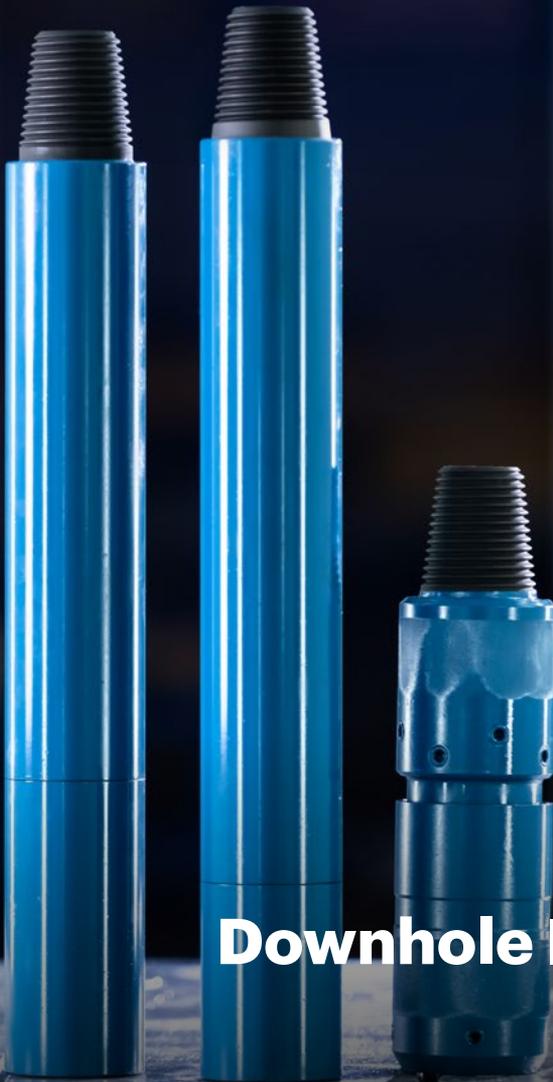


TerraTECH Coiled Tubing Tools



Downhole | 



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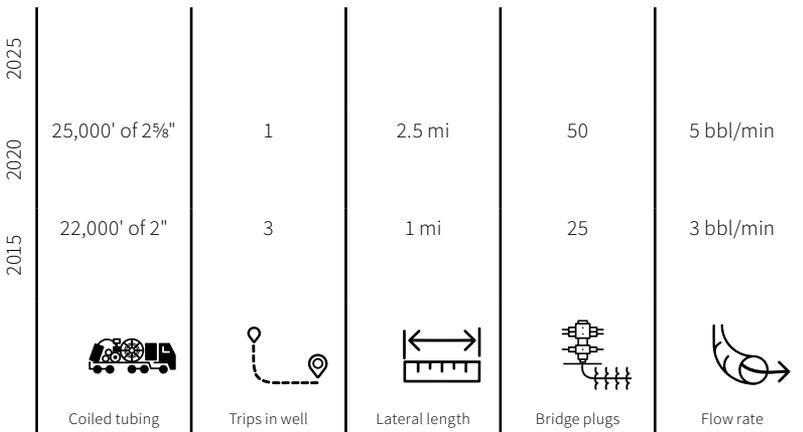
Tool

Keeping it reel.

The unconventional's unrelenting thirst for efficiency continues to challenge us to develop new technologies that enable coiled tubing to remain the safest and most efficient method of post-frac well cleanouts.

Spurred by the never-ending push for longer and longer laterals, the past 10 years have delivered the most dramatic transformation in the 80-year history of the coiled tubing industry. Long laterals have challenged the oil and gas industry to continuously develop new technologies at an unprecedented pace.

A coiled tubing unit's size is often measured by the amount of the largest pipe that it can carry. In 2015, a unit carrying 22,000 feet of 2 in. coil was considered a capable unit. By 2020, to effectively reach the depth of today's unconventional laterals, a unit must often carry closer to 25,000 feet of 2½ in. coil. All aspects of the well manufacturing process have had to become bigger, faster, lighter, stronger, or—like a 2 in. coiled tubing unit that carries 22,000 feet of coiled tubing—be quickly rendered obsolete and replaced with new technology.



TerraTech Coiled Tubing Tools

As the single most crucial downhole tool in the history of the world's unconventional, the NOV Agitator™ tool has played a critical role in providing access to longer laterals by continuing to break friction and get cleanout BHAs to the furthest limits of these wellbores. Like everything else, today's TerraPULSE™ Agitator extended reach tool (ERT) bears little resemblance to our leading Agitator technology in 2015. The TerraPULSE ERT delivers the exponentially higher energy necessary to reach total depth in longer laterals consistently.



Our overall R&D strategy revolves around reliability. We focus on developing tools that continuously improve in both durability and performance. In the pursuit of pushing our TerraPULSE Agitator technology to help reach greater depths, we inherently exposed weak points in the typical coiled tubing cleanout BHAs. Our TerraPULSE ERT's ability to provide efficient access to additional footage of the wellbore is unhelpful if the reliability of the other BHA components suffers. The TerraTECH line of coiled tubing tools is designed to withstand the harsh conditions BHAs are exposed to when reaching total depth in long laterals

Learn more about
TerraPulse CT Agitator



We are committed to continuing to push the boundaries on efficient access to the world's longest laterals.

TerraDRILL Motors



Our new TerraDRILL™ motors are offered as either an oil sealed or mud lube bearing assembly. This line of coiled tubing motors is engineered to perform reliably with extended reach technology such as the TerraPULSE™ extended reach tools. The new TerraDRILL motors are designed to exceed the requirements from wells with long laterals and difficult wellbore profiles. These motors deliver improved performance and reliability in virtually any milling application and perform reliably when run with our TerraPULSE ERTs.

Oil sealed

- Premium alloys
- Heavy duty roller bearings & races
- Longer flex shaft and integral straight housing
- Integral flex sub
- Surface indicator motor catch system
- Enhanced assembly tools

Mud lube

- Premium alloys
- Heavy duty ball bearings & races
- Longer flex shaft and integral straight housing
- Integral flex sub
- Simple flow restrictors
- Surface indicator motor catch system
- Mandrel catch system

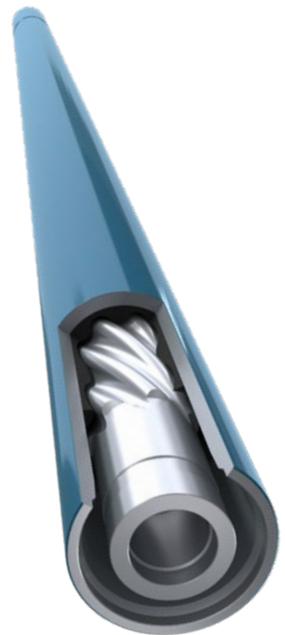
Part No.	Tool OD	Lube type	Connections	Service tool kits	Seal kits	Pull to Yield	Static Yield Torque	Length
287-48C-10	2 7/8"	Oil sealed	2 3/4" PAC	287-48C-T0	287-48C-S0	197,520 lbs	2,000 ft-lbs	69.7"
287-44-10	2 7/8"	Mud lubed	2 3/4" PAC	287-44-T0	287-44-S0	144,501 lbs	2,000 ft-lbs	58.7"
313-48C-10	3 1/8"	Oil sealed	2 3/4" REG	313-48C-T0	313-48C-S0	231,048 lbs	2,500 ft-lbs	77.5"
313-44-10	3 1/8"	Mud lubed	2 3/4" REG	313-44-T0	287-44-S0	173,087 lbs	2,500 ft-lbs	67.7"



ReliaTECH Power Sections

Our industry has significantly altered the fluid systems used in the completions process in the world's unconventional wellbores over the past 10 years. Additives like friction reducers and lubricants must be accounted for as they impact elastomer performance. As we extensively tested our TerraDRILL™ motors and TerraPULSE™ Agitator™ extended reach tools, we needed to make sure we adapted by raising the bar on power section performance and reliability.

ReliaTECH™ power sections were developed in part as a recognition that the downhole environment has changed. By re-engineering our facilities, workflows, processes and materials, we have closed the gap with our new ReliaTECH line of power sections. New bonding systems, new elastomers, higher strength steel, and more stringent controls within our manufacturing have produced the best performing product that we've ever made.



TerraLINK Coiled Tubing Connectors



Our TerraLINK™ slip-type coiled tubing connector is the solution for reliable performance in applications that generate high torsional and tensile loads. Developed with the latest material technologies and extensively tested to ensure world-class reliability in the world's most demanding applications. The rugged design of the TerraLINK connector helps reduce the overall cost of ownership through improved wear resistance of its components.

Available with a wide variety of ODs and pin connections to accommodate most jobs without the need for crossovers.

Part no.	CT size	ToolOD	ToolID	Service	Connection	Pressure rating	Service kit*
621-350	1¼"	1⅞"	0.750"	Standard	1" AMMT	10 KPSI	621-350-RDK
621-400	1¼"	1⅞"	0.750"	Sour	1" AMMT	10 KPSI	621-350-RDK
622-350	1½"	2⅞"	1.000"	Standard	1½" AMMT	10 KPSI	622-350-RDK
622-550	1½"	2⅞"	1.000"	Sour	1½" AMMT	10 KPSI	622-350-RDK
623-300	1¾"	3⅞"	1.000"	Standard	1½" AMMT	10 KPSI	623-300-RDK
623-350	1¾"	3⅞"	1.000"	Sour	1½" AMMT	10 KPSI	623-300-RDK
634-300	2"	2⅞"	1.375"	Standard	2⅞" PAC	10 KPSI	634-300-RDK
634-500	2"	2⅞"	1.375"	Sour	2⅞" PAC	10 KPSI	634-300-RDK
635-350	2⅝"	3⅞"	1.000"	Standard	2⅞" REG	10 KPSI	635-350-RDK
635-450	2⅝"	3⅞"	1.000"	Sour	2⅞" REG	10 KPSI	635-350-RDK
636-250	2⅝"	3½"	1.000"	Standard	2⅞" REG	10 KPSI	636-250-RDK
636-300	2⅝"	3½"	1.000"	Sour	2⅞" REG	10 KPSI	636-250-RDK

*Includes Slip

TerraSEAL Twin Flapper Check Valves

The byproduct of larger and larger coiled tubing strings has been higher and higher volume requirements. Higher flow rates through the same size tools exponentially increases the effects of erosion. Erosion can have devastating consequences as it can eventually damage the check valve's integrity and ultimately leave you vulnerable to the well's pressure.

Additionally, the high-frequency pressure pulses generated by today's extended reach tools can induce fluttering that introduces cyclical fatigue to the flapper valve's mechanical components. Engineered to withstand the rigors of today's high-pulsating flow environment, the TerraSEAL™ Twin Flapper Check Valves provides you long-lasting reliability in today's more demanding applications.



Part no.	Tool OD	Tool ID	Length	Connection	Pressure rating	Service	Flapper cartridge	Redress kit
C165-004-08	1 ¹ / ₄ "	.656"	12.0"	1" AMMT	10 KPSI	Standard	C165-152	C165-004-08/KS
C165-008-08	1 ¹ / ₄ "	.656"	12.0"	1" AMMT	10 KPSI	Sour	C165-152	C165-004-08/KS
C165-003-09	2 ³ / ₈ "	.781"	17.2"	1 ¹ / ₂ " AMMT	10 KPSI	Standard	C165-162	C165-003-09/KS
C165-007-09	2 ³ / ₈ "	.781"	17.2"	1 ¹ / ₂ " AMMT	10 KPSI	Sour	C165-162	C165-003-09/KS
C165-002-23	2 ⁷ / ₈ "	1.00"	19.6"	2 ³ / ₈ " PAC	10 KPSI	Standard	C165-161	C165-002-23/KS
C165-006-23	2 ⁷ / ₈ "	1.00"	19.6"	2 ³ / ₈ " PAC	10 KPSI	Sour	C165-161	C165-002-23/KS
C165-001-10	3 ¹ / ₈ "	1.00"	20.6"	2 ³ / ₈ " REG	10 KPSI	Standard	C165-163	C165-001-10/KS
C165-005-10	3 ¹ / ₈ "	1.00"	20.6"	2 ³ / ₈ " REG	10 KPSI	Sour	C165-163	C165-001-10/KS

TerraLOK Hydraulic Disconnects



As the heart of any coiled tubing BHA, the hydraulic disconnect must provide a joint that can reliably disconnect from the BHA should the need arise. When a BHA becomes stuck, the disconnect offers a means to release everything run below it so the coiled tubing can be retrieved from the wellbore and appropriate measures can be taken to fish or retrieve the obstruction from the wellbore.

Disconnect failures are occurring more frequently worldwide as the industry subjects BHAs to higher loads generated from today's anti-friction, milling, and jarring tools, in addition to larger and stronger coiled tubing strings.

The patented design of the TerraLOK™ disconnect eliminates what has often been the source of failures in the past—the castellation design used to carry torque loads. The TerraLOK disconnect's patented collapsible thread design provides a joint as strong as any threaded connection throughout the BHA. This tool has been thoroughly tested and qualified for reliable performance in the most extreme jarring and milling applications that often subject the disconnect to extreme cyclical loading that eventually leads to failure in many inferior designs.

Part no.	ToolOD	ToolID	Connection	Length	Pressure rating	Service	Ball size	Fish neck/GS	Redress kit	Assy Tool
C567-006-08	1 1/16"	.390"	1" AMMT	19.2"	10 KPSI	Standard	1/2"	2" GS	C567-006-08/KS	12-39581
C567-012-08	1 1/16"	.390"	1" AMMT	19.2"	10 KPSI	Sour	1/2"	2" GS	C567-006-08/KS	12-39581
C567-007-09	2 7/8"	.560"	1 1/2" AMMT	20.5"	10 KPSI	Standard	1 1/16"	2 1/2" GS	C567-007-09/KS	12-39482
C567-011-09	2 7/8"	.560"	1 1/2" AMMT	20.5"	10 KPSI	Sour	1 1/16"	2 1/2" GS	C567-007-09/KS	12-39482
C567-008-23	2 7/8"	.650"	2 3/8" PAC	21.3"	10 KPSI	Standard	1 1/16"	3" GS	C567-008-23/KS	12-39470
C567-010-23	2 7/8"	.650"	2 3/8" PAC	21.3"	10 KPSI	Sour	1 1/16"	3" GS	C567-008-23/KS	12-39470
C567-005-42	3 1/8"	.700"	2 3/8" Reg	21.0"	10 KPSI	Standard	3/4"	3 1/2" GS	C567-005-42/KS	12-39391
C567-009-42	3 1/8"	.700"	2 3/8" Reg	21.0"	10 KPSI	Sour	3/4"	3 1/2" GS	C567-005-42/KS	12-39391

TerraFLO Dual Activated Circ-Subs

Designed to withstand the rigors of today's demanding applications, the TerraFLO™ Dual Activated Circ-Sub has been thoroughly tested to ensure reliable actuation when needed. The circ-sub can be used to isolate and allow pumping of fluids to the annulus that might typically damage any equipment run below the circ-sub. When actuated, the overall flow area is increased, allowing for higher flow rates (for a given pressure) to be achieved, improving annular velocity and overall hole-cleaning capabilities.

In addition to drop-ball functionality, the TerraFLO circ-sub can also be activated at a predetermined pressure via a burst-disc if the BHA has become plugged off and loses the ability to circulate.



MHA Rupture Disc Assembly (8mm)

Part Number	Rupture Pressure
PO-49418	3,000 psi
PO-49399	4,000 psi
PO-49400	15,000 psi
PO-49401	6,000 psi
PO-49402	7,500 psi
PO-49586	8,000 psi
PO-49587	8,500 psi
PO-49588	9,000 psi
PO-49602	10,000 psi

Part no.	Tool OD	Tool ID	Connection	Length	Pressure rating	Service	Ball size	Redress kit
C416-006-08	1 1/16"	.312"	1" AMMT	8.3"	10 KPSI	Standard	3/8"	C416-006-08/KS
C416-010-08	1 1/16"	.312"	1" AMMT	8.3"	10 KPSI	Sour	3/8"	C416-006-08/KS
C416-009-09	2 1/8"	.450"	1 1/2" AMMT	8.5"	10 KPSI	Standard	1/2"	C416-009-09/KS
C416-003-09	2 1/8"	.450"	1 1/2" AMMT	8.5"	10 KPSI	Sour	1/2"	C416-009-09/KS
C416-008-23	2 7/8"	.563"	2 3/8" PAC	9.2"	10 KPSI	Standard	5/8"	C416-008-23/KS
C416-011-23	2 7/8"	.563"	2 3/8" PAC	9.2"	10 KPSI	Sour	5/8"	C416-008-23/KS
C416-007-42	3 1/8"	.625"	2 3/8" REG	9.6"	10 KPSI	Standard	1 1/16"	C416-007-42/KS
C416-012-42	3 1/8"	.625"	2 3/8" REG	9.6"	10 KPSI	Sour	1 1/16"	C416-007-42/KS

TerraFUSE Motorhead Assemblies



While modularity of the TerraTech™ line provides flexibility when designing your overall BHA, we combined the technology and reliability of each of the individual components to design the TerraFUSE™ motorhead assembly (MHA) to provide even greater reliability and performance. The TerraFUSE MHA incorporates each of the individual tools (TerraSEAL™ Twin Flapper Check Valve, TerraLOK™ Hydraulic Disconnect and TerraFLO™ Dual Activated Circ-Sub) into a short, compact assembly that removes connections from the BHA and drives additional efficiency in BHA make-up and break-down operations.

MHA Rupture Disc Assembly (8mm)	
Part Number	Rupture Pressure
PO-49418	3,000 psi
PO-49399	4,000 psi
PO-49400	15,000 psi
PO-49401	6,000 psi
PO-49402	7,500 psi
PO-49586	8,000 psi
PO-49587	8,500 psi
PO-49588	9,000 psi
PO-49602	10,000 psi

Part no.	Tool OD	Tool ID	Connection	Length	Pressure rating	Service	Disconnect ball size	Circ-sub ball size	Redress kit	Assy Tool
C425-015-08	1 1/16"	.312"	1" AMMT	36.6"	10 KPSI	Standard	1/2"	3/8"	C425-015-08/KS	12-39581
C425-016-08	1 1/16"	.312"	1" AMMT	36.6"	10 KPSI	Sour	1/2"	3/8"	C425-015-08/KS	12-39581
C425-012-09	2 1/8"	.450"	1 1/2" AMMT	42.6"	10 KPSI	Standard	1 1/16"	1/2"	C425-012-09/KS	12-39482
C425-013-09	2 1/8"	.450"	1 1/2" AMMT	42.6"	10 KPSI	Sour	1 1/16"	1/2"	C425-012-09/KS	12-39482
C425-010-23	2 7/8"	.563"	2 3/8" PAC	40.6"	10 KPSI	Standard	1 1/16"	5/8"	C425-010-23/KS	12-39470
C425-011-23	2 7/8"	.563"	2 3/8" PAC	40.6"	10 KPSI	Sour	1 1/16"	5/8"	C425-010-23/KS	12-39470
C425-004-42	3 1/8"	.625"	2 3/8" Reg	47"	10 KPSI	Standard	3/4"	1 1/16"	C425-004-42/KS	12-39391
C425-014-42	3 1/8"	.625"	2 3/8" Reg	47"	10 KPSI	Sour	3/4"	1 1/16"	C425-004-42/KS	12-39391

I-Stroke Impact Hammers

The I-Stroke™ Impact Hammer produces high impact loads in either an upward or downward direction. The tool will not activate unless force is applied and can be run as an up-impacting, a down-impacting or a bi-directional impacting configuration. It is activated by flow and low compression, or tension load. A full-bore ID allows ball-activated tools to be run below the I-Stroke hammer. Acid and H²S resistant materials ensure the I-Stroke hammer is safe to be used in common stimulation applications. A patented valve mechanism makes stalling impossible and ideal for applications like shifting sliding sleeves, shearing pins, breaking glass discs, fishing operations, or any other applications where high-frequency impacts are beneficial.



TerraTech Coiled Tubing Tools



ToolOD	ToolID	Connection	Drop ball	Service	Impact force	Frequency
2 1/8"	0.55"	1 1/2" AMMT	1/2"	Sour	21-37 klbs	10-15 impacts/sec

Tool	Part no.	Tensile yield strength	Torsional yield strength	Burst pressure	Max. operating pressure	Max temp	Max flow rate
Single lock-down tool	EZ-111117	48,000 lbf	Swivel	9,700 psi	3,000 psi	300°F	79 gpm
Bi-directional tool	EZ-118514	48,000 lbf	Swivel	9,700 psi	3,000 psi	300°F	79 gpm
Bumper sub	EZ-116739	43,000 lbf	Swivel	10,000 psi	3,000 psi	300°F	79 gpm
Up hammer	EZ-110921	43,000 lbf	800 ft-lb	8,600 psi	3,000 psi	300°F	13-79 gpm
Down hammer	EZ-110812	43,000 lbf	800 ft-lb	8,600 psi	3,000 psi	300°F	13-79 gpm

BHA configuration	Assembly no.	Components
Up hammering	EZ-160500	Bumper sub → Up acting hammer → Bi-directional tool
Down hammering	EZ-160497	Bumper sub → Single lock down tool → Down acting hammer
Bi-directional hammering	EZ-156641	Bumper sub → Up acting hammer → Bi-directional tool → Down acting hammer

Bowen TerraFORCE Jars

The Bowen™ TerraFORCE™ jar is a bi-directional hydraulic jarring assembly designed to operate in conjunction with the NOV coiled tubing jar intensifier. This jar's unique design allows for easy, dependable, hard-hitting operation with no setting or adjustment required before going in the hole or during operation. The assembly allows the operator to easily control the intensity of jarring impacts by varying the applied load.

The jar can deliver a wide range of impacts, from low to very high impact and impulse forces. Our unique, robust spline design increases torque capability and transfers stresses away from critical jarring components. The downstroke has been optimized for a shorter overall tool length, making this tool ideal for milling applications or fishing applications where up jarring is the primary requirement.

To complement the TerraFORCE jar, we have designed a jar placement program for customers to use that calculates placement for optimal impacts at the stuck point.

Find our proprietary NOV Jar Placement Program here:

tools.nov.com/JarPlacementProgram/



Part no.	Tool OD	Tool ID	Connection	Length	Stroke	Service	Seal kit	Max temp	Max Overpull / Overpush	Tensile yield	Torque
506562/005	1 1/16"	3/16"	1" AMMT	50.8"	10.2"	Standard Hi-temp	507261/010 507261/060	250°F	11,000 lbs	60,500 lbs	1,140 ft-lbs
508818/005	2 7/8"	1"	2 3/8" PAC	63.5"	10.3"	Standard Hi-temp	506476/010 506476/060	250°F 400°F	32,000 lbs	195,000 lbs	4,100 ft-lbs
507055/005	3 1/8"	1"	2 3/8" Reg	58.5"	10.3"	Standard Hi-temp	507074/010 507074/060	250°F 400°F	50,000 lbs	280,000 lbs	7,384 ft-lbs



Located just north of Houston, Texas, NOV's Surface Lateral is a 20,000 foot, above-ground wellbore that provides an unparalleled proving-ground for validating the performance of our R&D developments. This R&D investment ensures our new tools are optimized and ready to be deployed before commercialization.

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