure	1200




Element Pressure Rating (psi)	2300
Element Inflate Rating (psi)	1200

Note: The inflatable packer performance envelop when generated from the initial inflation temperature utilizes the Baker Hughes published element differential pressure ratings. When generating the performance envelopes for conditions #1 & #2 in conjunction with temperature changes, theoretical bulk modulus calculations are used which will make the results more subjective. No warranty is expressed or implied.

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Inflatable Element Well Condition #1



THRU-TUBING INTERVENTION

First Pressure Change

Coiled Tubing INFLATE^{DESIGN}™
Thru-Tubing Inflation Element Hydraulics

Customer	TTI Catalog
Field	Target
Well	Number 1

INITIAL CONDITION

WHISP (psi)	1750	Well-head shut in Pressure
BHP at Setting Depth (psi)	5050	Bottom Hole Pressure at Element Setting Depth
BHT (°F)	257	Bottom Hole Temperature
Inflation Pressure (psi)	1200	Disconnect Pressure for Bridge Plugs, Ball Seat Pressure for Packer and Cement Retainer
CT Fluid [working string] (ppg)	0.00	
Setting Depth [vertical] (ft)	14025	
Element OD Size (in.)	2.500	
Setting Depth (in.)	6.094	
Element Rating (psi)	2300	

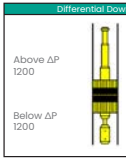
FINAL CONDITION AT SETTING DEPTH

Casing Inject/Drawdown (psi)	1000
Tubing Inject/Drawdown (psi)	0

These conditions are SIMULTANEOUS operations. If inject/drawdown occurs from one side only, enter 0 psi for the other side

INITIAL CONDITION

WHISP (psi)	1750	
BHP (psi)	5050	
BHT (°F)	257	
Inflation Pressure (psi)	1200	
Coiled Tubing Fluid (ppg)	0.00	
Workstring Hydrostatic (psi)	0	
Workstring Overbalance (psi)	-5050	
Est. Disconnect psi at Surface (psi)	6250	

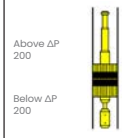


	Differential Downhole	Absolute Pressure
Above ΔP 1200	0	5050 [Above]
Below ΔP 1200	1200	6250 [Inflation]
Bottom Hole Δ Pressure	0	5050 [Below]

FINAL CONDITION

Casing Inject/Drawdown (psi)	1000
Tubing Inject/Drawdown (psi)	0

***** Pressure Conditions *****
 ***** Acceptable Within the *****
 ***** Tools Published Limitations *****



	Differential Downhole	Absolute Pressure
Above ΔP 200	1000	6050 [Above]
Below ΔP 200	1200	6250 [Inflation]
Bottom Hole Δ Pressure	0	5050 [Below]

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Thru-Tubing Fishing Pre-Job Information Request Form



THRU-TUBING INTERVENTION

Thru-Tubing Fishing Pre-Job Information Request

To be completed by Baker Hughes Sales/Operations Engineer during planning stage and checked on location by Baker Hughes Service Supervisor prior to execution.

Where ever you see this symbol () on the spreadsheet, place your cursor over the cell and a full explanation of the required cell input will be given.

Note: Do not type in the units (in., ft, degrees, etc.) with figures

1. General Information

Operator			
Contact Name			
Tel / Fax / Email			
District / Field /Well			
Well Type			
Anticipated Start Date			

2. Well Information

Tubing [OD (in.) and Weight (lb/ft)]		
Casing / Liner [OD (in.) and Weight (lb/ft)]		
Working Depth ID (in.)		
Condition (Scale, Corrosion, etc.)		
Min. Restriction [ID (in.) /Type/Depth (ft)]		
Maximum Well Deviation (°)		
Working Depth Deviation (°)		

3. Well Data

Bottom Hole Pressure (psi)	Static		Flowing		Inject	
Wellhead Pressure (psi)	Static		Flowing		Inject	
Bottom Hole Temperature (°F)	Static		Flowing		Inject	
Perforation Intervals (ft)						

4. Well Fluids Information

Description			
Density (p.p.g.)			
Fluid Level (ft)			
CO ₂ /H ₂ S (%)			

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SOFTWARE/INFORMATION

5. Conveyance Data	
Conveyance Method	
Coiled Tubing Company and Contact	
Coiled Tubing OD Size (in.)	
Coiled Tubing Wall Thickness (in.)	
Coiled Tubing Grade	
Max. Pull Available at Working Depth (lb)	
Max. Set Down Weight at Working Depth (lb)	
Max. Available Pump Rate (bpm)	
Treatment Fluids to be Used	
Treatment Fluids Density (p.p.g)	
Depth Correlation Method	
Maximum Riser Height (ft)	
Minimum Stack up ID (in.)	
6. Objective of Intervention	
7. Other Information	
<p>Note - Please include a copy of the following with this Pre-Job Information Request:</p> <ul style="list-style-type: none"> A. Well Schematic B. Deviation Survey C. Relevant Tool / Fish Drawings 	
8. Baker Hughes Contact Personnel	
<p>Name / Telephone / Fax / Email</p> <p><i>Baker Hughes</i> 713 466 2380 713 466 2314 thrutubing.interventions@bakerhughes.com</p>	
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Thru-Tubing Inflatable Pre-Job Information Request Form



THRU-TUBING INTERVENTION

TTI INFLATE^{DESIGN}™

Thru-Tubing Inflatable Pre-Job Information Request

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Where ever you see this symbol () on the spreadsheet, place your cursor over the cell and a full explanation of the required cell input will be given.

Note: Do not type in the units (in., ft, degrees, etc.) with figures

1. General Information

Operator			
Contact Name			
Tel / Fax / Email			
District / Field /Well			
Well Type			
Anticipated Start Date			

2. Well Information

Tubing [OD (in.) and Weight (lb/ft)]		
Casing / Liner [OD (in.) and Weight (lb/ft)]		
Setting Depth ID (in.)		
Condition (Scale, Corrosion, etc.)		
Min. Restriction [ID (in.) /Type/Depth (ft)]		
Maximum Well Deviation (°)		
Setting Depth Deviation (°)		

3. Well Data

Bottom Hole Pressure (psi)	Static		Flowing		Inject	
Wellhead Pressure (psi)	Static		Flowing		Inject	
Bottom Hole Temperature (°F)	Static		Flowing		Inject	
Perforation Intervals (ft)						
Crossflow (psi/bpd/direction)						

4. Well Fluids Information

Description			
Density (p.p.g.)			
Fluid Level (ft)			
Inflation Fluid [Type/Densisty (p.p.g.)]			
Treatment Fluid [Type/Densisty (p.p.g.)]			
CO ₂ /H ₂ S (%)			

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5. Intervention Data	
Setting Depth	MD (ft)
	TVD (ft)
First Pressure Change (psi)	
Second Pressure Change (psi)	
Temperature Change After Inflation (°F)	
6. Conveyance Data	
Conveyance Method	
Coiled Tubing Company and Contact	
Coiled Tubing OD Size (in.)	
Max. Pull Available at Setting Depth (lb)	
Max. Set Down Weight at Setting Depth (lb)	
E-Line Company and Contact	
E-Line Size (in.)	
Maximum Lubricator / Riser Length (ft)	
7. Reason for Intervention	
8. Other Information	
<p>Note – Please include a copy of the following with this Pre-Job Information Request:</p> <p>A. Well Schematic</p> <p>B. Deviation Survey</p>	
9. Baker Hughes Contact Personnel	
Name / Telephone / Fax / Email	
<p>Baker Hughes</p> <p>713 466 2380</p> <p>713 466 2314</p> <p>thrutubing.interventions@bakerhughes.com</p>	
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