



THRU-TUBING SERVICES

CATALOG

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WELLBORE DEPARTURE AND MILLING OPERATIONS



Trackmaster TT Wellbore Departure System

Integrated system for casing exits:
conventional or extended ratholes

System Applications

- Casing exits below production tubing
- Casing exits that require extended ratholes

FasTrack Bi-Mill Advantages

- Ideal for operations requiring conventional or extended ratholes
- Lead-and-follow mill design
- Consistent, fast, and reliable performance
- Optional PDC cutters for enhanced wear resistance

Thru-Tubing Whipstock Advantages

- Accommodates relative size difference between whipstock and casing diameters
- Hydraulic kick-over hinge for positioning and stabilization

Expandable Anchor Advantages

- Spans multiple casing sizes and weights
- Hydraulically actuated
- Designed to prevent rotation and high-axial load slip

Running Tools and Accessories Advantages

- Works with all hydraulically actuated anchor systems
- Provides clean hydraulic oil for to set anchors and packers
- Actuated with pump pressure

Multicycle Bypass Valve Advantages

- Facilitates flow rates sufficient to operate MWD and other telemetry tools
- Provides multiple open cycles

Debris Barrier Advantages

- Prevents debris from settling around anchors and packers

The nonretrievable Trackmaster TT* thru-tubing whipstock system integrates separate components to enable exits from standard steel casing below the production tubing and other exits that require 3-ft to 15-ft of rathole.

Trackmaster TT Specifications

Tool Size	4½ in × 7 in	7 in × 9⅝ in	9⅝ in × 13⅜ in
System OD, in	3.62	5.625	7.813
Mill OD, in	3.625 - 3.875	5.750 - 6.250	8.250 - 8.750
Setting pressure: whip, psi	939	955	510
Setting pressure: anchor, psi	3,000	3,000	3,000
Release load: whip, lbf	14,400	32,000	40,000
Release load: anchor, lbf	32,400	64,800	94,800
Torque, ft.lbf	6,000	30,000	50,000



Trackmaster TT wellbore departure system

TTT Turbomill

TTT Turbomill* thru-tubing turbomill is specifically designed for coiled tubing cleanouts.

Applications

- Scale clean outs
- Mills Copperhead bridge plugs
- Mills composite bridge plugs
- High-temperature conditions
- Low-pressure conditions where nitrogen is used to maintain well flow

Features

- Extended gage protection combats turbodrill's output speed
- Two rows diamond-enhanced insert (DEI) gage inserts ensures durability
- Limited-depth cutting profile reduces torque demand cuttings production



TTT Turbomill

TTT Turbomill Specifications

Outer Diameter, in	Overall Length, in	Fishing Neck Outer Diameter, in	Fishing Neck Length, in	Connection
3.250	10	2 $\frac{1}{8}$	4	2 $\frac{3}{8}$ -in PAC Box
3.500	10	2 $\frac{1}{8}$	4	2 $\frac{3}{8}$ -in PAC Box
3.625	10	2 $\frac{1}{8}$	4	2 $\frac{3}{8}$ -in PAC Box
3.750	10	2 $\frac{1}{8}$	4	2 $\frac{3}{8}$ -in PAC Box
3.875	10	2 $\frac{1}{8}$	4	2 $\frac{3}{8}$ -in PAC Box
4.375	10.5	2 $\frac{1}{8}$	4	2 $\frac{3}{8}$ -in PAC Box
4.415	10.5	2 $\frac{1}{8}$	4	2 $\frac{3}{8}$ -in PAC Box
4.625	10.5	2 $\frac{1}{8}$	4	2 $\frac{3}{8}$ -in PAC Box

PowerMill TT Thru-Tubing Motor

Tailored power for demanding thru-tubing applications

Applications

- Milling scale, cement, barium, steel, bridge and frac plugs
- Cleanout operations with venturi jet baskets
- Thru-tubing underreaming and sidetracking
- Coiled tubing operations with specific torque and RPM requirements for downhole tools

Advantages

- Motors available in a range of sizes and performance classes
- Rotor-stator components are rated for harsh fluids and HPHT conditions
- Mud-lubricated bearings with mechanical seal assembly promote reliable actuation of high-pressure downhole tools
- Rugged bearing assembly endures side loading and overpulls



PowerMill TT thru-tubing motors are designed for the demands of thru-tubing operations.

Performance Specifications

Outside diameter, in [mm]	1.688 [43]	1.688 [43]	2.125 [54]	2.375 [60]	2.875 [73]	2.875 [73]	2.875 [73]	3.375 [86]	3.375 [86]
Overall length, ft [m]	8.03 [2.45]	7.83 [2.39]	7.83 [2.39]	8.52 [2.60]	13.74 [4.19]	13.74 [4.19]	10.66 [3.25]	12.5 [3.83]	16.17 [4.93]
Weight, lbm [kg]	46 [20.8]	45 [20]	60 [27.2]	67.05 [30]	225 [102]	225 [102]	202 [92]	247 [112]	267 [121]
Top connection	1-in API Reg	1-in API Reg	1½-in API Reg [†]	1½-in API Reg [†]	2⅝-in PAC	2⅝-in PAC	2⅝-in PAC	2⅝-in PAC	2⅝-in PAC
Bottom connection	1-in API Reg	1-in API Reg	1½-in API Reg [†]	1½-in API Reg [†]	2⅝-in PAC	2⅝-in PAC	2⅝-in PAC	2⅝-in PAC	2⅝-in PAC
Maximum weight on bit, lbf [N]	2,500 [1,134]	2,500 [1,134]	5,000 [2,268]	5,500 [2,495]	7,000 [3,175]	7,000 [3,175]	7,000 [3,175]	9,900 [4,490]	9,900 [4,490]
Maximum bit pressure drop, psi [bar]	1,500 [103]	1,500 [103]	1,500 [103]	1,500 [103]	1,500 [103]	1,500 [103]	1,500 [103]	1,500 [103]	1,500 [103]
Minimum flow rate, galUS/min [L/min]	18 [68]	18 [68]	25 [95]	40 [151]	40 [151]	60 [227]	60 [227]	80 [302]	80 [302]
Maximum flow rate, galUS/min [L/min]	42 [159]	42 [159]	65 [246]	80 [302]	120 [454]	120 [454]	120 [454]	160 [606]	160 [606]
No load bit speed at min. flow rate, rpm	166	293	293	287	92	344	240	189	111
No load bit speed at max flow rate, rpm	388	685	622	574	276	688	480	380	222
No load pressure drop, psi [bar]	200 [13.8]	200 [13.8]	200 [13.8]	200 [13.8]	200 [13.8]	200 [13.8]	200 [13.8]	200 [13.8]	200 [13.8]
Maximum operating pressure differential, psi [bar]	520 [35.85]	900 [62.05]	900 [62.05]	900 [62.05]	390 [26.9]	1580 [108.94]	790 [62.05]	450 [31.0]	450 [31.0]
Maximum operating torque (with H ₂ O at 70 degF), lbf.ft [N.m]	140 [190]	150 [203]	240 [325]	320 [433]	400 [542]	760 [1,030]	510 [691]	500 [677]	840 [1,139]
Stall torque (with H ₂ O at 70 degF), lbf.ft [N.m]	210 [285]	230 [312]	360 [488]	480 [651]	590 [800]	1140 [1,546]	770 [1,044]	750 [1,016]	1,260 [1,708]
Maximum allowable overpull for re-running, lbf [N]	53,000 [24,040]	53,000 [24,040]	69,250 [31,411]	24,800 [11,249]	80,250 [36,400]	80,250 [36,400]	80,250 [36,400]	121,170 [54,962]	121,170 [54,962]
Absolute maximum allowable overpull, lbf [N]	53,000 [24,040]	53,000 [24,040]	69,250 [31,411]	33,000 [14,969]	100,300 [45,500]	100,300 [45,500]	100,300 [45,500]	151,500 [68,719]	151,500 [68,719]

[†] 1½-in API Reg is equivalent to 1½-in MT connection

i-MILL TT

Thru-tubing insert intervention mill

Applications

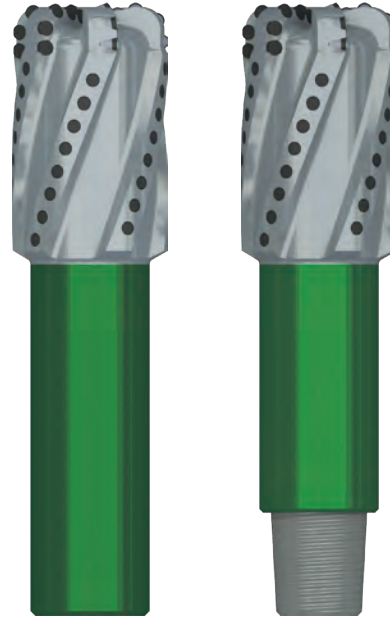
- Cleaning out scale, cement, barium, steel, bridge and frac plugs in thru-tubing
- Thru-tubing underreaming
- Milling gauges that must be customized to desired drift of tubing or liner

Advantages

- Protects completions with extended gauge
- Comes dressed with TCI inserts
- Can be upgraded with PDC inserts for better performance
- Removes manual welding of crushed carbide
- Produces small uniform cuttings
- Requires less torque
- Comes with pin or box connection to match PowerMill TT thru-tubing milling positive displacement motors

The i-MILL TT* thru-tubing insert intervention mill was developed using propriety design techniques to ensure a balanced and consistent milling profile capable of efficiently clearing cement and scale from tubing or liners. For application flexibility, the mill can be fitted with the type of insert that will best mill the restricting material.

The diameter of the mill can also be honed to meet specific gauge requirements. It operates at low-torque and provides extended gauge protection for completions, while producing small and uniform cuttings. The i-MILL TT intervention mill on a PowerMill TT positive displacement motor is the most effective mill for clearing cement or scale from tubing or liners to advance production or return flow to acceptable levels.



i-MILL TT intervention mill with box connection (left) and pin connection (right).

i-MILL TT Intervention Mill Specifications

OD, in	Overall Length, in	Part Number (TCI Inserts)	Fishing Neck OD, in	Fishing Neck Length, ft	Connection
3.500	12.2	80017088	2 $\frac{7}{8}$	6	2 $\frac{3}{8}$ PAC DSI Pin
3.500	12.2	80017085	2 $\frac{7}{8}$	6	2 $\frac{3}{8}$ PAC Box
3.625	12.3	80017084	2 $\frac{7}{8}$	6	2 $\frac{3}{8}$ PAC DSI Pin
3.625	12.3	80017083	2 $\frac{7}{8}$	6	2 $\frac{3}{8}$ PAC Box
3.750	12.3	80017087	2 $\frac{7}{8}$	6	2 $\frac{3}{8}$ PAC DSI Pin
3.750	12.3	80017086	2 $\frac{7}{8}$	6	2 $\frac{3}{8}$ PAC Box
3.875	12.4	80017526	2 $\frac{7}{8}$	6	2 $\frac{3}{8}$ PAC DSI Pin
3.875	12.4	80017523	2 $\frac{7}{8}$	6	2 $\frac{3}{8}$ PAC Box
3.900	12.4	80017525	2 $\frac{7}{8}$	6	2 $\frac{3}{8}$ PAC DSI Pin
3.900	12.4	80017522	2 $\frac{7}{8}$	6	2 $\frac{3}{8}$ PAC Box
4.000	12.4	80017524	2 $\frac{7}{8}$	6	2 $\frac{3}{8}$ PAC DSI Pin
4.000	12.4	80017521	2 $\frac{7}{8}$	6	2 $\frac{3}{8}$ PAC Box
4.125	12.6	80017708	2 $\frac{7}{8}$	6	2 $\frac{3}{8}$ PAC DSI Pin
4.125	12.6	80017709	3 $\frac{3}{8}$	6	2 $\frac{3}{8}$ PAC DSI Pin
4.125	12.6	80017704	2 $\frac{7}{8}$	6	2 $\frac{3}{8}$ PAC Box
4.250	12.6	80017707	2 $\frac{7}{8}$	6	2 $\frac{3}{8}$ PAC DSI Pin
4.250	12.6	80017705	3 $\frac{3}{8}$	6	2 $\frac{3}{8}$ PAC DSI Pin
4.250	12.6	80017704	2 $\frac{7}{8}$	6	2 $\frac{3}{8}$ PAC Box
4.400	12.4	80017075	2 $\frac{7}{8}$	6	2 $\frac{3}{8}$ PAC DSI Pin
4.400	12.4	80017076	3 $\frac{3}{8}$	6	2 $\frac{3}{8}$ PAC DSI Pin
4.400	12.4	80017074	2 $\frac{7}{8}$	6	2 $\frac{3}{8}$ PAC Box
4.500	12.4	80017061	2 $\frac{7}{8}$	6	2 $\frac{3}{8}$ PAC DSI Pin
4.500	12.4	80017062	3 $\frac{3}{8}$	6	2 $\frac{3}{8}$ PAC DSI Pin
4.500	12.4	80017060	2 $\frac{7}{8}$	6	2 $\frac{3}{8}$ PAC Box
4.625	12.4	80017058	3 $\frac{3}{8}$	6	2 $\frac{3}{8}$ PAC DSI Pin
4.625	12.4	80017059	2 $\frac{7}{8}$	6	2 $\frac{3}{8}$ PAC DSI Pin
4.625	12.4	80017057	2 $\frac{7}{8}$	6	2 $\frac{3}{8}$ PAC Box
4.750	12.8	80017718	2 $\frac{7}{8}$	6	2 $\frac{3}{8}$ PAC DSI Pin
4.750	12.8	80017717	3 $\frac{3}{8}$	6	2 $\frac{3}{8}$ PAC DSI Pin
4.750	12.8	80017716	2 $\frac{7}{8}$	6	2 $\frac{3}{8}$ PAC Box
4.250	12.6	80017704	2 $\frac{7}{8}$	6	2 $\frac{3}{8}$ PAC Box
4.400	12.4	80017075	2 $\frac{7}{8}$	6	2 $\frac{3}{8}$ PAC DSI Pin
4.400	12.4	80017076	3 $\frac{3}{8}$	6	2 $\frac{3}{8}$ PAC DSI Pin
4.400	12.4	80017074	2 $\frac{7}{8}$	6	2 $\frac{3}{8}$ PAC Box
4.500	12.4	80017061	2 $\frac{7}{8}$	6	2 $\frac{3}{8}$ PAC DSI Pin
4.500	12.4	80017062	3 $\frac{3}{8}$	6	2 $\frac{3}{8}$ PAC DSI Pin
4.500	12.4	80017060	2 $\frac{7}{8}$	6	2 $\frac{3}{8}$ PAC Box
4.625	12.4	80017058	3 $\frac{3}{8}$	6	2 $\frac{3}{8}$ PAC DSI Pin
4.625	12.4	80017059	2 $\frac{7}{8}$	6	2 $\frac{3}{8}$ PAC DSI Pin
4.625	12.4	80017057	2 $\frac{7}{8}$	6	2 $\frac{3}{8}$ PAC Box
4.750	12.8	80017718	2 $\frac{7}{8}$	6	2 $\frac{3}{8}$ PAC DSI Pin
4.750	12.8	80017717	3 $\frac{3}{8}$	6	2 $\frac{3}{8}$ PAC DSI Pin
4.750	12.8	80017716	2 $\frac{7}{8}$	6	2 $\frac{3}{8}$ PAC Box

Underreamer

Versatile configurations to match underreaming applications

Applications

- Cement cleanout
- Scale removal

Advantages

- Mechanically assisted knife retraction
- Self-stabilizing knife configuration
- Durable construction for downhole reliability
- Available with various dressings and carbide inserts
- Configurable as an anchor for pipe-cutting applications
- Field-changeable jet nozzles to meet application demands

The underreamer passes through borehole restrictions and then opens by hydraulic activation to a preset diameter. It effectively removes cement, scale, and hard debris from the liner below the production string. The underreamer blades and mills are available with tungsten carbide dressing for scale or cement removal, PDC dressing for scale or cement removal where protection of gauges and tubulars is essential, and Millmaster* carbide inserts for various applications, including those with high ROP.



Underreamer

TT Hydraulic Pipe Cutter

Low point load for one-trip pipe cutting

Applications

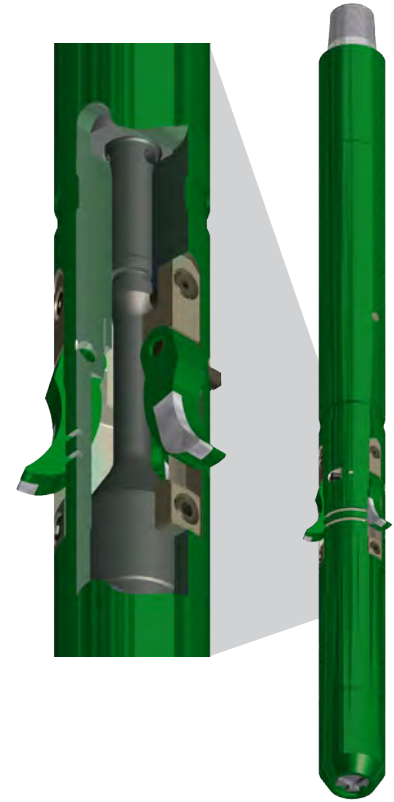
- Recovering tubing
- Severing tubing or drillpipe above stuck point
- Severing packer mandrels and tail pipes

Advantages

- Low-point loading across cutting surface to enable one-trip pipe cutting
- Profiled cutters to provide greater cutting efficiency
- Millmaster carbide inserts to increase knife cutting durability
- Rigsite blade changes for efficiency in cutting tubulars of various diameters
- Field-changeable jet nozzles to optimize performance

The TT hydraulic pipe cutter's knives produce low point-loading across the cutting surface for the durability to complete cutting in one trip. The pipe cutter can be run on CT or jointed pipe. When deployed on CT, an anchoring system, stabilizer, and PDM can be incorporated to ensure the most efficient operation.

To engage and quickly sever tubing or drillpipe, the TT hydraulic pipe cutter features three knives dressed with Millmaster carbide inserts. A variety of cutting structures is available, and the amount of hydraulic pressure required to open the knives can be reset at the rig site in minutes. Knife blades can also be changed at the rig site, enabling multiple cuts and increased efficiency when cutting tubulars of different diameters.



TT Hydraulic Pipe Cutter Specifications

Tool size, in	Tubing OD, in									
	2 ³ / ₈	2 ⁷ / ₈	3 ¹ / ₂	4	4 ¹ / ₂	5	5 ¹ / ₂	6	6 ⁷ / ₈	7
1 ¹¹ / ₁₆	■	■	■							
2 ¹ / ₄		■	■	■						
2 ¹ / ₂			■	■	■	■	■			
2 ⁷ / ₈					■	■	■			
3 ³ / ₈						■	■	■	■	■

- Recommended pipe cutter range for maximum performance
- Extended pipe cutter range for special cases

TT hydraulic pipe cutter

T Series Mill

Superior performance with low weight and torque

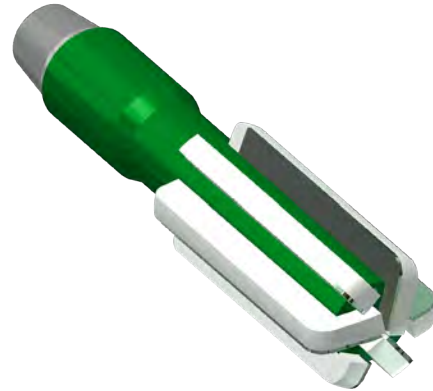
Applications

- Milling of cement, scale, and plugs
- Retrieving milling debris

Advantages

- Millmaster carbide inserts for optimal performance
- Strategically placed fluid port

The T Series mill combines low requirements for weight and torque with rugged Millmaster carbide inserts to deliver superior performance. Used with a thru-tubing positive displacement mud motor, the T Series mill removes plugs, scale, and debris with cutting matrices that can be designed for each application. T Series mills are available in 1¼- to 4¾-in sizes.



T Series mill

Stage Mill

Cost-effective enlargement

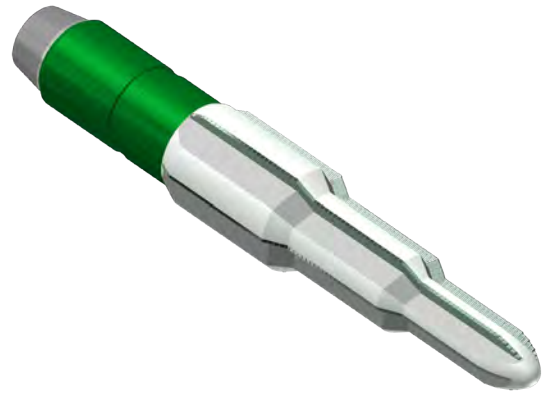
Applications

- Enlarging equipment profiles
- Opening or removing restrictions in tubing and liner
- Removing scale

Advantages

- Cost-effective means of increasing flow control equipment IDs
- Optional of Millmaster carbide inserts or PDC dressing

Stage mills are specifically designed for profile enlargement, mechanical removal of scale, and opening or removing other restrictions. The mills offer a cost-effective way to increase flow control equipment IDs such as seating nipples and no-gos. Stage mills are available in 1¾- to 4¾-in sizes.



Stage mill



FISHING TOOLS



Mechanical Pulling Tool

Two activation modes for added flexibility

Applications

- Fishing with CT or jointed pipe
- Wireline operations

Advantages

- Catching mechanism actuates with either jar-up or jar-down force
- Tool easily converts to jar-up or jar-down mode

The mechanical pulling tool retrieves downhole tools and other fish that have standard wireline profiles. The catching mechanism actuates with either jar-up or jar-down shear and release force. The tool converts easily from jar-up to jar-down actuation by replacement of the top sub, core, and retainer screw.



Mechanical pulling tool

Hydraulic Pulling Tool

Multiple latch-and-release operations

Applications

- Retrieval of downhole tools with standard wireline profiles

Advantages

- Fluid activated
- Multiple latch-and-releases
- Latches external neck of fish
- No requirement for redress after each latch

The hydraulic pulling tool retrieves downhole tools and other fish that have standard wireline profiles. The pulling tool's collet mechanism latches the external neck of the fish with weight down; the tool is released from the fish by applying set-down weight and differential pressure. Circulation through an insert in the core provides the differential pressure for activation. Fluid pumped through the tool before the operation washes debris or fill material from the top of the fish, ensuring a secure catch.

Although the tool retrieves equipment with standard wireline profiles, it cannot be used in wireline applications.



Hydraulic pulling tool

Hydraulic Release Overshot

Two-component activation for horizontal fishing

Applications

- Fishing in horizontal and highly deviated wells where sufficient set-down weight cannot be delivered to shear pins alone
- Recovery of CT and CT tools

Advantages

- Variable slip sizes expand retrieval options
- Externally engages fish necks that have smooth or slick walls
- Forms a pressure seal on fish
- Activates with combination of set-down weight and differential pressure
- Internal hammer action assists with release

The hydraulic release overshot engages the external neck of the fish without disrupting circulation to the fish and tools below it. Fluid pumped through the tool before the latch operation washes debris and fill from the top of the fish, ensuring a secure catch. The tool is activated mechanically by applying set-down weight; it is released by applying a combination of set-down weight and differential pressure, making it ideal for horizontal fishing applications.



Hydraulic release overshot

Continuous Tubing Overshot

Maximum grapple contact for retrieving slick-wall fish

Applications

- Retrieving parted CT and slick-wall fish
- Restoring circulation to parted CT in the well

Advantages

- High-pressure packoff assembly provides high-pressure circulation seal
- Compatible with CT or jointed pipe
- Accommodates extensions below the tool

The continuous tubing overshoot is conveyed on CT or jointed pipe. After engaging the fish, it provides circulation through the fish to the workstring below it. The 340° contact grapple system, combined with the ability to swallow the fish, makes this tool ideal for retrieving CT and other slick-wall fish. Addition of a high-pressure packoff above the overshoot enables circulation to the fish to be restored.

Continuous Tubing Overshot Specifications

Tool OD, in	Tool ID, in	Tool length, in	Catch range, in
1.858	1.300	24.5	1 to 1¼
2.063	1.313	23.5	1 to 1¼
2.295	1.563	24.5	1¼ to 1½
2.700	1.813	29.6	1½ to 1¾
3.375	2.125	34.8	1¾ to 2⅝



Continuous tubing overshoot

Series 10- and 20-Type Releasing Overshots

360° grapples for maximum contact

Applications

- Engaging, packing off, and retrieving tubular fish
- Baiting fish with damaged external profiles
- Fishing operations requiring wireline compatibility

Advantages

- 360° grapples to evenly distribute gripping force and maximize wall contact

The Series 10-Type releasing overshot engages, packs off, and retrieves tubular fish. It is available in sizes to engage an OD of up to 2 in inside 2 $\frac{1}{8}$ -in tubing and an OD of up to 1 $\frac{1}{2}$ in inside 2 $\frac{1}{8}$ -in tubing.

The Series 20-Type releasing overshot is designed specifically to retrieve a fish whose top is too short to be engaged with the Series 10-Type releasing overshot. The operation is accomplished by positioning the grapples at the bottom of the tool

Both tools have unique tapered helix internal construction that provides 360° wall contact and distributes loads evenly on the tool and fish.

Both spiral grapples and basket grapples are available. Helical spring spiral grapples are used when employing the overshot's maximum catch size, and expandable cylinder basket grapples are used when the fish OD is more than $\frac{1}{2}$ in smaller than the tool's maximum catch size.

Both releasing overshots are available in three configurations: full strength (FS), semifull strength (SFS), and slim hole (SH).



Series 10-Type releasing overshot

Series 10-Type Releasing Overshot Specifications

Overshot OD, in	1 $\frac{1}{16}$	1.43	1 $\frac{21}{32}$	1 $\frac{25}{32}$	1 $\frac{27}{32}$	1 $\frac{29}{32}$	2 $\frac{1}{8}$	2 $\frac{1}{4}$	2 $\frac{5}{16}$	2 $\frac{7}{32}$	2 $\frac{3}{8}$
Bowen assembly number	9790	17985	16490	13940	36423	9340	27765	16070	9400	15860	9530
Strength	FH	SH	SH	SH	SH	SH	SH	SH	SH	SH	FS
Spiral maximum catch, in	1 $\frac{1}{16}$	1 $\frac{1}{4}$	1 $\frac{1}{8}$	1 $\frac{1}{2}$	1 $\frac{1}{16}$	1 $\frac{1}{8}$	1 $\frac{13}{16}$	1 $\frac{15}{16}$	2	2 $\frac{1}{8}$	2
Basket maximum catch, in	$\frac{7}{8}$	1 $\frac{1}{16}$	1 $\frac{3}{16}$	1 $\frac{5}{16}$	1 $\frac{3}{8}$	1 $\frac{7}{16}$	1 $\frac{5}{8}$	1 $\frac{3}{4}$	1 $\frac{3}{16}$	2 $\frac{1}{16}$	1 $\frac{3}{16}$

Series 20-Type Releasing Overshot Specifications

Overshot OD, in	1 $\frac{1}{4}$	1 $\frac{3}{8}$	1 $\frac{1}{2}$	1 $\frac{5}{8}$	1 $\frac{3}{4}$	1 $\frac{3}{4}$	1 $\frac{29}{32}$	2 $\frac{1}{4}$	2 $\frac{5}{16}$	2 $\frac{5}{16}$	2 $\frac{25}{32}$	2 $\frac{7}{8}$	3 $\frac{1}{8}$	3 $\frac{1}{4}$
Bowen assembly number	17315	25780	28774	28760	18355	34601	11555	47464	17438	30421	18305	20170	20645	22270
Strength	SH	SH	SH	SH	SH	SH	SH	SH	SH	SH	SH	SH	FS	SH
Basket maximum catch, in	$\frac{7}{8}$	1	1 $\frac{1}{8}$	1 $\frac{1}{4}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{2}$	1 $\frac{3}{4}$	1 $\frac{13}{16}$	1 $\frac{13}{16}$	2 $\frac{1}{8}$	2 $\frac{1}{8}$	2 $\frac{3}{8}$	2 $\frac{1}{2}$

Series 70- and 150-Type Releasing Overshots

Large open bore for wireline compatibility

Applications

- Engaging, packing off, and retrieving tubular fish (Series 150-Type only)
- Baiting fish with damaged external profiles
- Fishing operations requiring wireline compatibility

Advantages

- Large open bore allows operation of wireline equipment
- 360° grapples for maximum wall contact and even distribution of gripping force

The Series 70-Type releasing overshoot is specifically designed to retrieve a fish whose top is too short to be engaged with a Series 150-Type releasing overshoot. The operation is accomplished by positioning the grapple at the bottom of the tool.

The Series 150-Type releasing overshoot engages, pack offs, retrieves tubular fish, and is especially suited for retrieval of parted drillpipe and drill collars. Its large bore enables use with wireline tools. Four strength categories are available for jarring and backoff operations: full strength (FS), semifull strength (SFS), slim hole (SH), and extra slim hole (XSH).

Both tools have a unique tapered helix, internal construction that provides 360° wall contact while distributing loads evenly on the tool and fish. Cylinder basket grapples are used when the fish OD is more than ½ in smaller than the tool's maximum catch size.



Series 70- and 150-Type releasing overshoots

Series 70-Type Releasing Overshot Specifications

Overshot OD, in	2 ⁵ / ₁₆	3 ⁵ / ₁₆	3 ³ / ₄	4 ¹ / ₈	4 ⁵ / ₁₆	4 ¹ / ₂	4 ³ / ₄
Bowen assembly number	38506	17615	13535	10434	11290	10543	12645
Strength	SH	SH	SH	SH	FS	SH	SH
Basket maximum catch, in	1 ⁵ / ₈	2 ¹ / ₂	2 ⁵ / ₈	3 ¹ / ₈	3 ¹ / ₁₆	3 ² / ₁₆	3 ³ / ₄

Series 150-Type Releasing Overshot Specifications

Overshot OD, in	2 ⁵ / ₁₆	2 ⁷ / ₁₆	2 ⁹ / ₁₆	3 ¹ / ₈	3 ¹ / ₄	3 ¹ / ₂	4 ¹ / ₈	3 ³ / ₄	3 ⁵ / ₈	3 ⁷ / ₈	3 ¹ / ₂	4	4 ¹ / ₈	3 ³ / ₄	7 ¹ / ₈
Bowen assembly number	B8919	C10199	16395	9305	C5072	C4741	1443	C4623	C5080	9270	C1827	C4736	4390	37585	C1835
Strength	SH	SH	SH	XSH	XSH	FS	FS	SH	FS	XSH	SH	FS	FS	SH	SH
Spiral maximum catch, in	2	2 ¹ / ₈	2 ¹ / ₄	2 ³ / ₈	2 ³ / ₄	2 ⁵ / ₈	2 ⁵ / ₈	2 ¹ / ₂	2 ¹ / ₂	2 ¹ / ₈	2 ¹ / ₈	2 ¹ / ₈	2 ¹ / ₈	3 ¹ / ₁₆	3 ¹ / ₈
Basket maximum catch, in	1 ³ / ₄	1 ³ / ₄	1 ³ / ₄	2	1 ⁷ / ₈	1 ⁷ / ₈	1 ⁷ / ₈	2	2	2 ¹ / ₂	2 ³ / ₈	2 ³ / ₈	2 ³ / ₈	2 ¹ / ₁₆	2 ⁵ / ₈

Mechanical Release GS

Easy conversion to jar-up mode for added flexibility

Applications

- Wireline fishing operations
- CT fishing operations where hydraulic pulling tools are not recommended
- Running and pulling X and XN locks and G-stops
- Retrieving disconnects

Advantages

- Simple redress for job design flexibility
- Easy-change shear pins

The mechanical release GS catches standard internal fishing necks with a down shear and release mechanism . Applications include running or pulling X and XN locks and G-stops, and retrieving disconnects. A GU adapter easily converts the mechanical release GS to a jar-up tool.



Mechanical release GS

Hydraulic Release GS

Load transfer produces reliable jarring

Applications

- Retrieval of CT tools with internal fishing profiles

Advantages

- Hydraulic operation
- Safety shear function guards fishing string from becoming stuck

The hydraulic release GS retrieves CT tools that have conventional, internal fishing necks. The release latches the tool with set-down weight and is released by a combination of set-down weight and increased hydraulic pressure. The collet system transfers load force to the central mandrel to enable jarring operations.



Hydraulic release GS

Hydraulic Release Spear

Engages fish internally

Applications

- Engages fish with damaged internal profiles
- Catches fish with a known internal diameter

Advantages

- Catch range of $\frac{1}{4}$ in to 3 $\frac{1}{2}$ in
- Engages with set-down weight; releases with set-down weight and increased pressure

The hydraulic release spear retrieves fish with damaged internal profiles and also catches fish with known diameters. The spear engages fish with slips actuated by set-down weight and is released with a combination of set-down weight and increased hydraulic pressure.

When used with CT, the tool should be run with the heavy-duty hydraulic disconnect to provide a controlled parting point in the toolstring.



Hydraulic release spear

Itco-Type Release Spear

Robust, efficient design that reliably engages fish

Applications

- Internally engaging fish with ODs up to 20 in
- Baiting fish with damaged profiles

Advantages

- Spiral or segment grapples available
- Sub-type nuts available to make up tools below the spear
- Compatibility with jarring assemblies, internal cutters, and backoff and pulling tools
- Contact with large area of fish to ensure engagement and minimal damage

Designed to make nearly 360° contact, the Itco-Type releasing spear internally engages fish over a large area to minimize the potential for damage or distortion. It is built to withstand severe jarring and pulling strains, and heavy-duty versions can be used with pulling tools for maximum performance. To improve reliability, the tool is designed without the small parts that typically can be lost or damaged downhole.

When used with CT, the tool should be run with a hydraulic disconnect to provide a controlled parting point in the toolstring.



Itco-Type release spear

TT Double-Acting Hydraulic Jar

Delivers high-impact jarring force

Applications

- Small-diameter milling, rotary drilling, workover, remedial, and completion operations
- Vertical, deviated, ultradeep, and ultrahot wellbores
- CT, snubbing, and concentric tubing workstrings

Advantages

- Jarring force delivered on up- and downstrokes
- Temperature-compensated detent system for extended operation
- Large bore for accommodation of drop balls and equipment below tool
- Maximum stroke length increases impact to optimize effectiveness
- Temperature rating: 260 degC [500 degF]
- Seal rating: 137,000 kPa [20,000 psi] differential
- Circulation system rating: 68,900 kPa [10,000 psi]

The TT double-acting hydraulic jar is a slimhole impact tool that delivers jarring force on both up- and downstrokes to free equipment stuck downhole. The tool's small diameter makes it ideal for use in CT operations, snubbing, and slimhole rotary drilling and fishing applications. Its ability to transmit torque enables the use of a downhole motor.

The standard tool has premium seals for use in high-temperature or high-pressure wells. Its robust design and high-quality materials ensure reliable performance in the harshest of downhole conditions.

TT Double-Acting Hydraulic Jar Specifications

Tool OD,in	1 ¹³ / ₁₆	2 ¹ / ₁₆	2 ¹ / ₈
Tool ID,in	⁹ / ₁₆	1 ¹ / ₁₆	³ / ₃₂
Tool joint connections, in	1 AMMT	1 ¹ / ₂ AMMT	2 ³ / ₈ PAC
Overall extended length	7 ft 10 in	7 ft 9 in	8 ft 3 in
Maximum detent working load, lbf	8,000	11,000	20,000
Tensile yield strength, lbf	56,000	86,000	200,000
Torsional yield strength, lbf.ft	850	1,600	5,300
Free stroke up,in	4	4	4
Free stroke down,in	4	4	4
Total stroke,in	12	12	12
Tool weight, lbm	38	56	140

Note

Jar-Pact fishing program should be utilized to optimize performance of Accelerator and jarring tools. Contact Wellbore Integrity Solutions for more information.

Ordering instructions, please specify:

Hole size
Drillstring component OD where the tool will be utilized
Connection size and type



TT double-acting hydraulic jar

TT Double-Acting Accelerator

Absorbs impact shock to prevent BHA damage

Applications

- Operations in which a jar is run in the workstring
- Small-diameter milling, rotary drilling, workover, and completion operations
- Small-diameter CT, snubbing, and fishing operations

Advantages

- Compression chamber stores tool energy and reduces tool length
- Large bore accommodates drop balls and equipment below the tool
- Temperature rating: 260 degC [500 degF]
- Seal rating: 137,000 kPa [20,000] psi
- Circulation system rating: 68,900 kPa [10,000 psi]

The double-acting accelerator is a slimhole tool that multiplies the impact of a double-acting jar by providing or maximizing a stored energy source. A nitrogen compression chamber stores the tool energy while reducing its length, and the tool's large bore accommodates drop balls and flow release equipment below it.

This tool is ideal for operations requiring small-diameter accelerators, and its ability to transmit torque enables the use of downhole motors. It also functions as a shock absorber to prevent impact damage to BHA components such as CT connectors and backpressure valves.

TT Double-Acting Accelerator Specifications

Tool OD,in	1 ¹¹ / ₁₆	2 ¹ / ₁₆	2 ⁷ / ₈
Tool ID,in	⁹ / ₁₆	¹ / ₁₆	³¹ / ₃₂
Tool joint connections, in	1 AMMT	1 ¹ / ₂ AMMT	2 ³ / ₈ PAC
Overall extended length	8 ft 6 in	8 ft 9 in	9 ft 1 in
Maximum detent working load, lbf	8,000	11,000	20,000
Tensile yield strength, lbf	56,000	86,000	200,000
Torsional yield strength, lbf.ft	850	1,600	5,300
Free stroke up,in	6	6	6
Free stroke down,in	6	6	6
Tool weight, lbm	43	66	156

Note

Jar-Pact fishing program should be utilized to optimize performance of Accelerator and jarring tools. Contact Wellbore Integrity Solutions for more information.

Ordering instructions, please specify:

- Hole size
- Drillstring component OD where the tool will be utilized
- Connection size and type
- Hole temperature
- Desired working loads



TT double-acting accelerator

Single-Acting Hydraulic TMC Jar (Up Only)

Rugged construction and controlled impact for HPHT conditions

Applications

- HPHT operations
- Fishing operations and those that include recovery of stuck pipe, packers, tubing, milling debris
- P&A operations, including pipe recovery and wellhead removal

Advantages

- Long free-travel design for optimized impact
- Temperature-compensation in the detent system enables extended operation
- Closed drive system for improved reliability
- Interchangeable parts for conversions between jars and accelerators
- Hydraulic metering system for variable-impact loads
- Temperature rating: 260 degC [500 degF]
- Seal rating: 137,000 kPa [20,000 psi]
- Circulation system rating: 68,900 kPa [10,000 psi]

The single-acting TMC Jar tool combines high-endurance construction with the capability to deliver variable-impact loads. It provides reliable, optimized fishing performance in HPHT environments. Tool seals have HPHT ratings, and temperature-compensation in the detent system enables extended operation without loss of impact force. The closed drive system prevents wellbore fluid from entering the drive section, improving tool performance and reliability.



Single-Acting Hydraulic TMC Jar (Up Only) Specifications

Tool OD, in	1 ¹³ / ₁₆	1 ¹³ / ₁₆	2 ¹ / ₄	3 ¹ / ₈	3 ¹ / ₈
Tool ID, in	3 ³ / ₈	3 ⁵ / ₁₆	1 ¹ / ₂ - 9 ¹ / ₁₆	1	1 ¹ / ₂
Tool joint connection, in	1 ¹³ / ₁₆	1 AMMT	1 ¹ / ₄ API Reg 1 ¹ / ₂ AMMT	2 ³ / ₈ API Reg	2 ³ / ₈ EUE
Assembly number	16420	16853	16421	16213	16457
Overall length, ft	7	5	10	12	11
Recommended maximum overpull working load during restricted travel, lbf	19,000	17,000	20,000	51,000	32,400
Total stroke, in	9 ³ / ₄	7 ¹ / ₄	12	16	14
Tensile yield, lbf	56,000	69,000	95,800	192,000	185,000
Torsional yield, lbf.ft	800	750	1,900	4,100	4,200
Tool weight, lbm	75	54	125	200	225

Ordering instructions, please specify:

Hole size
Connection size, type, and left- or right-hand threads
Tool diameter
Hole temperature

Single-acting hydraulic TMC jar (up only)

Single-Acting TMC Accelerator (Up Only)

Absorbs shock waves moving upward to prevent damage to surface equipment

Applications

- Fishing operations and those that include recovery of stuck pipe, packers, tubing, milling debris
- P&A operations, including pipe recovery and wellhead removal

Advantages

- Absorbs shock waves moving up the drillstring that could damage surface equipment
- Temperature rating: 260 degC [500 degF]
- Seal rating: 137,000 kPa [20,000 psi] differential
- Circulation system rating: 68,900 kPa [10,000 psi]
- Interchangeable parts for conversion between accelerators and hydraulic jars

The single-acting TMC Accelerator tool enhances the impact of a single-acting jar by delivering a supercharged blow directly above the fish. It maximizes jar impact regardless of depth, because it can replace pipe stretch as the energy source in shallow holes and supplements pipe stretch energy in deeper wells.

The tool's robust design and high-quality materials promote reliable performance in the harshest of fishing conditions.

Single-Acting TMC Accelerator (Up Only) Specifications

Tool OD, in	1 ¹³ / ₁₆	1 ¹³ / ₁₆	2 ¹ / ₄	3 ³ / ₈	3 ³ / ₈	
Tool ID, in	³ / ₈	⁹ / ₁₆	¹ / ₂ - 9 ⁹ / ₁₆	1	1 ¹ / ₂	
Tool joint connection, in	1 ¹³ / ₁₆	1 AMMT	1 ¹ / ₄ API Reg 1 ¹ / ₂ AMMT	2 ³ / ₈ API Reg	2 ³ / ₈ EUE	
Assembly number	16422	16854	16423	16214	16459	
Overall length	5 ft 10 in	4 ft 6 in	8 ft	10 ft	9 ft	
Tensile yield, lbf	56,000	69,000	95,800	192,000	185,000	
Torsional yield, lbf.ft	800	750	1,900	4,100	4,200	
Total distance traveled with stop sleeve,^{††} in	8	7 ¹ / ₄	10	12	10 ¹ / ₂	
Rack test in shop at 70 degF for a nominal BHT of 240 degF, [§] in.lbf	6 ³ / ₄ @ 6,000	4 ¹ / ₄ @ 5,000	7 ¹ / ₂ @ 6,000	11 @ 29,000	10 @ 13,200	
Oil fluid, oz	2	2	2	3	2	
Downhole at 240 degF jar and accelerator tool combination loads	Minimum overpull[†]	7,500	6,000	5,200	19,000	8,400
	Maximum overpull[‡]	19,000	17,000	20,000	50,000	32,400
Tool weight, lbm	60	46	100	160	130	

Note

Jar-Pact fishing program should be utilized to optimize performance of TMC accelerator tools and TMC jars. Contact Wellbore Integrity Solutions for more information.

Ordering instructions, please specify:

Hole size
Connection size, type, and left- or right-hand threads
Tool diameter
Hole temperature
Desired operating load

[†] Minimum overpull requirement for a jar-accelerator tool combination to obtain an efficient impact

[‡] Maximum overpull can be increased in the shop. As the maximum increases, the minimum increases

[§] Settings for other expected bottom hole temperatures are available

^{††} Check stroke before loading the accelerator tool. If stroke varies, stop sleeves must be modified to obtain stroke as listed



Single-acting TMC accelerator (up only)

TMC Bumper Sub

Up and down bumping for fine-tuned fishing

Applications

- Fishing operations and those including recovery of stuck pipe, packers, tubing, milling debris
- P&A operations, including pipe recovery and wellhead removal
- Releasing spears, overshots, and shear pins; dislodging strings; acting as feed-off tool in backoff operations

Advantages

- Temperature rating: 260 degC [500 degF]
- Seal rating: 137,000 kPa [20,000 psi] differential
- Circulation system rating: 68,900 kPa [10,000 psi]
- Closed drive system for improved reliability

The TMC Bumper sub, with maximum stroke length and a capacity for high torque-transmission, enables the operator to bump up or down until fishing objectives are met. The sub's robust design and high-quality materials promote reliable performance in the harshest downhole environments.

TMC Bumper Sub Specifications

Tool OD, in	1 ¹³ / ₁₆	1 ¹³ / ₁₆	2 ¹ / ₄	3 ¹ / ₈	3 ¹ / ₈
Tool ID, in	3/ ₈	9/ ₁₆	1 ¹ / ₂ - 9/ ₁₆	1	1 ¹ / ₂
Tool joint connection, in	1 ¹³ / ₁₆	1 AMMT	1 ¹ / ₄ API Reg 1 ¹ / ₂ AMMT	2 ³ / ₈ API Reg	2 ³ / ₈ EUE
Assembly number	16435	N/A	16471	16215	16461
Overall length,	4 ft 8 in	N/A	6 ft	7 ft 10 in	6 ft 11 in
Total stroke, in	9 ³ / ₄	7 ¹ / ₄	12	16	14
Tensile yield, lbf	56,000	69,000	95,800	192,000	185,000
Torsional yield,[†] lbf.ft	800	750	2,900	4,100	4,200
Tool weight, lbm	48	54	75	125	100

[†] Torsional yield strength is based on the tool joint connection.

Ordering instructions, please specify:

Hole size

Connection size, type, and left- or right-hand threads

Tool diameter



TMC bumper sub

Dual Circulating Sub

Rupture disc for activation redundancy

Applications

- Prevents wear on tools during periods of extended circulation
- Allows higher annular velocities following cleanouts
- Enables pumping of higher fluid volumes into annulus during cleanout
- Facilitates pumping of nitrogen into wellbore for fluid evacuation

Advantages

- Prevents damage to circulation-driven tools by diverting mud circulation
- Activation by ball drop or rupture disc
- Multiple preset options for rupture disc: 20,650, 34,400 or 41,300 kPa [3,000, 5,000 or 6,000 psi]

The dual circulating sub extends the life of downhole mud motors and other downhole tools by diverting mud circulation away from them. Activated by dropping a ball, the dual circulating sub prevents actuation of circulation-driven equipment during extended periods of pumping. A rupture disc offers activation redundancy; if a downhole restriction prevents drop ball actuation, applying pressure to burst the disc will restart circulation to the annulus.



Dual circulating sub

Dual-Flapper Check Valve

Large internal bore for reliable pressure seal

Applications

- Workover operations

Advantages

- Prevents wellbore fluids from entering the workstring
- Spring activated for positive closure during inactivity
- Redundant seals for enhanced safety
- Large bore pressure capacity for use with drop balls

The dual-flapper check valve ensures workstring integrity by using high-pressure cartridges to prevent wellbore fluids or pressure from entering the string during workover operations. The large internal bore minimizes friction at high flow rates and provides a reliable seal against the unwanted pressure and fluids typically encountered in these operations. The valve is spring activated for positive closure during inactivity and has redundant seals.



Dual-flapper check valve

Venturi Jet Basket

Flexibility to customize design for efficient retrieval

Applications

- Retrieval of gun debris, metal shavings, and other loose obstructions

Advantages

- Big-bore catcher sub to handle large pieces
- Extensions available to increase amount of retrievable debris
- Special milling shoe available to facilitate motor applications

The Venturi Jet Basket retrieves gun debris, metal, and other loose obstructions. Fluid pumped down the workstring is diverted through a jet nozzle in the upper section, creating a vacuum-like effect in the lower chamber; debris is sucked in and trapped above cages in the lower sub. Fluid is then filtered through the sub and returned to the annulus.



Venturi jet basket



WORKSTRING TOOLS



CT Connectors

Easy CT-BHA assembly with internal or external connections

Applications

- Attaching the BHA to CT

Advantages

- Slip section sealed from wellbore to prevent fluid damage
- Double O-ring seals
- Set screws to prevent rotation
- High tensile strength
- High resistance to pressure and torque
- Easy to assemble

External CT connectors, with their high tensile strength and high resistance to pressure and torque, are ideal for attaching the CT to a BHA for applications that involve motors and fishing assemblies. They are available in standard and slimline versions for CT sizes 1 to 2 $\frac{1}{8}$ in.

Internal CT connectors are available in slip, roller, and dimple configurations.



External coiled tubing connector

Quick Connector

Locking taper design for easy stab-in connections

Applications

- Perforating assemblies
- Memory production logging strings
- Fishing assemblies
- Long toolstrings and BHAs

Advantages

- Efficient toolstring makeup
- Safety locking collar to prevent first section from backing off
- High torque capacity

The quick connector enables easy makeup of long toolstrings. Its locking taper allows each section to stab into the next and a safety collar prevents backoff of the first section, greatly increasing makeup efficiency. It is especially well suited for applications where rotating the toolstring to engage threads is difficult or for those that require long BHAs.



Quick connector

Heavy-Duty Hydraulic Disconnect

Internal and external fishing profiles for easier retrieval

Applications

- Recovery of toolstring from below a jar
- Operations benefitting from predetermined release points

Advantages

- Internal and external fishing profiles for easier retrieval
- Compatibility with torque-generating tools
- Brass or steel shear screws available
- Flow ports that open when screws are sheared
- Circulation ports that open upon disconnect
- Hydraulically balanced piston to prevent accidental disconnect

The heavy-duty hydraulic disconnect provides a predetermined release point in a BHA. Its ability to withstand the extreme torsional and tensile loads exerted during jarring and underreaming make it a key component in demanding applications. A hydraulically balanced position prevents accidental disconnects.

Actuated at a preset pressure that is created by dropping a ball, an internal piston allows the disconnect assembly to separate, leaving the lower section downhole. Circulation ports open upon the separation, and the resulting pressure drop is seen at surface as confirmation of the disconnect. The lower section has an internal and external fishing profile to make future retrievals easier.



Heavy-duty hydraulic disconnect

TJ Hydraulic Disconnect

Surface confirmation of completed operation

Applications

- Milling, jarring, underreaming, and other high-torque applications

Advantages

- Internal G-neck for ease of future retrieval
- High resistance to tensile and torsional stresses
- Ability to transmit torque for underreaming
- Circulation ports that open upon disconnect
- Designed to prevent shear screw fatigue

The TJ hydraulic disconnect provides a predetermined release point in a BHA. Its ability to withstand the extreme torsional and tensile loads exerted during jarring and underreaming make it a key component in demanding operations.

Actuated at a preset pressure that is created by dropping a ball, an internal piston allows the disconnect assembly to separate, leaving the lower section downhole. Circulation ports open upon the separation, and the resulting pressure drop is seen at surface as confirmation of the disconnect. The lower section has an internal G-neck fishing profile for ease of future retrieval.



TJ hydraulic disconnect

Locking Swivel Joint

Toolstring makeup in two stages for easier deployment

Applications

- Facilitating deployment of long toolstrings

Advantages

- Enables makeup of upper and lower toolstrings in two stages for easier deployment

The locking swivel joint is designed for easier deployment of long toolstrings. When used with a deployment sub, this joint enables the lower toolstring to be hung off on the BOP slip rams. The locking swivel joint can then be made up to the toolstring. Pulling the coupling back, tightening the set screw, and disengaging the clutch readies the upper toolstring for makeup.



Locking swivel joint

Hydraulic Indexing Tool

Full 360° rotation for optimal maneuverability

Applications

- Fishing and washover operations on CT
- Sidetracking operations on CT

Advantage

- Hydraulic actuation for optimal performance
- 360° rotation in 30° increments

The hydraulic indexing tool facilitates axial orientation of a toolstring to maneuver past obstructions such as a fish or ledge. Its hydraulic actuation improves BHA compatibility and permits 360° rotation in 12, staged increments.

Hydraulic Indexing Tool Specifications

Tool size, in	Torque at 1,500 psi, ft.lbf	Tool length, in	Maximum tensile load, kips	Minimum actuating pressure, psi
1 ¹ / ₁₆	100	45	65	200
2 ¹ / ₄	125	45	70	200
3	510	56	135	200



Hydraulic indexing tool

Hydraulic Bowspring Centralizer

Collapsible springs for easier retrieval of toolstring

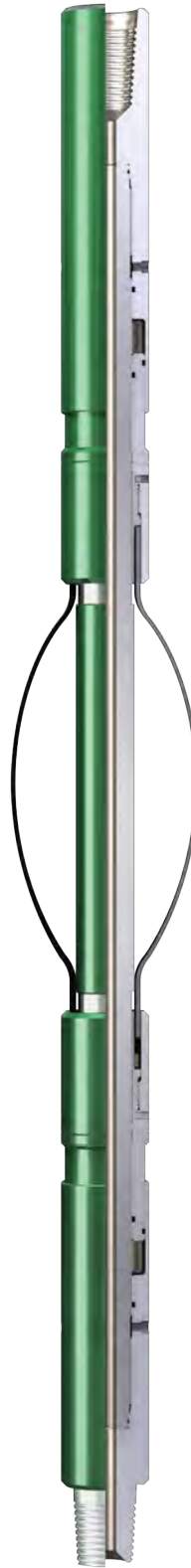
Applications

- Stabilization of toolstring for fishing, cutting, milling, underreaming, and washover operations
- Centralization of toolstring in deviated wellbores

Advantages

- Springs that expand and lock at preset diameter
- Springs that collapse with pressure interruption
- Adjustable sleeve for expansion of spring to accommodate various casing sizes

The hydraulic bowspring centralizer's springs are activated by hydraulic pressure. This enables selective toolstring centralization below wellbore restrictions or to facilitate passage through production tubing for centralization inside the casing below the tubing.



Hydraulic bowspring centralizer

Mechanical Bowspring Centralizer

Actuation without diverting hydraulic circulation

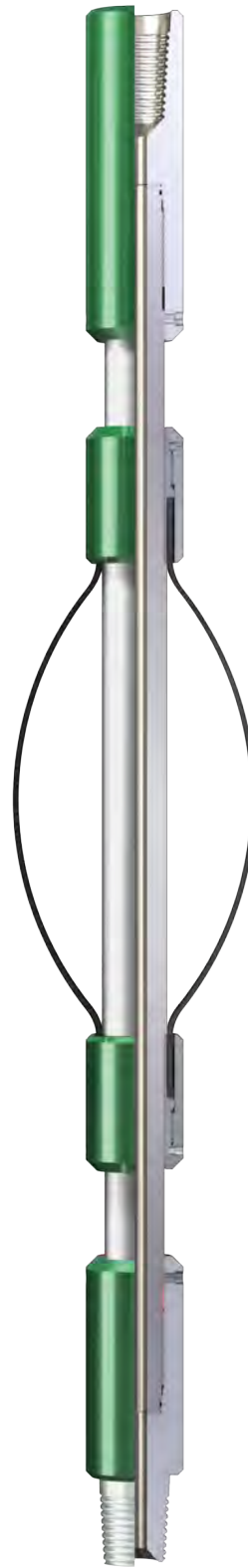
Applications

- Stabilization of toolstring for fishing, cutting, milling, underreaming, and washover operations
- Centralization of assemblies that require unrestricted hydraulic circulation
- Centralization of toolstring in deviated wellbores

Advantages

- Retractable springs
- Large through-bore for maintaining circulation to tools below the centralizer

The mechanical bowspring centralizer's springs retract to enable toolstring centralization below wellbore restrictions or to facilitate passage through production tubing for centralization inside the casing below the tubing. With automatic mechanical actuation of the centralizer springs, there is no diversion of hydraulic circulation from the equipment below the centralizer.



Mechanical bowspring centralizer

Motor Head Assembly

Integrated components to reduce assembly length

Applications

- CT applications with downhole motors

Advantages

- 30% shorter than individual components
- High torque and vibration capacity
- Multiple options for tubing connectors
- Flapper cartridges tested to 68,900 kPa and 204 degC [10,000 psi at 400 degF]
- Large bore to permit high circulation rates
- Easy assembly and disassembly to reduce wellsite tool inventory

The motor head assembly combines a dual-flapper check valve, hydraulic disconnect, dual circulating sub, and emergency rupture disc into one compact, heavy-duty component. The assembly has a large bore for high flow rates and is designed to withstand vibration and torsional stress over extended periods of operation.

Internal and external fishing necks promote ease of retrieval. Assembly design isolates shear pins from treatment and wellbore fluids and protects them from jarring and bending moments.



Motor head assembly



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