Coiled Tubing Tools

NOV Wellbore Technologies

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NOV is the largest independent downhole tool and equipment provider in the world. We have the expertise to optimize your bottomhole assembly (BHA) selection and performance, supporting over 150 locations in more than 80 countries.

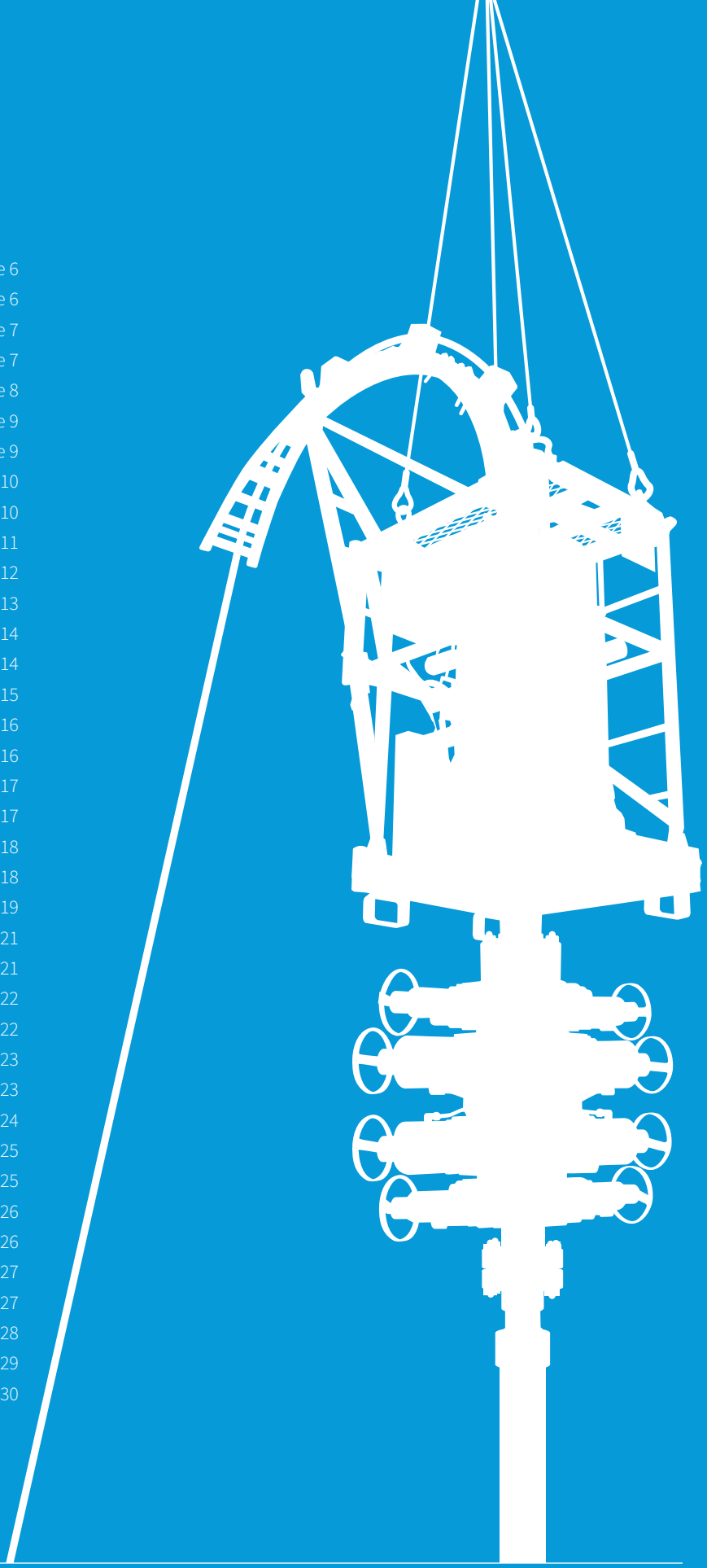
Our complete range of solutions for the BHA and related equipment includes:

- Coiled tubing tools
- Fishing tools
- Drill bits
- Drilling motors
- Borehole enlargement
- Drilling tools and products
- Coring services
- Service equipment
- Advanced drilling solutions

We take pride in delivering superior performance and reliability. Our objective is to exceed our customers' expectations, improve their economics and become an integral part of their strategies.

Worldwide Locations

Primary Tools



Primary Tools

Slim Line Dimple / Slip Connector

External combination dimple and slip connectors are the solution for high torque and tensile loads.

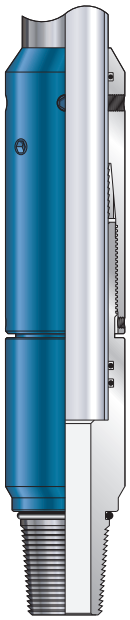
Drilling, fishing, and completion work is ideal for these premium connectors.

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

A slim line series of connectors accommodate tight IDs or nipple systems for coiled tubing applications.

Features and Benefits

- High tensile strength
- High torsional strength
- Internal pressure seal
- Replaceable hardened slips



Slim Line Dimple / Slip Connector

Full Size Dimple / Slip Connector

External combination dimple and slip connectors are the solution for high torque and tensile loads.

Drilling, fishing, and completion work are ideal for these premium connectors.

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

Full size connectors will provide extra strength where the OD of the connector is not critical.

Features and Benefits

- High tensile strength
- High torsional strength
- Internal pressure seal
- Replaceable slips

Full Size Dimple / Slip Connector

Slim Line Dimple / Slip Connector Technical Specifications

Part Number	CT Size	OD	ID	Service	Connection	Length	Service Kits	Pressure Rating	Min Temp Rating	Max Temp Rating	Tensile Strength	Torque Maxx
621-050	1 ¼"	1.687"	0.812"	H^2S	1" AMMT	8.00"	621-000-RDK	5,000 PSI	-20°F	300°F	35,000 lbs	350 ft-lbs
622-200	1 ½"	2.125"	0.750"	H^2S	1" AMMT	7.50"	622-200-RDK	5,000 PSI	-20°F	300°F	41,000 lbs	450 ft-lbs
623-100	1 ¾"	2.375"	1"	H^2S	1 ½" AMMT	7.25"	623-100-RDK	5,000 PSI	-20°F	300°F	77,000 lbs	1,050 ft-lbs
624-050	2"	2.875"	1.250"	H^2S	2 ⅜" PAC	10.75"	624-050-RDK	5,000 PSI	-20°F	300°F	160,000 lbs	1,600 ft-lbs
622-250	1 ½"	2.125"	1"	H^2S	1 ½" AMMT	7.50"	622-250-RDK	5,000 PSI	-20°F	300°F	77,000 lbs	1,050 ft-lbs

Full Size Dimple / Slip Connector Technical Specifications

Part Number	CT Size	OD	ID	Service	Connection	Length	Service Kits	Pressure Rating	Min Temp Rating	Max Temp Rating	Tensile Strength	Torque Max
632-050	1½"	2.875"	1.125"	H^2S	2 ⅜" PAC	14.250"	632-050-RDK	5,000 PSI	-20°F	300°F	160,000 lbs	2,900 ft-lbs
633-050	1¾"	2.875"	1.250"	H^2S	2 ⅜" PAC	13.750"	633-050-RDK	5,000 PSI	-20°F	300°F	140,000 lbs	2,900 ft-lbs
634-050	2"	2.875"	1.250"	H^2S	2 ⅜" PAC	14.000"	634-050-RDK	5,000 PSI	-20°F	300°F	84,000 lbs	2,500 ft-lbs
634-100	2"	2.875"	1"	H^2S	1 ½" AMMT	14.375"	634-100-RDK	5,000 PSI	-20°F	300°F	77,000 lbs	1,050 ft-lbs
632-150	1 ½"	3.125"	1.250"	H^2S	2 ⅜" REG	14.250"	632-150-RDK	5,000 PSI	-20°F	300°F	160,000 lbs	2,900 ft-lbs
635-150	2 ⅜"	3.375"	1"	H^2S	2 ⅜" PAC	14.500"	635-150-RDK	5,000 PSI	-20°F	300°F	98,000 lbs	3,000 ft-lbs
635-200	2 ⅜"	3.375"	1"	H^2S	2 ⅜" REG	14.000"	635-200-RDK	5,000 PSI	-20°F	300°F	98,000 lbs	3,000 ft-lbs
636-000	2 ⅞"	4.750"	2.25"	H^2S	3 ½" IF	16.500"	636-000-RDK	5,000 PSI	-20°F	300°F	217,000 lbs	6,800 ft-lbs
636-200	2 ⅞"	4.750"	2.44"	H^2S	2 ⅞" EUE	16.500"	636-000-RDK	5,000 PSI	-20°F	300°F	116,000 lbs	2,250 ft-lbs
637-000	3 ½"	4.750"	2.69"	H^2S	3 ½" IF	16.500"	637-000-RDK	5,000 PSI	-20°F	300°F	212,000 lbs	6,800 ft-lbs

Slimconnect External Slip Connector

The Slimconnect external slip connector allows the attachment of coiled tubing to the CT tool work string via the provision of a threaded connection.

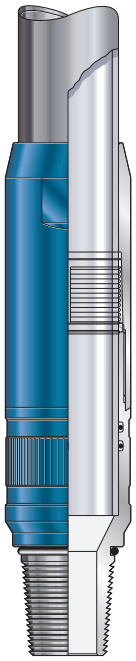
The Slimconnect connector has an OD that is smaller than a standard external slip connector. This enables the Slimconnect connector to be used in operations where the coiled tubing is to be run through a restricted ID.

The design of the Slimconnect connector utilizes a set of helical slips that grip the tubing in a wedging action. This increase in tension results in increased grip.

The external slip type connectors have O-ring pressure seals as standard equipment.

Features and Benefits

- High tensile strength for size
- Slimline body OD
- Internal pressure seal
- Replaceable slips



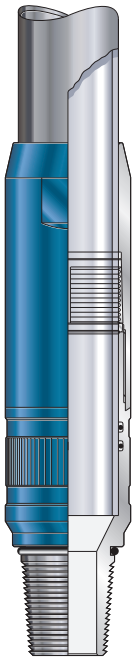
Slimconnect External Slip Connector

External Slip Connector

External slip connectors work the same way as the Slimconnect external slip connectors, but offer a larger OD for additional strength.

Features and Benefits

- High tensile strength
- Internal pressure seal
- Replaceable slips



External Slip Connector

Slimconnect External Slip Connector Technical Specifications

Part Number	Tool Size	CT Size	OD	ID	Service	Bottom Connection	Length	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength	Torque
C206-001-08	1 1/16"	1 ¼"	1.687"	¾"	STD	1" AMMT Pin	6"	C206-001-08/KS	5,000 PSI	0°F	350°F	25,000 lbs	205 ft-lbs
C206-002-08	1 15/16"	1 ½"	1.937"	¾"	STD	1" AMMT Pin	6"	C206-002-08/KS	5,000 PSI	0°F	350°F	32,000 lbs	246 ft-lbs
C206-003-09	2 3/16"	1 ¾"	2.188"	1"	STD	1 ½" AMMT Pin	6"	C206-003-09/KS	5,000 PSI	0°F	350°F	37,000 lbs	258 ft-lbs
C206-005-09	2 1/16"	1 ½"	2.062"	1"	H^2S	1 ½" AMMT Pin	5.75"	C206-005-09/KS	5,000 PSI	0°F	350°F	32,000 lbs	246 ft-lbs

External Slip Connector Technical Specifications

Part Number	CT Size	OD	ID	Service	Connection	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength	Max Torque
C403-212-150-09	1 ½"	2.125"	1"	STD	1 ½" AMMT	C403-212-150-09/KS	10,000 PSI	0°F	450°F	67,000 lbs	1,300 ft-lbs
C403-237-175-09	1 ½"	2.375"	1"	STD	1 ½" AMMT	C403-237-175-09/KS	10,000 PSI	0°F	450°F	72,000 lbs	1,600 ft-lbs
C403-287-175-23	1 ¾"	2.875"	1.38"	STD	2 ⅜" PAC	C403-287-175-23/KS	10,000 PSI	0°F	450°F	72,000 lbs	2,000 ft-lbs
C403-287-200-23	2"	2.875"	1.38"	STD	2 ⅜" PAC	C403-287-200-23/KS	10,000 PSI	0°F	450°F	72,000 lbs	1,600 ft-lbs
C403-312-237-23	2 ⅜"	3.125"	1.38"	STD	2 ⅜" PAC	C403-312-237-23/KS	10,000 PSI	0°F	450°F	144,000 lbs	2,000 ft-lbs
611-050	1 ¼"	1.950"	¾"	H^2S	1¾" AMMT	611-050-RDK	5,000 PSI	-20°F	300°F	32,800 lbs	300 ft-lbs
612-050	1 ½"	2.625"	¾"	H^2S	1¾" AMMT	612-050-RDK	5,000 PSI	-20°F	300°F	32,800 lbs	400 ft-lbs
613-100	1 ¾"	2.875"	¾"	H^2S	1¾" AMMT	613-100-RDK	5,000 PSI	-20°F	300°F	32,800 lbs	400 ft-lbs
614-150	2"	3.125"	1"	H^2S	1 ½" AMMT	614-150-RDK	5,000 PSI	-20°F	300°F	61,600 lbs	650 ft-lbs
615-050	2 ⅜"	3.375"	1.375"	H^2S	2 ⅜" PAC	615-000-RDK	5,000 PSI	-20°F	300°F	101,600 lbs	930 ft-lbs
C203-005-24	2"	2.875"	1.25"	H^2S	2 ⅜" PAC DSI	C203-005-24/KS	5,000 PSI	0°F	350°F	80,000 lbs	1,600 ft-lbs
C203-013-24	1 ¾"	2.875"	1.25"	H^2S	2 ⅜" PAC DSI	C203-013-24/KS	5,000 PSI	0°F	350°F	84,000 lbs	2,000 ft-lbs

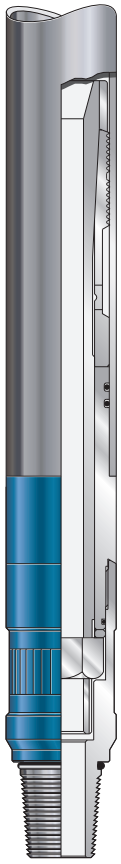
Internal Slip Connector

Unlike existing slip connectors, the Internal Slip Connector does not rely on grub screws to transmit torque from the toolstring through to the coiled tubing. This feature is provided through a unique non-rotational slip arrangement providing high bi-directional torque resistance. The slip is positively engaged into the bottom sub via drive teeth, therefore transmitting any rotational torque from the toolstring directly to the pipe.

The basic installation to the coiled tubing does not require any specialized tooling or make-up torque. The connector is simply fitted to the pipe and an overpull taken to test and set the connector.

The Internal Slip Connector also has only 4 main components and includes an enclosed lock nut feature to prevent the connector from being jarred free from the pipe.

Both Internal and External versions of the Slip Connector feature an interchangeable service connection sub allowing the operator to easily change from one thread connection to another.



Internal
Slip Connector

Features and Benefits

- High tensile strength
- Internal pressure seal
- Replaceable slips

Internal Slip Connector Technical Specifications

Part Number	CT Size	OD	ID	Service	Connection	Length	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
C203-007-08	1 ½"	1.687"	0.687"	H^2S	1" AMMT Pin	10 ½"	C203-007-08/KS	5000 PSI	0°F	350°F	18,000 lbs
C203-014-08	1 ½"	1.687"	0.687"	H^2S	1" AMMT Pin	10 ½"	C203-014-08/KS	5000 PSI	0°F	350°F	18,000 lbs
C203-015-08	1 ½"	1.687"	0.687"	H^2S	1" AMMT Pin	10 ½"	C203-015-08/KS	5000 PSI	0°F	350°F	18,000 lbs
C203-020-08	1 ½"	1.687"	0.687"	H^2S	1" AMMT Pin	10 ½"	C203-020-08/KS	5000 PSI	0°F	350°F	18,000 lbs
C203-030-09	1 ½"	2.25"	0.687"	H^2S	1 ½" AMMT Pin	10 ½"	C203-030-09/KS	5000 PSI	0°F	350°F	33,900 lbs
C203-037-08	1 ½"	1.687"	0.687"	H^2S	1" AMMT Pin	10 ¾"	C203-037-08/KS	5000 PSI	0°F	350°F	18,000 lbs
C203-035-09	1 ½"	2.00"	0.687"	H^2S	1 ½" AMMT Pin	10 ¾"	C203-035-09/KS	5000 PSI	0°F	350°F	18,000 lbs
C203-036-08	1 ¾"	1.750"	0.687"	H^2S	1" AMMT Pin	10 ½"	C203-036-08/KS	5000 PSI	0°F	350°F	23,000 lbs
C203-040-09	1 ¾"	2.25"	0.687"	H^2S	1 ½" AMMT Pin	10 ½"	C203-040-09/KS	5000 PSI	0°F	350°F	30,000 lbs
C203-044-08	1 ¾"	1.750"	0.625"	H^2S	1" AMMT Pin	10 ½"	C203-044-08/KS	5000 PSI	0°F	350°F	18,000 lbs
C203-041-09	2"	2.25"	0.900"	H^2S	1 ½" AMMT Pin	11"	C203-041-09/KS	5000 PSI	0°F	350°F	40,000 lbs
C203-041-23	2"	2.875"	0.900"	H^2S	2 ⅜" PAC Pin	11"	C203-041-23/KS	5000 PSI	0°F	350°F	40,000 lbs
C203-045-09	2"	2.00"	0.900"	H^2S	1 ½" AMMT Pin	11"	C203-045-09/KS	5000 PSI	0°F	350°F	40,000 lbs
C203-048-09	2"	2.25"	0.900"	H^2S	1 ½" AMMT Pin	11"	C203-048-09/KS	5000 PSI	0°F	350°F	40,000 lbs

Sleeved Dimple Connector

The sleeved dimple connector is ideal for coiled tubing drilling applications, as the connector already has an excellent track record in many deep and difficult wellbores. Installation is simple and does not require special tools, resulting in a very secure connection. This allows high tensile, compressive and torsional loads to be applied.

The tool is available with various pin thread connections and can also be ordered in a slimline configuration that reduces the OD for certain applications.

Features and Benefits

- High tensile strength
- High torsional strength
- Internal pressure seal
- Easy makeup

Sleeved Dimple Connector

Dimple Connector

For quickly latching onto the coil while still benefiting from all the torque and tensile features, this dimple connector is simple and popular with operators. 16 large-knurled point set screws and dual poly pack seals make this connector a premium one.

Easy to install with or without dimple applicator or special tools.

Features and Benefits

- High tensile strength
- High torsional strength
- Easy makeup

Dimple Connector

Sleeved Dimple Connector Technical Specifications

Part Number	CT Size	OD	ID	Service	Connection	Length	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength	Torque Max	Applicator P.N.
605-1175	2 ⅜"	3.50"	1"	H^2S	2 ⅜" REG	18"	605-1175-RDK	5,000 PSI	-20°F	300°F	157,000 lbs	3,800 ft-lbs	605-300
606-3188-400	2 ⅞"	4.00"	1"	H^2S	2 ⅜" REG	19.125"	606-3188-400-RDK	5,000 PSI	-20°F	300°F	206,000 lbs	3,800 ft-lbs	606-300-APL

Dimple Connector Technical Specifications

Part Number	CT Size	OD	ID	Service	Connection	Length	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength	Torque Max
601-062	1 ¼"	1.750"	0.750"	H^2S	1" AMMT	6"	601-062-RDK	5,000 PSI	-20°F	300°F	28,000 lbs	450 ft-lbs
602-055	1 ½"	2.125"	0.750"	H^2S	1 ½" AMMT	6.50"	602-000-RDK	5,000 PSI	-20°F	300°F	28,000 lbs	1,050 ft-lbs
602-063	1 ½"	2.875"	1.125"	H^2S	2 ⅜" PAC	6.75"	602-063-RDK	5,000 PSI	-20°F	300°F	28,000 lbs	1,300 ft-lbs
603-062	1 ¾"	2.875"	1.125"	H^2S	2 ⅜" PAC	7.75"	603-062-RDK	5,000 PSI	-20°F	300°F	43,000 lbs	2,350 ft-lbs
603-054	1 ¾"	3.125"	1"	H^2S	2 ⅜" REG	7.25"	603-054-RDK	5,000 PSI	-20°F	300°F	43,000 lbs	2,350 ft-lbs
604-056	2"	3.375"	1.500"	H^2S	2 ⅜" PAC	8"	604-000-RDK	5,000 PSI	-20°F	300°F	79,000 lbs	3,250 ft-lbs
605-053	2 ⅜"	3.375"	1"	H^2S	2 ⅜" PAC	7.75"	605-053-RDK	5,000 PSI	-20°F	300°F	79,000 lbs	3,250 ft-lbs
605-054	2 ⅜"	3.375"	1.125"	H^2S	2 ⅜" REG	7"	605-053-RDK	5,000 PSI	-20°F	300°F	79,000 lbs	3,800 ft-lbs
608-054	2 ⅝"	3.375"	1.125"	H^2S	2 ⅜" REG	7"	608-054-RDK	5,000 PSI	-20°F	300°F	79,000 lbs	3,800 ft-lbs
606-067	2 ⅞"	3.500""	1.125"	H^2S	2 ⅜" REG	7"	606-067-RDK	5,000 PSI	-20°F	300°F	79,000 lbs	3,800 ft-lbs
606-065	2 ⅞"	3.750"	1.125"	H^2S	2 ⅜" REG	7.50"	606-053-RDK	5,000 PSI	-20°F	300°F	79,000 lbs	3,800 ft-lbs
606-053	2 ⅞"	3.875"	1.125"	H^2S	2 ⅜" REG	7"	606-053-RDK	5,000 PSI	-20°F	300°F	79,000 lbs	3,800 ft-lbs
604-055	2"	2.875"	1"	H^2S	1 ½" AMMT	7"	604-055-RDK	5,000 PSI	-20°F	300°F	77,000 lbs	1,050 ft-lbs
602-062	1 ½"	2.125"	0.750"	H^2S	1" AMMT	7"	602-062-RDK	5,000 PSI	-20°F	300°F	28,000 lbs	450 ft-lbs
601-055	1 ¼"	1.750"	0.750"	H^2S	1 ¼" AMMT	7.75"	601-055-RDK	5,000 PSI	-20°F	300°F	28,000 lbs	700 ft-lbs
605-062	2 ⅜"	3.625"	1"	H^2S	2 ⅜" PAC	7.75"	605-062-RDK	5,000 PSI	-20°F	300°F	79,000 lbs	3,250 ft-lbs

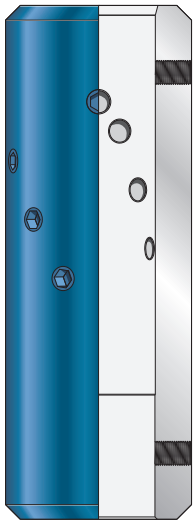
Internal Dimple Connector

The internal dimple connector has a slim line OD with a minimal change to ID. High tensile and torque loads are key features, making application to coil is easy, convenient, and positive. The outer dimple sleeve can be added as an option.

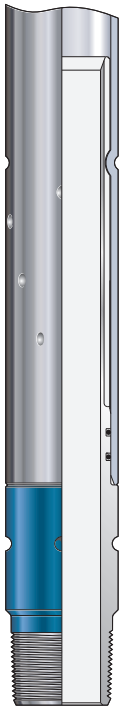
Optionally, an outer dimple sleeve may be added.

Features and Benefits

- High tensile strength
- High torsional strength
- Easy makeup



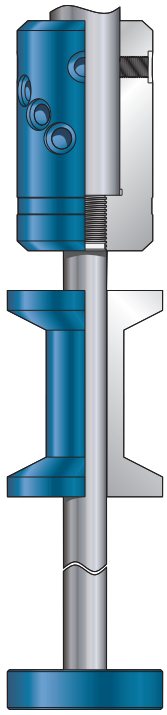
Dimple Tool



Internal Dimple Connector

Dimple Applicator

The dimple applicator is used to accurately produce the indentations in the coiled tubing wall by screwing the round headed cap screws into the dimple applicator. Installation and removal of the applicator is aided by the slide hammer.



Dimple Applicator

Internal Dimple Connector Technical Specifications

Part Number	CT Size	CT Wall Thickness	OD	Service	Connection	Length	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength	Torque Max
606-2188-15AMTP	2 ⅞"	0.188"	2.875"	H^2S	1 ½" AMMT	14.25"	606-2188-15AMTP-RDK	5,000 PSI	-20°F	300°F	71,000 lbs	1,050 ft-lbs
606-2188-23PAP	2 ⅞"	0.188"	2.875"	H^2S	2 ⅜" PAC	14"	606-2188-23PAP-RDK	5,000 PSI	-20°F	300°F	163,000 lbs	3,250 ft-lbs
607-2224-23REGP	3 ½"	0.244"	3.490"	H^2S	2 ⅜" REG	14"	607-2224-23REGP-RDK	5,000 PSI	-20°F	300°F	241,000 lbs	3,800 ft-lbs
609-2188-23REGP	3 ½"	0.188"	3.250"	H^2S	2 ⅜" REG	14"	609-2188-23REGP-RDK	5,000 PSI	-20°F	300°F	185,000 lbs	3,800 ft-lbs

Dimple Applicator Technical Specifications

Part Number	Coiled Tubing Size	OD	ID	Length	Service Kits	Hammer Part Number
640-051	1 ¼"	3.170"	1.290"	7.25"	640-000-RDK	655-000
641-051	1 ½"	3.420"	1.540"	7.25"	640-000-RDK	655-000
642-051	1 ¾"	3.680"	1.780"	7.25"	640-000-RDK	655-000
643-051	2"	3.930"	2.030"	7.25"	640-000-RDK	655-000
644-051	2 ⅜"	4.290"	2.390"	7.25"	640-000-RDK	655-000
647-051	2 ⅝"	4.460"	2.650"	7.25"	640-000-RDK	655-000
645-051	2 ⅞"	4.710"	2.900"	7.25"	640-000-RDK	655-000
646-051	3 ½"	5.335"	3.525"	7.25"	640-000-RDK	655-000

Roll-On x Thread Connector

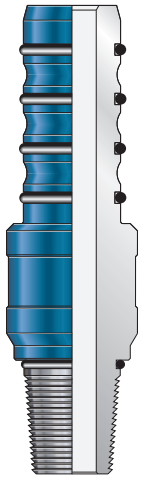
The roll-on connector allows the attachment of coiled tubing to the CT tool/work string via a threaded connection.

Featuring triple roll-on grooves and multiple seal points, this connector is easy to install, reliable and practical.

The roll-on crimping tool is available to aid in installing the connector the coiled tubing.

Features and Benefits

- Available for all CT sizes and wall thicknesses.
- Available with pin or box connections



Roll-On x Thread Connector

Roll-On x Thread Connector Technical Specifications

Part Number	CT Size	OD	ID	Wall	Service	Connection	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Crimper Wheel
7095-12RO-10MTP-AS	1 ¼"	1.560"	0.625"	0.095"	H^2S	1" AMMT Pin	7095-12RO-10MTP-RDK	5,000 PSI	-30°F	250°F	00-20598
7095-15RO-10MTP-AS	1 ¼"	1.687"	0.690"	0.095"	H^2S	1" AMMT Pin	7095-15RO-10MTP-RDK	5,000 PSI	-30°F	250°F	00-20598
7102-12RO-10MTP-AS	1 ¼"	1.562"	0.500"	0.102"	H^2S	1" AMMT Pin	7102-12RO-10MTP-RDK	5,000 PSI	-30°F	250°F	00-20598
7109-12RO-10MTP-AS	1 ¼"	1.250"	0.500"	0.109"	H^2S	1" AMMT Pin	7109-12RO-10MTP-RK	5,000 PSI	-30°F	250°F	00-20598
7109-15RO-10MTP-AS	1 ½"	1.687"	0.625"	0.109"	H^2S	1" AMMT Pin	7109-15RO-10MTP-RDK	5,000 PSI	-30°F	250°F	00-20598
7109-15RO-15MTP-AS	1 ½"	1.687"	0.690"	0.109"	H^2S	1 ½" AMMT Pin	7109-15RO-15MTP-RDK	5,000 PSI	-30°F	250°F	00-20598
7109-17RO-10MTP-AS	1 ¾"	1.750"	0.765"	0.109"	H^2S	1" AMMT Pin	7109-17RO-10MTP-RDK	5,000 PSI	-30°F	250°F	00-20598
7109-20RO-15MTP-AS	2"	2"	1"	0.109"	H^2S	1 ½" AMMT Pin	7109-20RO-15MTP-RDK	5,000 PSI	-30°F	250°F	00-27338
7118-12RO-10MTP-AS	1 ¼"	1.500"	0.500"	0.118"	H^2S	1" AMMT Pin	7118-12RO-10MTP-RDK	5,000 PSI	-30°F	250°F	00-20598
7125-12RO-10MTP-AS	1 ¼"	1.750"	0.500"	0.125"	H^2S	1" AMMT Pin	7125-12RO-10MTP-RDK	5,000 PSI	-30°F	250°F	00-20598
7125-15RO-10MTP-AS	1 ½"	1.560"	0.750"	0.125"	H^2S	1" AMMT Pin	7125-15RO-10MTP-RDK	5,000 PSI	-30°F	250°F	00-20598
7125-15RO-15MTP-AS	1 ½"	2.125"	0.780"	0.125"	H^2S	1 ½" AMMT Pin	7125-15RO-15MTP-RDK	5,000 PSI	-30°F	250°F	00-20598
7125-17RO-15MTP-AS	1 ¾"	2"	0.828"	0.125"	H^2S	1 ½" AMMT Pin	7125-17RO-15MTP-RDK	5,000 PSI	-30°F	250°F	00-20598
7134-20RO-15MTP-AS	2"	2"	1"	0.134"	H^2S	1 ½" AMMT Pin	7134-20RO-15MTP-RDK	5,000 PSI	-30°F	250°F	00-27338
7134-23RO-23PAP-AS	2 ⅜"	2.750"	1.250"	0.134"	H^2S	2 ⅜" PAC Pin	7134-23RO-23PAP-RDK	5,000 PSI	-30°F	250°F	00-27338
7145-20RO-15MTP-AS	2"	2"	1"	0.145"	H^2S	1 ½" AMMT Pin	7145-20RO-15MTP-RDK	5,000 PSI	-30°F	250°F	00-27338
7156-17RO-10MTP-AS	1 ¾"	1.750"	0.750"	0.156"	H^2S	1" AMMT Pin	7156-17RO-10MTP-RDK	5,000 PSI	-30°F	250°F	00-20598
7156-17RO-12MTP-AS	1 ¾"	1.750"	0.750"	0.156"	H^2S	1 ¼" AMMT Pin	7156-17RO-12MTP-RDK	5,000 PSI	-30°F	250°F	00-20598
7156-20RO-10MTP-AS	2"	2"	0.750"	0.156"	H^2S	1" AMMT Pin	7156-20RO-10MTP-RDK	5,000 PSI	-30°F	250°F	00-27338
7156-20RO-15MTP-AS	2"	2"	1"	0.156"	H^2S	1 ½" AMMT Pin	7156-20RO-15MTP-RDK	5,000 PSI	-30°F	250°F	00-27338
7175-23RO-15MTP-AS	2 ⅜"	2.375"	1"	0.175"	H^2S	1 ½" AMMT Pin	7175-23RO-15MTP-RDK	5,000 PSI	-30°F	250°F	00-27338
7102-15RO-10MTP-AS	1 ½"	1.560"	0.750"	0.102"	H^2S	1" AMMT Pin	7102-15RO-10MTP-RDK	5,000 PSI	-30°F	250°F	00-20598
7109-17RO-15MTP-AS	1 ¾"	2"	0.750"	0.109"	H^2S	1 ½" AMMT Pin	7109-17RO-15MTP-RDK	5,000 PSI	-30°F	250°F	00-20598
7156-15RO-10MTP-AS	1 ½"	1.560"	0.750"	0.156"	H^2S	1" AMMT Pin	7156-15RO-10MTP-RDK	5,000 PSI	-30°F	250°F	00-20598
7175-15RO-10MTP-AS	1 ½"	1.560"	0.750"	0.175"	H^2S	1" AMMT Pin	7175-15RO-10MTP-RDK	5,000 PSI	-30°F	250°F	00-20598

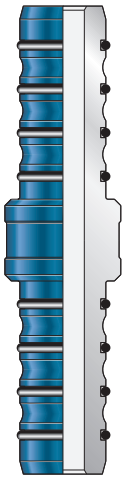
Roll-On x Roll-On Connector (Same Size Coiled Tubing)

The roll-on x roll-on connector aids in specialty work where joining two pieces of tubing is required.

Featuring triple roll-on grooves and quadruple seal points, this connector is easy to install, reliable and very practical.

The roll-on crimping tool is available to aid in installing the connector to the coiled tubing.

Contact an NOV Sales Representative for part number and technical data.



Roll-On x Roll-On Connector (Same Size Coiled Tubing)

Features and Benefits

- Internal pressure seal
- Easy makeup
- Available for all sizes of CT and wall thickness

Roll-On x Roll-On Connector (Same Size Coiled Tubing) Technical Specifications

Part Number	CT Size	OD	ID	Service	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating
7087-75RO-75RO-AS	¾"	¾"	1 3/64"	H^2S	7087-75RO-75RO-RDK	5000 PSI	-30°F	250°F
7095-75RO-75RO-AS	¾"	¾"	1 3/64"	H^2S	7095-75RO-75RO-RDK	5000 PSI	-30°F	250°F
7087-10RO-10RO-AS	1"	1"	5/16"	H^2S	7087-10RO-10RO-RDK	5000 PSI	-30°F	250°F
7095-10RO-10RO-AS	1"	1"	5/16"	H^2S	7095-10RO-10RO-RDK	5000 PSI	-30°F	250°F
7109-10RO-10RO-AS	1"	1"	5/16"	H^2S	7109-10RO-10RO-RDK	5000 PSI	-30°F	250°F
7080-12RO-12RO-AS	1 ¼"	1 ¼"	½"	H^2S	7080-12RO-12RO-RDK	5000 PSI	-30°F	250°F
7087-12RO-12RO-AS	1 ¼"	1 ¼"	5/8"	H^2S	7087-12RO-12RO-RDK	5000 PSI	-30°F	250°F
7095-12RO-12RO-AS	1 ¼"	1 ¼"	5/8"	H^2S	7095-12RO-12RO-RDK	5000 PSI	-30°F	250°F
7109-12RO-12RO-AS	1 ¼"	1 ¼"	½"	H^2S	7109-12RO-12RO-RDK	5000 PSI	-30°F	250°F
7125-12RO-12RO-AS	1 ¼"	1 ¼"	½"	H^2S	7125-12RO-12RO-RDK	5000 PSI	-30°F	250°F
7190-12RO-12RO-AS	1 ¼"	1 ¼"	7/16"	H^2S	7190-12RO-12RO-RDK	5000 PSI	-30°F	250°F
7095-15RO-15RO-AS	1 ½"	1 ½"	1 3/16"	H^2S	7095-15RO-15RO-RDK	5000 PSI	-30°F	250°F
7109-15RO-15RO-AS	1 ½"	1 ½"	1 3/16"	H^2S	7109-15RO-15RO-RDK	5000 PSI	-30°F	250°F
7125-15RO-15RO-AS	1 ½"	1 ½"	¾"	H^2S	7125-15RO-15RO-RDK	5000 PSI	-30°F	250°F
7156-15RO-15RO-AS	1 ½"	1 ½"	5/8"	H^2S	7156-15RO-15RO-RDK	5000 PSI	-30°F	250°F
7190-15RO-15RO-AS	1 ½"	1 ½"	37/64"	H^2S	7190-15RO-15RO-RDK	5000 PSI	-30°F	250°F
7095-17RO-17RO-AS	1 ¾"	1 ¾"	7/8"	H^2S	7095-17RO-17RO-RDK	5000 PSI	-30°F	250°F
7109-17RO-17RO-AS	1 ¾"	1 ¾"	7/8"	H^2S	7109-17RO-17RO-RDK	5000 PSI	-30°F	250°F
7125-17RO-17RO-AS	1 ¾"	1 ¾"	7/8"	H^2S	7125-17RO-17RO-RDK	5000 PSI	-30°F	250°F
7134-17RO-17RO-AS	1 ¾"	1 ¾"	7/8"	H^2S	7134-17RO-17RO-RDK	5000 PSI	-30°F	250°F
7156-17RO-17RO-AS	1 ¾"	1 ¾"	1 3/16"	H^2S	7156-17RO-17RO-RDK	5000 PSI	-30°F	250°F
7190-17RO-17RO-AS	1 ¾"	1 ¾"	¼"	H^2S	7190-17RO-17RO-RDK	5000 PSI	-30°F	250°F
7109-20RO-20RO-AS	2"	2"	1 ¼"	H^2S	7109-20RO-20RO-RDK	5000 PSI	-30°F	250°F
7118-20RO-20RO-AS	2"	2"	1"	H^2S	7118-20RO-20RO-RDK	5000 PSI	-30°F	250°F
7125-20RO-20RO-AS	2"	2"	1 ¼"	H^2S	7125-20RO-20RO-RDK	5000 PSI	-30°F	250°F
7134-20RO-20RO-AS	2"	2"	1 ¼"	H^2S	7134-20RO-20RO-RDK	5000 PSI	-30°F	250°F
7145-20RO-20RO-AS	2"	2"	1"	H^2S	7145-20RO-20RO-RDK	5000 PSI	-30°F	250°F
7156-20RO-20RO-AS	2"	2"	1"	H^2S	7156-20RO-20RO-RDK	5000 PSI	-30°F	250°F
7190-20RO-20RO-AS	2"	2"	1"	H^2S	7190-20RO-20RO-RDK	5000 PSI	-30°F	250°F
7134-23RO-23RO-AS	2 3/8"	2 3/8"	1 1/8"	H^2S	7134-23RO-23RO-RDK	5000 PSI	-30°F	250°F
7156-23RO-23RO-AS	2 3/8"	2 3/8"	1 1/8"	H^2S	7156-23RO-23RO-RDK	5000 PSI	-30°F	250°F
7188-23RO-23RO-AS	2 3/8"	2 3/8"	1 1/8"	H^2S	7188-23RO-23RO-RDK	5000 PSI	-30°F	250°F
7204-23RO-23RO-AS	2 3/8"	2 3/8"	1 1/8"	H^2S	7204-23RO-23RO-RDK	5000 PSI	-30°F	250°F
7134-26RO-26RO-AS	2 5/8"	2 5/8"	33/64"	H^2S	7134-26RO-26RO-RDK	5000 PSI	-30°F	250°F
7190-26RO-26RO-AS	2 5/8"	2 5/8"	1 1/8"	H^2S	7190-26RO-26RO-RDK	5000 PSI	-30°F	250°F

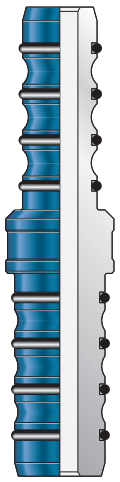
Roll-On x Roll-On Connector (Different Size Coiled Tubing)

The roll-on x roll-on connector aids in specialty work where joining two different sizes of tubing is required.

Featuring triple roll-on grooves and quadruple seal points, this connector is easy to install, reliable and very practical.

The roll-on crimping tool is available to aid in installing the connector to the coiled tubing.

Note: High temperature seals available upon request



Roll-On x Roll-On Connector (Different Size Coiled Tubing)

Features and Benefits

- Internal pressure seal
- Easy makeup
- Available for all sizes of CT and wall thickness

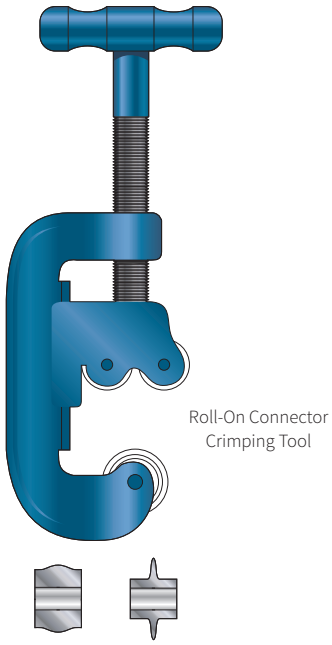
Roll-On x Roll-On Connector (Different Size Coiled Tubing) Technical Specifications

Part Number	CT Size	Wall	OD	ID	CT Size	Wall	Service	Operating Pressure	Min Temp Rating	Max Temp Rating
7000-10RO080-10RO087-AS	1"	0.080"	1"	5/16"	1"	0.087"	H2S	5,000 PSI	-30°F	250°F
7000-10RO087-10RO095-AS	1"	0.087"	1"	5/16"	1"	0.095"	H2S	5,000 PSI	-30°F	250°F
7000-12RO080-12RO087-AS	1 1/4"	0.080"	1 1/4"	5/8"	1 1/4"	0.087"	H2S	5,000 PSI	-30°F	250°F
700-12RO190-12RO087-AS	1 1/4"	0.087"	1 1/4"	7/16"	1 1/4"	0.190"	H2S	5,000 PSI	-30°F	250°F
700-12RO095-12RO109-AS	1 1/4"	0.095"	1 1/4"	1/2"	1 1/4"	0.109"	H2S	5,000 PSI	-30°F	250°F
700-12RO102-12RO109-AS	1 1/4"	0.102"	1 1/2"	1/2"	1 1/4"	0.109"	H2S	5,000 PSI	-30°F	250°F
700-12RO109-12RO125-AS	1 1/4"	0.109"	1 1/4"	1/2"	1 1/4"	0.125"	H2S	5,000 PSI	-30°F	250°F
700-15RO109-15RO125-AS	1 1/2"	0.109"	1 1/2"	3/4"	1 1/2"	0.125"	H2S	5,000 PSI	-30°F	250°F
700-17RO190-17RO175-AS	1 3/4"	0.175"	1 3/4"	1/4"	1 3/4"	0.190"	H2S	5,000 PSI	-30°F	250°F
7095-75RO-10RO-AS	3/4"	0.095"	1"	13/64"	1"	0.095"	H2S	5,000 PSI	-30°F	250°F
700-10RO095-12RO109-AS	1"	0.095"	1 1/4"	5/16"	1 1/4"	0.109"	H2S	5,000 PSI	-30°F	250°F
7109-10RO-12RO-AS	1"	0.109"	1 1/4"	5/16"	1 1/4"	0.109"	H2S	5,000 PSI	-30°F	250°F
7000-10RO087-15RO109-AS	1"	0.087"	1 1/2"	5/16"	1 1/2"	0.109"	H2S	5,000 PSI	-30°F	250°F
7000-10RO109-17RO095-AS	1"	0.109"	1 3/4"	1/4"	1 3/4"	0.095"	H2S	5,000 PSI	-30°F	250°F
7000-10RO095-17RO109-AS	1"	0.095"	1 3/4"	1/4"	1 3/4"	0.109"	H2S	5,000 PSI	-30°F	250°F
7109-10RO-17RO-AS	1"	0.109"	1 3/4"	1/4"	1 3/4"	0.109"	H2S	5,000 PSI	-30°F	250°F
7095-12RO-15RO-AS	1 1/4"	0.095"	1 1/2"	1/2"	1 1/2"	0.095"	H2S	5,000 PSI	-30°F	250°F
7109-12RO-15RO-AS	1 1/4"	0.109"	1 1/2"	33/64"	1 1/2"	0.109"	H2S	5,000 PSI	-30°F	250°F
700-12RO095-15RO109-AS	1 1/4"	0.095"	1 1/2"	41/64"	1 1/2"	0.109"	H2S	5,000 PSI	-30°F	250°F
700-12RO087-17RO109-AS	1 1/4"	0.087"	1 3/4"	1/2"	1 3/4"	0.109"	H2S	5,000 PSI	-30°F	250°F
700-15RO109-17RO175-AS	1 1/2"	0.109"	1 3/4"	5/8"	1 3/4"	0.175"	H2S	5,000 PSI	-30°F	250°F
700-15RO109-17RO190-AS	1 1/2"	0.109"	1 3/4"	5/8"	1 3/4"	0.190"	H2S	5,000 PSI	-30°F	250°F
700-15RO087-17RO109-AS	1 1/2"	0.095"	1 3/4"	5/8"	1 3/4"	0.109"	H2S	5,000 PSI	-30°F	250°F
7109-15RO-17RO-AS	1 1/2"	0.109"	1 3/4"	49/64"	1 3/4"	0.109"	H2S	5,000 PSI	-30°F	250°F
700-15RO125-17RO134-AS	1 1/2"	0.125"	1 3/4"	5/8"	1 3/4"	0.134"	H2S	5,000 PSI	-30°F	250°F
7095-15RO-17RO-AS	1 1/2"	0.095"	1 3/4"	13/16"	1 3/4"	0.095"	H2S	5,000 PSI	-30°F	250°F
700-15RO156-20RO109-AS	1 1/2"	0.156"	2"	3/8"	2"	0.109"	H2S	5,000 PSI	-30°F	250°F
7095-20RO-15RO-AS	1 1/2"	0.095"	2"	25/32"	2"	0.095"	H2S	5,000 PSI	-30°F	250°F
700-20RO190-17RO140-AS	1 3/4"	0.140"	2 1/8"	1"	2"	0.190"	H2S	5,000 PSI	-30°F	250°F
700-20RO175-17RO140-AS	1 3/4"	0.140"	2 1/8"	1"	2"	0.175"	H2S	5,000 PSI	-30°F	250°F
7109-17RO-20RO-AS	1 3/4"	0.109"	2"	7/8"	2"	0.109"	H2S	5,000 PSI	-30°F	250°F
700-17RO125-20RO190-AS	1 3/4"	0.125"	2 3/16"	13/16"	2"	0.190"	H2S	5,000 PSI	-30°F	250°F
700-12RO087-15RO125-AS	1 1/4"	0.087"	1 1/2"	5/8"	1 1/2"	0.125"	H2S	5,000 PSI	-30°F	250°F
700-12RO095-17RO109-AS	1 1/4"	0.095"	1 3/4"	1/2"	1 3/4"	0.109"	H2S	5,000 PSI	-30°F	250°F
700-10RO087-17RO109-AS	1"	0.087"	1 3/4"	1/2"	1 3/4"	0.109"	H2S	5,000 PSI	-30°F	250°F

Roll-On Connector Crimping Tool

The roll-on connector crimping tool ensures easy field installation of the roll-on connector to the coiled tubing.

The crimping tool has two interchangeable wheels, one of which is used to swage the coiled tubing onto the roll-on connector. The other is a cutting wheel which can be used to cut the coiled tubing.



Roll-On Connector Crimping Tool

Roll-On Connector Crimping Tool Technical Specifications

Part Number	Tubing Size Range
C160-040	1" x 2"
C160-291	1" x 3"
C160-292	2" x 4"

Roll-On Connector Crimping and Cutting Tool Technical Specifications

Part Number	Tubing Size Range
P0-17792	1" x 2"
P0-17610	1" x 3"
P0-49047	2" x 4"

Crimping Wheel Technical Specifications

Part Number	Radius	Tubing Size Range
00-27338	1/8"	1 5/8"
00-30739	3/16"	1 5/8"
00-20598	1/8"	1 1/4"
00-34586	7/32"	1 1/4"
00-34621	5/64"	1 1/4"

Internal Tubing Bead Removal Tool

The internal tubing bead removal tool is a useful service tool that is used to remove the weld bead found on the internal bore of the coiled tubing. This is achieved by locating the slot on the weld bead and then rotating the tool using a suitable pipe wrench to break the weld.

The tool has particular application in the preparation of coiled tubing that uses roll-on and internal slip type connectors.

Internal Tubing Bead Removal Tool Technical Specifications

Part Number	CT Size	Wall
00-27480	1 1/4"	0.087"
00-25486	1 1/4"	0.095"
00-25359	1 1/4"	0.109"
00-35535	1 1/4"	0.118"
00-35951	1 1/4"	0.125"
00-31866	1 1/4"	0.134"
00-27481	1 1/2"	0.095"
00-25452	1 1/2"	0.109"
00-35525	1 1/2"	0.118"
00-16547	1 1/2"	0.125"
00-35352	1 1/2"	0.134"
00-34969	1 1/2"	0.156"
00-33747	1 1/2"	0.175"
00-16020	1 3/4"	0.109"
00-34970	1 3/4"	0.125"
00-35913	1 3/4"	0.134"
00-39668	1 3/4"	0.145"
00-33704	1 3/4"	0.156"
00-38097	1 3/4"	0.175"
00-25185	2"	0.109"
00-36615	2"	0.125"
00-36931	2"	0.145"
00-20994	2"	0.156"
00-36932	2"	0.175"
00-26136	1 3/8"	0.156"
00-36821	2 3/8"	0.175"
00-38018	2 3/8"	0.203"
00-36723	2 3/8"	0.203"
00-36933	2 3/8"	0.175"

Twin Flapper Check Valve

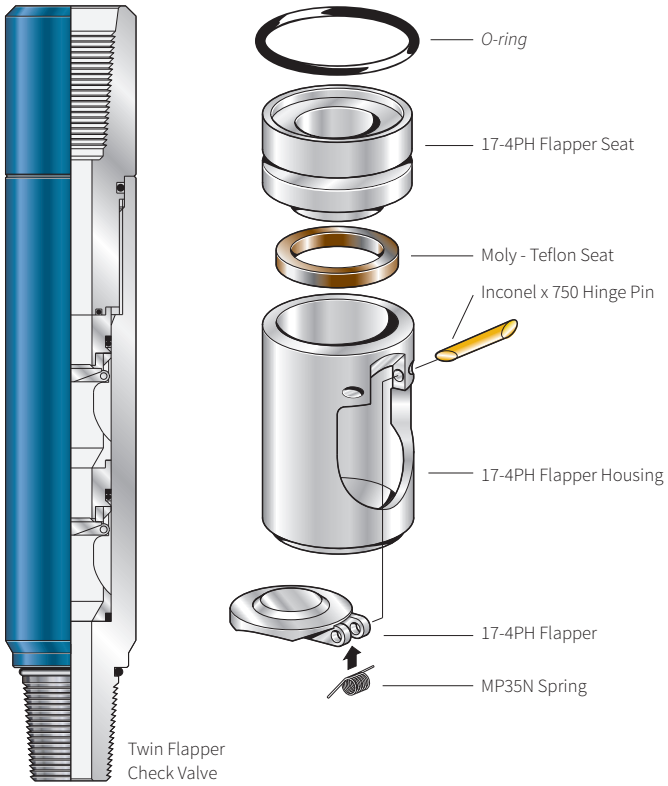
The twin flapper check valve is a standard coiled tubing string component. It provides a means of preventing the back flow of well fluids into the coiled tubing.

The design of the twin flapper check valve incorporates a dual sealing system in each flapper assembly for increased safety. A non-stick seal provides the primary low pressure seal, while at higher pressure the flapper seals into a metal-to-metal arrangement.

Maximum flow area through the flapper cartridges reduces unnecessary back pressure on the surface pumps. The flow path through the flapper cartridges does not restrict the passage of balls or darts if required during operations such as cementing.

Features and Benefits

- Full flow through bore
- Dual sealing in each flapper cartridge (low pressure seat/seal and high pressure full metal-to-metal seat/seal)
- Full bore fluid passage for balls, darts and plugs
- Removable flapper cartridges



Twin Flapper Check Valve Technical Specifications

Part Number	Size	OD	ID	Service	Connections	Length	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength	Flapper Cartridge Part Number	Flapper Cartridge OD
C165-072-08	1 1 1/16"	1.687"	0.750"	STD	1" AMMT Box x Pin	13.75"	C165-072-08/KS	5,000 PSI	0°F	350°F	52,380 lbs	C165-008	1.365"
C165-033-09	2 1/8"	2.125"	0.890"	STD	1 1/2" AMMT Box x Pin	12.75"	C165-033-09/KS	5,000 PSI	0°F	350°F	92,230 lbs	C165-014	1.511"
C165-019-23	2 7/8"	2.875"	1.375"	STD	2 3/8" PAC Box x Pin	15.00"	C165-019-23/KS	5,000 PSI	0°F	350°F	140,000 lbs	C165-010	2.240"
C165-023-10	3 1/8"	3.125"	1"	STD	2 3/8" REG Box x Pin	15.00"	C165-023-10/KS	5,000 PSI	0°F	350°F	162,000 lbs	C165-010	2.240"
C165-127-08	1 1/2"	1.500"	0.500"	H^2S	1" AMMT Box x Pin	8.00"	C165-127-08/KS	5,000 PSI	0°F	350°F	33,628 lbs	C165-004	0.933"
C165-076-08	1 1 1/16"	1.687"	0.750"	H^2S	1" AMMT Box x Pin	13.75"	C165-076-08/KS	5,000 PSI	0°F	350°F	37,662 lbs	C165-008	1.365"
C165-066-08	1 3/4"	1.750"	0.750"	H^2S	1" AMMT Box x Pin	13.50"	C165-066-08/KS	5,000 PSI	0°F	350°F	48,310 lbs	C165-008	1.365"
C165-129-09	2"	2.000"	0.890"	H^2S	1 1/2" AMMT Box x Pin	11.75"	C165-129-09/KS	5,000 PSI	0°F	350°F	55,200 lbs	C165-014	1.511"
C165-067-09	2 1/8"	2.125"	0.890"	H^2S	1 1/2" AMMT Box x Pin	12.00"	C165-067-09/KS	5,000 PSI	0°F	350°F	61,160 lbs	C165-014	1.511"
C165-082-09	2 1/4"	2.250"	1.030"	H^2S	1 1/2" AMMT Box x Pin	13.25"	C165-082-09/KS	5,000 PSI	0°F	350°F	51,150 lbs	C165-009	1.803"
C165-083-09	2 3/8"	2.375"	1.032"	H^2S	1 1/2" AMMT Box x Pin	14.50"	C165-083-09/KS	5,000 PSI	0°F	350°F	60,185 lbs	C165-009	1.803"
C165-106-23	2 7/8"	2.875"	1.375"	H^2S	2 3/8" PAC Box x Pin	16.50"	C165-106-23/KS	5,000 PSI	0°F	350°F	93,380 lbs	C165-010	2.240"
C165-084-23	3 1/8"	3.125"	1.375"	H^2S	2 3/8" PAC Box x Pin	15.75"	C165-084-23/KS	5,000 PSI	0°F	350°F	108,000 lbs	C165-010	2.240"
C165-122-08	1 1 1/16"	1.687"	0.687"	STD	1" AMMT Box x Pin	11.00"	C165-122-08/KS	10,000 PSI	0°F	350°F	38,800 lbs	C165-115	1.310"
C165-113-09	2 1/8"	2.125"	0.890"	STD	1 1/2" AMMT Box x Pin	12.25"	C165-113-09/KS	10,000 PSI	0°F	350°F	64,000 lbs	C165-087	1.514"
C165-142-09	2 3/8"	2.375"	0.687"	H^2S	1 1/2" AMMT Box x Pin	14.50"	C165-142-09/KS	10,000 PSI	0°F	350°F	47,700 lbs	C165-117	1.803"
C165-151-23	2 7/8"	2.875"	1.375"	STD	2 3/8" PAC Box x Pin	17.50"	C165-151-23/KS	10000 PSI	0°F	350°F	141,600 lbs	C165-098	1.400"
C411-313-2-23	3.125"	3.125"	1.375"	H^2S	2 3/8" PAC Box x Pin	15.75"	C411-313-2-23/KS	10000 PSI	0°F	350°F	130,500 lbs	C410-224-2	1.375"
C165-019-24	2.875"	2.875"	1.400"	STD	2 3/8" PAC DSI Box x Pin	17.50"	C165-019-24/KS	5000 PSI	0°F	350°F	141,600 lbs	C165-010	2.240"
C165-084-24	3.125"	3.125"	1.400"	H^2S	2 3/8" PAC DSI Box x Pin	16"	C165-084-24/KS	5000 PSI	0°F	350°F	112,400 lbs	C165-010	2.240"

Twin Flapper Check Valve with Lock-Out Sleeve

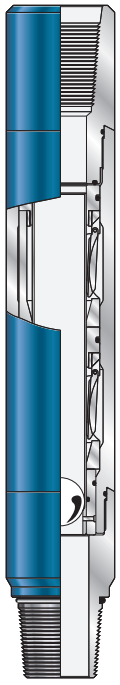
The twin flapper check valve with lock-out sleeve is a coiled tubing string component that can be run in the locked out position and activated with a drop ball when required to perform as a downhole safety barrier. It provides a means of preventing the back flow of well fluids into the coiled tubing.

The design of the twin flapper check valve incorporates a dual sealing system in each flapper assembly for increased safety. A non-stick seat provides the primary low pressure seal, while at higher pressure the flapper seals into a metal to metal arrangement.

This valve is ideally suited to CT velocity string systems, allowing activation by a drop ball prior to pulling the string from the well.

Features and Benefits

- Dual sealing in each flapper cartridge (low pressure non-stick seat/seal and high pressure full metal to metal seat/seal)
- Full bore fluid passage for balls, darts & plugs
- Removable flapper cartridges
- Simple drop ball activation



TFCV with Lock-Out Sleeve

Poppet Check Valve

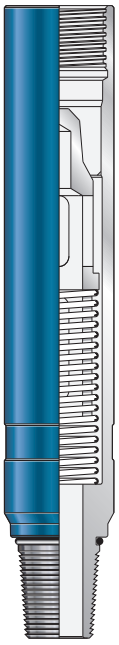
Safety, well control, and advanced operations are a few of the applications for check valves.

The poppet check valve comes standard with modular box up, pin down threads, but can be made to customer specifications. These valves can be stacked in tandem or more and can fit anywhere in your bottomhole assembly.

Incorporating a specially engineered dynamic flow poppet, as opposed to a standard ball, these valves have proven to be durable, giving long life under all working conditions, including acid, H^2S, or CO^2 applications.

Features and Benefits

- Easy redress
- Metal to metal seal



Poppet Check Valve

Twin Flapper Check Valve with Lock Out Sleeve Technical Specifications

Part Number	Size	OD	ID	Service	Connections	Length	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength	Flapper Cartridge Part Number	Drop Ball Size	Flapper Cartridge OD
C165-130-08	1 1⁄16”	1.690”	0.470”	STD	1” AMMT Box x Pin	13.750”	C165-130-08/KS	5,000 PSI	0°F	350°F	52,215 lbs	C165-008	½”	1.365”
C165-139-09	2 ⅞”	2.875”	0.750”	STD	1 ½” AMMT Box x Pin	29”	C165-139-09/KS	5,000 PSI	0°F	350°F	92,232 lbs	C165-098	13⁄16”	2.240”

Poppet Check Valve Technical Specifications

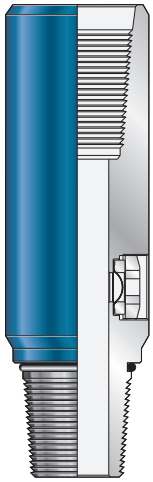
Part Number	Size	OD	ID	Service	Connections	Length	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
443-510	1 ¾”	1.750”	0.750”	H^2S	1” AMMT Box x Pin	20.00”	443-510-RDK	3,000 PSI	-20°F	300°F	33,176 lbs
444-100	2 ⅛”	2.125”	0.812”	H^2S	1 ½” AMMT Box x Pin	21.25”	444-000-RDK	3,000 PSI	-20°F	300°F	52,144 lbs

Burst Disc Circulation Sub

The burst disc circulation sub is a standard coiled tubing toolstring component that is used in conjunction with tools.

The burst disc circulation sub is incorporated into the tubing toolstring just below the tool that requires a drop ball. Should circulation be lost due to a downhole restriction, a predetermined pressure applied to the coil will burst the disc in the sub and re-establish circulation.

Burst disc circulation subs are supplied with a blanking plug for the burst disc. When ordering burst disc circulation subs, customers should choose the burst discs they require separately.



Burst Disc Circulation Sub

Features and Benefits

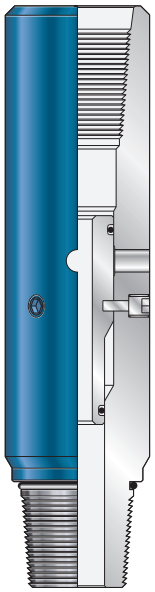
- Various burst disc pressure ratings available require drop balls that need to be circulated into the coiled tubing.

Dual Activated Circulation Valve

The dual activated circulation valve offers the traditional method of returning circulation of the toolstring through use of a drop ball. In addition, the valve is capable of operating through internal overpressure within the tubing string.

Conventional dual circulation valves use a burst or rupture disc to return circulation through overpressure. However, the dual-activated circulation valve offers a pressure differential activated piston. The piston activation pressure can be predetermined at the surface through shear pins, offering superior flexibility and considerable savings on redress.

As with many other tools in the standard BHA tool range, the emphasis is on simplicity, and the dual-activated circulation valve has very few component parts, seals, and thread connections.



Dual Activated Circulation Valve

Features and Benefits

- Simple drop ball design and pressure differential to operate

Burst Disc Circulation Sub Technical Specifications

Part Number	Size	OD	ID	Service	Connections	Length	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
C166-021-08	1 1⁵⁄₁₆”	1.688”	0.39”	H²S	1” AMMT Box x Pin	5.50”	C166-021-08/KS	5,000 PSI	0°F	350°F	55,920 lbs
C166-037-08	1 ¾”	1.750”	0.406”	H²S	1” AMMT Box x Pin	5.50”	C166-037-08/KS	5,000 PSI	0°F	350°F	55,269 lbs
C166-038-09	2 ⅛”	2.125”	0.875”	H²S	1 ½” AMMT Box x Pin	5.75”	C166-038-09/KS	5,000 PSI	0°F	350°F	75,659 lbs
C166-039-09	2 ¼”	2.250”	0.875”	H²S	1 ½” AMMT Box x Pin	5.75”	C166-039-09/KS	5,000 PSI	0°F	350°F	75,569 lbs
C166-047-09	2 ⅜”	2.375”	0.875”	H²S	1 ½” AMMT Box x Pin	5.50”	C166-047-09/KS	5,000 PSI	0°F	350°F	75,659 lbs
C166-052-23	2 ⅞”	2.875”	1.380”	H²S	2 ⅜” PAC Box x Pin	6.50”	C166-052-23/KS	5,000 PSI	0°F	350°F	130,517 lbs
C166-040-24	3 ⅛”	3.125”	1.000”	H²S	2 ⅜” PAC DSI Box x Pin	9”	C166-040-24/KS	5,000 PSI	0°F	350°F	200,000 lbs

Burst Disc Assembly

Part Number	Rupture Pressure
P0-49313	2,000 PSI
P0-49425	3,500 PSI
P0-49426	4,000 PSI
P0-49427	4,500 PSI
P0-17656	4,880 PSI
P0-17665	6,000 PSI

Dual Activated Circulation Valve Technical Specifications

Part Number	Size	OD	ID	Service	Connections	Length	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength	Drop Ball Size
C166-031-08	1 1⁵⁄₁₆”	1.687”	0.406”	H²S	1” AMMT Box x Pin	5.00”	C166-031-08/KS	5,000 PSI	0°F	350°F	43,820 lbs	⁷⁄₁₆”
C166-032-08	1 ¾”	1.750”	0.406”	H²S	1” AMMT Box x Pin	5.50”	C166-032-08/KS	5,000 PSI	0°F	350°F	43,820 lbs	⁷⁄₁₆”
C166-033-09	2 ⅛”	2.125”	0.406”	H²S	1 ½” AMMT Box x Pin	4.75”	C166-033-09/KS	5,000 PSI	0°F	350°F	86,030 lbs	⁷⁄₁₆”
C166-034-09	2 ¼”	2.250”	0.625”	H²S	1 ½” AMMT Box x Pin	5.50”	C166-034-09/KS	5,000 PSI	0°F	350°F	69,968 lbs	1 ¹⁄₁₆”
C166-035-09	2 ⅜”	2.375”	0.625”	H²S	1 ½” AMMT Box x Pin	5.50”	C166-035-09/KS	5,000 PSI	0°F	350°F	69,968 lbs	1 ¹⁄₁₆”
C166-046-23	2 ⅞”	2.875”	0.750”	H²S	2 ⅜” PAC Box x Pin	6.25”	C166-046-23/KS	5,000 PSI	0°F	350°F	130,517 lbs	1 ³⁄₁₆”
C166-048-23	3 ⅛”	3.125”	0.750”	H²S	2 ⅜” PAC Box x Pin	6.25”	C166-048-23/KS	5,000 PSI	0°F	350°F	130,517 lbs	1 ³⁄₁₆”

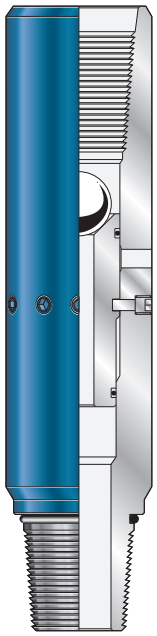
Ball Activated Circulation Sub

The ball activated circulation valve is designed to allow circulation above the coiled tubing work/ toolstring.

The tool is activated by using a drop ball and can be adjusted on the surface to shear out by varying the number and type of shear pins used. Pressure applied to the drop ball causes the pins to shear and the sleeve to move down, allowing circulation via the side ports.

Features and Benefits

- Simple drop ball design to activate



Ball Activated Circulation Sub

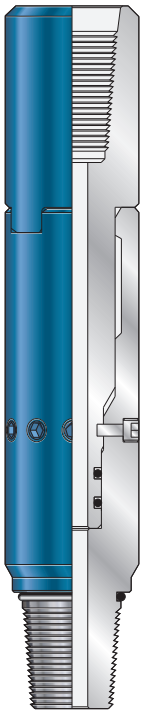
Shear Release Joint

The shear release joint allows the parting of the coiled tubing string by appling predetermined tension.

The shear release joint was designed for and is used primarily in cement stinger operations as a simple, effective emergency release. It incorporates shear screws that can be used in various combinations, allowing a wide range of predetermined shear settings. The released part of the shear release joint can be retrieved using an industry standard GS-type pulling tool (page 42).

Features and Benefits

- Simple design
- On location adjustable settings
- Internal pressure seal
- Internal standard GS-type fish neck after release
- Torque thru capability



Shear Release Joint

Ball Activated Circulation Sub Technical Specifications

Part Number	Size	OD	ID	Service	Connections	Length	Service Kits	Operating Pressure	Max Shear Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength	Drop Ball Size
C166-028-08	1 1/16"	1.687"	0.312"	STD	1" AMMT Box x Pin	7.25"	C166-028-08/KS	5,500 PSI	5,000 PSI	0°F	350°F	37,840 lbs	3/8"
C166-016-08	1 3/4"	1.750"	0.312"	STD	1" AMMT Box x Pin	7.25"	C166-016-08/KS	5,500 PSI	5,000 PSI	0°F	350°F	54,075 lbs	3/8"
C166-010-09	2 1/8"	2.125"	0.500"	STD	1 1/2" AMMT Box x Pin	8.75"	C166-010-09/KS	5,000 PSI	5,000 PSI	0°F	350°F	92,160 lbs	3/8"
C166-049-09	2 3/8"	2.375"	0.437"	STD	1 1/2" AMMT Box x Pin	12"	C166-049-09/KS	5,000 PSI	5,000 PSI	0°F	350°F	101,370 lbs	9/16"
C166-050-23	2 3/8"	2.875"	0.750"	STD	2 3/8" PAC Box x Pin	7.25"	C166-050-23/KS	5,000 PSI	5,000 PSI	0°F	350°F	195,770 lbs	13/16"
C166-012-23	3 1/8"	3.125"	0.750"	STD	2 3/8" PAC Box x Pin	7.25"	C166-012-23/KS	3,000 PSI	4,800 PSI	0°F	350°F	195,770 lbs	13/16"

Shear Release Joint Technical Specifications

Part Number	Size	OD	ID	Service	Connections	Length	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
C167-070-09	2 1/8"	2.125"	0.750"	H^2S	1 1/2" AMMT Box x Pin	8.750"	C167-070-09/KS	5,000 PSI	0°F	350°F	17,400 lbs
C167-079-09	2 1/4"	2.250"	0.750"	H^2S	1 1/2" AMMT Box x Pin	9"	C167-079-09/KS	5,000 PSI	0°F	350°F	17,400 lbs
C167-071-09	2 3/8"	2.375"	0.750"	H^2S	1 1/2" AMMT Box x Pin	9.750"	C167-071-09/KS	5,000 PSI	0°F	350°F	17,400 lbs
C167-076-09	2 7/8"	2.875"	1.060"	H^2S	1 1/2" AMMT Box x Pin	10.625"	C167-076-09/KS	5,000 PSI	0°F	350°F	43,200 lbs
C167-080-23	3 1/8"	3.125"	0.500"	H^2S	2 3/8" PAC Box x Pin	11.250"	C167-080-23/KS	5,000 PSI	0°F	350°F	43,200 lbs
C167-105-10	3 1/8"	3.125"	1.250"	STD	2 3/8" REG Box x Pin	13.750"	C167-105-10/KS	5,000 PSI	0°F	350°F	76,800 lbs
C167-076-24	2 7/8"	2.875"	1.062"	H^2S	2 3/8" PAC DSI Box x Pin	12"	C167-076-24/KS	5000 PSI	0°F	350°F	43,200 lbs
C167-091-24	2 7/8"	2.875"	0.875"	H^2S	2 3/8" PAC DSI Box x Pin	16"	C167-091-24/KS	5000 PSI	0°F	350°F	100,000 lbs
C167-092-24	2 7/8"	2.875"	1.500"	H^2S	2 3/8" PAC DSI Box x Pin	10"	C167-092-24/KS	5000 PSI	0°F	350°F	42,000 lbs

Heavy Duty Hydraulic Disconnect

The heavy duty hydraulic disconnect (HDHD) allows the toolstring to detach at a predetermined point via the deployment of a suitable drop/trip ball through the coiled tubing. The drop ball locates on a piston sleeve, creating sufficient back pressure to shear the pins and disconnect the tool. When this happens, the piston sleeve pushes the tool apart to ensure a clean disconnect, and circulation is immediately returned to the toolstring, providing a surface indication of a positive disconnect. All piston sleeves and drop balls are returned to the surface, leaving a standard GS internal fish neck for retrieval purposes.

The HDHD utilizes a heavy duty, one piece, threaded collet slip to disconnect. The collet slip endures higher tensile loading than collet finger type release mechanisms, and is far less susceptible to fatigue. The collet slip is backed up with a collet slip sleeve to give the maximum tensile strength possible to the disconnect during heavy jarring operations.

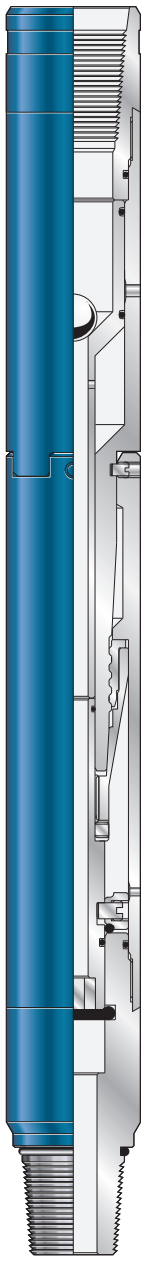
Only by dropping a ball and shearing the pins can the collet sleeve shift, allowing the collet and top sub to part. The piston sleeve is pressure balanced so internal pressure does not affect the hydraulic configuration and shear values.

High torque capabilities are achieved through positive torque drive teeth between the top sub and the main body of the tool. The HDHD is therefore ideally suited for high torque, heavy duty coiled tubing drilling operations where maximum performance and durability is essential.

Shear screws can be supplied in either brass or steel to give a comprehensive pressure range suitable for any coiled tubing application. Shear screws are also integrally situated to eliminate the possibility of vibrating free during CT drilling operations.

Features and Benefits

- Retrieved with a standard GS running tool (page 42).



Heavy Duty Hydraulic Disconnect

Heavy Duty Hydraulic Disconnect Technical Specifications

Part Number	Size	OD	ID	Service	Connections	Length	Fish Neck / GS	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength	Drop Ball Size
C167-112-08	1 1⁄16”	1.690”	0.469”	STD	1” AMMT Box x Pin	18.25”	1.38” / 2” GS	C167-112-08/KS	5,000 PSI	0°F	350°F	49,423 lbs	5⁄8”
C167-113-08	1 3⁄4”	1.750”	0.469”	STD	1” AMMT Box x Pin	19.50”	1.38” / 2” GS	C167-113-08/KS	5,000 PSI	0°F	350°F	49,423 lbs	5⁄8”
C167-114-09	2 1⁄8”	2.120”	0.469”	STD	1 1⁄2” AMMT Box x Pin	18”	1.38”/ 2” GS	C167-114-09/KS	5,000 PSI	0°F	350°F	56,390 lbs	5⁄8”
C167-115-23	2 7⁄8”	2.870”	0.875”	STD	2 3⁄8” PAC Box x Pin	20.75”	2.31” / 3” GS	C167-115-23/KS	5,000 PSI	0°F	350°F	80,000 lbs	15⁄16”
C167-116-23	3 1⁄8”	3.125”	1.060”	STD	2 3⁄8” PAC Box x Pin	20.75”	2.31” / 3” GS	C167-116-23/KS	5,000 PSI	0°F	350°F	90,201 lbs	1 1⁄8”
C167-096-08	1 1⁄2”	1.500”	0.345”	H2S	1” AMMT Box x Pin	18”	1.06” / 1.5” GS	C167-096-08/KS	5,000 PSI	0°F	350°F	37,788 lbs	3⁄8”
C167-088-08	1 1⁄16”	1.687”	0.469”	H2S	1” AMMT Box x Pin	19.50”	1.38” / 2” GS	C167-088-08/KS	5,000 PSI	0°F	350°F	49,423 lbs	5⁄8”
C167-094-08	1 3⁄4”	1.750”	0.469”	H2S	1” AMMT Box x Pin	19.50”	1.38” / 2” GS	C167-094-08/KS	5,000 PSI	0°F	350°F	49,423 lbs	5⁄8”
C167-095-09	2”	2”	0.469”	H2S	1 1⁄2” AMMT Box x Pin	19.50”	1.38” / 2” GS	C167-095-09/KS	5,000 PSI	0°F	350°F	49,423 lbs	5⁄8”
C167-085-09	2 1⁄8”	2.125”	0.469”	H2S	1 1⁄2” AMMT Box x Pin	18”	1.38” / 2” GS	C167-085-09/KS	5,000 PSI	0°F	350°F	56,390 lbs	5⁄8”
C167-089-09	2 1⁄4”	2.250”	0.780”	H2S	1 1⁄2” AMMT Box x Pin	18”	1.38” / 2” GS	C167-089-09/KS	5,000 PSI	0°F	350°F	67,987 lbs	13⁄16”
C167-097-09	2 3⁄8”	2.375”	0.780”	H2S	1 1⁄2” AMMT Box x Pin	18”	1.81” / 2” GS	C167-097-09/KS	5,000 PSI	0°F	350°F	67,987 lbs	13⁄16”
C167-101-23	2 7⁄8”	2.875”	0.875”	H2S	2 3⁄8” PAC Box x Pin	20.75”	2.31” / 3” GS	C167-101-23/KS	5,000 PSI	0°F	350°F	80,000 lbs	15⁄16”
C167-098-23	3 1⁄8”	3.125”	1.062”	H2S	2 3⁄8” PAC Box x Pin	20.75”	2.31” / 3” GS	C167-098-23/KS	5,000 PSI	0°F	350°F	90,201 lbs	1 1⁄8”
C167-098-24	3 1⁄8”	3.125”	1.062”	H2S	2 3⁄8” PAC Box x Pin	20.75”	2.31” / 3” GS	C167-098-24/KS	5,000 PSI	0°F	350°F	60,000 lbs	1 1⁄8”
C167-101-24	2 7⁄8”	2.875”	0.875”	H2S	2 3⁄8” PAC DSI Box x Pin	20.75”	2.31” / 3” GS	C167-101-24/KS	5,000 PSI	0°F	350°F	80,000 lbs	15⁄16”
C167-107-24	3 1⁄8”	3.125”	0.813”	H2S	2 3⁄8” PAC DSI Box x Pin	20.75”	3” GS	C167-107-24/KS	5,000 PSI	0°F	350°F	120,000 lbs	1 1⁄8”

Motorhead Assembly (MHA)

The Motorhead Assembly (MHA) was developed in response to industry demands for compact, heavy duty integrated BHA components. The MHA combines the twin flapper check valve with the Heavy Duty Hydraulic Disconnect (HDHD) and the dual circulation valve, standard components for virtually all tool string designs.

Twin Flapper Check Valve - The MHA incorporates two flapper cartridge assemblies. Each flapper cartridge assembly incorporates a primary metal to metal seal, providing high pressure sealing integrity, and a secondary PTFE seal for low pressure sealing. The flapper cartridge assemblies simply drop into the valve housing, providing a simple and easy redress of the MHA.

Heavy Duty Hydraulic Disconnect (HDHD) - The heavy duty hydraulic disconnect allows the tool string to detach at a predetermined point by deploying a suitable drop/trip ball through the coiled tubing.
The drop ball locates on a piston sleeve, creating sufficient back pressure to shear the pins and disconnect the tool. When this happens, the piston sleeve pushes the tool apart to ensure a clean disconnect and circulation is immediately returned to the tool string, providing a surface indication of a positive disconnect. All piston sleeves and drop balls are returned to surface as well, leaving a standard GS internal fish neck for retrieval purposes.

The HDHD utilizes a heavy duty single-piece threaded collet slip to hold the tool together. The collet slip endures higher tensile loading than collet finger type release mechanisms and is far less susceptible to fatigue. The collet slip is backed up by a collet slip sleeve to provide maximum tensile strength to the disconnect during heavy jarring operations.

Only by dropping a ball and shearing the pins can the collet sleeve shift, allowing the collet and top sub to part. The piston sleeve is pressure balanced, so internal pressure does not affect the hydraulic configuration and shear values.

High torque capabilities are achieved through positive torque drive teeth between the top sub and the main body of the tool. The heavy duty hydraulic disconnect is therefore ideally suited for high torque, heavy duty coiled tubing drilling operations where maximum performance and durability are essential.

Shear screws can be supplied in either brass or steel to give a comprehensive pressure range that will suit virtually any coiled tubing application. Shear screws are also integrally situated to eliminate the possibility of vibrating free during CT drilling operations.

The standard configuration consists of the maximum flow through bore while maintaining maximum tensile strength in the tool. By interchanging the piston sleeve, the drop/trip ball size can be varied to suit the desired tool string requirements. This is a particularly useful feature when the hydraulic disconnect is situated below jars and intensifiers and ID restrictions are a considering factor. Running the heavy duty hydraulic disconnect below jars and intensifiers ensures that if disconnection of the toolstring is necessary, a greater proportion of the tool string is safely returned to surface.

Motorhead Assembly Technical Specifications

Part Number	Size	OD	ID	Service	Connections	Length	Fish Neck / GS	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength	Circulation Sub Drop Ball Size	Disconnect Drop Ball Size
C200-045-08	1 1⁄16”	1.687”	0.406”	STD	1” AMMT Box x Pin	30”	1.38” / 2” GS	C200-045-08/KS	5,000 PSI	0°F	350°F	49,423 lbs	7⁄16”	5⁄8”
C200-046-08	1 ¾”	1.750”	0.406”	STD	1” AMMT Box x Pin	27”	1.38” / 2” GS	C200-046-08/KS	5,000 PSI	0°F	350°F	49,423 lbs	7⁄16”	5⁄8”
C200-047-09	2 1⁄8”	2.125”	0.406”	STD	1 ½” AMMT Box x Pin	25.50”	1.38” / 2” GS	C200-047-09/KS	5,000 PSI	0°F	350°F	56,390 lbs	7⁄16”	5⁄8”
C200-044-23	2 7⁄8”	2.875”	0.750”	STD	2 3⁄8” PAC Box x Pin	30.50”	2.31” / 3” GS	C200-044-23/KS	5,000 PSI	0°F	350°F	80,000 lbs	13⁄16”	15⁄16”
C200-051-10	3 1⁄8”	3.125”	0.812”	STD	2 3⁄8” API REG Box x Pin	32.25”	2.31” / 3” GS	C200-051-10/KS	5,000 PSI	0°F	350°F	90,201 lbs	27⁄32”	15⁄16”
C200-030-23	3 1⁄8”	3.125”	0.812”	H2S	2 3⁄8” PAC Box x Pin	29.70”	2.31”/ 3” GS	C200-030-23/KS	5,000 PSI	0°F	350°F	90,200 lbs	7⁄8”	1 1⁄8”
C200-052-08	1 1⁄16”	1.687”	0.406”	H2S	1” AMMT Box x Pin	30”	1.38” / 2” GS	C200-052-08/KS	5,000 PSI	0°F	350°F	49,423 lbs	7⁄16”	5⁄8”
C200-056-08	1 ¾”	1.750”	0.406”	H2S	1” AMMT Box x Pin	27”	1.38” / 2” GS	C200-056-08/KS	5,000 PSI	0°F	350°F	49,423 lbs	7⁄16”	5⁄8”
C200-053-09	2 1⁄8”	2.125”	0.406”	H2S	1” AMMT Box x Pin	25.50”	1.38” / 2” GS	C200-053-09/KS	5,000 PSI	0°F	350°F	56,390 lbs	7⁄16”	5⁄8”
C200-036-09	2 ¼”	2.250”	0.590”	H2S	1” AMMT Box x Pin	26”	1.81” / 2.50” GS	C200-036-09/KS	5,000 PSI	0°F	350°F	67,987 lbs	11⁄16”	13⁄16”
C200-054-23	2 7⁄8”	2.875”	0.750”	H2S	2 3⁄8” PAC Box x Pin	30.50”	2.31” / 3” GS	C200-054-23/KS	5,000 PSI	0°F	350°F	80,000 lbs	13⁄16”	15⁄16”
C200-051-23	3 1⁄8”	3.125”	0.812”	STD	2 3⁄8” PAC Box x Pin	29.70”	2.31”/ 3” GS	C200-051-23/KS	5,000 PSI	0°F	350°F	90,200 lbs	27⁄32”	15⁄16”
C425-213-3-09	2 1⁄8”	2.125”	0.406”	STD	1 ½” AMMT Box x Pin	28”	1.38” / 2” GS	C425-213-3-09/KS	10,000 PSI	0°F	350°F	56,000 lbs	7⁄16”	5⁄8”
C425-287-3-23	2 7⁄8”	2.875”	0.750”	STD	2 3⁄8” PAC Box x Pin	30.3”	3” INT 'GS'	C425-213-3-09/KS	10,000 PSI	0°F	350°F	120,000 lbs	13⁄16”	15⁄16”
C200-019-24	2 7⁄8”	2.875”	0.750”	H2S	2 3⁄8” PAC DSI Box x Pin	28”	2.31”/ 3” GS	C200-019-24/KS	5,000 PSI	0°F	350°F	120,000 lbs	13⁄16”	15⁄16”

Motorhead Assembly (MHA)

The HDHD has been methodically designed to ensure assembly and disassembly of the tool is trouble-free.

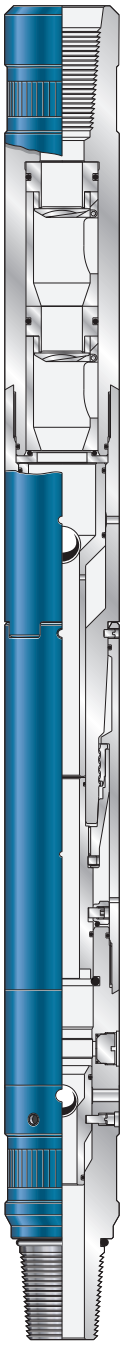
Dual Circulation Valve - The dual circulation valve offers the traditional method of returning circulation of the tool string through use of a drop ball. In addition, the valve is capable of operating through internal over-pressure within the tubing string.

The motorhead assembly (MHA) is a compact, versatile and robust upper BHA that offers the following components:

- The MHA's compact design reduces the overall length compared to standard tools
- Twin flapper check valve
- Heavy duty hydraulic disconnect (HDHD)
- Dual Circulation Valve (rupture discs sold separately)

Features and Benefits

- The MHA's compact design gives an overall length saving of approximately 30% over the use of conventional individual components.
- The high torque capability of the MHA provides the ideal motorhead for today's high demand coiled tubing drilling applications.
- The choice of tubing connector is not dictated by the MHA, giving the operator the flexibility to choose. Most Coiled Tubing connectors can be used with the MHA.
- With a considerable reduction in the number of component parts, seals and thread connections. The MHA is simple to assemble/disassemble and inexpensive to redress.
- Retrieved with a standard GS running tool (see page 42).



Motorhead Assembly

MHA Rupture Disc Assembly (8mm)

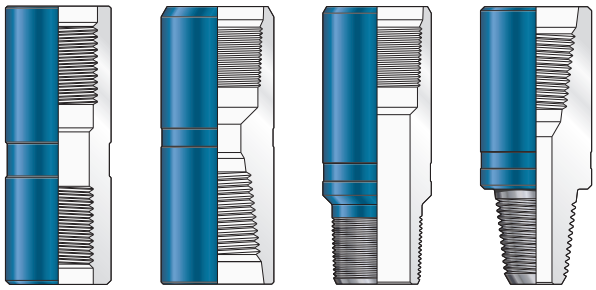
Part Number	Rupture Pressure
P0-49418	3,000 psi
P0-49399	4,000 psi
P0-49400	5,000 psi
P0-49401	6,000 psi
P0-49402	7,500 psi
P0-49586	8,000 psi
P0-49587	8,500 psi
P0-49588	9,000 psi
P0-49602	10,000 psi

Crossovers

The crossover is used to connect two different tools with varying or similar end connections. It is available in pin x pin, pin x box, and box x box configurations. The crossover is optimized for the shortest possible overall length.

Features and Benefits

- Full range of connections are available
- Upon request, longer crossovers can be manufactured to aide in tool spacing



Typical Crossovers

Crossovers Technical Specifications

Part Number	Tool Description	OD	ID	Service	Length	Operating Pressure
1200-10MTB-10MTB	1" MT Box x 1" MT Box	1.750"	0.750"	STD	5.500"	5,000 PSI
1200-10MTB-12MTB	1" MT Box x 1 ¼" MT Box	1.690"	0.750"	H²S	6"	5,000 PSI
1200-10MTP-10MTP-075-AS	1" MT Pin x 1" MT Pin	1.687"	0.750"	STD	7"	5,000 PSI
1200-10MTP-12MTB-AS	1" MT Pin x 1 ¼" MT Box	1.750"	0.750"	H²S	4.500"	5,000 PSI
1200-10MTP-15MTB-AS	1" MT Pin x 1 ½" MT Box	2"	0.750"	H²S	6"	5,000 PSI
1200-12MTP-10MTB-AS	1 ¼" MT Pin x 1" MT Box	1.750"	0.750"	H²S	5.500"	5,000 PSI
1200-15MTB-15MTB	1 ½" MT Box x 1 ½" MT Box	2.125"	1"	STD	6.250"	5,000 PSI
1200-15MTB-15MTB-H2S	1 ½" AMMT Box x 1 ½" MT Box	2.125"	1"	H²S	7"	5,000 PSI
1200-15MTP-10MTB-AS	1 ½" MT Pin x 1" MT Box	2"	0.810"	H²S	6"	5,000 PSI
1200-15MTP-10MTB-212-AS	1 ½" MT Pin x 1" MT Box	2.125"	0.750"	STD	6.250"	5,000 PSI
1200-15MTP-15MTB-H2S-AS	1 ½" MT Pin x ½" MT Box	2.125"	0.750"	H²S	7"	5,000 PSI
1200-15MTP-15MTP-7-AS	1 ½" MT Pin x ½" MT Pin	2.125"	1"	H²S	7"	5,000 PSI
1200-15MTP-23APB-AS	1 ½" MT Pin x 2 ⅜" REG Box	2.125"	1"	STD	8"	5,000 PSI
1200-23APB-35APB	2 ⅜"REG Box x 3 ½" REG Box	4.500"	1.750"	H²S	10"	5,000 PSI
1200-23APP-15MTB	2 ⅜" REG Pin x 1 ½" MT Box	3.125"	0.750"	H²S	7"	5,000 PSI
1200-23APP-23PAB	2 ⅜" REG Pin x ⅜" PAC Box	3.125"	1"	H²S	7.380"	5,000 PSI
1200-23PAB-15MTB	2 ⅜" PAC Box x 1 ½" MT Box	2.875"	1"	STD	7.500"	5,000 PSI
1200-23PAB-15MTP-AS	2 ⅜" PAC Box x 1 ½" MT Pin	2.875"	1"	H²S	6.500"	5,000 PSI
1200-23PAB-23APB	2 ⅜" PAC Box x 2 ⅜" REG Box	3.125"	1.625"	H²S	7"	5,000 PSI
1200-23PAP-15MTB	2 ⅜" PAC Pin x 1 ½" MT Box	2.875"	1"	H²S	7"	5,000 PSI
1200-23PAP-15MTB-HT	2 ⅜" PAC Pin x 1 ½" MT Box	2.875"	1"	STD	7"	5,000 PSI
1200-23PAP-23APB	2 ⅜" PAC Pin x 2 ⅜" REG Box	3.125"	1"	H²S	8"	5,000 PSI
1200-27APP-35APB	2 ⅞" REG Pin x 3 ½" REG Box	4.500"	1.250"	H²S	11.380"	5,000 PSI
1200-27PAP-23PAB	2 ⅜" PAC BOX x 2 ⅞" PAC Pin	3.125"	1.125"	H²S	7"	5,000 PSI

Knuckle Joint

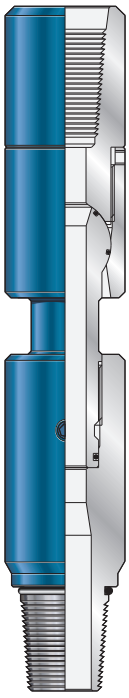
The knuckle joint, when incorporated between the jars and the manipulation tool, provides additional flexibility in the tool string. This flexibility is often necessary when the bore of the hole is restricted and/or highly deviated.

The knuckle joint allows full 360° rotation of the tool string and provides 15° of angular deviation and internal pressure sealing throughout the full rotation of the tool. The ball and socket of the knuckle provide the rotation and angular deviation of the tool. Seals in the ball provide the sealing capability.

The full flow through bore also allows the use of flow-activated tools below the coiled tubing knuckle joint. Multiple coiled tubing knuckle joints can be incorporated in particularly long tool strings. Where rotation under load is required, see the coiled tubing swivel joint.

Features and Benefits

- Full flow through bore
- Internal pressure seal
- 15° angular deviation
- Full 360° rotation



Knuckle Joint

Torque Thru Knuckle Joint

The torque thru knuckle joint provides additional flexibility to the tool string when incorporated between the jars and the manipulation tool. This provides the flexibility that is often necessary when running the tool restricted and/or highly deviated boreholes. The torque thru knuckle joint can be used when rotation of the tool string is not required, which makes it ideal for coiled tubing drilling applications.

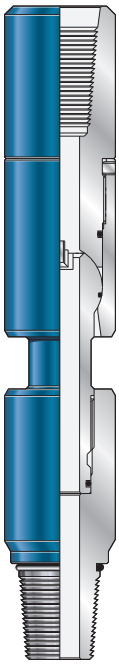
The knuckle joint provides a full 15° angular deviation and internal pressure sealing throughout the full deviation of the tool. The ball and socket of the knuckle have a key that prevents rotation but still allows full angular movement.

The full flow-through bore also allows the use of flow-activated tools below the knuckle joint.

Multiple coiled tubing torque thru knuckle joints can be incorporated in particularly long tool strings.

Features and Benefits

- Full flow through bore
- Internal pressure seal
- 15° angular deviation
- Full 360° rotation



Torque Thru Knuckle Joint

Knuckle Joint Technical Specifications

Part Number	Size	OD	ID	Service	Connections	Length	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
C064-061-08	1 1⁄16”	1.688”	0.500”	STD	1” AMMT Box x Pin	10”	C064-061-08/KS	5,000 PSI	0°F	350°F	38,096 lbs
C064-052-08	1 ¾”	1.750”	0.500”	STD	1” AMMT Box x Pin	9.25”	C064-052-08/KS	5,000 PSI	0°F	350°F	49,680 lbs
C064-019-09	2 ⅛”	2.125”	0.750”	STD	1 ½” AMMT Box x Pin	10”	C064-019-09/KS	5,000 PSI	0°F	350°F	66,920 lbs
C064-050-23	2 ⅞”	2.875”	1”	STD	2 ⅜” PAC Box x Pin	11.75”	C064-050-23/KS	5,000 PSI	0°F	350°F	127,816 lbs
C064-050-24	2 ⅞”	2.875"	1"	STD	2 ⅜” PAC DSI Box x Pin	14.46"	C064-050-24/KS	5000 PSI	0°F	350°F	126,000 lbs
C064-077-10	3 ⅛”	3.125”	1”	STD	2 ⅜” REG Box x Pin	11.75”	C064-077-10/KS	5,000 PSI	0°F	350°F	127,816 lbs
C064-077-23	3 ⅛”	3.125”	1”	STD	2 ⅜” PAC Box x Pin	16.50”	C067-077-23/KS	5,000 PSI	0°F	350°F	122,887 lbs
C064-102-08	1 ½”	1.500”	0.375”	H^2S	1” AMMT Box x Pin	8.50”	C064-102-08/KS	5,000 PSI	0°F	350°F	18,080 lbs
C064-067-08	1 ¾”	1.750”	0.500”	H^2S	1” AMMT Box x Pin	9”	C064-067-08/KS	5,000 PSI	0°F	350°F	33,120 lbs
C064-105-09	2 ⅛”	2.125”	0.750”	H^2S	1 ½” AMMT Box x Pin	10”	C064-105-09/KS	3,000 PSI	0°F	350°F	44,000 lbs
C064-104-24	2 ⅞”	2.875”	1”	H^2S	2 ⅜” PAC DSI Box x Pin	17”	C064-104-24/KS	5000 PSI	0°F	350°F	80,000 lbs
C064-078-24	3 ⅛”	3.125”	1”	H^2S	2 ⅜” PAC DSI Box x Pin	15.5”	C064-078-24/KS	5000 PSI	0°F	350°F	80,000 lbs

Torque Thru Knuckle Joint Technical Specifications

Part Number	Size	OD	ID	Service	Connections	Length	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength	Torque Ratings
C064-064-08	1 1⁄16”	1.688”	0.500”	STD	1” AMMT Box x Pin	10.75”	C064-064-08/KS	3,000 PSI	0°F	350°F	42,651 lbs	622 ft-lbs
C064-053-08	1 ¾”	1.750”	0.500”	STD	1” AMMT Box x Pin	10.75”	C064-053-08/KS	3,000 PSI	0°F	350°F	49,910 lbs	622 ft-lbs
C064-066-08	1 1⁄16”	1.688”	0.500”	H^2S	1” AMMT Box x Pin	10.75”	C064-066-08/KS	3,000 PSI	0°F	350°F	28,430 lbs	415 ft-lbs
C064-059-08	1 ¾”	1.750”	0.500”	H^2S	1” AMMT Box x Pin	10.75”	C064-059-08/KS	3,000 PSI	0°F	350°F	33,560 lbs	415 ft-lbs
C064-060-09	2 ⅛”	2.125”	0.750”	H^2S	1 ½” AMMT Box x Pin	11”	C064-060-09/KS	3,000 PSI	0°F	350°F	44,108 lbs	516 ft-lbs
C064-073-09	2 ¼”	2.250”	0.750”	H^2S	1 ½” AMMT Box x Pin	12”	C064-073-09/KS	3,000 PSI	0°F	350°F	44,108 lbs	516 ft-lbs
C064-085-09	2 ⅜”	2.375”	0.750”	H^2S	1 ½” AMMT Box x Pin	12”	C064-085-09/KS	3,000 PSI	0°F	350°F	44,108 lbs	516 ft-lbs
C064-078-23	3 ⅛”	3.125”	1”	H^2S	2 ⅜” PAC Box x Pin	12.75”	C064-078-23/KS	5,000 PSI	0°F	350°F	106,680 lbs	1982 ft-lbs

Swivel Joint

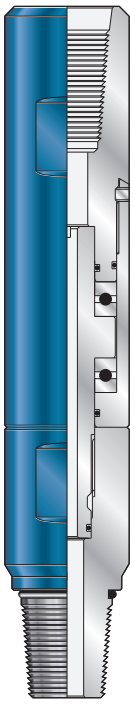
The swivel joint is a standard toolstring component that permits full rotation of the bottomhole assembly (BHA) made up below the joint. The swivel joint's design includes integral sealed bearings, which ensure full integrity of flow through the joint.

The inclusion of a swivel joint in a typical BHA gives the operator orientation flexibility. A CT swivel joint in a BHA will allow the toolstring to be broken and made up below the joint without the need to disconnect from the coil.

The swivel joint is necessary where toolstring orientation is required, such as in the running and pulling of gas lift mandrels.

Features and Benefits

- Full range of sizes available
- Sealed bearings for integrity of flow
- Maximum flow area



Swivel Joint

Back Pressure Valve

The coiled tubing back pressure valve is a coiled tubing string component that provides a circulation path against a predetermined back pressure. It is ideally suited to operations where the hydrostatic pressure within the coiled tubing needs to be higher than the pressure in the annulus areas.

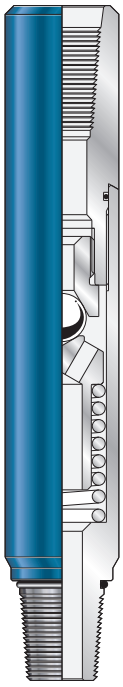
The design of the coiled tubing back pressure valve allows for an on-site determination of back pressure to be set at surface. This is achieved with the use of different ball diameters to increase/decrease the piston area and pressure required to open the valve.

- Coiled tubing back pressure valves are not ideally suited for cementing or abrasive fluids.

For calibrated fluid delivery valves, please see coiled tubing cement valves (see page 73).

Features and Benefits

- Metal-to-metal sealing
- Ball and cage design protects components from wash out
- Site adjustable settings
- Simple design allows for easy maintenance



Back Pressure Valve

Swivel Joint Technical Specifications

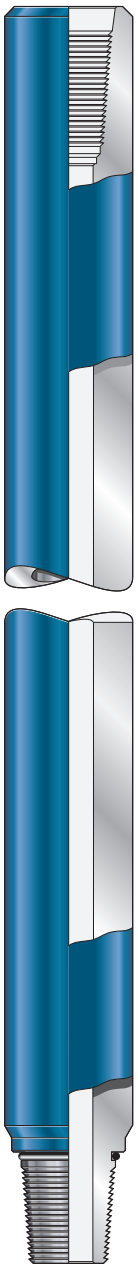
Part Number	Size	OD	ID	Service	Connections	Length	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
C091-027-09	2 1⁄8"	2.125"	0.375"	STD	1 ½" AMMT Box x Pin	9.5"	C091-027-09/KS	5,000 PSI	0°F	350°F	42,900 lbs
C091-024-09	2 1⁄4"	2.250"	0.375"	STD	1 ½" AMMT Box x Pin	11"	C091-024-09/KS	5,000 PSI	0°F	350°F	49,550 lbs
C091-041-23	2 7⁄8"	2.875"	0.870"	STD	2 3⁄8" PAC Box x Pin	13.75"	C091-041-23/KS	5,000 PSI	0°F	350°F	94,890 lbs
C091-034-10	3 1⁄8"	3.125"	1.125"	STD	2 3⁄8" REG Box x Pin	14.75"	C091-034-10/KS	5,000 PSI	0°F	350°F	93,630 lbs
C091-034-24	3 1⁄8"	3.125"	1.125"	STD	2 3⁄8" PAC DSI Box x Pin	13"	C091-034-24	5,000 PSI	0°F	350°F	100,000 lbs
C091-029-08	1 $^{11}/_{16}$"	1.687"	0.5"	H^2S	1" AMMT Box x Pin	9.97"	C091-029-08/KS	5,000 PSI	0°F	350°F	32,900 lbs
C091-031-09	2 1⁄8"	2.125"	0.375"	H^2S	1 ½" AMMT Box x Pin	11"	C091-031-09/KS	5,000 PSI	0°F	350°F	31,252 lbs

Back Pressure Valve Technical Specifications

Part Number	Size	OD	Service	Connections	Length	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
C180-008-08	1 $^{11}/_{16}$"	1.688"	STD	1" AMMT Box x Pin	9"	C180-008-08/KS	5,000 PSI	0°F	350°F	56,490 lbs
C180-003-08	1 3⁄4"	1.750"	STD	1" AMMT Box x Pin	8.75"	C180-003-08/KS	5,000 PSI	0°F	350°F	72,470 lbs
C180-009-09	2 1⁄8"	2.125"	STD	1 ½" AMMT Box x Pin	11.50"	C180-009-09/KS	5,000 PSI	0°F	350°F	89,714 lbs
C180-014-08	1 $^{11}/_{16}$"	1.688"	H^2S	1" AMMT Box x Pin	9"	C180-014-08/KS	5,000 PSI	0°F	350°F	37,660 lbs
C180-037-08	1 3⁄4"	1.750"	H^2S	1" AMMT Box x Pin	8.75"	C180-037-08/KS	5,000 PSI	0°F	350°F	48,300 lbs
C180-015-09	2 1⁄8"	2.125"	H^2S	1 ½" AMMT Box x Pin	11.50"	C180-015-09/KS	5,000 PSI	0°F	350°F	60,000 lbs

Straight Bar

The straight bar provides a means of extending the toolstring while maintaining the maximum through bore. The tubular section between the top and bottom sub can we interchanged to vary the length of the straight bar, offering an ideal solution to spacing out tools within the toolstring without compromising the flow requirements of flow-activated or jetting tools.



Straight Bar

Features and Benefits

- Full flow through bore
- Solid construction

Straight Bar Technical Specifications

Part Number	Size	OD	ID	Service	Connections	Length	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
8001-003	1 ¼"	1.250"	0.500"	-	0.937" SA Box x Pin	3 ft	-	5,000 PSI	0°F	250°F	24,000 lbs
8001-004	1 ¼"	1.250"	0.625"	-	0.937" SA Box x Pin	4 ft	-	5,000 PSI	0°F	250°F	14,000 lbs
8002-003	1 ½"	1.500"	0.755"	-	1.25" SA Box x Pin	3 ft	-	5,000 PSI	0°F	250°F	25,000 lbs
8002-004	1 ½"	1.500"	0.755"	-	1.25" SA Box x Pin	4 ft	-	5,000 PSI	0°F	250°F	25,000 lbs
8002-006	1 ½"	1.500"	0.755"	-	1.25" SA Box x Pin	6 ft	-	5,000 PSI	0°F	250°F	25,000 lbs
C193-001-08	1 1⁄16"	1.688"	0.750"	H_2S	1" AMMT Box x Pin	2 ft	C193-001-08/KS	5,000 PSI	0°F	250°F	35,040 lbs
C193-027-08	1 1⁄16"	1.688"	0.750"	H_2S	1" AMMT Box x Pin	3 ft	C193-027-08/KS	5,000 PSI	0°F	350°F	35,040 lbs
C193-003-08	1 1⁄16"	1.688"	0.750"	H_2S	1" AMMT Box x Pin	5 ft	C193-003-08/KS	5,000 PSI	0°F	350°F	35,040 lbs
C193-006-08	1 ¾"	1.750"	0.750"	H_2S	1" AMMT Box x Pin	3 ft	C193-006-08/KS	5,000 PSI	0°F	350°F	35,040 lbs
C193-045-08	1 ¾"	1.750"	0.750"	H_2S	1" AMMT Box x Pin	4 ft	C193-045-08/KS	5,000 PSI	0°F	350°F	35,040 lbs
C193-020-08	1 ¾"	1.750"	0.750"	H_2S	1" AMMT Box x Pin	5 ft	C193-020-08/KS	5,000 PSI	0°F	350°F	35,040 lbs
8003-004	1 ¾"	1.750"	0.875"		1 ½" SA Box x Pin	4 ft		5,000 PSI	0°F	250°F	33,000 lbs
8003-006	1 ¾"	1.750"	0.875"		1 ½" SA Box x Pin	6 ft		5,000 PSI	0°F	250°F	33,000 lbs
8003-104	1 ¾"	1.750"	0.75"		1" MT Pin X Box	4 ft		5,000 PSI	0°F	250°F	60,000 lbs
C193-037-09	2"	2"	1"	H_2S	1 ½" AMMT Box x Pin	3 ft	C193-037-09/KS	5,000 PSI	0°F	350°F	51,680 lbs
C193-046-09	2"	2"	1"	H_2S	1 ½" AMMT Box x Pin	5 ft	C193-046-09/KS	5,000 PSI	0°F	350°F	51,680 lbs
C193-009-09	2 ⅛"	2.125"	1"	H_2S	1 ½" AMMT Box x Pin	2 ft	C193-009-09/KS	5,000 PSI	0°F	350°F	42,866 lbs
C193-028-09	2 ⅛"	2.125"	1"	H_2S	1 ½" AMMT Box x Pin	3 ft	C193-028-09/KS	5,000 PSI	0°F	350°F	42,866 lbs
C193-030-09	2 ⅛"	2.125"	1"	H_2S	1 ½" AMMT Box x Pin	4 ft	C193-030-09/KS	5,000 PSI	0°F	350°F	42,866 lbs
C193-032-09	2 ⅛"	2.125"	1"	H_2S	1 ½" AMMT Box x Pin	5 ft	C193-032-09/KS	5,000 PSI	0°F	350°F	42,866 lbs
8004-002	2 ⅛"	2.125"	1"	-	1.812" SA THD	2 ft	-	5,000 PSI	0°F	250°F	52,000 lbs
8004-003	2 ⅛"	2.125"	1"	-	1.812" SA THD	3 ft	-	5,000 PSI	0°F	250°F	52,000 lbs
8004-004	2 ⅛"	2.125"	1"	-	1.812" SA THD	4 ft	-	5,000 PSI	0°F	250°F	52,000 lbs
8004-006	2 ⅛"	2.125"	1"	-	1.812" SA THD	6 ft	-	5,000 PSI	0°F	250°F	52,000 lbs
8004-104	2 ⅛"	2.125"	1"	-	1 ½" MT Pin X Box	4 ft	-	5,000 PSI	0°F	250°F	70,000 lbs
C193-033-09	2 ¼"	2.250"	1"	H_2S	1 ½" AMMT Box x Pin	3 ft	C193-033-09/KS	5,000 PSI	0°F	350°F	75,650 lbs
C193-034-09	2 ¼"	2.250"	1"	H_2S	1 ½" AMMT Box x Pin	5 ft	C193-034-09/KS	5,000 PSI	0°F	350°F	75,650 lbs
C193-029-09	2 ⅜"	2.375"	1"	H_2S	1 ½" AMMT Box x Pin	3 ft	C193-029-09/KS	5,000 PSI	0°F	350°F	75,650 lbs
C193-040-09	2 ⅜"	2.375"	1"	H_2S	1 ½" AMMT Box x Pin	5 ft	C193-040-09/KS	5,000 PSI	0°F	350°F	64,000 lbs
8006-004	2 ⅞"	2.875"	1"	-	2 ⅜" PAC Box x Pin	4 ft	-	5,000 PSI	0°F	250°F	239,100 lbs
8006-010	2 ⅞"	2.875"	1.250"	-	2 ⅜" PAC Box x Pin	4 ft	-	5,000 PSI	0°F	250°F	147,100 lbs
C193-031-23	2 ⅞"	2.875"	1.250"	H_2S	2 ⅜" PAC Box x Pin	2 ft	C193-031-23/KS	5,000 PSI	0°F	350°F	75,150 lbs
C193-041-23	2 ⅞"	2.875"	1.250"	H_2S	2 ⅜" PAC Box x Pin	5 ft	C193-041-23/KS	5,000 PSI	0°F	350°F	98,000 lbs
C393-287-3-23	2 ⅞"	2.875"	1.250"	H_2S	2 ⅜" PAC Box x Pin	4 ft	C393-287-3-23/KS	10,000 PSI	0°F	350°F	180,000 lbs
C193-047-23	3 ⅛"	3.125"	1.250"	H_2S	2 ⅜" PAC Box x Pin	4 ft	C193-047-23/KS	5,000 PSI	0°F	350°F	168,000 lbs
C193-014-23	3 ⅛"	3.125"	1.250"	H_2S	2 ⅜" PAC Box x Pin	5 ft	C193-014-23/KS	5,000 PSI	0°F	350°F	168,000 lbs
8006-005	2 ⅞"	2.875"	1.370"	-	2 ⅜" PAC Box x Pin	5 ft	-	5,000 PSI	0°F	250°F	151,000 lbs

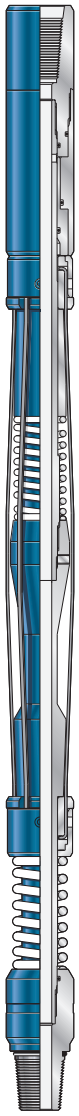
Flow Activated Bow Spring Centralizer

The flow-activated bow spring centralizer is designed so that the bow springs are normally retracted. The bow springs only expand when a pressure differential is achieved across the tool. This enables the centralizer to pass through restricted spaces, such as the bores of the tail pipe, and then expand out into larger spaces without any unnecessary wear on the bow springs.

As a safety precaution, the bow springs are mounted above a coil spring. This is to allow the bow springs the movement they require in order to pass through a restricted bore while still expanded.

Features and Benefits

- Full flow through bore
- Allows bow springs movement when meeting restrictions in expanded condition, therefore preventing bow spring damage



Flow Activated Bow Spring Centralizer

Bow Spring Coiled Tubing Centralizer

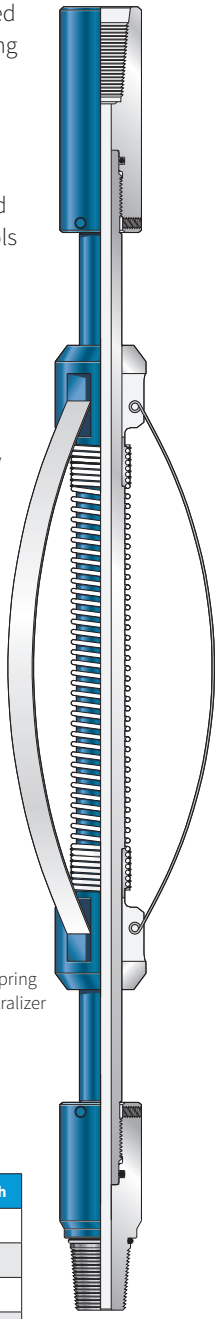
The coiled tubing centralizer (bow spring) is designed for use with coiled tubing toolstrings or when running downhole gauges out through the tail pipe and into the casing.

The coiled tubing centralizer (bow spring) is able to pass through the restricted bores of the tail pipe and expand into the casing liner below, enabling the tools to be held away from the casing.

Logging, fishing, camera work and liner lap crossing are only a few of the challenges this proven tool has overcome. A full pump through bore, modular or custom threads, and resistance to corrosion make this centralizer a necessary component for specialty work.

Features and Benefits

- Ease of use
- Easy redress
- Multiple applications



Bow Spring CT Centralizer

Flow Activated Bow Spring Centralizer Technical Specifications

Part Number	Size	OD	ID	Service	Connections	Length	Service Kits	Activation Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
C082-062-08	1 $^{11}/_{16}$" - 6.5"	6.50"	0.51"	STD	1" AMMT Box x Pin	40"	C082-062-08/KS	300 PSI	0°F	350°F	40,000 lbs
C082-065-09	2 ⅛" - 7"	7"	0.75"	STD	1 ½" AMMT Box x Pin	40"	C082-065-09/KS	500 PSI	0°F	350°F	44,000 lbs
C082-057-09	2.7" - 8"	8"	0.93"	STD	1 ½" AMMT Box x Pin	44"	C082-057-09/KS	500 PSI	0°F	350°F	44,000 lbs
C082-076-23	3 ⅛"	8"	0.93"	STD	2 ⅜" Pac Box x Pin	44"	C082-076-23/KS	500 PSI	0°F	350°F	44,000 lbs
C082-076-24	3 ⅛"	8"	0.93"	STD	2 ⅜" PAC DSI BOX	44"	C082-076-24/KS	500 PSI	0°F	350°F	39,000 lbs
C082-083-08	1 $^{11}/_{16}$" - 6 ½"	6.50"	0.51"	H^2S	1" AMMT Box x Pin	44"	C082-083-08/KS	300 PSI	0°F	350°F	28,000 lbs
C082-084-09	2 ⅛" - 7"	7"	0.75"	H^2S	1 ½" AMMT Box x Pin	40"	C082-084-09/KS	500 PSI	0°F	350°F	30,000 lbs

Bow Spring Coiled Tubing Centralizer Technical Specifications

Part Number	Size	OD	ID	Free OD	Service	Connections	Length	Service Kits	Min Temp Rating	Max Temp Rating	Tensile Strength
831-060	1.687"	0.927"	0.250"	19"	STD	1" AMMT Pin x Box	40"	831-060-RDK	-20°F	300°F	34,040 lbs
833-100	2.125"	1.240"	0.750"	21"	H^2S	1 ½" AMMT Pin x Box	40"	833-100-RDK	-20°F	300°F	25,056 lbs

Floating Fluted Centralizer

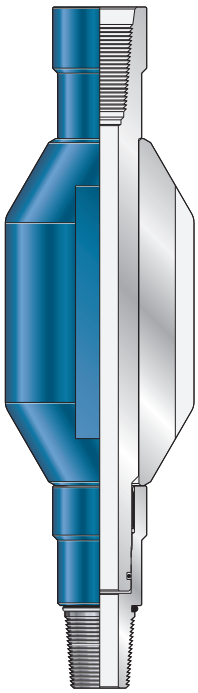
The floating fluted centralizer is a CT tool designed to ensure that the work string and BHA is at its most central position, especially during operations in deviated wells.

The floating fluted centralizer comprises a central carrier mandrel capable of housing a number of interchangeable, floating slip-over fluted centralizers of different size ODs. As such, it is more versatile and economical than a single-piece centralizer.

Normally attached to the toolstring just above the running/pulling tool or fishing tool, the floating centralizer OD is machined to suit the ID of the tubing in which it is to be run. This allows the tool to be used as a tubing drift or gauge in addition to centralizing the toolstring.

Features and Benefits

- Single mandrel suits multiple centralizer diameters
- Tool string can be oriented without rotating the centralizer
- Bore diameter is maintained



Floating Fluted Centralizer

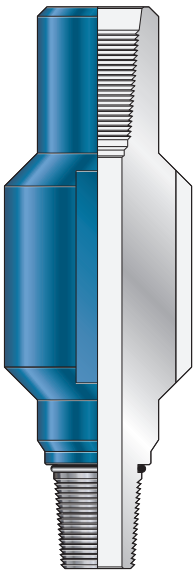
Fluted Centralizer

The fluted centralizer is designed to be included as part of the coiled tubing work string to assist in providing centralization to allow easier location of tools during fishing or to provide general stability in the tubing.

The fluted centralizer has a full flow through bore, allowing the passage of darts or drop balls, and is available in any specific length. The fluted centralizers are available in all common sizes.

Features and Benefits

- Full flow through bore
- Solid one-piece construction



Fluted Centralizer

Floating Fluted Centralizer Technical Specifications

Part Number	Size	OD	ID	Service	Connections	Length	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
C082-127-08	1 1⁵⁄₁₆"	1.687"	0.63"	H^2S	1" AMMT Pin x Box	18.75"	C082-127-08/KS	5,000 PSI	0°F	350°F	42,160 lbs
C082-122-09	2 ⅛"	2.125"	1"	H^2S	1 ½" AMMT Pin x Box	17.50"	C082-122-09/KS	5,000 PSI	0°F	350°F	62,460 lbs
C082-126-09	2 ⅜"	2.375"	1"	H^2S	1 ½" AMMT Pin x Box	23.50"	C082-126-09/KS	5,000 PSI	0°F	350°F	62,460 lbs

Fluted Centralizer Technical Specifications

Part Number	Size	OD	ID	Service	Connections	Length	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
C082-073-08	1 ⁹⁄₁₆"	1.75"	0.75"	STD	1" AMMT Box x Pin	6.50"	C082-073-08/KS	5,000 PSI	0°F	350°F	49,496 lbs
C082-132-08	1 ¾"	2.75"	0.50"	STD	1" AMMT Box x Pin	8.50"	C082-132-08/KS	5,000 PSI	0°F	350°F	76,000 lbs
C082-117-08	1 ½"	1.65"	0.75"	H^2S	1" AMMT Box x Pin	6"	C082-117-08/KS	5,000 PSI	0°F	350°F	35,040 lbs
C082-125-08	1 ½"	1.70"	0.75"	H^2S	1" AMMT Box x Pin	6"	C082-128-08/KS	5,000 PSI	0°F	350°F	35,040 lbs
C082-103-08	1 1⁵⁄₁₆"	2"	0.75"	H^2S	1" AMMT Box x Pin	6.50"	C082-103-08/KS	5,000 PSI	0°F	350°F	35,040 lbs
C082-119-09	2"	2.25"	1"	H^2S	1 ½" AMMT Box x Pin	7"	C082-119-09/KS	5,000 PSI	0°F	350°F	62,465 lbs
C082-120-09	2"	2.50"	1"	H^2S	1 ½" AMMT Box x Pin	7"	C082-120-09/KS	5,000 PSI	0°F	350°F	62,465 lbs
C082-124-09	2 ⅛"	2.35"	1"	H^2S	1 ½" AMMT Box x Pin	8"	C082-124-09/KS	5,000 PSI	0°F	350°F	62,465 lbs
C082-079-09	2 ⅛"	2.87"	1"	H^2S	1 ½" AMMT Box x Pin	6"	C082-079-09/KS	5,000 PSI	0°F	350°F	62,465 lbs
C082-080-24	3 ⅛"	4.75"	1.375"	H^2S	2 ⅜" PAC DSI Box x Pin	12.50"	C082-080-24/KS	5,000 PSI	0°F	350°F	112,400 lbs

Multi-Jet Wash Tool

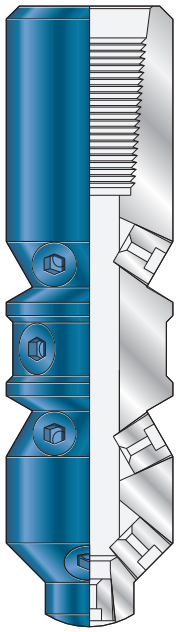
The multi-jet wash tool is a non-rotational wash tool with simple grub screw nozzles that are field adjustable.

Multi-jet wash tools are normally used in conjunction with the flow activated hydraulic jetting indexing tool.

The multi-jet wash tools are available a range of sizes.

Features and Benefits

- Simple and robust construction
- Easily field redressed
- Adjustable flow ports



Multi-Jet Wash Tool

Rotary Jet Wash Tool

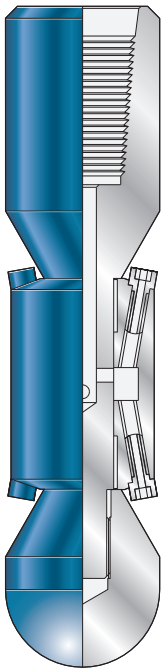
The rotary jet wash tool is designed to be used for both jetting and circulating operations when cleaning and washing the inside of the tubing. It can also be used to assist in the manipulation of the coiled tubing string both in and out of the well.

The design of the rotary jet wash tool works on the principal of applied fluid pressure, causing the nozzle to rotate and jet the fluid against the tubing wall in a full 360° rotating action.

The rotary jet wash tools are available in a range of sizes.

Features and Benefits

- Forward and reverse jetting
- Numerous jetting options
- Simple design



Rotary Jet Wash Tool

Multi-Jet Wash Tool Technical Specifications

Part Number	Size	OD	Service	Top Connection	Length	Service Kits	Recommended Pressure	Tensile Strength
C162-006-08	1 ¾"	1.750"	STD	1" AMMT Box	6.625"	C162-006-08/KS	5,000 PSI	49,496 lbs
C162-009-09	2 ⅛"	2.125"	STD	1 ½" AMMT Box	6.625"	C162-009-09/KS	5,000 PSI	92,232 lbs
C162-007-24	2 ⅞"	2.875"	STD	2 ⅜" PAC DSI Box	8"	C162-007-24/KS	5,000 PSI	168,650 lbs
C162-003-10	3 ⅛"	3.125"	STD	2 ⅜" REG Box	10"	C162-003-10/KS	5,000 PSI	108,800 lbs
C162-038-08	1 ^{1}1⁄$_{16}$"	1.688"	H$_2$S	1" AMMT Box	6.625"	C162-038-08/KS	5,000 PSI	32,996 lbs
C162-022-08	1 ¾"	1.750"	H$_2$S	1" AMMT Box	6.625"	C162-022-08/KS	5,000 PSI	32,996 lbs
C162-039-09	2 ⅛"	2.125"	H$_2$S	1 ½" AMMT Box	7.500"	C162-039-09/KS	5,000 PSI	61,488 lbs
C162-040-09	2 ⅜"	2.375"	H$_2$S	1 ½" AMMT Box	7.500"	C162-040-09/KS	5,000 PSI	61,488 lbs
C162-007-23	2 ⅞"	2.875"	H$_2$S	2 ⅜" PAC Box	8"	C162-007-23/KS	5,000 PSI	130,516 lbs

Rotary Wash Tool Technical Specifications

Part Number	Size	OD	Service	Top Connection	Length	Service Kits	Recommended Pressure	Tensile Strength
C162-018-08	1 1⁄$_{16}$"	1.688"	STD	1" AMMT Box	7.25"	C162-018-08/KS	5,000 PSI	14,382 lbs
C162-005-08	1 ¾"	1.750"	STD	1" AMMT Box	7.25"	C162-005-08/KS	5,000 PSI	17,482 lbs
C162-014-09	2 ⅛"	2.125"	STD	1 ½" AMMT Box	7.75"	C162-014-09/KS	5,000 PSI	8,164 lbs
C162-044-23	2 ⅞"	2.875"	STD	2 ⅜" PAC Box	10.25"	C162-044-23/KS	5,000 PSI	42,362 lbs
C162-015-10	3 ⅛"	3.125"	STD	2 ⅜" API Reg Box	12"	C162-015-10/KS	5,000 PSI	60,597 lbs
C162-033-08	1 1⁄$_{16}$"	1.688"	H$_2$S	1" AMMT Box	7.25"	C162-033-08/KS	5,000 PSI	9,588 lbs
C162-016-08	1 ¾"	1.750"	H$_2$S	1" AMMT Box	7.25"	C162-016-08/KS	5,000 PSI	11,937 lbs
C162-017-09	2 ⅛"	2.125"	H$_2$S	1 ½" AMMT Box	7.75"	C162-017-09/KS	5,000 PSI	6,440 lbs
C162-034-09	2 ⅜"	2.375"	H$_2$S	1 ½" AMMT Box	8.50"	C162-034-09/KS	5,000 PSI	6,440 lbs
C162-045-24	3 ⅛"	3.125"	H$_2$S	2 ⅜" PAC BOX	10.12"	C162-045-24/KS	5,000 PSI	39,000 lbs

Flow Activated Hydraulic Jetting Indexing Tool

The flow-activated hydraulic jetting indexing tool is designed to rotate jetting wash nozzles, allowing full 360° bore coverage.

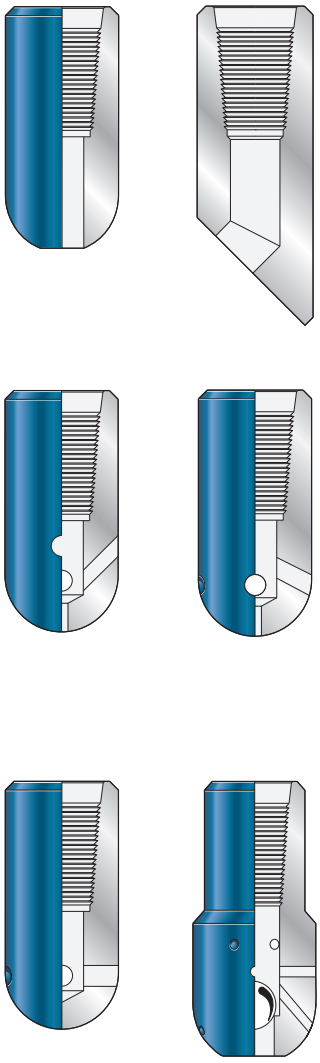
The jetting indexing tool is rotated in a controlled incremental manner by applying intermittent surface pump pressure. When flow pressure is increased to the index operating pressure, the lower half of the tool strokes downwards and indexes, and maintaining pressure allows the increased flow to jet through the jetting wash nozzle.

When the flow pressure is decreased, the tool strokes back and completes the indexing cycle. By repeating this operation, a full 360° wash cycle can be achieved.

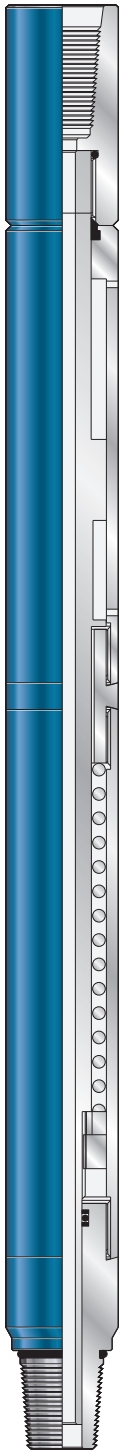
A range of jetting nozzles can be supplied with the jetting indexing tool. See page 30 for more detail.

Features and Benefits

- Flow-Activated (No drop balls required)
- Low pressure actuation
- Full bore opening for high pressure rates
- Easy to operate
- Simple construction



Nozzle Options (See page 34)



Flow-Activated Hydraulic Jetting Indexing Tool

Flow-Activated Hydraulic Jetting Indexing Tool Technical Specifications

Part Number	Size	OD	ID	Service	Connections	Length	Service Kits	Working Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
C163-019-08	1 ¾"	1.750"	0.250"	STD	1" AMMT Box	28.75"	C163-019-08/KS	3,000 PSI	0°F	350°F	32,890 lbs
C163-035-09	2 ⅜"	2.375"	0.500"	STD	1 ½" AMMT Box	26.25"	C163-035-09/KS	3,000 PSI	0°F	350°F	58,230 lbs
C163-020-10	3 ⅛"	3.125"	0.750"	STD	2 ⅜" REG Box	30"	C163-020-10/KS	5,000 PSI	0°F	350°F	102,240 lbs
C163-021-08	1 ¾"	1.750"	0.250"	H^2S	1" AMMT Box	29"	C163-021-08/KS	3,000 PSI	0°F	350°F	22,000 lbs

Slimhole Jetting Head Assembly

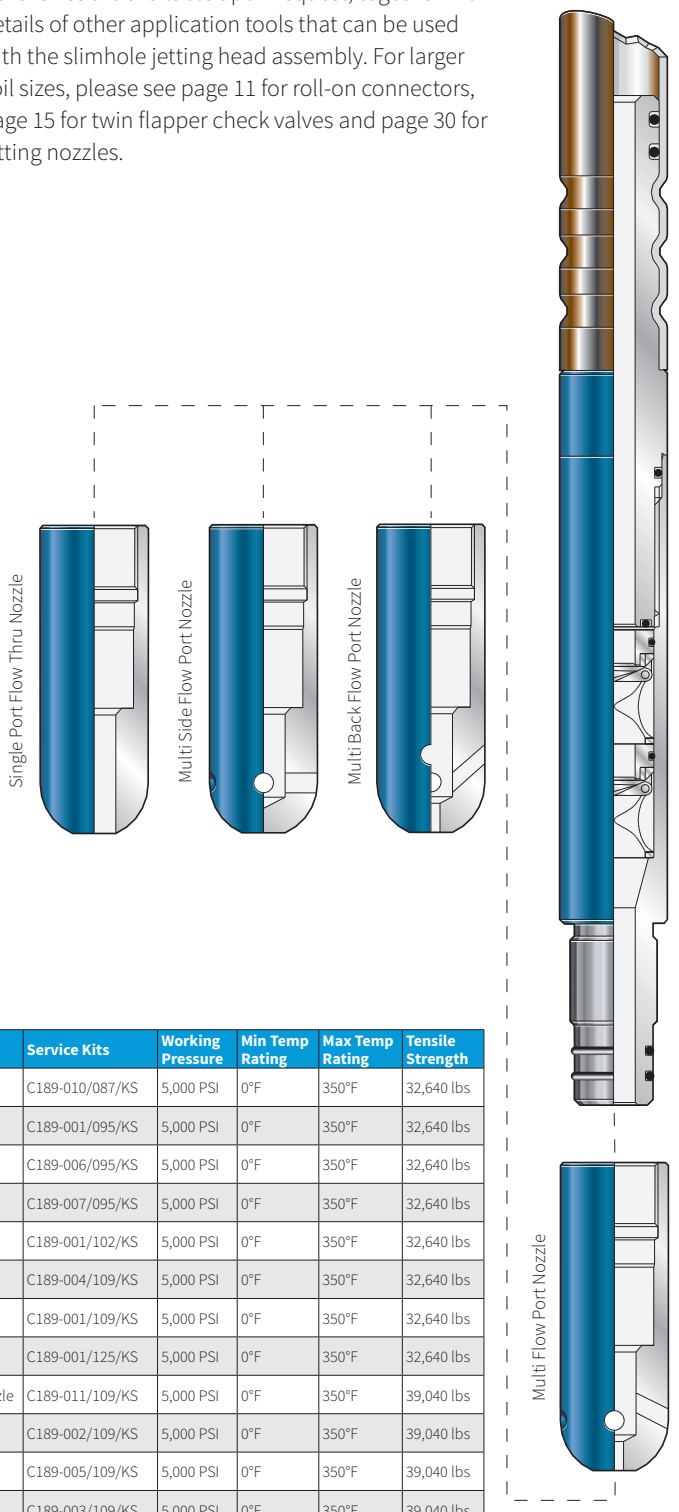
The slimhole jetting head assembly provides the operator with a jetting wash tool assembly that is the same diameter as the coiled tubing. The flapper check valve cartridge is used as the prime safety barrier to prevent back flow from running up the coiled tubing should control of the pump or ancillary surface equipment be lost for any reason.

By incorporating a conventional roll-on connector and facilitating the choice of jetting nozzles, wash tools, or other slimhole tools into the integrated design, the slimhole jetting head assembly becomes the ideal tool for all slimhole applications.

Other sizes are available upon request, together with details of other application tools that can be used with the slimhole jetting head assembly. For larger coil sizes, please see page 11 for roll-on connectors, page 15 for twin flapper check valves and page 30 for jetting nozzles.

Features and Benefits

- One simple roll-on connection to the coiled tubing is used for easy field service.
- Roll-on connectors are interchangeable to accommodate different coil weights.
- Twin flapper cartridges are used in the assembly to provide a double safety barrier.
- Maximum flow area through the flapper cartridges reduces unnecessary back pressure on the surface pumps.
- The flow path through the flapper cartridges does not restrict the passage of balls or darts used during operations such as cementing.
- The flapper cartridges are a field proven construction, featuring the latest material technologies to provide the best possible field life.
- The unique characteristic of the cartridge and flapper seal is the twin seal. This provides a low pressure non-stick seal and a high pressure metal to metal seal.



Slim-Hole Jetting Head Assembly

Slimhole Jetting Head Assembly Technical Specifications

Part Number	Size	OD	ID	Service	Top Connection	Length	Flow Port Nozzle Type	Service Kits	Working Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
C189-010/087	1 ¼"	1.250"	0.375"	STD	1" x 0.087" CT	11.25"	Multi Flow Port Nozzle	C189-010/087/KS	5,000 PSI	0°F	350°F	32,640 lbs
C189-001/095	1 ¼"	1.250"	0.500"	STD	1 ¼" x 0.095" CT	11"	Multi Flow Port Nozzle	C189-001/095/KS	5,000 PSI	0°F	350°F	32,640 lbs
C189-006/095	1 ¼"	1.250"	0.500"	STD	1 ¼" x 0.095" CT	11"	Single Flow Port Nozzle	C189-006/095/KS	5,000 PSI	0°F	350°F	32,640 lbs
C189-007/095	1 ¼"	1.250"	0.500"	STD	1 ¼" x 0.095" CT	11"	Multi Side Flow Port Nozzle	C189-007/095/KS	5,000 PSI	0°F	350°F	32,640 lbs
C189-001/102	1 ¼"	1.250"	0.500"	STD	1 ¼" x 0.102" CT	11"	Multi Flow Port Nozzle	C189-001/102/KS	5,000 PSI	0°F	350°F	32,640 lbs
C189-004/109	1 ¼"	1.250"	0.500"	STD	1 ¼" x 0.109" CT	11"	Multi Back Flow Port Nozzle	C189-004/109/KS	5,000 PSI	0°F	350°F	32,640 lbs
C189-001/109	1 ¼"	1.250"	0.500"	STD	1 ¼" x 0.109" CT	11"	Multi Flow Port Nozzle	C189-001/109/KS	5,000 PSI	0°F	350°F	32,640 lbs
C189-001/125	1 ¼"	1.250"	0.500"	STD	1 ¼" x 0.125" CT	11"	Multi Flow Port Nozzle	C189-001/125/KS	5,000 PSI	0°F	350°F	32,640 lbs
C189-011/109	1 ½"	1.500"	0.500"	STD	1 ½" x 0.109" CT	11.25"	Multi Back & Down Flow Port Nozzle	C189-011/109/KS	5,000 PSI	0°F	350°F	39,040 lbs
C189-002/109	1 ½"	1.500"	0.500"	STD	1 ½" x 0.109" CT	11.25"	Multi Flow Port Nozzle	C189-002/109/KS	5,000 PSI	0°F	350°F	39,040 lbs
C189-005/109	1 ½"	1.500"	0.500"	STD	1 ½" x 0.109" CT	11.25"	Multi Side Flow Port Nozzle	C189-005/109/KS	5,000 PSI	0°F	350°F	39,040 lbs
C189-003/109	1 ½"	1.500"	0.500"	STD	1 ½" x 0.109" CT	11.25"	Multi Back Flow Port Nozzle	C189-003/109/KS	5,000 PSI	0°F	350°F	39,040 lbs
C189-009/109	1 ½"	1.500"	0.500"	STD	1 ½" x 0.109" CT	11.25"	Multi Side +1D Flow Port Nozzle	C189-009/109/KS	5,000 PSI	0°F	350°F	39,040 lbs
C189-002/125	1 ½"	1.500"	0.500"	STD	1 ½" x 0.125" CT	11.25"	Multi Flow Port Nozzle	C189-002/125/KS	5,000 PSI	0°F	350°F	39,040 lbs

Jetting Nozzles

Single Port Flow Thru Nozzle Technical Specifications

Part Number	Size	OD	Service	Top Connetion	Tool makeup Length	Working Tensile	Nozzle Port Configuration
02-29228	1 1⁄16”	1.687”	H²S	1” AMMT Box	5.0”	32,990 ft-lbs	1” x 0.250”
02-29236	2 1⁄8”	2.125”	H²S	1 ½” AMMT Box	6.0”	61,480 ft-lbs	1” X 0.500”
02-29245	2 3⁄8”	2.375”	H²S	1 ½” AMMT Box	6.0”	61,480 ft-lbs	1” x 0.750”

Single Port Muleshoe Nozzle Technical Specifications

02-29230	1 1⁄16”	1.687”	H²S	1” AMMT Box	5.50	32,990 ft-lbs	1” x 0.625” @ 45°
02-29243	2 1⁄8”	2.125”	H²S	1 ½” AMMT Box	6”	61,480 ft-lbs	1” x 0.875” @ 45°
02-29249	2 3⁄8”	2.375”	H²S	1 ½” AMMT Box	6”	61,480 ft-lbs	1” x 0.875” @ 45°

Multiple Back Flow Nozzle Technical Specifications

02-33788	1 1⁄16”	1.687”	H²S	1” AMMT Box	5”	32,990 ft-lbs	4” x 0.250” @ 135°
02-30229	2 1⁄8”	2.375”	H²S	1 ½” AMMT Box	5”	61,480 ft-lbs	4” x 0.250” @ 135°

Multiple Side Flow Nozzle Technical Specifications

02-29233	1 1⁄16”	1.687”	H²S	1” AMMT Box	5”	32,990 ft-lbs	4” x 0.250” @ 90°
02-29238	2 1⁄8”	2.125”	H²S	1 ½” AMMT Box	5”	61,480 ft-lbs	4” x 0.250” @ 90°
02-29247	2 3⁄8”	2.375”	H²S	1 ½” AMMT Box	6”	61,480 ft-lbs	4” x 0.312” @ 90°

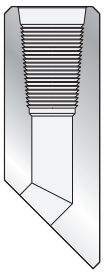
Multiple Flow Port Nozzle Technical Specifications

02-29229	1 1⁄16”	1.687”	H²S	1” AMMT Box	5”	32,990 ft-lbs	4” x 0.250” @ 45°
02-29237	2 1⁄8”	2.125”	H²S	1 ½” AMMT Box	5”	61,480 ft-lbs	4” x 0.250” @ 45°
02-29246	2 3⁄8”	2.375”	H²S	1 ½” AMMT Box	6”	61,480 ft-lbs	4” x 0.312” @ 45°

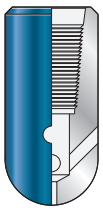
Multiple Up Flow Nozzle Technical Specifications

C162-035-08	1 1⁄16”	1.687”	H²S	1” AMMT Box	5”	37,122 ft-lbs	4” x 0.250” @ 45°
C162-036-09	2 1⁄8”	2.125”	H²S	1 ½” AMMT Box	6”	69,174 ft-lbs	4” x 0.250” @ 45°
C162-037-09	2 3⁄8”	2.375”	H²S	1 ½” AMMT Box	6”	69,174 ft-lbs	4” x 0.312” @ 45°

Single Port
Flow Thru Nozzle

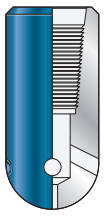


Single Port
Muleshoe Nozzle

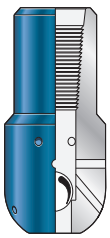


Multiple Back
Flow Nozzle

Multiple Side
Flow Nozzle

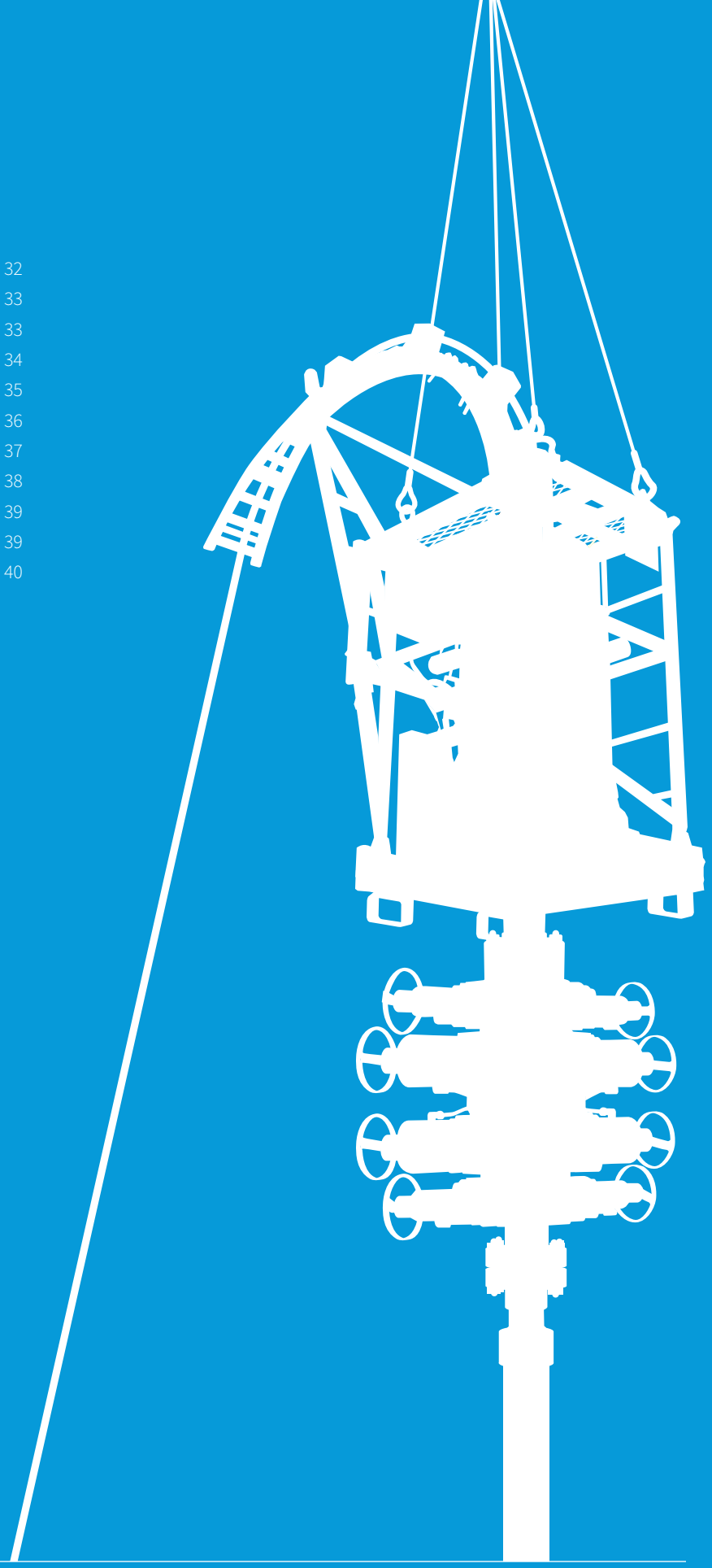


Multiple Flow
Port Nozzle



Multiple Up
Flow Nozzle

Fishing Tools



Bowen™ *TerraForce*™ Coiled Tubing (CT) Jar

The *Bowen*™ *TerraForce*™ coiled tubing drilling jar is a bi-directional hydraulic CT 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. The new 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* CT jar, we have designed a jar placement program that provides impacts at the stuck point for service companies and operators to use.

Features and Benefits

- Full hydraulic operation
- Variable impact control
- A series of impacts can be applied without having to apply the reverse jarring cycle
- Class-leading torque handling capabilities
- Overall length has been optimized to fit in typical milling BHAs

Bowen™
TerraForce™
Coiled Tubing Jar

TerraForce Coiled Tubing Jar Technical Specifications

Part Number	OD	ID	Service	Top Connection	Bottom Connection	Length	Stroke	Seal Kit Part Number	Seal Kit	Max Temp @ 5,000 psi	Max Temp @ 10,000 psi	Tensile Strength	Torque
506562/005	1 1⁄16"	9⁄16"	STD	1" AMMT	1" AMMT	50.8"	10.2"	507621/010	Standard - 90 Duro	250°F	Do Not Use	60,500 lbs	1140 ft-lbs
506230/005	2 7⁄8"	1"	STD	2 3⁄8" PAC DSI	2 3⁄8" AM-PAC Box x Pin	56.7"	10.3"	506476/010 506476/060	Standard - 90 Duro Hi Temp - 90 Duro	250°F 400°F	Do Not Use 375°F	195,000 lbs	4100 ft-lbs
507055/005	3 1⁄8"	1"	STD	2 3⁄8" API REG	2 3⁄8" API REG	58.45"	10.3"	507074/010 507074/060	Standard - 90 Duro Hi Temp - 90 Duro	250°F 400°F	Do Not Use 375°F	280,000 lbs	7384 ft-lbs

Bowen™ Ultra Hydraulic Coiled Tubing Jar and *Bowen*™ Coiled Tubing Intensifier

The *Bowen*™ Ultra coiled tubing jar is a bi-directional hydraulic CT jarring assembly designed to operate in conjunction with the coiled tubing jar intensifier. This jar's unique design allows for easy, dependable, and hard hitting operation, with no setting or adjustment is 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. The new patent-pending technology within the assembly allows the tool to deliver higher impacts.

To complement the new Ultra CT jar, we have designed a new jar placement program that provides impacts at the stuck point for service companies and operators to use.

The new CT jar placement program:

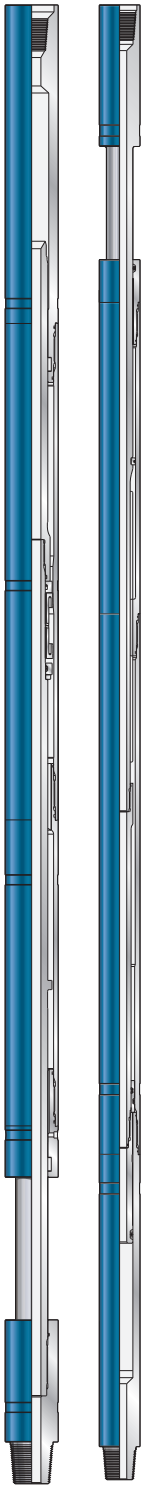
- Impacts at the stuck point, not just the jar
- Allows the service company to optimize the BHA to deliver the hardest impact and impulse
- Considers configuration and length of fish, hole profile, friction, mud weight effects, CT size, etc.
- Program designed only for NOV tools - all calculations and results are based on NOV tools
- Customers can download program for free at nov.com

NOV offers free technical support on the program and our tools 24/7 at 1-888-DHT-TOOL

We will run jar impact calculations for customers through the 24-hour hotline.

Features and Benefits

- Full hydraulic operation
- Variable impact control
- A series of impacts applied without having to apply the reverse jarring cycle



Ultra Hydraulic CT Jar

Bowen CT Intensifier

The coiled tubing intensifier is a straight pull-and-push jarring tool that employs patented combinations of hydraulics and mechanics. The unique design allows for easy and dependable operation. No setting or adjustment is required before going in the hole or after the fish is engaged. The operator can easily and simply control the intensity of the jarring blows by varying the applied load. The Ultra coiled tubing jar can deliver a wide range of blows, from low to very high impact forces. The coiled tubing intensifier is designed to operate in conjunction with the Ultra CT jar to supply force acceleration during the jarring stroke. The comparatively large ID permits the use of drop balls to actuate tools below the jar.

Features and Benefits

- Increased impact ratios above existing industry tools
- Industry-leading impact values
- Shorter, more robust design
- Enhanced seal technology to ensure reliability

Bowen™ Ultra Hydraulic Coiled Tubing Jar Technical Specifications

Part Number	OD	ID	Service	Connections	Length	Stroke	Seal Kits	Max Temp @ 5KSI	Max Temp @ 10KSI	Min Temp Rating	Tensile Strength
505485/005	1.687"	0.562"	STD	1" AMMT	57.50"	11"	505265/010 505265/060	250°F 400°F	Do Not Use 375°F	0°F	50,000 lbs
505494/005	2.125"	0.750"	STD	1 ½" AMMT	61.75"	12"	505271/010 505271/060	250°F 400°F	Do Not Use 375°F	0°F	95,000 lbs
504980/005	2.875"	1"	STD	2 ⅜" AM-PAC	68.25"	12"	504988/010 504988/060	250°F 400°F	Do Not Use 375°F	0°F	195,000 lbs

Bowen™ Coiled Tubing Intensifier Technical Specifications

Part Number	OD	ID	Service	Connections	Length	Length in Neutral Position	Total Stroke	Seal Kits	Max Temp @ 5KSI	Max Temp @ 10KSI	Min Temp Rating	Tensile Strength
155969/010	1.687"	0.562"	STD STD	1" AMMT	74.500"	76"	6"	504824/010 504824/060	250°F 400°F	Do Not Use 375°F	0°F	50,000 lbs
154412/010	2.125"	0.750"	STD STD	1 ¼" REG	85.000"	87"	7"	504819/010 504819/060	250°F 400°F	Do Not Use 375°F	0°F	95,000 lbs
154412/012	2.125"	0.750"	STD STD	1 ½" AMMT	85.000"	87"	7"	504819/010 504819/060	250°F 400°F	Do Not Use 375°F	0°F	95,000 lbs
156341/010	2.875"	1"	STD STD	2 ⅜" AM PAC	92.500"	104"	8"	504820/010 504820/060	250°F 400°F	Do Not Use 375°F	0°F	195,000 lbs
154440/010	3.125"	1.250"	STD STD	2 ⅜" REG	93.625"	104"	8"	504821/010 504821/060	250°F 400°F	Do Not Use 375°F	0°F	214,000 lbs

Flow Activated Releasable Overshot Tool

The flow-activated releasable overshot tool is a variable catch external overshot used to retrieve a lost cylindrical fish from the wellbore. The flow-activated releasable overshot tool is run in hole until it latches onto the fish and butts out. Pulling up will cause the slips to set into the fish.

Should the fish be irretrievable, the tool can be released from the fish by flow activation and returned to surface. Circulation of up to a 100 psi differential can be maintained during fishing. A variety of choke sizes are available to suit different flow rates and fluid densities.

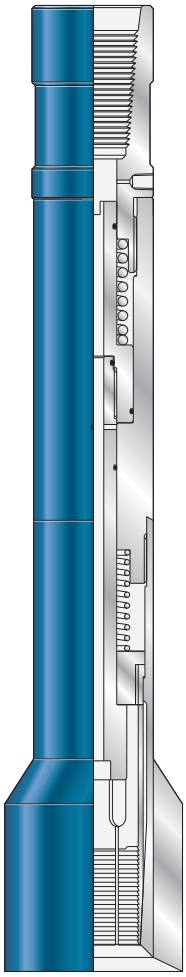
The flow-activated releasable overshot tool can be used to retrieve lost or broken tubing, coil, and coiled tubing tools that have backed off down hole. The flow-activated releasable overshot tool can be supplied to overshoot and seal onto a specific fish. This is of importance if there is a flow-activated tool beneath the fish that requires operation before the fish can be retrieved.

The flow-activated releasable overshot tool is also available with pack-off O-rings. Please contact NOV for more details.

A complete range of hardened and double-tempered slips are available for each size tool. See table on page 35 for slip and catch size details.

Features and Benefits

- Internal hammer action assists release
- Flow or drop ball activated
- Hardened and double tempered slips
- Robust construction
- Variable slips sizes for each tool
- Optional bell guides available



Flow Activated Releasable Overshot Tool

Flow Activated Releasable Overshot Tool Extension Kits

Part Number	Descriptions
C090-118	Extension Kit 2" Flow Activated Releasable Overshot Tool 12" Reach x 1.125" Diameter
C090-119	Extension Kit 2.5" Flow Activated Releasable Overshot Tool 12" Reach x 1.375" Diameter
C090-120	Extension Kit 3" Flow Activated Releasable Overshot Tool 12" Reach x 1.687" Diameter
C090-121	Extension Kit 3.5" Flow Activated Releasable Overshot Tool 12" Reach x 2.187" Diameter
C090-122	Extension Kit 4" Flow Activated Releasable Overshot Tool 12" Reach x 2.687" Diameter
C090-135	Extension Kit 4" Flow Activated Releasable Overshot Tool 12" Reach x 2.656" Diameter
C090-138	Extension Kit 4.5" Flow Activated Releasable Overshot Tool 36" Reach x 3.281" Diameter
C090-139	Extension Kit 4" Flow Activated Releasable Overshot Tool 36" Reach x 2.656" Diameter
C090-140	Extension Kit 4.5" Flow Activated Releasable Overshot Tool 12" Reach x 2.687" Diameter
C090-142	Extension Kit 3.5" Flow Activated Releasable Overshot Tool 36" Reach 3.281" Diameter

Flow Activated Releasable Overshot Tool Technical Specifications

Part Number	Size	OD	ID (No Choke)	Service	Top Connection	Length	Size of Grapple in Assy	Service Kits	Min Temp Rating	Max Temp Rating	Tensile Strength
C090-058-08	2"	1.850"	0.390"	STD	1" AMMT Box	23.25"	1 5/16" to 1 1 1/16"	C090-058-08/KS	0°F	350°F	32,800 lbs
C090-068-09	2 1/8"	2.125"	0.390"	STD	1 1/2" AMMT Box	23.50"	1 3/16" to 1 5/16	C090-068-09/KS	0°F	350°F	54,400 lbs
C090-064-09	2 1/2"	2.250"	0.390"	STD	1 1/2" AMMT Box	23.50"	1 7/16" to 1 9/16"	C090-064-09/KS	0°F	350°F	73,600 lbs
C090-055-09	3"	2.625"	0.390"	STD	1 1/2" AMMT Box	21.50"	1 7/8" to 2 1/16"	C090-055-09/KS	0°F	350°F	65,600 lbs
C090-056-23	3 1/2"	3.250"	0.390"	STD	2 3/8" PAC Box	25.50"	2" to 2 3/16"	C090-056-23/KS	0°F	350°F	133,600 lbs
C090-057-23	4"	3.800"	0.390"	STD	2 3/8" PAC Box	25.75"	2 3/8" to 2 5/8"	C090-057-23/KS	0°F	350°F	152,800 lbs
C090-124-10	4 1/2"	4.500"	0.390"	STD	2 3/8" REG Box	26.50"	2 7/8" to 3 1/8"	C090-124-10/KS	0°F	350°F	151,188 lbs
C090-086-08	2"	1.850"	0.390"	H^2S	1" AMMT Box	23.25"	1 5/16" to 1 1 1/16"	C090-086-08/KS	0°F	350°F	21,866 lbs
C090-110-09	2 1/8"	2.125"	0.390"	H^2S	1 1/2" AMMT Box	23.50"	1 7/16" to 1 9/16"	C090-110-09/KS	0°F	350°F	36,266 lbs
C090-087-09	2 1/2"	2.250"	0.390"	H^2S	1 1/2" AMMT Box	23.50"	1 7/16" to 1 9/16"	C090-087-09/KS	0°F	350°F	49,066 lbs
C090-088-09	3"	2.625"	0.390"	H^2S	1 1/2" AMMT Box	20.25"	1 7/8" to 2 1/16"	C090-088-09/KS	0°F	350°F	43,732 lbs
C090-089-23	3 1/2"	3.250"	0.390"	H^2S	2 3/8" PAC Box	26"	2" to 2 3/16"	C090-089-23/KS	0°F	350°F	89,066 lbs
C090-089-24	3 1/2"	3.250"	0.390"	H^2S	2 3/8" PAC DSI Box	26"	2" to 2 3/16"	C090-089-24/KS	0°F	350°F	105,000 lbs
C090-123-23	4"	3.800"	0.390"	H^2S	2 3/8" PAC Box	26"	2 3/8" to 2 5/8"	C090-123-23/KS	0°F	350°F	101,866 lbs

Flow Activated Releasable Overshot Tool Slips

Typical Flow Activated Releasable Overshot Tool Slips

Flow Activated Releasable Overshot Tool Hardened Slips

Nominal Size	2”	2 ⅛”	2 ½”	3”	3 ½”	4”	4 ½”
Actual O.D.	1.850”	2.125”	2.250”	2.625”	3.250”	3.800”	4.500”
Nominal Slip Size	Catch Range (Part Number)	Catch Range (Part Number)	Catch Range (Part Number)	Catch Range (Part Number)	Catch Range (Part Number)	Catch Range (Part Number)	Catch Range (Part Number)
½”	7/16” to 9/16” (00-16024)	7/16” to 9/16” (00-16024)	7/16” to 9/16” (00-16032)	3/8” to 9/16” (00-16038)	-	3/8” to 5/8” (00-16042)	-
5/8”	9/16” to 11/16” (00-16025)	9/16” to 11/16” (00-16025)	9/16” to 11/16” (00-16033)	9/16” to ¾” (00-16039)	½” to 11/16” (00-17491)	-	-
¾”	11/16” to 13/16” (00-16026)	11/16” to 13/16” (00-16026)	11/16” to 13/16” (00-16034)	-	11/16” to 7/8” (00-17492)	5/8” to 7/8” (00-16043)	-
7/8”	13/16” to 15/16” (00-16027)	**13/16” to 15/16” (00-16027)**	13/16” to 15/16” (00-16047)	¾” to 15/16” (00-16040)	-	-	-
1”	**15/16” to 1 1/16” (00-13769)**	15/16” to 1 1/16” (00-13769)	15/16” to 1 1/16” (00-16035)	15/16” to 1 ⅛” (00-16041)	7/8” to 1 1/16” (00-17493)	7/8” to 1 ⅛” (00-16044)	-
1 ⅛”	1 1/16” to 1 3/16” (00-16028)	1 1/16” to 1 3/16” (00-16028)	1 1/16” to 1 3/16” (00-16036)	-	1 1/16” to 1 ¼” (00-17494)	-	-
1 ¼”	1 3/16” to 5/16” (00-16029)	1 3/16” to 1 5/16” (00-16029)	1 3/16” to 1 5/16” (00-16048)	1 ⅛” to 1 5/16” (00-13807)	-	1 ⅛” to 1 3/8” (00-16045)	-
1 3/8”	1 5/16” to 1 7/16” (00-16030)	1 5/16” to 1 7/16” (00-16030)	1 5/16” to 1 7/16” (00-16049)	1 5/16” to 1 ½” (00-13806)	1 ¼” to 1 7/16” (00-17495)	-	-
1 ½”		1 7/16” to 1 9/16” (00-16031)	**1 7/16” to 1 9/16” (00-13764)**	-	1 7/16” to 1 5/8” (00-17496)	1 3/8” to 1 5/8” (00-13198)	-
1 5/8”	-	-	1 9/16” to 1 11/16” (00-16050)	1 ½” to 1 11/16” (00-13805)	-	-	-
1 ¾”	-	-	1 5/8” to 1 ¾” (00-16037)	1 11/16” to 1 7/8” (00-13804)	1 5/8” to 1 13/16” (00-17497)	1 5/8” to 1 7/8” (00-13195)	-
1 7/8”	-	-	-	-	1 13/16” to 2” (00-17498)	-	-
2”	-	-	-	**1 7/8” to 2 1/16” (00-13799)**	**2” to 2 3/16” (00-16582)**	1 7/8” to 2 1/8” (00-13196)	-
2 ¼”	-	-	-	-	2 1/8” to 2 5/16” (00-17499)	2 1/8” to 2 3/8” (00-13197)	-
2 ½”	-	-	-	-	-	**2 3/8” to 2 5/8” (00-13765)**	-
2 ¾”	-	-	-	-	-	2 5/8” to 2 7/8” (00-16046)	2 5/8” to 2 7/8” (00-36131)
3”	-	-	-	-	-	-	**2 7/8” to 3 1/8” (00-36132)**
3 ¼”	-	-	-	-	-	-	3 1/8” to 3 3/8” (00-36133)
3 ½”	-	-	-	-	-	-	3 3/8” to 3 5/8” (00-36134)

Sizes highlighted in blue indicate Overshot Slip standard fitment

Flow Activated Releasable Fishing/Bulldog Spear

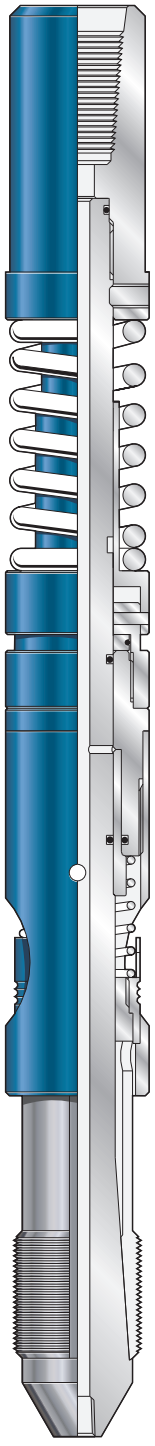
The flow-activated releasable fishing/bulldog spear is a variable catch internal spear used to retrieve a lost cylindrical fish from the wellbore. A complete range of slips is available for each size tool. To operate, simply run into the fish, set down and then pick up the weight, and retrieve the fish.

To release from the fish, simply set down the weight and circulate. The spear will then release due to the flow differential created.

A complete range of hardened slips are available for each size tool. See the table on page 37 for slip and catch size details.

Features and Benefits

- Flow or drop ball activated
- Hardened & double tempered slips
- Robust construction
- Variable slip sizes for each tool



Flow Activated Releasable Fishing/Bulldog Spear

Flow Activated Releaseable Fishing/Bulldog Spear Technical Specifications

Part Number	Size	OD	ID No Choke	Service	Top Connection	Length	Size of Slip in Assy	Service Kits	Working Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
C087-038-08	2"	1.850"	0.250"	STD	1" AMMT Box	22"	1 ⅜" to 1 ½"	C087-038-08/KS	5,000 PSI	0°F	350°F	30,783 lbs
C087-037-09	2 ½"	2.250"	0.390"	STD	1 ½" AMMT Box	24.375"	2" to 2⅛"	C087-037-09/KS	5,000 PSI	0°F	350°F	63,685 lbs
C087-048-23	3"	2.875"	0.390"	STD	2 ⅜" PAC Box	25.125"	2 ¼" to 2 ⅜"	C087-048-23/KS	5,000 PSI	0°F	350°F	83,729 lbs
C087-048-09	3"	2.730"	0.390"	STD	1 ½" AMMT Box	25.125"	2 ⅜" to 2 ⅜"	C087-048-09/KS	5,000 PSI	0°F	350°F	83,729 lbs
C087-065-23	3 ½"	3.110"	0.390"	STD	2 ⅜" PAC Box	25.125"	2 ⅝" to 2 ¾"	C087-065-23/KS	5,000 PSI	0°F	350°F	83,729 lbs
C087-065-24	3 ½"	3.110"	0.390"	STD	2 ⅜" PAC DSI Box	24.18"	2 ⅝" to 2 ¾"	C087-065-24/KS	5,000 PSI	0°F	350°F	75,000 lbs
C087-066-10	4"	3.630"	0.390"	STD	2 ⅜" REG Box	24.125"	3⅛" to 3 ¼"	C087-066-10/KS	5,000 PSI	0°F	350°F	83,729 lbs

Flow Activated Releasable Fishing/Bulldog Spear Slips

Flow Activated Releaseable Fishing/Bulldog Slips Technical Specifications

Spear Size	2”	2 ½”	3”	3½”	4”
Spear O.D.	1.810”	2.250”	2.625”	3.110”	3.625”
Bulldog Spear Nominal Size Range	1 ⅛”- 1 ⅞”	1 ⅞” - 2 ½”	2 ⅜” - 2 ⅞”	2 ⅝”- 3 ⅛”	3 ⅛”- 3 ¾”
Nominal Slip Size	Catch Range (Part Number)	Catch Range (Part Number)	Catch Range (Part Number)	Catch Range (Part Number)	Catch Range (Part Number)
1 ⅛”	1 ⅛” to 1 ¼” (00-21155)		-	-	-
1 ¼”	1 ¼” to 1 ⅜” (00-21156)	-	-	-	-
1 ⅜”	**1 ⅜” to 1 ½” (00-21157)**	-	-	-	-
1 ½”	1 ½” to 1 ⅝” (00-21158)	-	-	-	-
1 ⅝”	1 ⅝” to 1 ¾” (00-21159)	-	-	-	-
1 ¾”	1 ¾” to 1 ⅞” (00-24282)	1 ¾” to 2 ⅞” (00-24187)	-	-	-
1 ⅞”	-	1 ⅞” to 2” (00-20832)	-	-	-
2”	-	**2” to 2 ⅛” (00-29546)**	-	-	-
2 ⅛”	-	2 ⅛” to 2 ¼” (00-21124)	-	-	-
2 ¼”	-	2 ¼” to 2 ⅜” (00-29547)	**2 ¼” to 2⅜” (00-30548)**	-	-
2 ⅜”	-	2 ⅜” to 2 ½” (00-21125)	2 ⅜” to 2 ½” (00-27971)	-	-
2 ½”	-	-	2 ½” to 2 ⅝” (00-27972)	-	-
2 ⅜”	-	-	2 ⅝” to 2 ¾” (00-27973)	2 ⅝” to 2 ¾” (00-30549)	-
2 ¾”	-	-	2 ¾” to 2 ⅞” (00-27974)	2 ¾” to 2 ⅞” (00-30550)	-
2 ⅞”	-	-	-	2 ⅞” to 3” (00-30551)	-
3”	-	-	-	3” to 3 ⅛” (00-30552)	-
3 ⅛”	-	-	-	-	**3 ⅛” to 3 ¼” (00-30553)**
3 ¼”	-	-	-	-	3 ¼” to 3 ⅜” (00-30554)
3 ⅜”	-	-	-	-	3 ⅜” to 3 ½” (00-30555)
3 ½”	-	-	-	-	3 ½” to 3 ⅝” (00-30556)
3 ⅝”	-	-	-	-	3 ⅝” to 3 ¾” (00-30557)

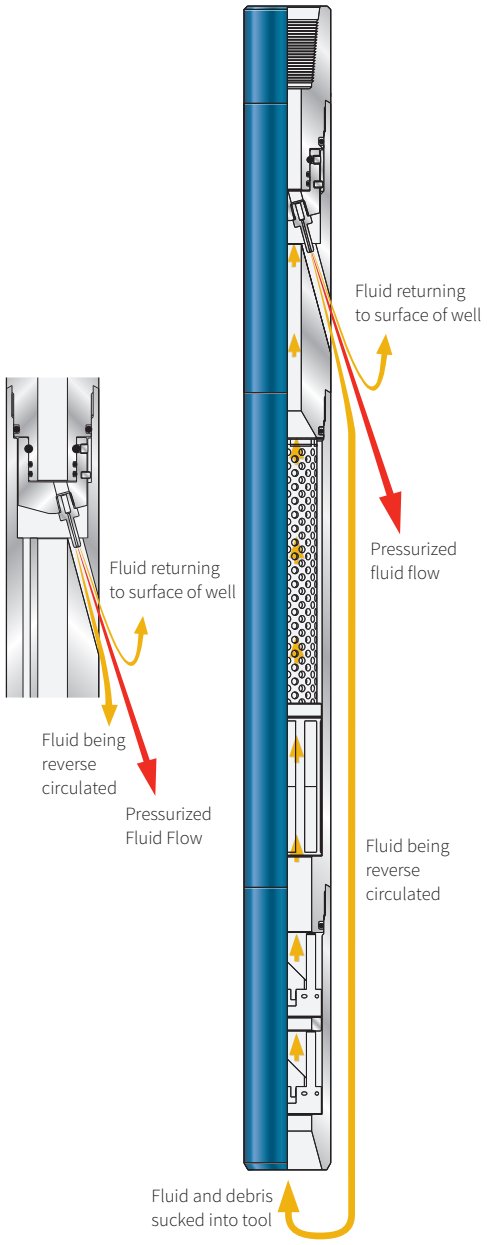
Sizes highlighted in blue indicate bulldog spear slip standard fitment

Venturi Junk Basket

The Venturi junk basket is a tool used to retrieve junk and debris from the wellbore. When fluid is pumped through the string of the coiled tubing and out through the nozzles in the Venturi chamber, a vacuum is created. Fluid is sucked from the bottom of the tool to exit back through the Venturi tubes. Most of this fluid mixes with the pressurized fluid to be recirculated around the bottom of the tool.

The tool is essentially a high-powered vacuum cleaner that may be used with fluid, multiphase fluids, foams, or gases. The nozzles in the tool are simply changed out for the available pump rate, fluid or gas. A debris filter screen is placed before the Venturi chamber to prevent debris from blocking the Venturi tubes.

A hollow magnetic section with a finger-type trap catches junk and debris, which is then carried from the well inside the tool. Barrel extensions are available to increase the volume of junk which may be carried. The tool is not dependent on hole size to work, so you could use a 3⅛ in. OD tool to retrieve debris from 7 in. casing.



Optional Nozzles

Venturi Basket Sizes 1 ¾" - 2 ¼"		Venturi Basket Sizes 2 ⅝" - 3 ⅛"	
Part Number	**Size**	**Part Number**	**Size**
00-28232 (Std)	0.062" (Std)	00-24372 (Std)	0.062" (Std)
01-28232	0.078"	01-24372	0.078"
02-28232	0.094"	02-24372	0.094"
03-28232	0.109"	03-24372	0.109"
04-28232	0.125"	04-24372	0.125"
05-28232	0.140"	05-24372	0.140"
06-28232	0.156"	06-24372	0.156"
07-28232	0.171"	07-24372	0.171"
08-28232	0.187"	08-24372	0.187"

Venturi Junk Basket Extension Tubes

Venturi Basket Size	Extension Tube Part Number	Extension Tube Length
1 ¾"	00-33086 00-30943	4 ft 6 ft
2 1/16"	00-29978 00-34096	4 ft 6 ft
2 ¼"	00-31713	4 ft
2 ⅝"	00-27341 00-29977 00-27342 00-34097	2 ft 4 ft 5 ft 5 ft
3 ⅛"	00-26095 00-34765	10 ft 4 ft

Venturi Junk Basket Technical Specifications

Part Number	Size	OD	ID	Service	Top Connection	Length	Service Kits	Nozzle	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
C183-006-08	1 ¾"	1.75"	0.469"	STD	1" AMMT Box	33"	C183-006-08/KS	00-28232 (Std)	5,000 PSI	0°F	350°F	36,000 lbs
C183-007-09	2 1/16"	2.062"	1"	STD	1 ½" AMMT Box	33"	C183-007-09/KS	00-28232 (Std)	5,000 PSI	0°F	350°F	45,840 lbs
C183-011-09	2 ¼"	2.062"	1"	STD	1 ½" AMMT Box	33"	C183-011-09/KS	00-28232 (Std)	5,000 PSI	0°F	350°F	45,840 lbs
C183-002-09	2 ⅝"	2.625"	1"	STD	1 ½" AMMT Box	36.625"	C183-002-09/KS	00-24372 (Std)	5,000 PSI	0°F	350°F	45,840 lbs
C183-014-23	3 ⅛"	3.125"	1"	STD	2 ⅜" PAC Pin	42"	C183-014-23/KS	00-24372 (Std)	5,000 PSI	0°F	350°F	109,600 lbs
C183-001-10	3 ⅛"	3.125"	1"	STD	2 ⅜" REG Box	42"	C183-001-10/KS	00-24372 (Std)	5,000 PSI	0°F	350°F	109,600 lbs

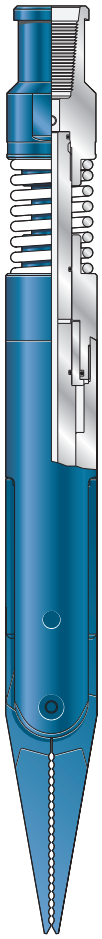
Flow Activated Alligator Grab Tool

The flow-activated alligator grab tool is a fishing tool used to catch and retrieve loose objects from within the wellbore. The flow-activated alligator grab tool is run in the permanently closed position and is flow activated to the open grab position by circulating fluid and creating a pressure differential at the tool.

Please note that the flow-activated alligator grab tool is not designed to withstand the heavy jarring operations in the event that the jaws have gripped onto any firmly stuck fish.

Features and Benefits

- Flow or drop-ball activated
- Variable grab lengths available
- Optional external fishneck



Flow Activated Alligator Grab Tool

Fishing Grab Tool

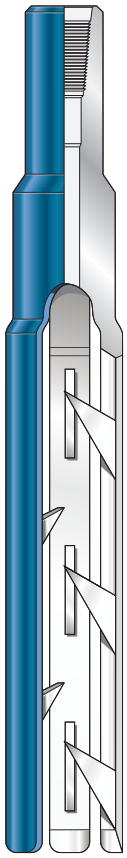
The fishing grab tool is used to retrieve wire that has broken in the tubing.

The fishing grab tool consists of a box-up connection in a housing with either two or three flexible prongs extending downward. Pointed barbs are welded to the inside of the prongs to form hooks that will catch the looped end of the broken line. The coiled tubing fishing grab tool also has a large flow through the bore.

When a line breaks below the stuffing box, a full gauge, such as a slotted skirt wirefinder, is normally used to both locate and ball up the broken end of the line before running the fishing grab tool. The fishing grab tool is flexible enough to bend and can be gauged for the tubing it is to be run in. The prong ends of the grab should fit snugly against the walls of the tubing to help prevent line bypass.

Features and Benefits

- Flow through facility
- Simple flexible design
- Robust construction
- External fish neck available



Fishing Grab Tool

Flow Activated Alligator Grab Tool Technical Specifications

Part Number	Size	OD	Service	Top Connection	Length	Service Kits	Min Temp Rating	Max Temp Rating	Tensile Strength
C115-018-08	1 1⁄16”	1.690”	STD	1” AMMT Box	28.50”	C115-018-08/KS	0°F	350°F	30,783 lbs
C115-020-09	2 1⁄8”	2.125”	STD	1 ½” AMMT Box	22.50”	C115-020-09/KS	0°F	350°F	30,860 lbs
C115-019-09	2 1⁄4”	2.250”	STD	1 ½” AMMT Box	22.50”	C115-019-09/KS	0°F	350°F	30,783 lbs
C115-021-09	2 3⁄8”	2.375”	STD	1 ½” AMMT Box	22.50”	C115-021-09/KS	0°F	350°F	30,860 lbs

Fishing Grab Tool Technical Specifications

Part Number	Size	OD	ID	Service	Top Connection	Length	Service Kits	Tensile Strength
C040-062-08	1 3⁄4”	1.750”	0.75”	STD	1” AMMT Box	21.25”	C040-062-08/KS	49,496 lbs
C040-081-09	2 1⁄8”	2.125”	1.00”	STD	1 ½” AMMT Box	24.50”	C040-081-09/KS	92,232 lbs
C040-063-09	2 1⁄4”	2.250”	1.00”	STD	1 ½” AMMT Box	24.50”	C040-063-09/KS	92,232 lbs
C040-080-09	2 3⁄8”	2.375”	1.00”	STD	1 ½” AMMT Box	24.50”	C040-080-09/KS	92,232 lbs
C040-082-09	2 1⁄2”	2.500”	1.00”	STD	1 ½” AMMT Box	25”	C040-082-08/KS	92,232 lbs
C040-065-09	2.867”	2.867”	1.00”	STD	1 ½” AMMT Box	24”	C040-065-09/KS	92,232 lbs

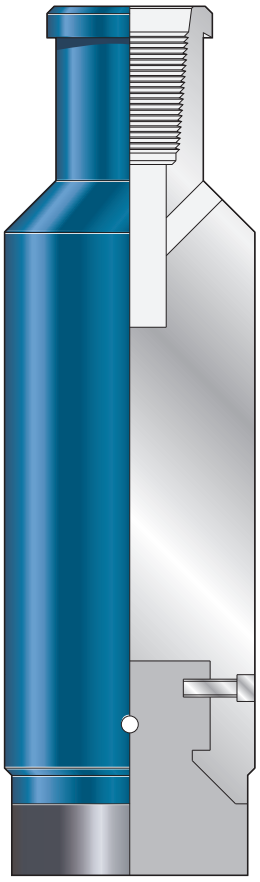
Lead Impression Block

The lead impression block is an adapted standard tool used to obtain impressions of foreign objects in the tubing string to assist in identification of the object, and thus aid in the selection of the correct fishing tool.

The lead impression blocks are available in a range of shapes and sizes

Features and Benefits

- Wash out prevention sleeve
- Easily refillable
- External fish neck
- Flat bottom, conical, or other

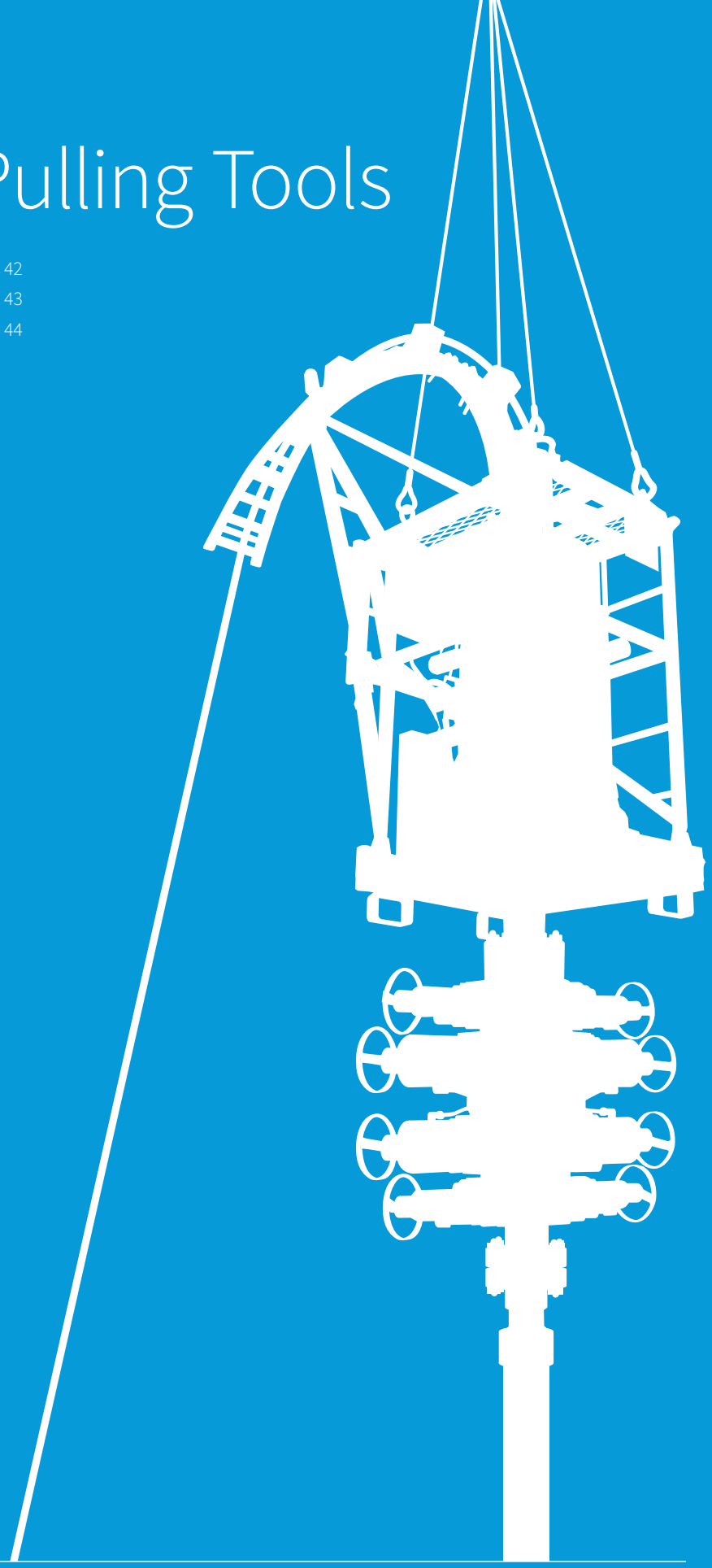


Lead Impression Block

Lead Impression Block Technical Specifications

Part Number	Size	OD	Service	Top Connection	Length	Service Kits	Tensile Strength
C080-023-08	1 ¾"	1.750"	STD	1" AMMT Box	7.750"	C080-023-08/KS	49,496 lbs
C080-039-08	2"	2"	STD	1" AMMT Box	7.750"	C080-039-08/KS	49,496 lbs
C080-040-08	2 ⅛"	2.125"	STD	1" AMMT Box	7.750"	C080-040-08/KS	49,496 lbs
C080-040-09	2 ⅛"	2.125"	STD	1 ½" AMMT Box	8.500"	C080-040-09/KS	92,232 lbs
C080-043-09	2 ¼"	2.250"	STD	1 ½" AMMT Box	8.375"	C080-043-09/KS	92,232 lbs
C080-025-09	2 ½"	2.500"	STD	1 ½" AMMT Box	8.375"	C080-025-09/KS	92,232 lbs
C080-026-09	2 ¾"	2.750"	STD	1 ½" AMMT Box	8.500"	C080-026-09/KS	92,232 lbs
C080-027-09	3"	3"	STD	1 ½" AMMT Box	8.625"	C080-027-09/KS	92,232 lbs
C080-028-09	3 ¼"	3.250"	STD	1 ½" AMMT Box	9"	C080-028-09/KS	92,232 lbs
C080-022-09	3 ½"	3.500"	STD	1 ½" AMMT Box	9"	C080-022-09/KS	92,232 lbs

Running and Pulling Tools



Flow Activated GS Type Running/Pulling Tool

The flow-activated GS-type running/pulling tool is designed to run and retrieve downhole tools with conventional internal fish necks.

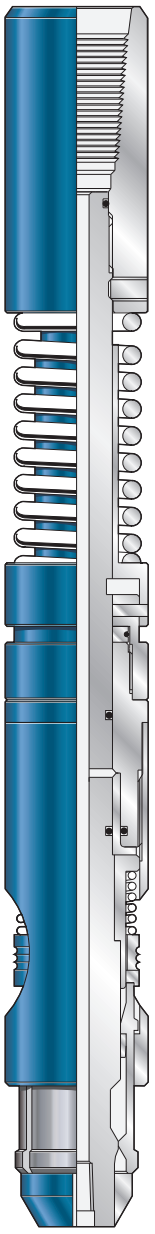
The latching mechanism is a robust dog/core design that releases positively from the internal fish neck when a hydraulic differential is applied to the tool.

The tool does not require shear pins or drop balls since the differential required to activate the tool is provided by circulating through a choke insert in the core.

Flow-activated GS-type running/pulling tools are available for all standard internal fish neck sizes.

Features and Benefits

- Full hydraulic operation
- Multiple latch and release capability
- Proven dog/core design
- Available to catch internal fish necks from 2” to 7”
- Safety shear function



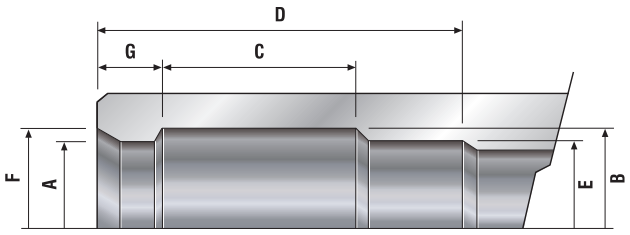
Flow Activated GS Type Running/Pulling Tool

Flow Activated GS Type Running/Pulling Tool Technical Specifications

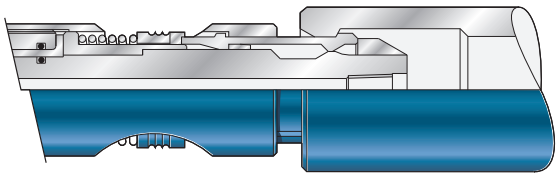
Part Number	Size	OD	ID	Service	Top Connection	Length	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
C086-179-08	1 ½”	1.690”	0.250”	STD	1” AMMT Box	17.75”	C086-179-08/KS	5,000 PSI	0°F	350°F	30,000 lbs
C086-160-08	2”	1.690”	0.250”	STD	1” AMMT Box	18.25”	C086-160-08/KS	5,000 PSI	0°F	350°F	23,499 lbs
C086-072-08	2”	1.810”	0.250”	STD	1” AMMT Box	18.25”	C086-072-08/KS	5,000 PSI	0°F	350°F	23,499 lbs
C086-072-09	2”	2.125”	0.250”	STD	1 ½” AMMT Box	18.25”	C086-072-09/KS	5,000 PSI	0°F	350°F	23,499 lbs
C086-068-09	2 ½”	2.250”	0.390”	STD	1 ½” AMMT Box	23”	C086-068-09/KS	5,000 PSI	0°F	350°F	29,287 lbs
C086-067-23	3”	2.730”	0.390”	STD	2 ⅜” PAC Box	18”	C086-067-23/KS	5,000 PSI	0°F	350°F	50,686 lbs
C086-067-24	3”	2.730”	0.390”	STD	2 ⅜” PAC DSI Box	18”	C086-067-24/KS	5000 PSI	0°F	350°F	60,000 lbs
C086-073-24	3 ½”	3.110”	0.390”	STD	2 ⅜” PAC DSI Box	21”	C086-073-24/KS	5000 PSI	0°F	350°F	60,000 lbs
C086-073-09	3 ½”	3.110”	0.390”	STD	1 ½” AMMT Box	21.50”	C086-073-09/KS	5,000 PSI	0°F	350°F	58,180 lbs
C086-074-23	4”	3.620”	0.390”	STD	2 ⅜” PAC Box	21.25”	C086-074-23/KS	5,000 PSI	0°F	350°F	64,303 lbs
C086-074-24	4”	3.620”	0.390”	STD	2 ⅜” PAC DSI Box	19”	C086-074-24/KS	5,000 PSI	0°F	350°F	67,000 lbs
C086-079-24	5”	4.500”	0.390”	STD	2 ⅜” PAC DSI Box	21”	C086-079-24/KS	5,000 PSI	0°F	350°F	96,000 lbs
C086-079-23	5”	4.500”	0.390”	STD	2 ⅜” PAC Box	21”	C086-079-23/KS	5,000 PSI	0°F	350°F	98,384 lbs
C086-124-24	5.62”	5.560”	0.912”	STD	2 ⅜” PAC DSI Box	25”	C086-124-24/KS	5,000 PSI	0°F	350°F	168,650 lbs
C086-110-24	7”	5.830”	0.912”	STD	2 ⅜” PAC DSI Box	25”	C086-110-24/KS	5,000 PSI	0°F	350°F	168,650 lbs
C086-110-10	7”	5.830”	0.912”	STD	2 ⅜” REG Box	25”	C086-110-10/KS	5,000 PSI	0°F	350°F	57,880 lbs
C086-118-08	2”	1.810”	0.250”	H^2S	1” AMMT Box	18.50”	C086-118-08/KS	5,000 PSI	0°F	350°F	20,669 lbs
C086-118-09	2”	2.125”	0.250”	H^2S	1 ½” AMMT Box	18.50”	C086-118-09/KS	5,000 PSI	0°F	350°F	20,669 lbs
C086-117-09	2 ½”	2.250”	0.390”	H^2S	1 ½” AMMT Box	23”	C086-117-09/KS	5,000 PSI	0°F	350°F	28,072 lbs

GS Internal Fishneck Reference Table

Nominal Tool Size	Tubing Size O.D.	A	B	C	D	E	F	G
1 ¼”	1.66”	0.88”	1.03”	0.97”	1.97”	0.88”	1.00”	0.42”
1 ½”	1.90”	1.06”	1.22”	1.47”	2.97”	1.06”	1.16”	0.54”
1 ½”	2 1/16”	1.06”	1.22”	1.47”	2.97”	1.06”	1.16”	0.54”
2”	2 ⅜”	1.38”	1.57”	1.47”	2.97”	1.38”	1.59”	0.54”
2 ½”	2 ⅞”	1.81”	2.00”	1.47”	2.97”	1.81”	1.98”	0.54”
3”	3 ½”	2.31”	2.50”	1.47”	2.97”	2.31”	2.47”	0.54”
3 ½”	4”	2.62”	2.81”	1.47”	2.97”	2.62”	2.78”	0.54”
Special 4”	4”	2.75”	2.94”	1.47”	2.97”	2.75”	2.91”	0.54”
4”	4 ½”	3.12”	3.31”	1.47”	2.97”	3.12”	3.35”	0.54”
5”	5 ½”	4.00”	4.19”	1.47”	2.97”	4.00”	4.16”	0.54”
5 ⅝”	5 ⅝”	4.75”	5.00”	1.47”	2.97”	4.75”	4.98”	0.54”
7”	7”	5.38”	5.62”	1.47”	2.97”	5.38”	5.60”	0.54”
7 ¾”	7 ¾”	6.25”	6.50”	1.47”	2.97”	6.25”	6.48”	0.54”
8 ⅝”	8 ⅝”	7.12”	7.50”	1.58”	3.23”	7.12”	7.47”	0.77”
9 ⅝”	9 ⅝”	7.62”	8.00”	1.58”	3.23”	7.62”	7.98”	0.77”



GS Running/Pulling Internal Fishneck Dimensions



Flow Activated GS Running/Pulling Tool Shown Latching GS Fish Neck

Flow Activated Heavy Duty Running/Pulling Tool

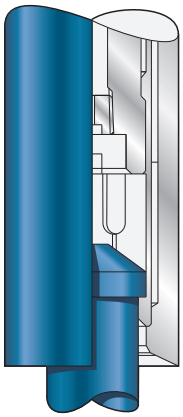
A Heavy Duty Running/Pulling Tool Shown Latching a Rope Socket Fishneck

The flow-activated heavy duty running/pulling tool is a collet type running/pulling tool designed to run or retrieve downhole tools that have conventional external fishing necks. The running/pulling tool design is extremely robust and allows a full 360° engagement of the fishing neck to be latched. The tool is fully hydraulic and therefore does not require the use of shear pins or drop balls to operate since this is achieved by circulating through a choke in the core of the tool.

Hydraulic heavy duty running/pulling tools are available for all sizes of standard external fish necks. Adaptor kits are available to increase a standard tool's catch size.

Features and Benefits

- Full hydraulic operation
- Heavy duty construction
- Available to catch all standard external fish necks



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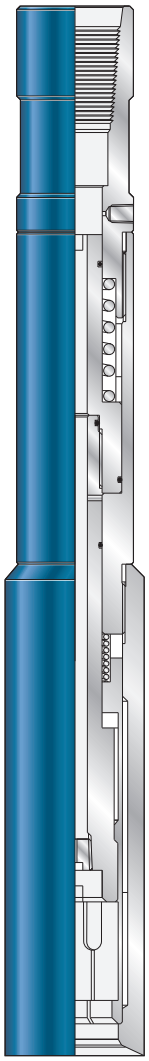
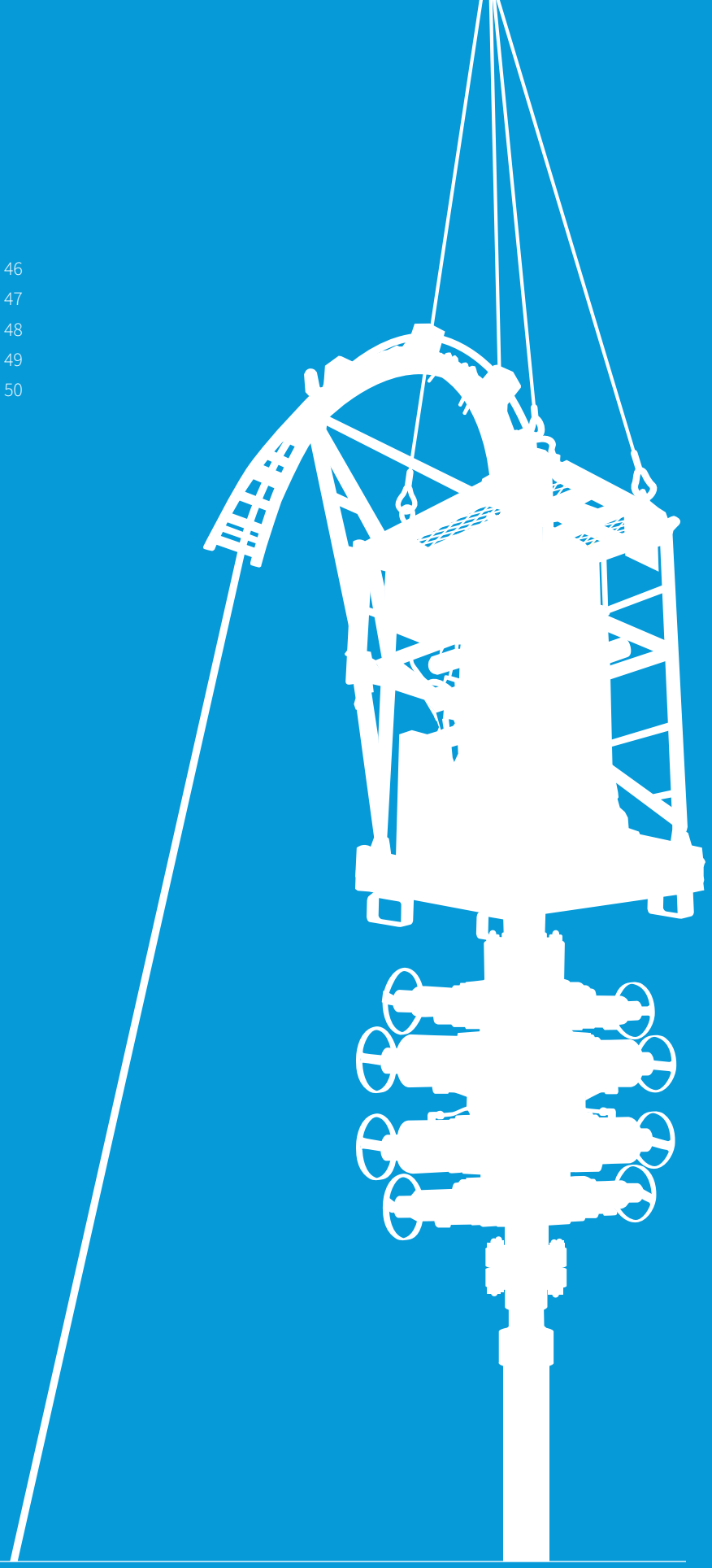


Flow Activated Heavy Duty Running/Pulling Tool

Flow Activated Heavy Duty Running/Pulling Tool Technical Specifications

Part Number	Size	OD	ID	Service	Top Connection	Length	Service Kits	Operating Pressure	Working Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
C138-016-08	2"	1.875"	0.39"	STD	1" AMMT Box	16.750"	C138-016-08/KS	500-700 DPSI	5,000 PSI	0°F	350°F	47,956 lbs
C138-016-09	2"	2.125"	0.39"	STD	1 ½" AMMT Box	16.750"	C138-016-09/KS	500-700 DPSI	5,000 PSI	0°F	350°F	47,956 lbs
C138-017-09	2 ½"	2.300"	0.39"	STD	1 ½" AMMT Box	16.750"	C138-017-09/KS	500-700 DPSI	5,000 PSI	0°F	350°F	83,288 lbs
C138-026-09	3"	2.870"	0.39"	STD	1 ½" AMMT Box	23.250"	C138-026-09/KS	350 DPSI	5,000 PSI	0°F	350°F	91,015 lbs
C138-026-23	3"	2.870"	0.39"	STD	2 ⅜" PAC Box	23.250"	C138-026-23/KS	350 DPSI	5,000 PSI	0°F	350°F	91,015 lbs
C138-043-08	2"	1.875"	0.39"	H^2S	1" AMMT Box	16.750"	C138-043-08/KS	500-700 DPSI	5,000 PSI	0°F	350°F	42,369 lbs
C138-044-09	2 ½"	2.300"	0.39"	H^2S	1 ½" AMMT Box	16.750"	C138-044-09/KS	500-700 DPSI	5,000 PSI	0°F	350°F	72,876 lbs
C138-045-09	3"	2.870"	0.39"	H^2S	1 ½" AMMT Box	19.625"	C138-045-09/KS	350 DPSI	5,000 PSI	0°F	350°F	74,667 lbs
C138-045-23	3"	2.870"	0.39"	H^2S	2 ⅜" PAC Box	19.625"	C138-045-23/KS	350 DPSI	5,000 PSI	0°F	350°F	74,667 lbs
C138-045-24	3"	2.87"	0.39"	H^2S	2 ⅜" PAC DSI Box	19.625"	C138-045-24/KS	350 DPSI	5000 PSI	0°F	350°F	74,667 lbs
C138-051-24	4"	3.75"	0.39"	H^2S	2 ⅜" PAC DSI Box	23.500"	C138-051-24/KS	800 DPSI	5000 PSI	0°F	350°F	108,572 lbs
C138-071-24	4"	3.75"	0.39"	H^2S	2 ⅜" PAC DSI Box	23.500"	C138-071-24/KS	800 DPSI	5000 PSI	0°F	350°F	108,572 lbs
C138-051-23	4"	3.750"	0.39"	H^2S	2 ⅜" PAC Box	23.500"	C138-051-23/KS	800 DPSI	5,000 PSI	0°F	350°F	108,572 lbs

Motors



Coiled Tubing Motor Bearing Assembly

The National Oilwell Varco coiled tubing motor is an engineered solution for the CT market. This motor line was designed by NOV engineers specializing in coiled tubing and drilling motors to ensure the tool's ability to meet the demands of CT applications. We used NOV design methodology, best practices, years of senior experience, and field information from the wellsite to develop this product offering. The CT motor is not only reliable; it has many features applicable to the growing needs of the coiled tubing industry.

The bearing assembly is a sealed bearing unit that provides maximum tool life with low redress cost and class-leading torque ratings. With a zero-bypass sealed bearing assembly, the assembly delivers 100% flow to the mill for effective returns.

The slick, true-stated OD options provide a comprehensive tool selection range to meet the well requirements. The titanium flex rod within the assembly is designed to deliver the longest stator life to meet the demands of extended reach wells.

The CT motor is sold with the standard options for motors, with the exception of the power section, which is purchased separately. Complete configured motors with additional options, such as a bent housing or rotor catch tools, are available. Please contact your NOV sales representative for details.

Features

- High torque capacity - Can be run with *HEMIDRIL*™ or *PowerPLUS*™ CT stators
- Sealed bearing assembly
- Zero bypass
- Slick, true-stated OD
- Flex rod designed to maximize the stator life

Benefits

- Class-leading torque ratings
- Eliminates downhole failures
- Maximum tool life with low redress cost
- 100% flow to the mill to reduce stuck BHAs
- Ease of assembly

Coiled Tubing Motor Bearing Pack Sub Assembly Technical Specifications

Item Number	Description	Connections	Service Tool Kits	Seal Kits	Housing	Pull to Yield	Theoretical Static Yield Torque	Bearing Pack + Top Sub Length
169-43C-10	1 $^{11}/_{16}$" Motor Assembly	1" AMMT	169-43C-TA0A	169-43C-SA0 - Seal Kit - 300°F (150°C)	Fixed	28,000 lbs	550 ft-lbs	40.50 in.
213-43C-10	2 ⅛" Motor Assembly	1 ½" AMMT	213-43C-TA0A	213-43C-SA0 - Seal Kit - 300°F (150°C)	Fixed	61,000 lbs	1,100 ft-lbs	44.00 in.
287-36C-40	2 ⅞" Motor Assembly, 2 $^{9}/_{16}$" Stub Acme Connection	2 ⅜" PAC	287-36C-TA0A	287-36C-SA0A - Seal Kit - 300°F (150°C) 287-36C-SA1A - Seal Kit - 400°F (204°C)	Fixed/Adjustable	130,000 lbs	2,000 ft-lbs	62.40 in.
287-36C-50	2 ⅞" Motor Assembly, 2 ½" Special Stub Acme Connection	2 ⅜" PAC	313-36-TA0A	287-36C-SA0A - Seal Kit - 300°F (150°C) 287-36C-SA1A - Seal Kit - 400°F (204°C)	Fixed/Adjustable	130,000 lbs	2,000 ft-lbs	62.40 in.
313-36-10	3 ⅛" Motor Assembly	2 ⅜" REG	313-36-TA1A	313-36-SA0A - Seal Kit - 300°F (150°C) 313-36-SA1 - Seal Kit - 400°F (204°C)	Fixed/Adjustable	179,000 lbs	2,700 ft-lbs	67.00 in.
350-43C-10	3 ½" Series 43C Motor Assembly	2 ⅜" REG	350-43C-TA0A	350-43C-SA0 - Seal Kit - 300°F (150°C)	Fixed/Adjustable	172,000 lbs	4,500 ft-lbs	61.20 in.

NOTE: Power Section Sold Separately

PowerPLUS™ Coiled Tubing Power Sections

National Oilwell Varco proudly introduces a new series of high performance power sections for coiled tubing operations. The *PowerPLUS*™ CT power section delivers more power and torque than conventional coiled tubing power sections. PowerPLUS power sections utilize a high-performance elastomer that delivers 50% more power and torque than traditional power sections.

The elastomer has proven to perform remarkably in both water-based fluids and nitrogen, which makes this power section ideal for CT milling operations. Selection of new NOV power sections will provide high-performance CT operations and reduce your milling and drilling time.

Extensive research and analysis was conducted by NOV to design and manufacture this impressive addition to our fleet of power sections.

This includes:

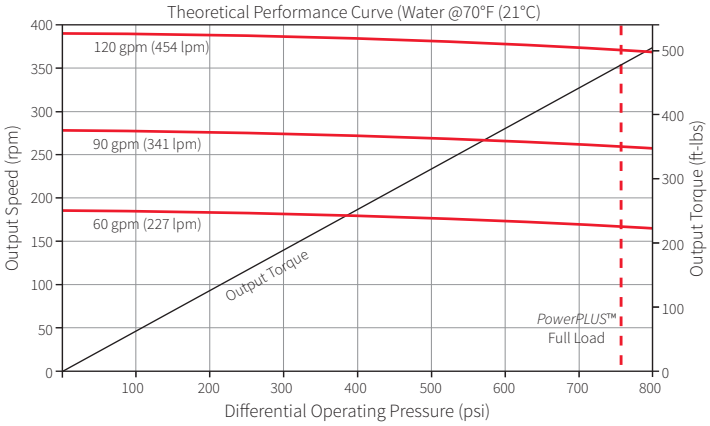
- Elastomer formulation testing
- Fluid immersion testing
- Performance testing
- Endurance testing
- Field testing

The results of extensive testing provided a strong base for the *PowerPLUS* power section, another quality National Oilwell Varco solution for the coiled tubing industry.

Features

- High performance elastomer power section
- Performs well with water based fluids
- Generates 50% more power than conventional power sections
- Performs well with nitrogen and air milling/drilling
- Generates 50% higher torque than traditional power sections
- Less stress on the coiled tubing
- Improved CT milling/drilling performance
- Reduced operational cost
- Increased speed at which plugs are milled

2 ⅞” - 5⅞” - 3.5 Stage *PowerPLUS*™ CT Power Section



Stator Fit Temperature Guide

Elastomer Description (Elastomer Code)	PowerPLUS NBR (PRR)
Continuous BHT	**Water Based Mud**
Below 220° F (104° C)	Preferred Standard Fit
220° - 280° F (104° - 138° F)	Preferred OS Fit
280° - 320° F (138° - 160° F)	Preferred 2OS Fit

PowerPLUS Coiled Tubing Power Section Technical Specifications

Size	Configuration	Rev/gal Rev/l	Min Flow (gpm / lpm)	Max Flow (gpm / lpm)	Full Load Torque (lb-ft / Nm)	Full Load Pressure (psi / kPa)
1 $^{11}/_{16}$”	5:6, 5.0 stage	12.93 rev/ gal / 3.42 rev/l	25 gpm / 95 lpm	45 gpm / 170 lpm	182 ft-lbs / 247 Nm	1092 psi / 7530 kPa
2 ⅛”	5:6, 6.0 stage	10.93 rev/ gal / 2.73 rev/l	20 gpm / 76 lpm	50 gpm / 189 lpm	246 ft-lbs / 347 Nm	1307 psi / 9009 kPa
2 ⅞”	5:6, 3.5 stage	3.1 rev/ gal / 0.82 rev/l	60 gpm / 227 lpm	120 gpm / 454 lpm	472 ft-lbs / 640 Nm	757 psi / 5218.5 kPa
2 ⅞”	5:6, 4.7 stage	3.76 rev/ gal / 1.00 rev/l	50 gpm / 189 lpm	125 gpm / 473 lpm	646 ft-lbs / 875 Nm	1020 psi / 7033.5 kPa
2 ⅞”	5:6, 7.0 stage	5.28 rev/ gal / 1.40 rev/l	20 gpm / 76 lpm	80 gpm / 303 lpm	773 ft-lbs /1048 Nm	1530 psi / 10549.5 kPa
3 ⅛”	7:8, 3.0 stage	1.8 rev/ gal / 0.48 rev/l	80 gpm / 303 lpm	168 gpm / 636 lpm	990 ft-lbs /1342 Nm	1829 psi / 12,611 kPa
3 ½”	5:6, 3.0 stage	2.45 rev/ gal / 0.65 rev/l	60 gpm / 227 lpm	168 gpm / 636 lpm	836 ft-lbs / 1133 Nm	1730 psi / 11,923 kPa

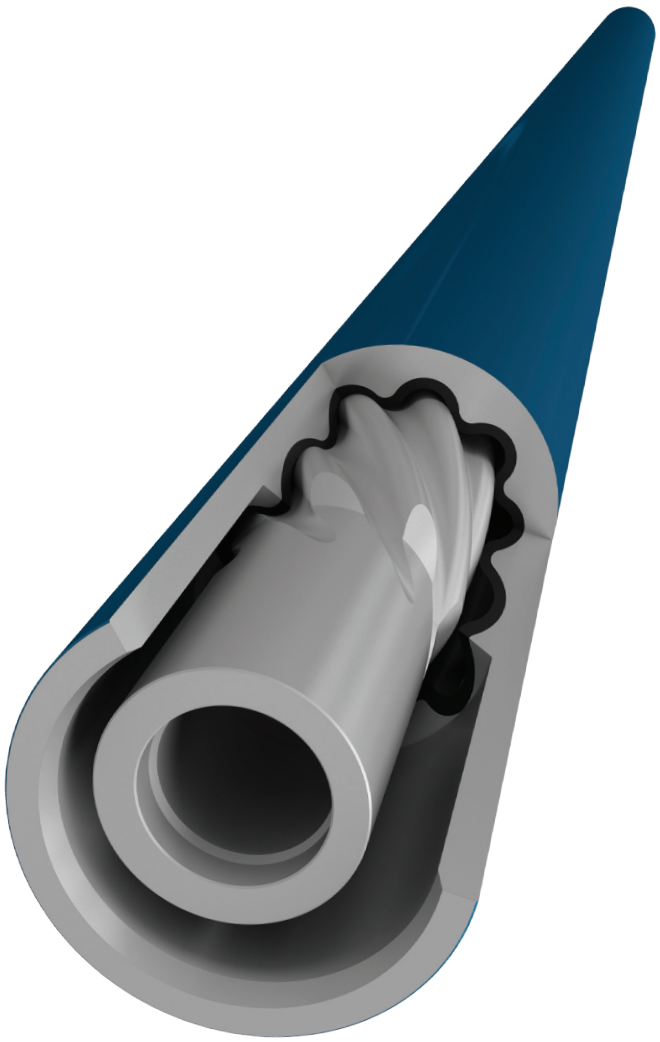
PowerPLUS™ Stators and Rotors

		Size	Part Number	Description	Coating	ID	Connection	Length
1 11/16" Power Sections	1 11/16" 5:6 5.0 Power Sections	1 11/16"	PRR16F6500AG	Stator 1 11/16" 5:6 5.0 STG - GRP 0 STD	NA	NA	Monoflo blank	99"
		1 11/16"	PRR16F6500ZG	Stator 1 11/16" 5:6 5.0 STG - GRP 0 STD	NA	NA	Monoflo threaded	94"
		1 11/16"	PRR16F6504AG	Stator 1 11/16" 5:6 5.0 STG - GRP 4 OS	NA	NA	Monoflo blank	99"
		1 11/16"	PRR16F6504ZG	Stator 1 11/16" 5:6 5.0 STG - GRP 4 OS	NA	NA	Monoflo threaded	94"
		1 11/16"	PRR16F6507AG	Stator 1 11/16" 5:6 5.0 STG - GRP 7 2XOS	NA	NA	Monoflo blank	99"
		1 11/16"	PRR16F6507ZG	Stator 1 11/16" 5:6 5.0 STG - GRP 7 2XOS	NA	NA	Monoflo threaded	94"
		1 11/16"	SZ 16E5500ZGT02	Rotor 1 11/16" 5:6 5.0 STG - GRP 0 STD	Chrome	Solid	Monoflo blank	93"
		1 11/16"	SZ 16E5500XGHTW	Rotor 1 11/16" 5:6 5.0 STG - GRP 0 STD	Carbide	Solid	Monoflo threaded	91"
		1 11/16"	SZ 16E5500XGHTT	Rotor 1 11/16" 5:6 5.0 STG - GRP 0 STD	Chrome	Solid	Monoflo threaded	91"
2 1/8" Power Sections	2 1/8" 5:6 6.0 Power Sections	2 1/8"	PRR21F6600AG	Stator 2 1/8" 5:6 6.0 STG - GRP 0 STD	NA	NA	Monoflo blank	88"
		2 1/8"	PRR21F6600ZG	Stator 2 1/8" 5:6 6.0 STG - GRP 0 STD	NA	NA	Monoflo threaded	88"
		2 1/8"	PRR21F6604AG	Stator 2 1/8" 5:6 6.0 STG - GRP 4 OS	NA	NA	Monoflo blank	88"
		2 1/8"	PRR21F6604ZG	Stator 2 1/8" 5:6 6.0 STG - GRP 4 OS	NA	NA	Monoflo threaded	88"
		2 1/8"	PRR21F6607AG	Stator 2 1/8" 5:6 6.0 STG - GRP 7 2XOS	NA	NA	Monoflo blank	88"
		2 1/8"	PRR21F6607ZG	Stator 2 1/8" 5:6 6.0 STG - GRP 7 2XOS	NA	NA	Monoflo threaded	88"
		2 1/8"	SZ 21E5600ZGT02	Rotor 2 1/8" 5:6 6.0 STG - GRP 0 STD	Chrome	Solid	Monoflo blank	85"
		2 1/8"	SZ 21E5600GGT02	Rotor 2 1/8" 5:6 6.0 STG - GRP 0 STD	Chrome	0.375"	Monoflo blank	85"
		2 1/8"	SZ 21E5600XGHTW	Rotor 2 1/8" 5:6 6.0 STG - GRP 0 STD	Carbide	Solid	Monoflo threaded	83"
		2 1/8"	SZ 21E5600XGHTT	Rotor 2 1/8" 5:6 6.0 STG - GRP 0 STD	Chrome	Solid	Monoflo threaded	83"
2 7/8" Power Sections	2 7/8" 5:6 3.5 Power Sections	2 7/8"	PRR28F6350AG	Stator 2 7/8" 5:6 3.5 STG - GRP 0 STD	NA	NA	Monoflo blank	98"
		2 7/8"	PRR28F6350ZGT07	Stator 2 7/8" 5:6 3.5 STG - GRP 0 STD	NA	NA	Monoflo 2.500" SA thread	92"
		2 7/8"	PRR28F6350ZG	Stator 2 7/8" 5:6 3.5 STG - GRP 0 STD	NA	NA	Monoflo 2.562" SA thread	92"
		2 7/8"	PRR28F6354AG	Stator 2 7/8" 5:6 3.5 STG - GRP 4 OS	NA	NA	Monoflo blank	98"
		2 7/8"	PRR28F6354ZG	Stator 2 7/8" 5:6 3.5 STG - GRP 4 OS	NA	NA	Monoflo 2.562" SA thread	92"
		2 7/8"	PRR28F6354ZGT07	Stator 2 7/8" 5:6 3.5 STG - GRP 4 OS	NA	NA	Monoflo 2.500" Special SA thread	98"
		2 7/8"	PRR28F6357AG	Stator 2 7/8" 5:6 3.5 STG - GRP 7 2XOS	NA	NA	Monoflo blank	98"
		2 7/8"	PRR28F6357ZG	Stator 2 7/8" 5:6 3.5 STG - GRP 7 2XOS	NA	NA	Monoflo 2.562" SA thread	98"
		2 7/8"	PRR28F6357ZGT07	Stator 2 7/8" 5:6 3.5 STG - GRP 7 2XOS	NA	NA	Monoflo 2.500" Special SA thread	98"
		2 7/8"	SZ 28E5350XGTHT	Rotor 2 7/8" 5:6 3.5 STG - GRP 0 STD	Chrome	Solid	Monoflo threaded	90"
		2 7/8"	SZ 28E5350ZGC09	Rotor 2 7/8" 5:6 3.5 STG - GRP 0 STD	Carbide	Solid	Monoflo blank	93"
		2 7/8"	SZ 28E5350ZG	Rotor 2 7/8" 5:6 3.5 STG - GRP 0 STD	Chrome	Solid	Monoflo blank	93"
		2 7/8"	SZ 28E5354ZG	Rotor 2 7/8" 5:6 3.5 STG - GRP 4 US	Chrome	Solid	Monoflo blank	93"
	2 7/8" 5:6 4.7 Power Sections	2 7/8"	PRR28F6470AG	Stator 2 7/8" 5:6 4.7 STG - GRP 0 STD	NA	NA	Monoflo blank	105"
		2 7/8"	PRR28F6470ZGT07	Stator 2 7/8" 5:6 4.7 STG - GRP 0 STD	NA	NA	Monoflo 2.500" Special SA thread	92"
		2 7/8"	PRR28F6470ZG	Stator 2 7/8" 5:6 4.7 STG - GRP 0 STD	NA	NA	Monoflo 2.562" SA thread	92"
		2 7/8"	PRR28F6474AG	Stator 2 7/8" 5:6 4.7 STG - GRP 4 OS	NA	NA	Monoflo blank	105"
		2 7/8"	PRR28F6474ZGT07	Stator 2 7/8" 5:6 4.7 STG - GRP 4 OS	NA	NA	Monoflo 2.500" Special SA thread	92"
		2 7/8"	PRR28F6474ZG	Stator 2 7/8" 5:6 4.7 STG - GRP 4 OS	NA	NA	Monoflo 2.562" SA thread	92"
		2 7/8"	PRR28F6477AG	Stator 2 7/8" 5:6 4.7 STG - GRP 7 2XOS	NA	NA	Monoflo blank	105"
		2 7/8"	PRR28F6477ZGT07	Stator 2 7/8" 5:6 4.7 STG - GRP 7 2XOS	NA	NA	Monoflo 2.500" Special SA thread	92"
		2 7/8"	PRR28F6477ZG	Stator 2 7/8" 5:6 4.7 STG - GRP 7 2XOS	NA	NA	Monoflo 2.562" SA thread	92"
		2 7/8"	SZ 28E5470ZGT02	Rotor 2 7/8" 5:6 4.7 STG - GRP 0 STD	Chrome	Solid	Monoflo blank	93"
		2 7/8"	SZ 28E5470XGHTW	Rotor 2 7/8" 5:6 4.7 STG - GRP 0 STD	Carbide	Solid	Monoflo threaded	90"
		2 7/8"	SZ 28E5470XGTHT	Rotor 2 7/8" 5:6 4.7 STG - GRP 0 STD	Chrome	Solid	Monoflo threaded	90"
	2 7/8" 5:6 7.0 Power Sections	2 7/8"	PRR28F6700AG	Stator 2 7/8" 5:6 7.0 STG - GRP 0 STD	NA	NA	Monoflo blank	117"
		2 7/8"	PRR28F6700ZGT07	Stator 2 7/8" 5:6 7.0 STG - GRP 0 STD	NA	NA	Monoflo 2.500" Special SA thread (dbl check)	114"
		2 7/8"	PRR28F6704AG	Stator 2 7/8" 5:6 7.0 STG - GRP 4 OS	NA	NA	Monoflo blank	117"
		2 7/8"	PRR28F6704ZGT07	Stator 2 7/8" 5:6 7.0 STG - GRP 4 OS	NA	NA	Monoflo 2.500" Special SA thread (dbl check)	114"
		2 7/8"	PRR28F6707AG	Stator 2 7/8" 5:6 7.0 STG - GRP 7 2XOS	NA	NA	Monoflo blank	117"
		2 7/8"	SZ 28E5700GGC09	Rotor 2 7/8" 5:6 7.0 STG - GRP 0 STD	Carbide	0.5"	Monoflo 2.500" Special SA thread (dbl check)	110"
		2 7/8"	SZ 28E5700ZG	Rotor 2 7/8" 5:6 7.0 STG - GRP 0 STD	Chrome	Solid	Monoflo blank	110"
		2 7/8"	SZ 28E5704ZG	Rotor 2 7/8" 5:6 7.0 STG - GRP 4 OS	Chrome	Solid	Monoflo blank	110"
		2 7/8"	SZ 28E5700XGHTT	Rotor 2 7/8" 5:6 7.0 STG - GRP 0 STD	Chrome	Solid	Monoflo threaded	110"
		2 7/8"	SZ 28E5700GG	Rotor 2 7/8" 5:6 7.0 STG - GRP 0 STD	Chrome	0.5"	Monoflo blank	110"
		2 7/8"	PRR28F6707ZGT07	Stator 2 7/8" 5:6 7.0 STG - GRP 7 2XOS	Chrome	Solid	Monoflo blank	114"
3 1/8" Power Sections	3 1/8" 7:8 3.0 Power Sections	3 1/8"	PRR31H8300AG	Stator 3 1/8" 7:8 3.0 STG - GRP 0 STD	NA	NA	monoflo threaded	106"
		3 1/8"	PRR31H8300ZGT07	Stator 3 1/8" 7:8 3.0 STG - GRP 0 STD	NA	NA	monoflo blank	106"
		3 1/8"	PRR31H8305AG	Stator 3 1/8" 7:8 3.0 STG - GRP 5 1.5XOS	NA	NA	monoflo threaded	106"
		3 1/8"	PRR31H8305ZGT07	Stator 3 1/8" 7:8 3.0 STG - GRP 5 1.5XOS	NA	NA	monoflo blank	106"
		3 1/8"	PRR31H8307AG	Stator 3 1/8" 7:8 3.0 STG - GRP 7 2XOS	NA	NA	monoflo threaded	106"
		3 1/8"	PRR31H8307ZG	Stator 3 1/8" 7:8 3.0 STG - GRP 7 2XOS	Chrome	Solid	monoflo blank	106"
		3 1/8"	SZ 31G7300ZGT02	Rotor 3 1/8" 7:8 3.0 STG - GRP 0 STD	Chrome	Solid	monoflo threaded	103"
		3 1/8"	SZ 31G7300XGHTT	Rotor 3 1/8" 7:8 3.0 STG - GRP 0 STD	Chrome	Solid	Monoflo blank	101"
3 1/2" Power Sections	3 1/2" 5:6 3.0 Power Sections	3 1/2"	PRR35F6300AG	Stator 3 1/2" 5:6 3.0 STG - GRP 0 STD	NA	NA	Monoflo blank	80"
		3 1/2"	PRR35F6304AG	Stator 3 1/2" 5:6 3.0 STG - GRP 4 OS	NA	NA	Monoflo blank	80"
		3 1/2"	PRR35F6304ZG	Stator 3 1/2" 5:6 3.0 STG - GRP 4 OS	NA	NA	Monoflo threaded	80"
		3 1/2"	PRR35F6307AG	Stator 3 1/2" 5:6 3.0 STG - GRP 7 2XOS	NA	NA	Monoflo blank	80"
		3 1/2"	PRR35F6307ZG	Stator 3 1/2" 5:6 3.0 STG - GRP 7 2XOS	NA	NA	Monoflo threaded	80"
		3 1/2"	SZ 35E5300ZGT02	Rotor 3 1/2" 5:6 3.0 STG - GRP 0 STD	Chrome	Solid	Monoflo blank	74"

HEMIDRIL™ Coiled Tubing Power Sections

Our high performance *HEMIDRIL*™ CT power sections are ideal for straight hole and lateral coiled tubing milling and drilling operations. The *HEMIDRIL* CT power section utilizes the same constant wall technology that NOV has used with success for years in our well-respected *HEMIDRIL* drilling motors. This constant wall stator includes a patented PowerRib surface that improves efficiency and tool life.

The uniform elastomer thickness, thin wall design, and power rib technology combine to deliver increased torque, horsepower, and efficiency. *HEMIDRIL* CT power sections have proven to withstand the harsh conditions that often plague coiled tubing operations.



Features and Benefits

- Even layer of rubber
- Patented Power Rib technology which increases efficiency and tool life
- 75% more power than conventional stators
- 75% more torque than conventional stators
- Improved CT milling/drilling performance
- Increased speed at which plugs are milled
- Reduced rubber swelling in hot hole environments
- Reduced rubber swell while using nitrogen
- Less stress on the coiled tubing
- Reduced operational cost

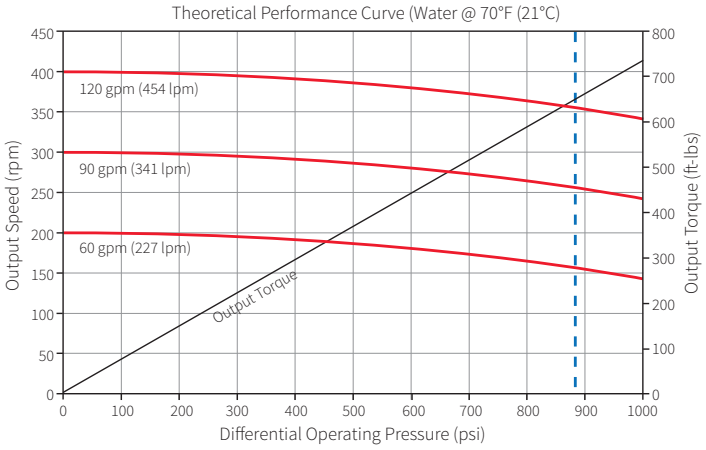
HEMIDRIL™ CT Power Section Technical Specifications

Size	2 ⅞”
Configuration	5/6, 3.5 stage
Rev/gal / Rev/l	3.3 rev/gal / 0.88 rev/l
Min Flow (gpm / lpm)	60 gpm / 227 lpm
Max flow (gpm / lpm)	120 gpm / 454 lpm
Full Load Torque (lb-ft / Nm)	644 ft-lbs / 873 Nm
Full Load Pressure (psi / kPa)	883 psi / 6088 kPa

Stator Fit Temperature Guide

Elastomer Description (Monoflo Elastomer Code)	Standard NBR (RR)	Standard HNBR (OC)	PowerPLUS NBR (PRR)	HEMIDRIL (HD)
Continuous BHT		**Water Based Mud**		
Below 220°F (104°C)	Preferred STD Fit	Not Preferred	Preferred STD Fit	Preferred
220°-280°F (104°-138°C)	Preferred OS Fit	Not Preferred	Preferred OS Fit	Preferred
280°-320°F (138°-160°C)	Preferred 2xOS Fit	Not Preferred	Preferred 2xOS Fit	Preferred
Continuous BHT		**Oil Based Mud**		
Below 220°F (104°C)	Preferred STD Fit	Acceptable STD Fit	Preferred STD Fit	Preferred
220°-280°F (104°-138°C)	Preferred OS Fit	Acceptable OS Fit	Preferred OS Fit	Preferred
280°-320°F (138°-160°C)	Caution 2xOS Fit	Preferred 2xOS Fit	Caution 2xOS Fit	Preferred
280°-320°F (138°-160°C)	Not Preferred	Caution 2xOS Fit	Not Preferred	Caution

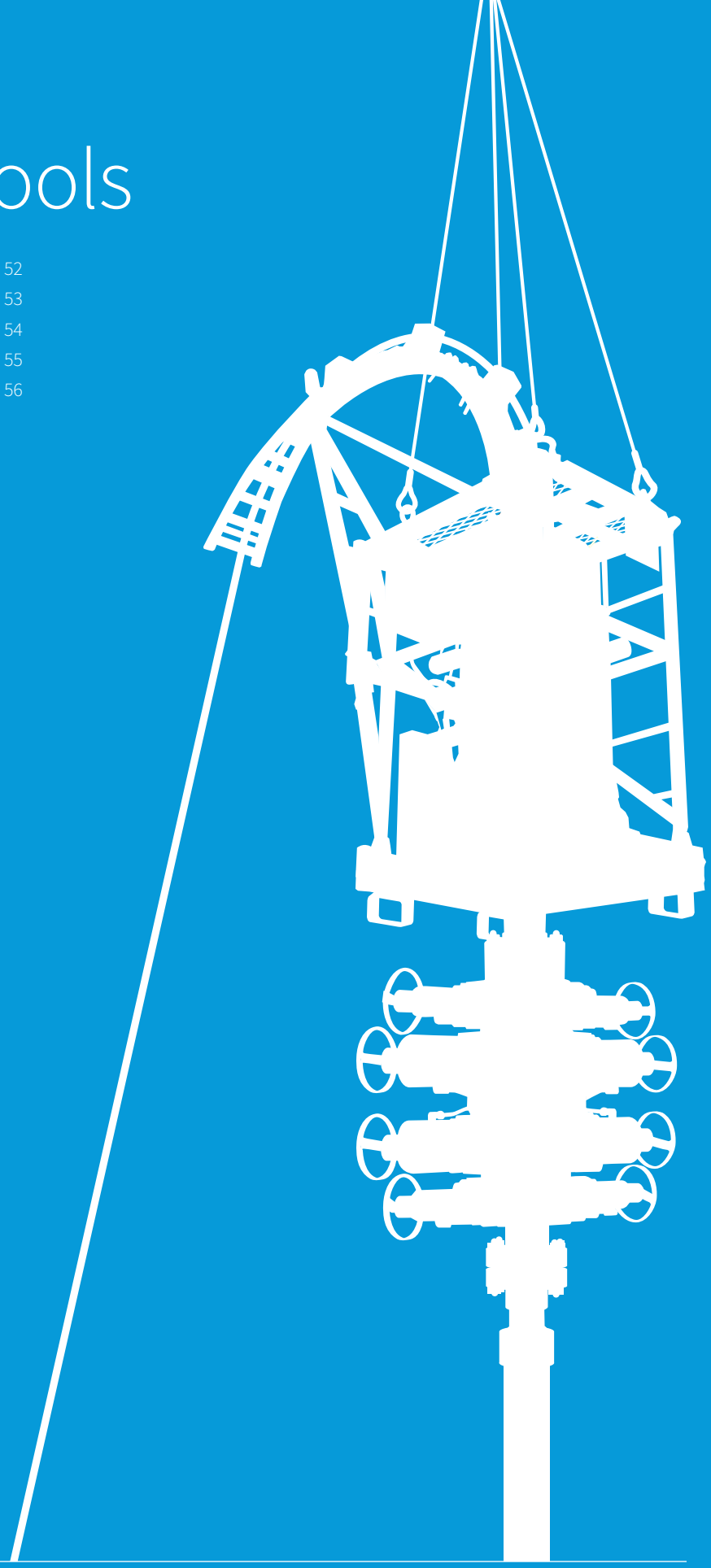
2 ⅞” - 5⁄6” - 3.5 Stage *HEMIDRIL*™ CT Power Section



HEMIDRIL™ Coiled Tubing Stators and Rotors

	Size	Part Number	Description	Coating	ID	Connection	Length
HEMI 2 ⅞" 5:6 3.5 Power Sections	2 ⅞"	3804-B-79	HEMI Stator 2 ⅞" 5:6 3.5 STG STD	NA	NA	Monoflo 2.500 Special SA thread	98"
	2 ⅞"	3804-B-67	HEMI Stator 2 ⅞" 5:6 3.5 STG STD	NA	NA	Monoflo 2.562 SA thread	98"

Deployment Tools



Deployment System

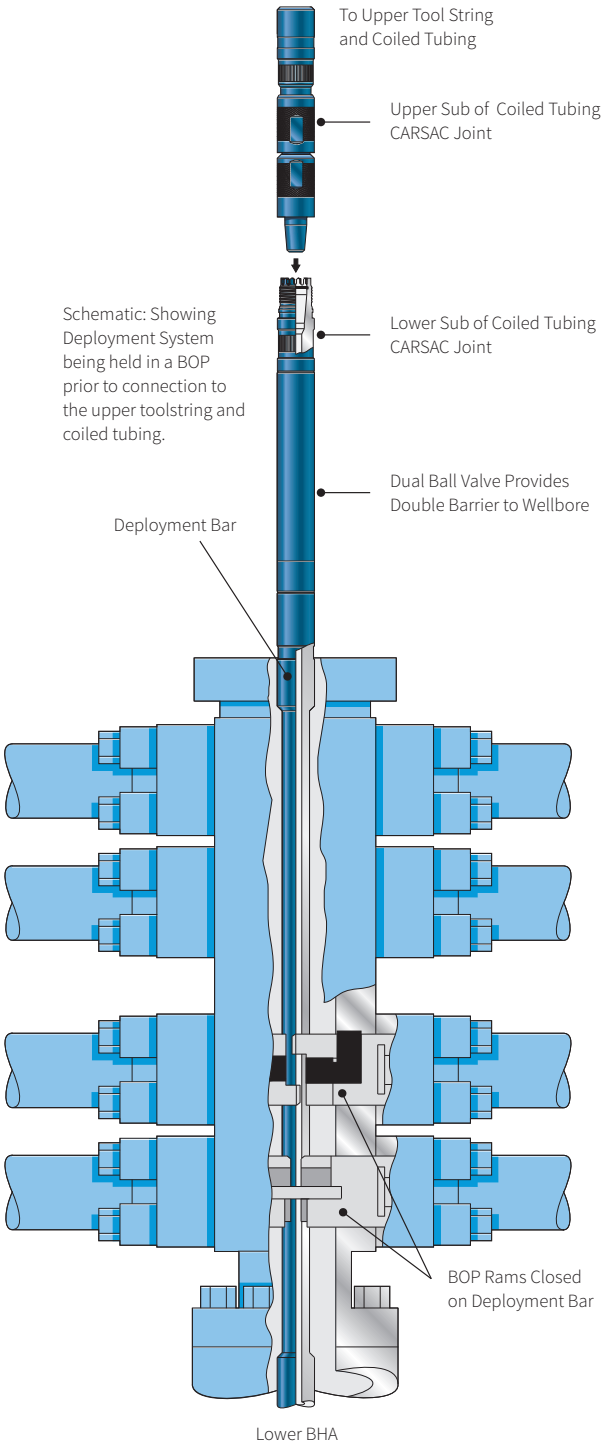
The deployment system is an application workstring used where the toolstring length exceeds the capacity of the lubricator section. By using a deployment system the BHA deployment can be staggered.

The deployment system is a combination of three components, a deployment bar, a dual ball kelly cock valve (see page 55) and a CARSAC HT (see page 54). The diameter of the wasted section of the deployment bar is matched to the size of coiled tubing being used, and retains full bore flow-through. Closing the ball valves in the kelly cock valve gives a double barrier to the wellbore.

The CARSAC connector allows connection with the upper toolstring without the need to rotate the work string. By running a combination of a deployment bar, a dual ball kelly cock valve and a CARSAC HT, the BHA can be deployed in multiple stages as follows:

- First, the lower BHA assembly should be made up to the deployment system and positioned in the lubricator.
- Connect the upper (male) section of CARSAC, check valve and connector to the coiled tubing.
- The upper string is lowered onto lower BHA section and connected via the CARSAC.
- Lower the BHA section below the BOP and close pipe rams around the deployment bar, creating a seal between the well and surface.
- Close the ball valves on the dual ball kelly cock and bleed off the remaining pressure in the upper string.
- Separate the CARSAC, leaving the female lower sub facing upwards.
- Make up the remaining BHA with the upper male section of CARSAC and stab into the lower BHA section.
- Open the BOP pipe rams and the complete BHA can then be run in the hole.

As rotation of either BHA section is not possible, the stab-in feature of the CARSAC HT is vital. The coiled tubing deployment bar system is available to suit most applications and configurations of coiled tubing pipe rams.



Deployment Bar

CARSAC HT Joint Technical Specifications

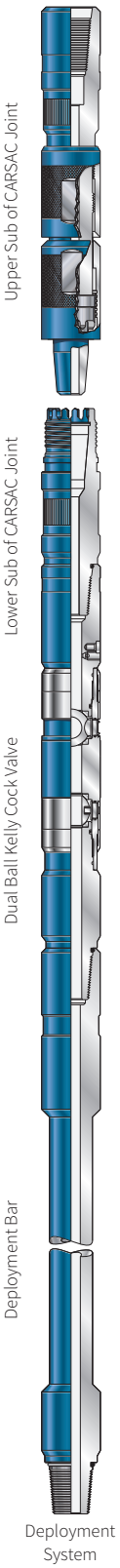
Part Number	Size	OD	ID	Service	Connections	Length	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
C169-014-08	1 ¾"	1.750"	0.437"	STD	1" AMMT Box x Pin	14"	C169-014-08/KS	3000 PSI	0°F	350°F	54,075 lbs
C169-022-10	3 ⅛"	3.125"	1.250"	STD	2 ⅜" REG Box x Pin	22"	C169-022-10/KS	5,000 PSI	0°F	350°F	125,320 lbs
C169-032-08	1 ¹1⁄16"	1.687"	0.500"	H^2S	1" AMMT Box x Pin	15.12"	C169-032-08/KS	3,000 PSI	0°F	350°F	30,128 lbs
C169-026-08	1 ¾"	1.750"	0.500"	H^2S	1" AMMT Box x Pin	14.25"	C169-026-08/KS	5,000 PSI	0°F	350°F	36,000 lbs
C169-039-09	2 ⅛"	2.125"	0.875"	H^2S	1 ½" AMMT Box x Pin	14.25"	C169-039-09/KS	5,000 PSI	0°F	350°F	43,636 lbs
C169-028-09	2 ¼"	2.250"	1"	H^2S	1 ½" AMMT Box x Pin	14"	C169-028-09/KS	5,000 PSI	0°F	350°F	49,940 lbs
C169-037-09	2 ⅜"	2.375"	1"	H^2S	1 ½" AMMT Box x Pin	14"	C169-037-09/KS	5,000 PSI	0°F	350°F	63,480 lbs
C169-030-23	2 ⅞"	2.875"	1.250" Nom	H^2S	2 ⅜" PAC Box x Pin	22"	C169-030-23/KS	5,000 PSI	0°F	350°F	76,160 lbs
C169-029-10	38"	3.125"	1.250"	H^2S	2 ⅜" REG Box x Pin	22.50"	C169-029-10/KS	5,000 PSI	0°F	350°F	91,200 lbs

Dual Ball Kelly Cock Valve Technical Specifications

Part Number	Size	OD	ID	Service	Connections	Length	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
C204-006-23	2 ⅞"	2.875"	0.968"	STD	2 ⅜" PAC Box x Pin	19"	C204-006-23/KS	5,000 PSI	0°F	350°F	102,260 lbs
C204-011-23	2 ⅞"	2.875"	0.968"	STD	2 ⅜" PAC Box x Pin	22.65"	C204-011-50/KS	10,000 PSI	0°F	350°F	158,480 lbs
C204-006-24	2 ⅞"	2.875"	0.968"	STD	2 ⅜" PAC DSI Box x Pin	19"	C204-006-24/KS	5,000 PSI	0°F	350°F	82,000 lbs
C204-007-24	3 ⅛"	3.125"	1.258"	STD	2 ⅜" PAC DSI Box x Pin	19.2"	C204-007-24/KS	5,000 PSI	0°F	350°F	78,300 lbs
C204-007-10	3 ⅛"	3.125"	1.258"	STD	2 ⅜" REG Box x Pin	15"	C204-007-10/KS	5,000 PSI	0°F	350°F	110,266 lbs
C204-001-08	1 ¹1⁄16"	1.687"	0.500"	H^2S	1" AMMT Box x Pin	14"	C204-001-08/KS	5,000 PSI	0°F	350°F	36,629 lbs
C204-003-09	2 ⅛"	2.125"	0.780"	H^2S	1 ½" AMMT Box x Pin	16.50"	C204-003-09/KS	5,000 PSI	0°F	350°F	53,412 lbs
C204-005-09	2 ⅜"	2.375"	0.968"	H^2S	1 ½" AMMT Box x Pin	14.50"	C204-005-09/KS	5,000 PSI	0°F	350°F	70,323 lbs
C204-010-09	2 ⅛"	2.125"	0.780"	H^2S	1 ½" AMMT Box x Pin	14.79"	C204-010-09/KS	10,000 PSI	0°F	350°F	53,412 lbs

Deployment Bar Technical Specifications

Part Number	OD /CT Size	OD	ID	Service	Connections	Length/Height	Sealing OD/BOP RAM	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
C194-034-08	1 ¹1⁄16"	1.688"	0.750"	STD	1" AMMT Box x Pin	132" Make Up	1.500"	C194-034-08/KS	5000 PSI	0°F	350°F	52,215 lbs
C194-026-08	1 ¹1⁄16"	1.688"	0.750"	STD	1" AMMT Box x Pin	72" Make Up	1.500"	C194-026-08/KS	5000 PSI	0°F	350°F	52,215 lbs
C194-035-08	1 ¾"	1.750"	0.750"	STD	1" AMMT Box x Pin	72" Make Up	1.500"	C194-035-08/KS	5000 PSI	0°F	350°F	52,215 lbs
C194-041-08	1 ¾"	1.750"	0.625"	STD	1" AMMT Box x Pin	48" Make Up	1.250"	C194-041-08/KS	5000 PSI	0°F	350°F	63,536 lbs
C194-038-10	3 ⅛" X 3"	3.125"	1"	STD	2 ⅜" REG Box x Pin	51" Make Up	3"	C194-038-10/KS	5000 PSI	0°F	350°F	154,335 lbs
C194-039-10	3 ⅛" X 3"	3.125"	1"	STD	2 ⅜" REG Box x Pin	75" Make Up	3"	C194-039-10/KS	5000 PSI	0°F	350°F	154,335 lbs
C194-040-10	3 ⅛" X 3"	3.125"	1"	STD	2 ⅜" REG Box x Pin	135" Make Up	3"	C194-040-10/KS	5000 PSI	0°F	350°F	154,335 lbs
C194-031-09	2 ⅛"	2.125"	0.875"	H^2S	1 ½" AMMT Box x Pin	76" Make Up	1.500"	C194-031-09/KS	5000 PSI	0°F	350°F	94,880 lbs
C194-037-09	2 ⅛"	2.125"	1"	H^2S	1 ½" AMMT Box x Pin	82" Make Up	1.750"	C194-037-09/KS	5000 PSI	0°F	350°F	55,328 lbs
C194-029-09	2 ⅜" X 1 ¾"	2.375"	1"	H^2S	1 ½" AMMT Box x Pin	76" Make Up	1.750"	C194-029-09/KS	5000 PSI	0°F	350°F	61,488 lbs
C194-028-23	2 ⅞" X 1 ¾"	2.875"	1"	H^2S	2 ⅜" PAC Box x Pin	83" Make Up	1.750"	C194-028-23/KS	5000 PSI	0°F	350°F	135,586 lbs
C194-030-23	2 ⅞" X 2"	2.875"	1"	H^2S	2 ⅜" PAC Box x Pin	71" Make Up	2"	C194-030-23/KS	5000 PSI	0°F	350°F	203,520 lbs
C194-032-23	2 ⅞" X 2 ⅜"	2.875"	1.380"	H^2S	2 ⅜" PAC Box x Pin	71" Make Up	2.390"	C194-032-23/KS	5000 PSI	0°F	350°F	109,412 lbs
C194-042-23	3 ⅛" X 1 ¾"	3.125"	1"	H^2S	2 ⅜" PAC Box x Pin	71" Make Up	1.750"	C194-042-23/KS	5000 PSI	0°F	350°F	133,600 lbs



Deployment System

CARSAC HT Joint

The CARSAC HT connector (combination anti-rotation self-aligning connector – high torque) was developed to create a dedicated self-aligning toolstring connector capable of withstanding high degrees of torque in both directions.

The CARSAC HT is designed to assist with making up tubing where it is difficult to rotate the tools to engage threads, and it is particularly suited for long toolstring applications. The CARSAC HT connector is especially useful when utilized in conjunction with integral ball valves and deployment bars.

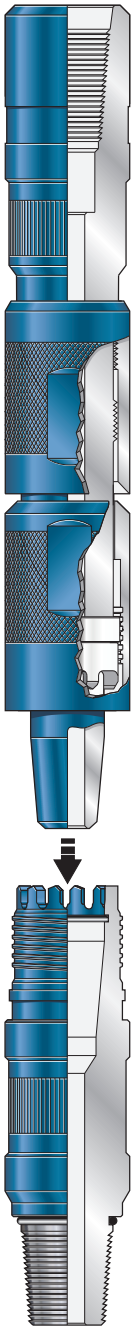
By incorporating the CARSAC HT in the BHA, the string can be divided into smaller, more manageable sections. Each section can be torqued up accordingly before loading into the lubricator section so the CARSAC HT matches the torsion yield strengths of all coiled tubing drilling thread connections where high torque tolerance is a major consideration.

The locking taper feature allows each section of the toolstring to simply stab-in and centralize before the torque drive teeth positively engage into the female lower sub. The primary locking collar is then screwed down to lock the two sections together. The secondary locking collar can then be screwed down to secure the joint and prevent the primary collar from backing off.

The CARSAC HT is also a fundamental component of the coiled tubing deployment system. For applications where the toolstring length exceeds the capacity of the lubricator section, BHA deployment can be staggered by use of a coiled tubing deployment system. By running a combination of a deployment bar, dual ball kelly cock valve and a CARSAC HT, the BHA can be deployed in multiple stages. (See pages 53, 55 and 54)

Features and Benefits

- Anti Rotation
- High Tensile/High Torque
- Self-aligning
- Easy stabbing/easy break-out



CARSAC HT

CARSAC HT Joint Technical Specifications

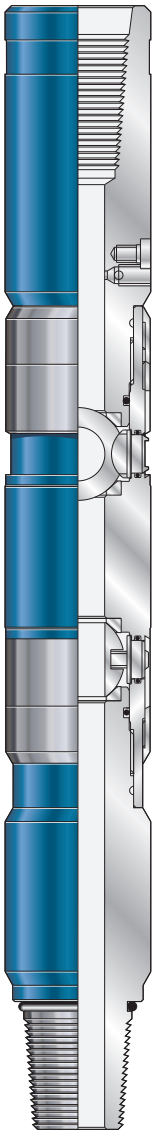
Part Number	Size	OD	ID	Service	Connections	Length	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
C169-014-08	1 ¾"	1.750"	0.437"	STD	1" AMMT Box x Pin	14"	C169-014-08/KS	3000 PSI	0°F	350°F	54,075 lbs
C169-022-10	3 ⅛"	3.125"	1.250"	STD	2 ⅜" REG Box x Pin	22"	C169-022-10/KS	5,000 PSI	0°F	350°F	125,320 lbs
C169-032-08	1 ¹¹⁄₁₆"	1.687"	0.500"	H^2S	1" AMMT Box x Pin	15.12"	C169-032-08/KS	3,000 PSI	0°F	350°F	30,128 lbs
C169-026-08	1 ¾"	1.750"	0.500"	H^2S	1" AMMT Box x Pin	14.25"	C169-026-08/KS	5,000 PSI	0°F	350°F	36,000 lbs
C169-039-09	2 ⅛"	2.125"	0.875"	H^2S	1 ½" AMMT Box x Pin	14.25"	C169-039-09/KS	5,000 PSI	0°F	350°F	43,636 lbs
C169-028-09	2 ¼"	2.250"	1"	H^2S	1 ½" AMMT Box x Pin	14"	C169-028-09/KS	5,000 PSI	0°F	350°F	49,940 lbs
C169-037-09	2 ⅜"	2.375"	1"	H^2S	1 ½" AMMT Box x Pin	14"	C169-037-09/KS	5,000 PSI	0°F	350°F	63,480 lbs
C169-030-23	2 ⅞"	2.875"	1.250" Nom	H^2S	2 ⅜" PAC Box x Pin	22"	C169-030-23/KS	5,000 PSI	0°F	350°F	76,160 lbs
C169-029-10	3 ⅛"	3.125"	1.250"	H^2S	2 ⅜" REG Box x Pin	22.50"	C169-029-10/KS	5,000 PSI	0°F	350°F	91,200 lbs

Dual Ball Kelly Cock Valve

The dual ball kelly cock valve is designed to be used in conjunction with the combination anti-rotation self-aligning connector (CARSAC), in order to safely deploy coiled tubing downhole assemblies in or out of the wellbore (see page 54).

The dual ball valves can be opened or closed at the surface through the use of an allen wrench. By sliding a locking plate to allow a wrench to be inserted into the ball key, the locking slot can be rotated into the horizontal or vertical position. When both balls have been turned into the open position, pressure can be bled off via the bleed screws and balls.

A locking feature is incorporated in the design to hold the balls securely in the open position when run into the wellbore.



Dual Ball
Kelly Cock Valve

Dual Ball Kelly Cock Valve Technical Specifications

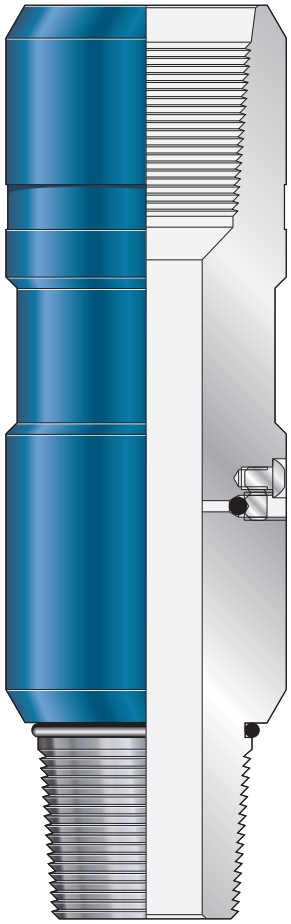
Part Number	Size	OD	ID	Service	Connections	Length	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
C204-006-23	2 7/8"	2.875"	0.968"	STD	2 3/8" PAC Box x Pin	19"	C204-006-23/KS	5,000 PSI	0°F	350°F	102,260 lbs
C204-011-23	2 7/8"	2.875"	0.968"	STD	2 3/8" PAC Box x Pin	22.65"	C204-011-50/KS	10,000 PSI	0°F	350°F	158,480 lbs
C204-006-24	2 7/8"	2.875"	0.968"	STD	2 3/8" PAC DSI Box x Pin	19"	C204-006-24/KS	5,000 PSI	0°F	350°F	82,000 lbs
C204-007-24	3 1/8"	3.125"	1.258"	STD	2 3/8" PAC DSI Box x Pin	19.2"	C204-007-24/KS	5,000 PSI	0°F	350°F	78,300 lbs
C204-007-10	3 1/8"	3.125"	1.258"	STD	2 3/8" REG Box x Pin	15"	C204-007-10/KS	5,000 PSI	0°F	350°F	110,266 lbs
C204-001-08	1 $^{1}1/_{16}$"	1.687"	0.500"	H^2S	1" AMMT Box x Pin	14"	C204-001-08/KS	5,000 PSI	0°F	350°F	36,629 lbs
C204-003-09	2 1/8"	2.125"	0.780"	H^2S	1 1/2" AMMT Box x Pin	16.50"	C204-003-09/KS	5,000 PSI	0°F	350°F	53,412 lbs
C204-005-09	2 3/8"	2.375"	0.968"	H^2S	1 1/2" AMMT Box x Pin	14.50"	C204-005-09/KS	5,000 PSI	0°F	350°F	70,323 lbs
C204-010-09	2 1/8"	2.125"	0.780"	H^2S	1 1/2" AMMT Box x Pin	14.79"	C204-010-09/KS	10,000 PSI	0°F	350°F	53,412 lbs

Coiled Tubing Bleed-Off Sub

The NOV CT bleed-off sub is a short tool that can be placed anywhere in a CT tool string where there is a possibility of trapped residual CT pressure.

Features and Benefits

- Enables the CT operator to manually bleed the toolstring at the surface using a hex socket wrench
- Utilizes a ball seat and has a captive bleed screw to prevent it from completely backing out of the sub body
- Particularly useful in conjunction with the dual ball kelly cock valve for deploying tools into the well

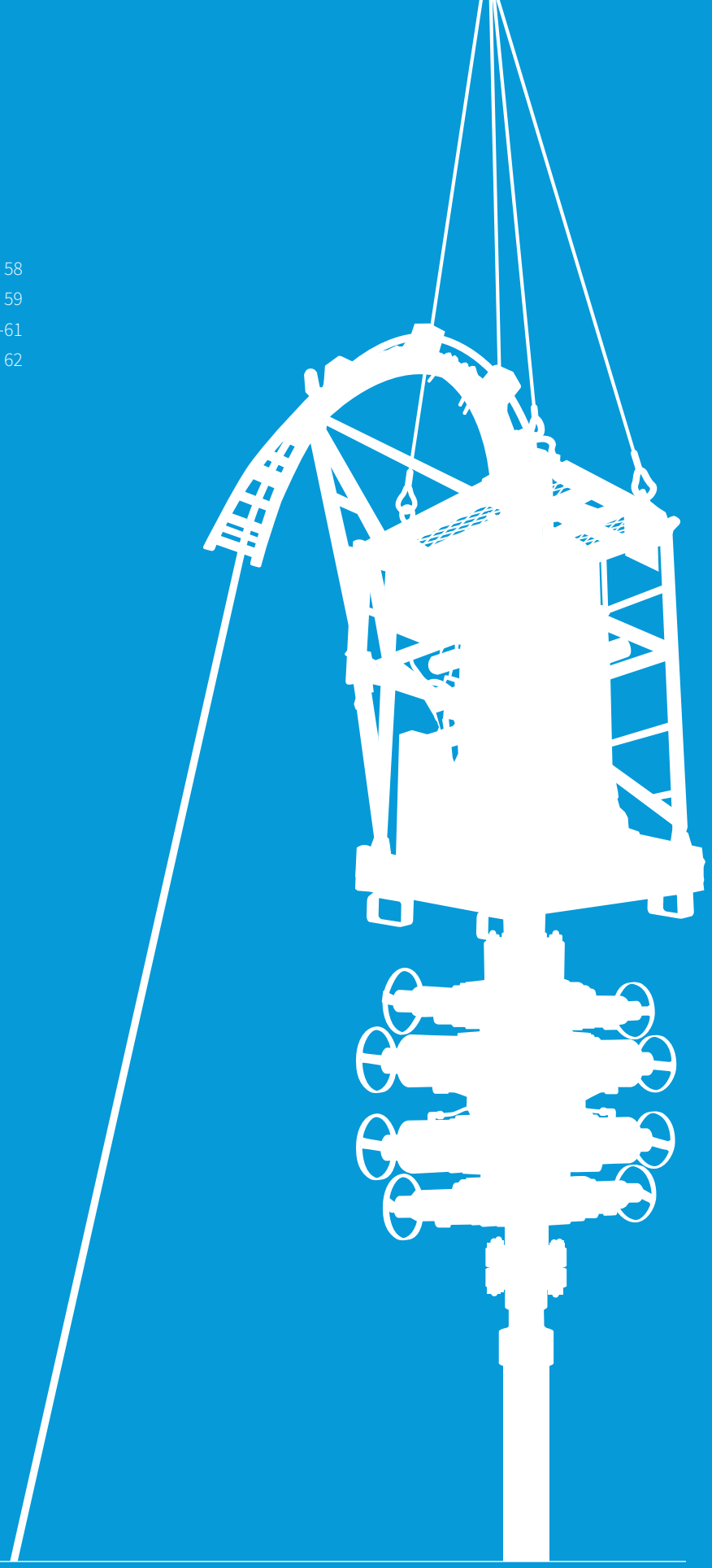


Coiled Tubing
Bleed-Off Sub

Coiled Tubing Bleed-Off Sub Technical Specifications

Part Number	Size	OD	ID	Service	Top Connection	Length	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
C169-035-24	2 ⅞"	2.875"	1.25"	H^2S	2 ⅜" PAC DSI	8"	C169-035-24/KS	5,000 PSI	0°F	350°F	112,448 lbs
C169-031-24	3 ⅛"	3.125"	1.25"	STD	2 ⅜" PAC DSI	8"	C169-031-24/KS	5,000 PSI	0°F	350°F	168,672 lbs

Logging Tools



Twin Flapper Check Valve with Cable Bypass

The twin flapper check valve with cable bypass is used for logging cable bypass operations. It provides a means to accommodate the twin flapper check valve in coiled tubing logging operations. It prevents the back flow of well fluids into the coiled tubing in the event of failure or damage to the coiled tubing string or surface equipment.

The design of the twin flapper check valve incorporates a dual sealing system in each flapper assembly for increased safety. A non-stick seal provides the primary low pressure seal, while at higher pressure the flapper seals on a metal to metal arrangement.

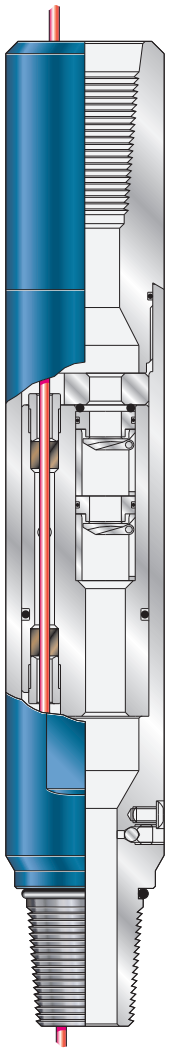
The twin flapper check valve assemblies with cable bypass are available in a range of sizes.

NOV also manufactures a range of cable logging associated tools to be used in conjunction with the twin flapper check valve with bypass.

This includes an over-pressure release joint and the logging cable termination sub (see page 59).

Features and Benefits

- Dual sealing in each flapper cartridge (the low-pressure non-stick seat/seal and high-pressure full metal to metal seat/seal).
- Fluid passage for balls, darts & plugs
- Removable flapper cartridges
- Electric line bypass facility



Twin Flapper Check Valve with Cable Bypass

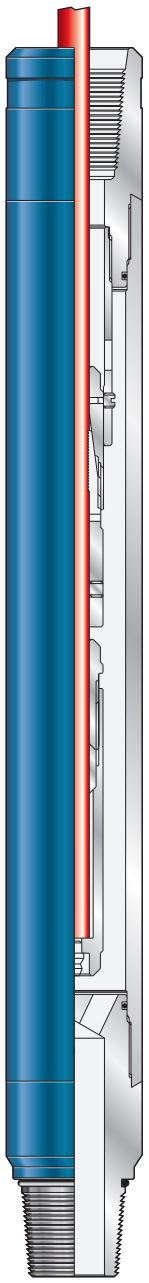
Twin Flapper Check Valve with Cable Bypass Technical Specifications

Part Number	Tool Size	OD	ID	Service	Connections	Length	Cable Size	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
C165-048-08	2 ¼"	2.250"	N/A	H^2S	1" AMMT Box x Pin	13"	7/32"	C165-048-08/KS	5,000 PSI	0°F	350°F	32,996 lbs
C165-048-09	2 ¼"	2.250"	N/A	H^2S	1 ½" AMMT Box x Pin	12.75"	7/32"	C165-048-09/KS	5,000 PSI	0°F	350°F	92,232 lbs
C165-116-24	2 ⅞"	2.875"	N/A	H^2S	2 ⅜" PAC DSI Box x Pin	15"	7/16"	C165-116-24/KS	5,000 PSI	0°F	350°F	80,979 lbs
C165-140-23	3 ⅛"	3.125"	N/A	H^2S	2 ⅜" PAC Box x Pin	16"	15/64"	C165-140-23/KS	5,000 PSI	0°F	350°F	159,125 lbs
C165-128	3 ⅛"	3.125"	N/A	H^2S	2 ⅜" REG Box x Pin	17"	5/16"	C165-128/KS	5,000 PSI	0°F	350°F	156,125 lbs

Logging Cable Termination Sub

The logging cable termination sub provides a method of securing the cable and inhibits the ingress of fluids into the logging cable during normal coiled tubing operations.

The logging cable termination sub allows the operator to use logging coiled tubing for conventional runs, without the added expense of having to provide two types of coiled tubing on the rig when both logging and manipulation work is required.



Logging Cable Termination Sub

Fitting Method

The coil should be cut back to allow sufficient cable length protruding below to reach the position in the BHA where the logging cable termination sub will be positioned.

After securing the coiled tubing connector and the upper part of the BHA to the coil, the logging cable is secured into the cable anchor, which is retained with shear pins into a shear sub. The shear pins allow the cable to release from its mounting if the logging cable encounters a tensile strain greater than the shear value of the shear pins.

The remaining cable is inserted into a termination body with a rubber element. The rubber element is compressed around the cable and into the bore of the body; a suitable fluid repellent can then be injected through a nipple at the bottom of the body.

The outer sleeve is secured around the cable anchor and termination body to the top and bottom subs, which are then fitted to complete the assembly.

The remaining components of the BHA, which normally include a twin flapper check valve and over-pressure shear sub release joint, can then be attached.

Features and Benefits

- Size/Nipple
- Thread connection

Logging Cable Termination Sub Technical Specifications

Part Number	Size	OD	ID	Service	Connections	Length	Cable Size	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
C139-091-09	2 ⅛"	2.125"	N/A	H^2S	1 ½" AMMT Box x Pin	22"	5/16"	C139-091-09/KS	5,000 PSI	0°F	350°F	90,391 lbs
C139-090	2 ¼"	2.250"	N/A	H^2S	1 ½" AMMT Box x Pin	22.50"	7/16"	C139-090/KS	5,000 PSI	0°F	350°F	61,488 lbs
C139-094-24	2 ⅞"	2.875"	N/A	H^2S	2 ⅜" PAC - DSI Box x Pin	22.50"	7/16"	C139-094-24/KS	5,000 PSI	0°F	350°F	145,381 lbs

CT Logging Cable Head (Mono Conductor)

Introduction

The coiled tubing cable logging head for mono-conductor cables is a robust tool that integrates six standard NOV products into an optimized assembly. The assembly provides a coiled tubing BHA with the required standard coiled tubing safety and disconnect features while also providing an electrical path for a mono-conductor cable. Although the tool is primarily for cable logging applications, it can be used for any application where an electrical connection is required below the tool.

The tool can be connected quickly and simply to the coiled tubing using the CARSAC connector. This allows the majority of the tool to be pre-assembled away from the rig floor, providing time savings and improving safety.

The tool consists of a cable anchor sub, coiled tubing quick-connect (CARSAC), twin flapper check valve, hydraulic disconnect, circulation control valve, and the electrical connectors of choice. It is made from alloy steel and is suitable for mild H^2S environments. However, due to the complexity of the internals of the tool, it is not advisable to circulate large amounts of corrosive fluid through the tool.

Cable Anchor Sub

The cable anchor sub is located at the top end of the assembly and has several functions. It provides a connection to the pre-installed coiled tubing connector while also providing an anchor point for the armored cable. The armored cable is clamped in place using a slip assembly. Once fully installed, the top half of the CARSAC connector can be threaded to the lower end.

CARSAC Joint

The CARSAC connector is a torque-resistant coiled tubing quick connect that allows for fast and simple connection of the tool or BHA to the coiled tubing. The upper section is attached to the coil by threading it through the lower end of the cable anchor sub. The lower section is threaded to the remainder of the cable logging tool.

This provides both time savings and improvements in safety. Time spent on the rig floor attaching the tools to the coil is minimized, and the majority of the cable head assembly can be assembled in a safe, comfortable environment.

Once the top half of the CARSAC is connected to the cable anchor sub and the lower half of the cable head is assembled, the two sections can be mated and secured quickly and easily. The mating process consists of aligning and stabbing the two sections together, then securing with a double collar. This secures the whole cable head assembly to the coiled tubing.

Twin Flapper Check Valve

The twin flapper check valve with electrical bypass is a high-integrity safety device used to prevent the inflow of fluids into the coiled tubing (CT) in the event of failure or damage to the CT string or surface equipment. It is a one-way valve that allows fluid and drop balls to pass down through the flappers, but prevents inflow of fluids and pressure into the coiled tubing. The flappers provide a high integrity seal and can be supplied with dual seals to provide elastomeric sealing at low pressure and metal-to-metal sealing at high pressures. Dual flappers provide redundancy for additional safety. The flappers are housed in cartridges that can be easily replaced, allowing for simple and quick assembly and disassembly.

The upper part of this assembly houses the primary electrical bulkhead into which the flying lead from the cable anchor sub is passed through the CARSAC and connected to the top of this bulkhead. Below this bulkhead, the fluid path and electrical paths are separated and isolated. The fluid path maintains pressure integrity through the check valves while the electrical path bypasses the check valves without compromising the integrity of the check valves.

Heavy Duty Over Pressure Release Joint

The heavy duty over-pressure (HDOP) release joint is a robust, high strength assembly used to disconnect coiled tubing from the tool/work string should it become stuck downhole. When activated, the tool will disconnect from the work string in a controlled manner at a pre-determined point in the tool. The release joint is designed to withstand vibration and torsional loading and provides an electrical connection through the tool. The release joint is flow activated, and leaves an internal fish neck facing upwards after disconnect. This enables the remainder of the work/toolstring left downhole to be easily latched with a standard GS pulling tool. Shear pins ensure that the release joint is not activated accidentally by a pressure surge at the tool.

To release the HDOP release joint, the circulation pump rate is increased to a pre-determined level (see Circulation Control Valve below). An internal piston with varying diameters is exposed to this internal pressure, causing the piston to move down after shearing retaining shear screws. The movement of this piston releases the latching device.

To ensure that the tool is not released accidentally by a pressure surge, a secondary overpull on the coiled tubing is required to complete the release. This secondary overpull will shear a second set of pins, all of which are preset by the operative to suit the specific operation.

Circulation Control Valve

The circulation control valve is a standard, robust downhole device that allows fluid circulation to be established through the Coiled Tubing above the work/toolstring.

The circulation control valve has two principle functions:

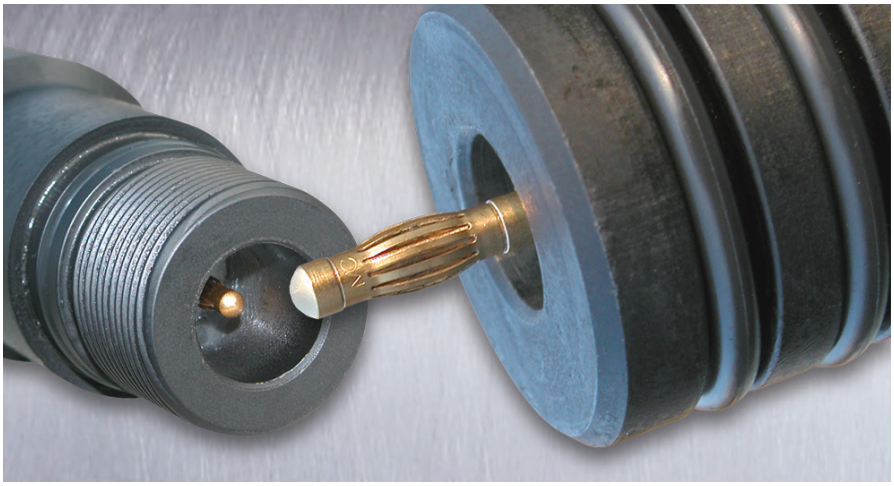
1) To provide a controlled back pressure on the circulated fluid when working in an underbalanced well operation. The flow rate and back pressure is controlled by changing choke beans in the assembly.

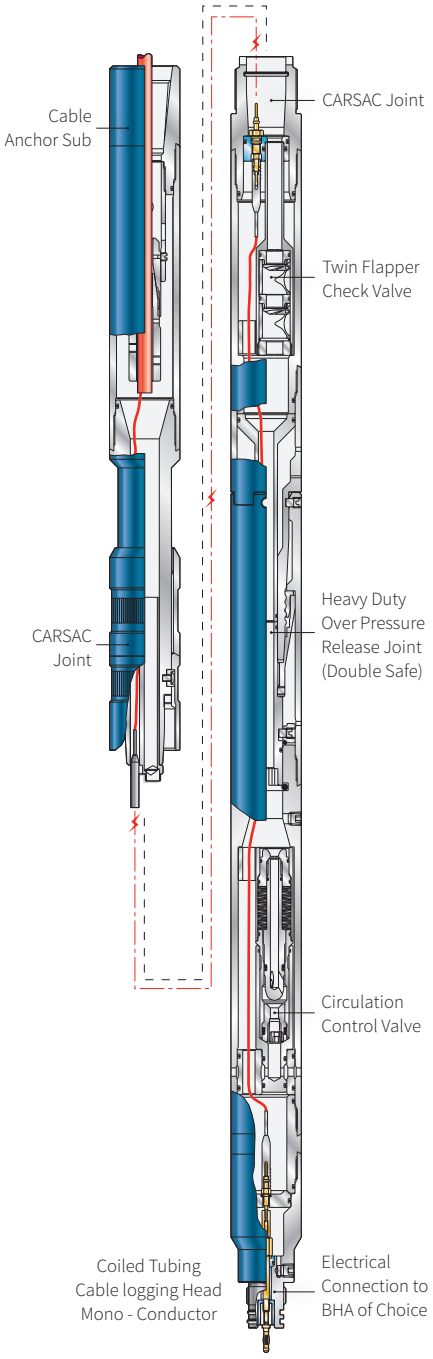
2) To provide an adjustable maximum circulation shutoff control valve that enables the HDOP release joint to operate effectively. At a pre-determined internal flow pressure, the internal piston of the circulation control will move forward and close the flow path, and internal pressure in the coil will build to the required release pressure. If the maximum flow rate is reached as a result of a pressure surge, the internal piston will return and open the circulation path. The fluid path exits the coiled tubing assembly at this point into the annular volume. The electrical conduit bypasses the circulation control valve and is terminated at the lower internal bulk head.

Electrical Connection to BHA of Choice

The tool can be supplied with a variety of industry standard CT mono-conductor electrical connectors.

Please specify the connection required when ordering.





CT Logging Cable Head (Mono Conductor) Technical Specifications

Part Number	Tool Size	OD	ID	Service	Top Connection	Bottom Connection	Length	Cable Size	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
C205-003	1 1/16"	1.687"	N/A	H^2S	1" AMMT Box	1 3/16" GO Pin	54"	7/16"	C205-003/KS	5,000 PSI	0°F	350°F	23,816 lbs
C205-004	2 1/8"	2.125"	N/A	H^2S	1 1/2" AMMT Box	1 3/16" - 12 'GO' Pin	56"	7/16"	C205-004/KS	5,000 PSI	0°F	350°F	55,548 lbs
C205-011-23	2 7/8"	2.875"	N/A	H^2S	2 3/8" PAC Box	1 3/16" - 12 'GO' Pin	64"	7/16"	C205-011-23/KS	5,000 PSI	0°F	350°F	81,340 lbs

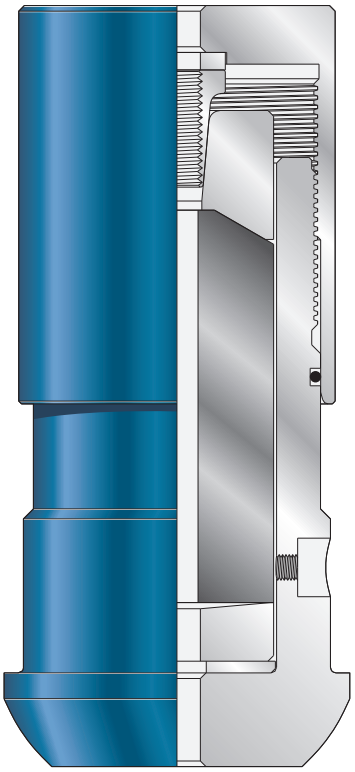
Cable Reel Assembly/Bulkhead

The cable reel assembly is the primary component of the e-line system and works in conjunction with NOV's model #1000-000 cable head assembly, which is mounted directly into the reel core allowing access to the coil ID.

Using a durable and fully adjustable dual packoff (hydraulic and mechanical), this tool can accommodate a variety of cable sizes.

Features and Benefits

- Easy to make up/break out
- Easy to redress

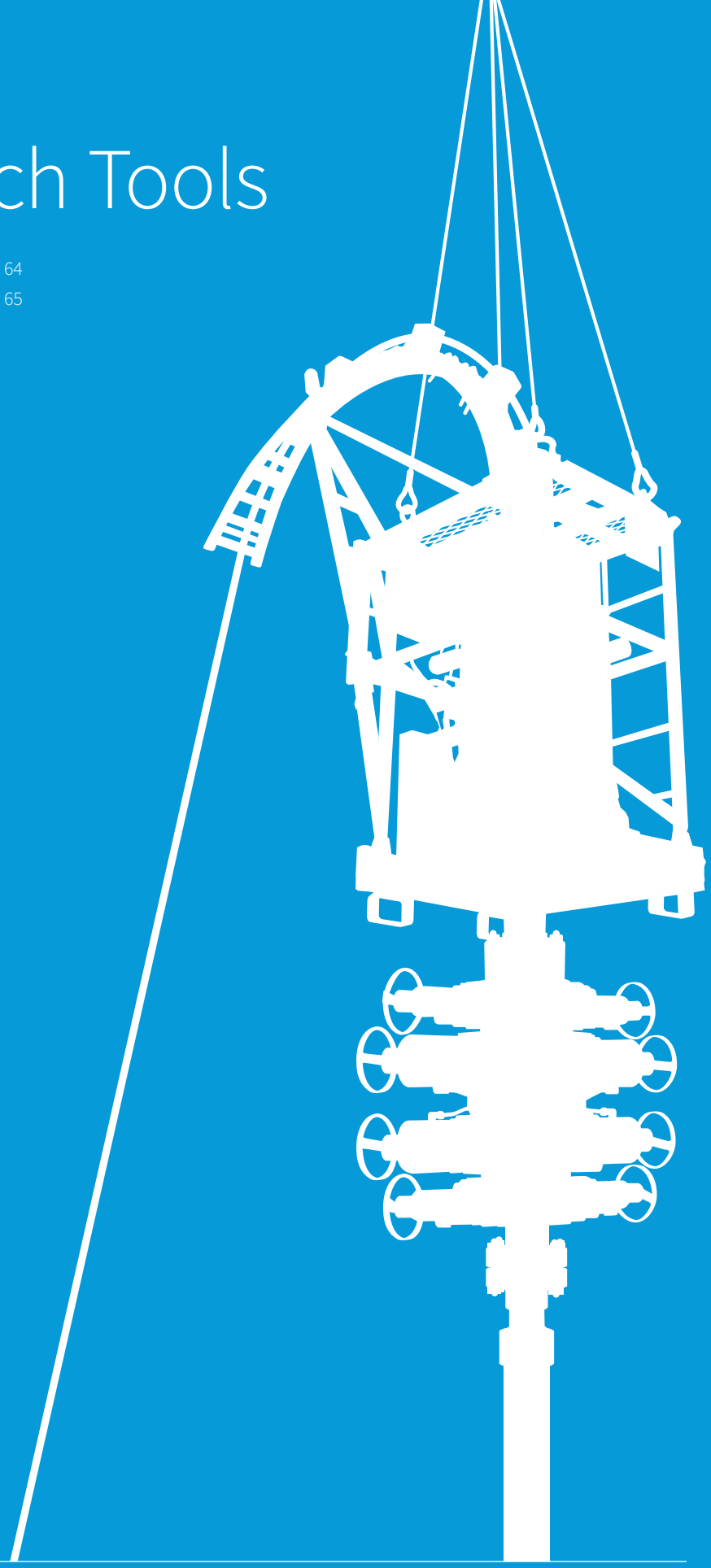


Cable Reel Assembly

Cable Reel Assembly Technical Specifications

Part Number	OD	ID	Cable Size	Length	Min Temp Rating	Max Temp Rating
1010-2188	3.687"	0.218"	7/32"	8.125"	-20°F	300°F
1010-3125	3.687"	0.312"	5/16"	8.125"	-20°F	300°F
1010-375	3.687"	0.375"	3/8"	8.125"	-20°F	300°F
1010-4375	3.687"	0.437"	7/16"	8.125"	-20°F	300°F
1010-050	3.687"	0.500"	1/2"	8.250"	-20°F	300°F

Extended Reach Tools



Agitator™ NEO Coiled Tubing Tool

Our *Agitator*™ tools have provided superior friction reduction longer than any other tool in the industry, and our *Agitator* NEO Coiled Tubing (CT) tool furthers that tradition. Featuring a shorter length and improved design, the *Agitator* NEO CT tool is an integral component of your bottomhole assembly (BHA) in reducing helical and sinusoidal buckling.

Improved Design

We have redesigned the power section and valve assemblies for the *Agitator* NEO CT tool to improve performance and reliability. The new power section design allows you to pump at higher flow rates and pressures up to 10,000 psi, and the valve assemblies were redesigned to work at optimum operational frequencies. These improvements produce axial vibrations that work on a longer length of coiled tubing. By reducing buckling, the *Agitator* NEO CT tool allows for increased weight-on-bit, improving your rate of penetration and helping you reach total depth.

Features

- Variable pressure pulses (frequency and size of the pulses are directly proportional to the flow rate)
- No downhole settings or adjustments are required
- Elastomer compatible with oil-based mud and nitrogen

Benefits

- Extends your reach by reducing friction downhole
- Improves rate of penetration (ROP) by allowing for increased weight on bit (WOB)
- Redesigned power section and valve assemblies allows for higher flow rates and pressures
- Delays sinusoidal and helical buckling by reducing weight stacking

Field Proven Applications

- Extending coiled tubing reach
  - Acid treatments
  - Well clean-outs
  - Sliding sleeve manipulation
  - Logging
- Drilling
  - Coiled tubing drilling (CTD)
  - Through-tubing rotary drilling (TTRD)
- Fishing
  - Plugs
  - Sand screens
- Milling
  - Composite plugs
  - Window milling
  - Scale

CT *Agitator* NEO Coiled TubingTool

Agitator™ NEO Coiled Tubing Tool Technical Specifications

Tool Size (OD)	1 1⁄16"*	3 1⁄8"	3 1⁄2"
Length	34.3"	45.7"	52"
Weight	17 lbs	65 lbs	114 lbs
Recommended mud weight	8-10 ppg	8-10 ppg	8-12 ppg
Recommended flow rate	30-65 gpm	110-210 gpm	110-210 gpm
Temperature range	150°-320°F	150°-320°F	150°-320°F
Operational frequency	14 Hz @ 65 gpm	9.07 Hz @ 210 gpm	7.7 Hz @ 210 gpm
Pressure rating (static)	10,000 psi	10,000 psi	10,000 psi
Operational pressure drop generated	350-700 psi	350-750 psi	350-750 psi
Stator/sub makeup torque (@62.5% of yield)	620 ft-lbs	2,380 ft-lbs	6,060 ft-lbs
Max tensile	37,150 lbs	120,000 lbs	190,800 lbs
Max tensile	1" AMMT Pin x Box	2 3⁄8" API REG Pin x Box	2 3⁄8" API REG Pin x Box
Rig connections makeup torque (@62.5% of yield)	400 ft-lbs	4,000 ft-lbs	5,300 ft-lbs
Rotor type	Chrome plate	Chrome plate	Chrome plate

**Currently undergoing field trials*

Agitator™ XP Coiled Tubing Tool

The *Agitator*™ CT tool creates gentle pressure pulses that have been proven to help you complete CT operations in extended reach wells and reduce the time to complete an operation. The tool generates pressure pulses which create axial movement in the CT pipe, reducing the onset of lock up. This axial movement reduces friction between the wellbore and the outer diameter of the CT string.

How it Works

The *Agitator* CT tool comprises a short positive displacement motor section which powers a rotating valve. The rotor of the short motor section oscillates an upper valve plate with an off-centered hole above a static plate with a central hole. As the two holes align, the total flow area increases. As the rotation continues, it partially restricts the static hole and decreases the flow area. The changing flow area creates pressure pulses which travel outward from the tool to break static friction with the wellbore.

Features

- Variable pressure pulses (the frequency and size of the pulses are directly proportional to the flow rate)
- No downhole settings or adjustments required

Benefits

- Helps you complete CT operations in extended reach wells
- Reduces friction between the BHA and borehole
- Reduces helical buckling
- Improves weight transfer
- Allows you to complete operations faster

Field Proven Applications

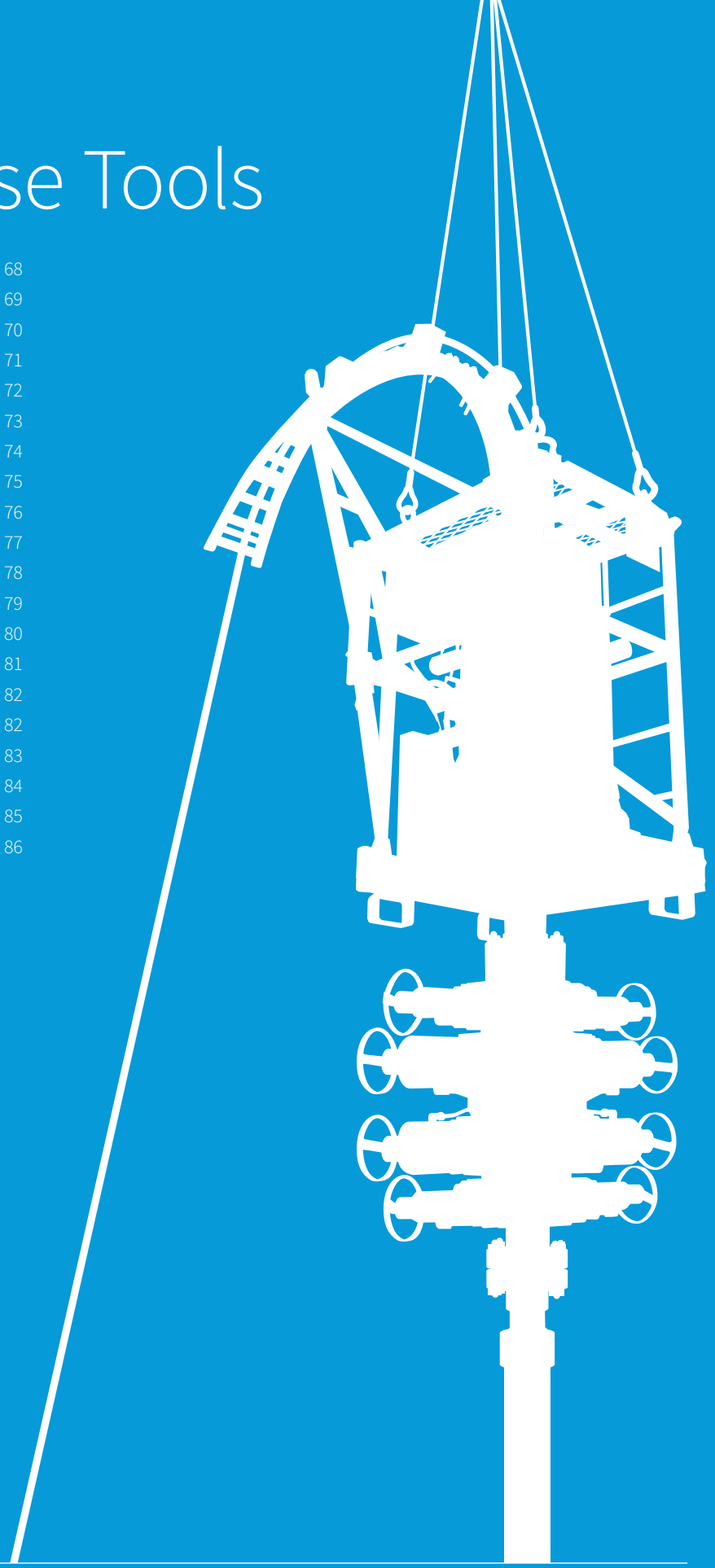
- Extending coiled tubing reach
  - Acid treatments
  - Well clean-outs
  - Sliding sleeve manipulation
  - Logging
- Drilling
  - Coiled tubing drilling (CTD)
  - Through-tubing rotary drilling (TTRD)
- Fishing
  - Plugs
  - Sand screens
- Milling
  - Composite plugs
  - Window milling
  - Scale

Agitator XP Coiled Tubing Tool

Agitator™ XP Coiled Tubing Tool Technical Specifications

Tool Size (OD)	2 1⁄8”	2 7⁄8”	3 1⁄8”
Connections	1 ½” AMMT Pin x Box	2 3⁄8” PAC Pin x Box	2 3⁄8” REG Pin x Box
Overall Length	72”	61.375”	61.375”
Recommended Flow Range	40-80 gpm	40-140 gpm	40-140 gpm
Operating Frequency	9 Hz @ 40 gpm	9 Hz @ 120 gpm	9 Hz @ 120 gpm
Operational Pressure Drop Generated	600-800 PSI	500-700 PSI	500-700 PSI
Max Pull	51,000 lbs	78,000 lbs	129,000 lbs
Temp Range	320°F	320°F	320°F
Weight	80 lbs	100 lbs	125 lbs

Special Purpose Tools



FluidHammer Impact Drill Jar

The FluidHammer tool transmits multiple downward impact forces at high frequency when fluid is pumped through it, thus eliminating the need to cycle the coil. The tool operates through a combination of layoff weight and controlled flow activation through the toolstring, converting flow and pressure into mechanical energy.

Applications

- Underbalanced and overbalanced clean outs
- Shifting stubborn sliding sleeves
- Breaking ceramic and glass discs
- Swaging collapsed tubing and screens
- Broaching operations
- Driving debris downhole
- Scale clean out including cement, resin coated sand, plastic, barium, calcium and iron

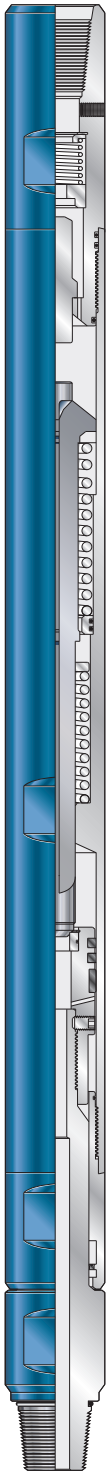
The FluidHammer tool is composed of a single-piece, non-flexible impact shaft for simplicity and maximum efficiency in transmitting impacts. Internally, a fluted dart ensures that fluid can flow through the tool with the minimum of interruption.

When the FluidHammer tool is set down, the impact shaft becomes seated onto the fluted dart. The dart is extended upwards against a spring under piston pressure. At a critical point, the dart comes into contact with a tappet valve, and the fluid flow path through the tool is interrupted as the tappet valve becomes seated. A rapid pressure drop results in a downward impact between the dart and the seat. Continuous flow with set-down weight will recommence the cycle.

In order to function correctly, the FluidHammer tool requires a small amount of movement/ stroke at the BHA. The FluidHammer intensifier allows this function at shallow operating depths and during surface testing, when pick-up or sit-down weight is applied (see page 74). When operating at deeper depths, this movement is usually taken up through the coil.

Operations where large diameter/heavy wall coil is used may require an extra intensifier to optimize the performance of the FluidHammer tool. The FluidHammer tool has an atypical power section that does not rely on rubber components for efficient functionality, so operators are not limited to only pumping water as a circulating medium. Nitrogen, foam, Xylene, diesel and light-bodied fluids of up to 12 ppg can all be used.

FluidHammer
Impact Drill Jar
(shown with a Ceramic
Disc Breaker Bit fitted)



FluidHammer
Impact Drill Jar

FluidHammer Impact Drill Jar Technical Specifications

Part Number	Size	OD	ID	Service	Connections	Length	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
C182-022-08	1 1⁵⁄₁₆"	1.687"	NA	H^2S	1" AMMT Box x Pin	31.75"	C182-022-08/KS	500 - 2,500 PSI	0°F	350°F	34,736 lbs
C182-023-09	2 ⅛"	2.125"	NA	H^2S	1 ½" AMMT Box x Pin	36.75"	C182-023-09/KS	500 - 2,500 PSI	0°F	350°F	34,200 lbs

FluidHammer Impact Drill Jar Bits

FluidHammer Impact Drill Jar Bits Technical Specifications

Part Number	Tool Description	Bit Maximum OD	Service	Top Connection
00-31647	1 1⁄16" Chisel Point (Rotor Hammer Bit)	1.75"	STD	1" MT
00-31651	1 1⁄16" Parafin Wax Cutter (RHB)	2.00"	STD	1" MT
00-31649	1 1⁄16" Star Chisel Bit (RHB)	1.75"	STD	1" MT
C230-009-08	1 1⁄16" Balistic Button Bit (RHB), 45mm	45mm	STD	1" MT
C230-014-08	1 1⁄16" Cross Blade Bit (RHB), 45mm	45mm	STD	1" MT
00-31942	1 1⁄16" Ceramic Disc Breaker (RHB)	1.69"	STD	1" MT
00-31940	1 1⁄16" Flat Blade Sand Bit	1.69"	STD	1" MT
00-31648	2 1⁄8" Chisel Point Bit (RHB)	2.25"	STD	1 ½" MT
00-31652	2 1⁄8" Parafin Wax Cutter	2.50"	STD	1 ½" MT
00-31650	2 1⁄8" Star Chisel Bit (RHB)	2.50"	STD	1 ½" MT
C230-012-09	2 1⁄8" Balistic Button Bit (RHB), 57 mm	57mm	STD	1 ½" MT
00-31951	2 1⁄8" Ceramic Disc Breaker	2.12"	STD	1 ½" MT
C230-016-09	2 1⁄8" Cross Blade Bit for (RHB), 57mm	57mm	STD	1 ½" MT
00-31949	2 1⁄8" Flat Blade Sand Bit	2.19"	STD	1 ½" MT


Star Chisel Bit


Chisel Point Bit


Parafin Wax Cutter


Ballistic Button Bit


Flat Blade Sand Bit


Ceramic Disc Breaker

FluidHammer Intensifier

The FluidHammer intensifier is used in conjunction with the FluidHammer coiled tubing impact jar to provide the necessary tool movement and acceleration for the FluidHammer to operate efficiently. This is achieved by storing upward energy in the discs and compression spring, which imparts a predictable downward blow.

Operations where large diameter/heavy wall coil is used may require an extra intensifier to optimize the performance of the FluidHammer impact jar.

The full pump through capability of the intensifier is compatible with the FluidHammer impact jar.

Features and Benefits

- Full flow through bore
- Maximized stroke
- High sit down load
- Simple redress
- Only one dynamic seal

Fluid-Hammer Intensifier

FluidHammer Intensifier Technical Specifications

Part Number	Size	OD	ID	Service	Connections	Length	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
C182-020-08	1 1/16"	1.690"	0.44"	H^2S	1" AMMT Box x Pin	58"	C182-020-08/KS	450-750 (up impact) 500-800 (down impact)	0°F	350°F	24,561 lbs
C182-021-09	2 ⅛"	2.125"	0.39"	H^2S	1 ½" AMMT Box x Pin	57.75"	C182-021-09/KS	500-800 (up/down impact)	0°F	350°F	44,344 lbs

Flow Activated Multi-Shot Tubing End Locator

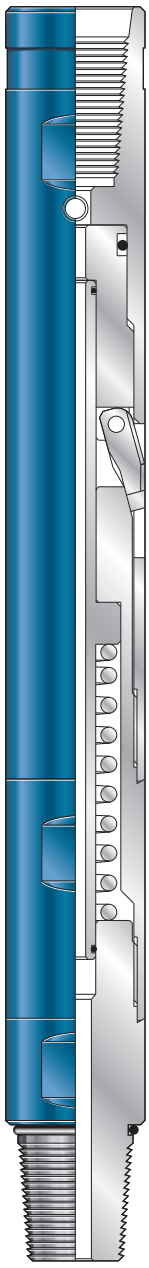
The flow-activated multi-shot tubing end locator can be used as part of the standard toolstring assembly to locate the end of the production tubing for depth correlation.

The tubing end locator is flow-activated, and therefore offers the ability to retag the end of the tubing as many times as required without the need to retract from the well for redress. In addition, since the tool is flow-activated by surface pump volume and pressure, the force required to pull through the tubing end can therefore be infinitely varied.

The hydraulic tubing end locator is available in a range of toolstring sizes with fingers to suit the tubing ID as required.

Features and Benefits

- Design allows multiple re-tagging
- Fingers retract within body diameter
- Flow or drop ball activated
- Optional external fish neck



Flow Activated Multi-Shot Tubing End Locator

Flow Activated Multi-Shot Tubing End Locator Technical Specifications

Part Number	OD	ID	Service	Connections	Length	Tubing Size Range	Service Kits	Activation Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
C062-063-08	1.690”	0.375” (No Choke)	STD	1” AMMT Box x Pin	25”	2 ⅜” - 3 ½”	C062-063-08/KS	500 PSI	0°F	350°F	37,493 lbs
C062-064-09	2.125”	0.720” (No Choke)	STD	1 ½” AMMT Box x Pin	26.375”	2 ⅞” - 3 ½”	C062-064-09/KS	500 PSI	0°F	350°F	61,244 lbs
C062-065-09	2.625”	0.930” (No Choke)	STD	1 ½” AMMT Box x Pin	26”	3 ½” - 4 ½”	C062-065-09/KS	500 PSI	0°F	350°F	90,708 lbs

Flow Activated Hydraulic Knuckle Joint

The coiled tubing flow-activated hydraulic knuckle joint, when incorporated within the coiled tubing, has the flexibility of being a straight semi-rigid toolstring. When pressure is applied to the toolstring, the flow-activated elbow bends and becomes inclined.

An additional flow-activated knuckle joint extension is also available to add greater reconfiguration options to the flow-activated knuckle joint. With an elbow extension, the flow-activated knuckle joint can be reconfigured into a double-acting knuckle joint end form to aid side wall fishing operations.

The flow-activated knuckle joint has a ball and socket knuckle with a key that gives a torque-through capability.

Operation

The knuckle joint is flow-activated and will allow normal through-circulation without activating the bending mechanism.

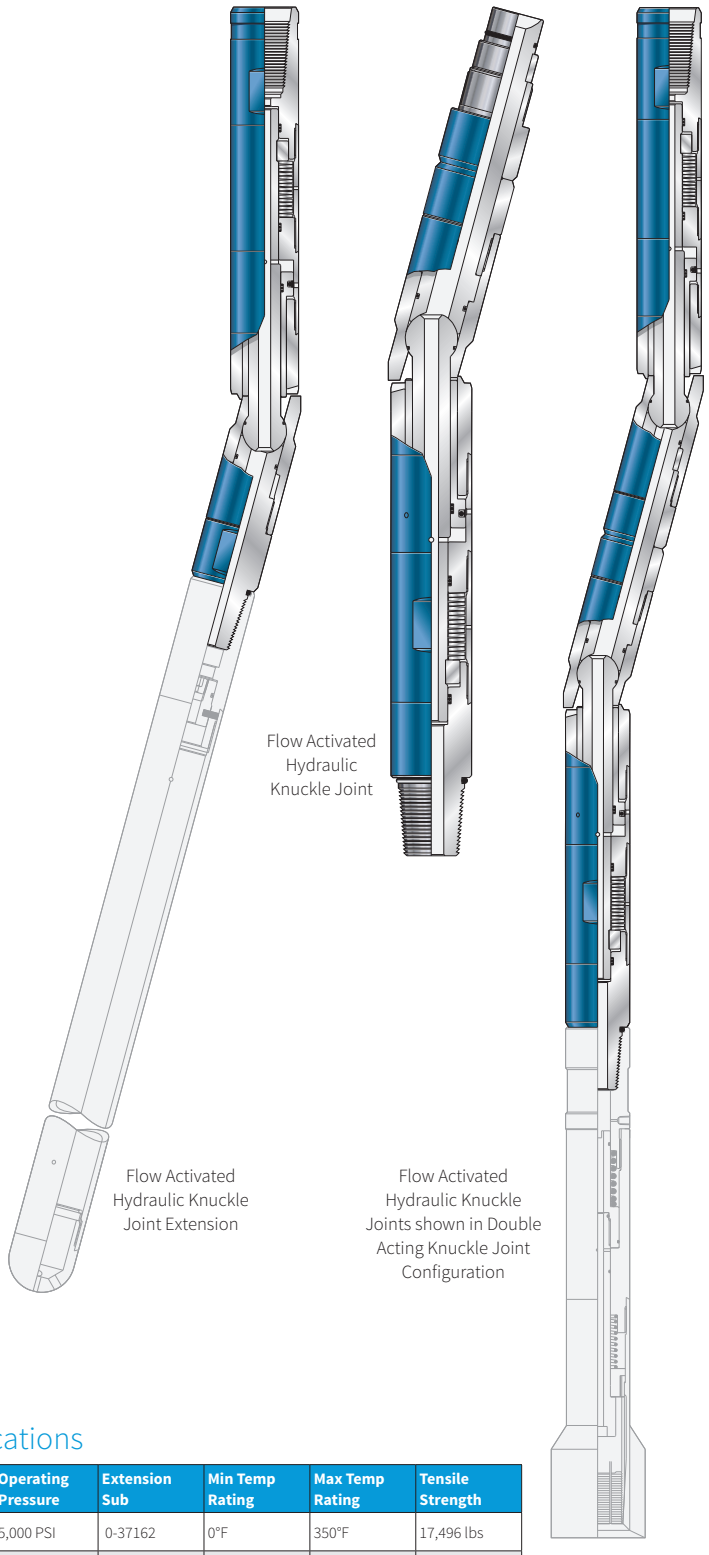
By increasing the flow rate above the normal circulating flow rate, a pressure differential is achieved at the tool, typically in the range of 1000 psi. This causes the elbow, if unrestrained, to bend and become rigid, creating a pressure drop indication of full inclination. Under normal circumstances, in order to achieve the necessary operating pressure differentials, a choke will be installed at a point below the elbow.

To repeat the cycle, the flow rate should be reduced back to normal circulation, causing the tool to straighten. This will cause the piston to automatically return to its start position so that the tool is reset. The pressure cycle can then be repeated as before to make the elbow joint bend.

When adding an knuckle joint extension to a single elbow, there are six positions of possible alignment. This allows the operator to control the orientation selection of the extension elbow.

Features and Benefits

- Full flow through bore
- Internal pressure seal
- 15° or 30° inclusive angular deviation
- Torque through capability
- Lifting ability: 200 lbs at 12”
- May be reconfigured to give a double acting elbow arrangement
- Pressure bleed-off at full inclination



Flow Activated Hydraulic Knuckle Joint

Flow Activated Hydraulic Knuckle Joint Extension

Flow Activated Hydraulic Knuckle Joints shown in Double Acting Knuckle Joint Configuration

Flow Activated Hydraulic Knuckle Joint Technical Specifications

Part Number	Size	OD	ID	Service	Connections	Length	Service Kits	Operating Pressure	Extension Sub	Min Temp Rating	Max Temp Rating	Tensile Strength
C064-108-08	1 1⁵⁄₁₆”	1.687”	0.312”	STD	1” AMMT Box x Pin	23”	C064-108-08/KS	5,000 PSI	0-37162	0°F	350°F	17,496 lbs
C064-074-09	2 ⅛”	2.125”	0.375”	STD	1 ½” AMMT Box x Pin	23”	C064-074-09/KS	5,000 PSI	00-27112	0°F	350°F	30,240 lbs
C064-072-09	2 ⅛”	2.125”	0.375”	H^2S	1 ½” AMMT Box x Pin	21”	C064-072-09/KS	5,000 PSI	01-27112	0°F	350°F	26,500 lbs

Cement Valve

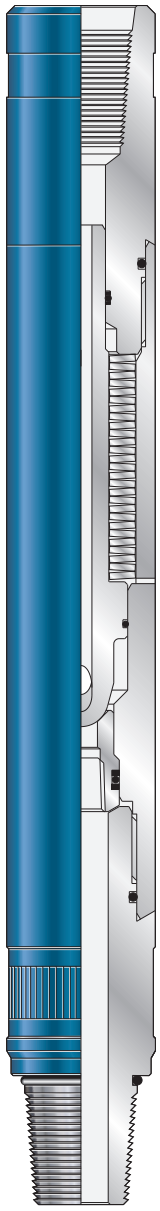
The cement valve is a check valve designed to support a column of fluid until such time as an increase in pressure is applied to the column from above. Once the increased pressure is seen at the valve, it will open and the column of fluid will be allowed to flow through. By reducing the pressure in the column of fluid to its original level, the valve will close and the fluid will cease to flow.

- As pressure is applied to the column of fluid, it sees the selected cross-sectional area and begins to compress the disc springs.
- The compressed disc springs hold the piston nose on seat, preventing the fluid from travelling through the tool.
- When the pressure is increased to a predetermined level, the fluid is allowed to bypass the piston seat and travel down the tool.
- The cement valve can be reconfigured to operate at different pressures in a range from 500 psi.

The cement valve was originally developed as a control valve, capable of accurately delivering cement during coiled tubing cementing operations. The same tool can also be used to deliver any fluid downhole using the same principle.

Features and Benefits

- Works in underbalanced situations
- Suitable for most fluid applications
- Multiple operating delivery pressure configuration
- Precision calibrated valve opening pressure against pre-determined B.H.P.



Cement Valve

Cement Valve Technical Specifications

Part Number	Size	OD	Service	Connections	Length	Service Kits	Working Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
C180-032-08	1 1⁄16”	1.687”	H^2S	1” AMMT Box x Pin	13”	C180-032-08/KS	5,000 PSI	0°F	350°F	45,498 lbs
C180-033-09	2 1⁄8”	2.125”	H^2S	1 ½” AMMT Box x Pin	14.50”	C180-033-09/KS	5,000 PSI	0°F	350°F	47,000 lbs
C180-039-23	2 7⁄8”	2.875”	H^2S	2 3⁄8” PAC Box x Pin	17.50”	C180-039-23/KS	5,000 PSI	0°F	350°F	80,979 lbs
C180-040-23	3 1⁄8”	3.125”	H^2S	2 3⁄8” PAC Box x Pin	17.50”	C180-040-23/KS	5,000 PSI	0°F	350°F	156,125 lbs

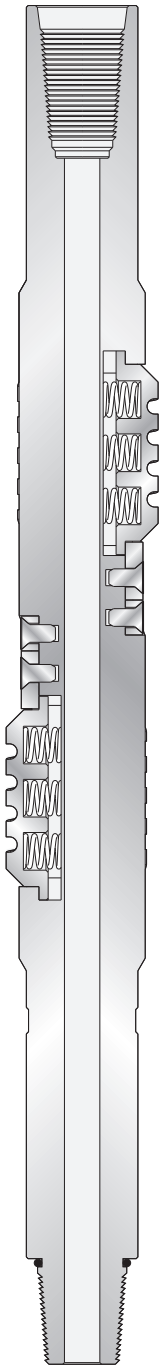
Coiled Tubing Casing Scraper

The NOV CT casing scraper is used to remove cement scale, mud, mill scale, rust, paraffin, perforation burrs and other substances from the inside walls of casing. This operation produces a smooth inside casing diameter that will assist in a successful down hole operation, such as setting packers, bridge plugs, and similar equipment.

The CT casing scraper is a versatile and rugged tool manufactured from a solid piece of heat-treated alloy steel. The scraper blades fit into precision-machined pockets, and are securely held by a tenon retainer and lock block. The scraper blades feature left hand helical grooves and are heat-treated for maximum service. The blades are arranged to produce a complete 360° coverage within the casing.

The CT casing scraper is simple to operate. The tools generally run with the pin up and the box down, installed in the drilling string between the bit and the bit sub. The CT casing scraper may be either reciprocated or rotated in the hole, but for best results it is recommended that the scraper first be run through the section to be scraped without rotation and then rotated as it is withdrawn. If rotation is not possible, the scraper should be run vertically twice. For optimal results, the tool should be rotated from 30°-45° before making the second run.

The NOV CT casing scraper is available to condition pipe ranging from 4 ½" tubing to 13 ⅜" casing.



Casing Scraper

Features and Benefits

- Maximized blade contact
- Large fluid/debris flow path
- Short, compact, easy to assemble and disassemble
- Guide taper on blades for passing through joints without hanging
- Robust construction
- May be run on coiled tubing or drill pipe

Casing Scraper Technical Specifications

Part Number	Casing Size	OD	ID	Service	Connections	Length	Service Kits	Min Temp Rating	Max Temp Rating	Tensile Strength
0105-450	4.5"	3.56"	1"	STD	2 ⅜" REG	35.375"	0105-450-RDK	0°F	350°F	290,128 lbs
0105-500	5"	3.56"	1"	STD	2 ⅜" REG	35.375"	0105-500-RDK	0°F	350°F	290,128 lbs
0105-550	5.5"	4.37"	1"	STD	2 ⅞" REG	36.625"	0105-550-RDK	0°F	350°F	382,832 lbs
0105-658	6.625"	4.37"	1"	STD	2 ⅞" REG	36.625"	0105-658-RDK	0°F	350°F	382,832 lbs
0105-700	7"	5.50"	1.25"	STD	3 ½" REG	42.250"	0105-700-RDK	0°F	350°F	543,896 lbs
0105-758	7.625"	5.50"	1.25"	STD	3 ½" REG	42.250"	0105-758-RDK	0°F	350°F	543,896 lbs
0105-858	8.625"	7.35"	2"	STD	4 ½" REG	42"	0105-858-RDK	0°F	350°F	949,152 lbs
0105-958	9.625"	7.35"	2"	STD	4 ½" REG	42"	0105-958-RDK	0°F	350°F	949,152 lbs
0105-133	13.375"	9.50"	3.50"	STD	6 ⅝" REG	57.250"	0105-133-RDK	0°F	350°F	1,416,400 lbs

Coiled Tubing Anchor with Mechanical Shear Release

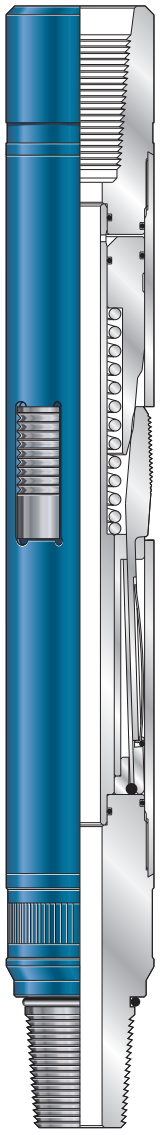
The coiled tubing (CT) anchor provides a fixed anchor point within the tubing to assist in the performance of other CT downhole tools. The CT anchor also can be supplied in a double unit for increased holding forces.

The CT anchor is a flow-activated tool. Increasing the flow at the surface generates a back pressure at the tool, which activates the slip mechanism and sets the slips against the tubing wall. Once set, the anchor can withstand large axial loads, subject to the tool size and application.

The anchor can be re-set at another location within the tubing string by reducing coiled tubing pressure. The slips are then able to retract away from the tubing wall and release the toolstring. Once the toolstring has been moved to a new location, the slips can again be set with the application of pressure. This operation can be repeated as many times as required in a single deployment.

Typical CT operations that could benefit from the coiled tubing anchor include:

- Underbalanced situations
- Situations where completion tubing cutting where coil motors need to be stationary for knives to be effective.
- Production logging surveys to hold survey tools deployed on coiled tubing rigidly and to dampen vibration caused by high production flow rates.
- Accurate spotting of well treatments, where changes in flow pressures can cause the end of the coiled tubing to move significantly.



Coiled Tubing Anchor with Mechanical Shear Release

Coiled Tubing Anchor with Mechanical Shear Release Technical Specifications

Part Number	Tubing Size	OD	ID	Service	Connections	Length	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
C195-006-08	2 ⅜"	1.81"	0.312"	H^2S	1" AMMT Box x Pin	23"	C195-006-08/KS	5,000 PSI	0°F	350°F	38,253 lbs
C195-007-09	2 ⅞"	2.18"	0.438"	H^2S	2 ½" AMMT Box x Pin	22"	C195-007-09/KS	5,000 PSI	0°F	350°F	41,918 lbs
C195-008-09	3 ½"	2.72"	0.812"	H^2S	1 ½" AMMT Box x Pin	21.50"	C195-008-09/KS	5,000 PSI	0°F	350°F	53,485 lbs
C195-009-24	4 ½"	3.62"	1.250"	H^2S	2 ⅜" PAC DSI Box x Pin	23"	C195-009-24/KS	5,000 PSI	0°F	350°F	107,047 lbs

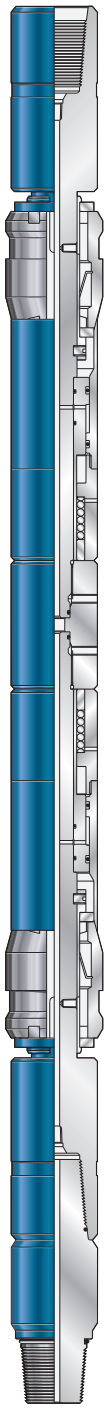
Flow Activated Double-Ended Selective Shifting Tool

The double-ended selective shifting tool (DESST) has been designed to selectively shift PCE, Otis, Camco, and Baker sliding sleeves (SSDs) in horizontal wellbores. Shifting keys can be custom designed for other profiles as needed.

The DESST shifting keys are normally retracted during the running operation, and are flow-activated to the open shift position by increasing surface pump volume, and therefore, pressure at the downhole location of the DESST and SSD. The DESST can selectively open or close multiple SSDs in a single coiled tubing trip.

Features and Benefits

- Flow-activated; no drop balls required
- Dual action for opening or closing sliding sleeves
- Positive or selective key options
- Optional external fish neck



Flow Activated Double Ended Selective Shifting Tool

Flow Activated Double-Ended Selective Shifting Tool Technical Specifications

Part Number	SSD Size	Key Range OD	ID	Service	Connections	Length	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
C084-106-08	1.875”	1.85” - 2.16” Keys	0.25”	STD	1” AMMT Box	40”	C084-106-08/KS	5,000 PSI	0°F	350°F	31,806 lbs
C084-093-08	2.312”	2.15” - 2.60” Keys	0.25”	STD	1” AMMT Box	44.75”	C084-093-08/KS	5,000 PSI	0°F	350°F	38,410 lbs
C084-093-09	2.312”	2.15” - 2.60” Keys	0.25”	STD	1 ½” AMMT Box	44.25”	C084-093-09/KS	5,000 PSI	0°F	350°F	38,728 lbs
C084-135-09	2.530”	2.53” - 3.00” Keys	0.14”	STD	1 ½” AMMT Box	38”	C084-135-09/KS	5,000 PSI	0°F	350°F	50,208 lbs
C084-094-09	2.750”	2.72” - 3.02” Keys	0.39”	STD	1 ½” AMMT Box	42”	C084-094-09/KS	5,000 PSI	0°F	350°F	92,232 lbs
C084-110-09	2.812”	2.72” - 3.16” Keys	0.39”	STD	1 ½” AMMT Box	42”	C084-110-09/KS	5,000 PSI	0°F	350°F	92,232 lbs
C084-142-23	3.688”	3.66” - 4.15” Keys	0.44”	STD	2 ⅜” PAC Box	41”	C084-142-23/KS	5,000 PSI	0°F	350°F	103,148 lbs
C084-108-23	3.813”	3.75” - 4.09” Keys	0.72”	STD	2 ⅜” PAC Box	53”	C084-108-23/KS	5,000 PSI	0°F	350°F	160,149 lbs
C084-117-09	4.562”	4.52” - 4.99” Keys	0.72”	STD	1 ½” AMMT Box	30.75”	C084-117-09/KS	5,000 PSI	0°F	350°F	92,232 lbs

Flow Activated Shifting Tool

The flow-activated shifting tool is designed to be used as a work tool for opening and closing sliding sleeves.

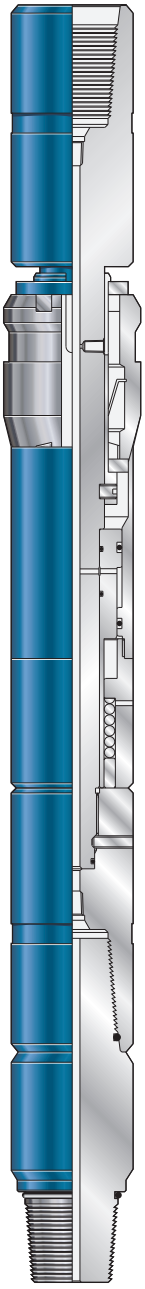
Normally closed, the shifting tool is flow-activated and therefore does not require the use of drop balls to activate. The shifting tool can be used to either open or close sliding sleeves.

Flow-activated shifting tools are supplied with a pin-pin crossover, enabling the tool to be run shifting either up or down.

Flow-activated shifting tools are available to suit all sizes and makes of sliding sleeves, and can be supplied with either positive or selective keys.

Features and Benefits

- Flow-activated; no drop balls required
- Positive or selective key options
- Optional external fishneck



Flow Activated Shifting Tool

Flow Activated Shifting Tool Technical Specifications

Part Number	SSD Size	Key Range OD	ID	Service	Connections	Length	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
C084-104-08	1.875”	1.875” - 2.16” Keys	0.25”	STD	1” AMMT Box x Pin	23.375”	C084-104-08/KS	5,000 PSI	0°F	350°F	31,806 lbs
C084-105-08	2.312”	2.15” -2.60” Keys	0.25”	STD	1” AMMT Box x Pin	27.50”	C084-105-08/KS	5,000 PSI	0°F	350°F	38,728 lbs
C084-105-09	2.312”	2.15” - 2.60” Keys	0.25”	STD	1 ½” AMMT Box x Pin	27.50”	C084-105-09/KS	5,000 PSI	0°F	350°F	38,728 lbs
C084-087-09	2.562”	2.53”- 2.97” Keys	0.14”	STD	1 ½” AMMT Box x Pin	21.25”	C084-087-09/KS	5,000 PSI	0°F	350°F	50,208 lbs
C084-111-09	2.750”	2.72” - 3.00” Keys	0.39”	STD	1 ½” AMMT Box x Pin	26.75”	C084-111-08/KS	5,000 PSI	0°F	350°F	92,232 lbs
C084-118-09	2.812”	2.72” - 3.16” Keys	0.39”	STD	1 ½” AMMT Box x Pin	26.75”	C084-118-09/KS	5,000 PSI	0°F	350°F	92,232 lbs
C084-095-24	3.125”	3.06” - 3.44” Keys	0.39”	STD	2 ⅜” DSI PAC Box x Pin	45.25”	C084-095-24/KS	5,000 PSI	0°F	350°F	91,500 lbs
C084-089-09	3.313”	3.11” - 3.16” Keys	0.72”	STD	1 ½” AMMT Box x Pin	26.75”	C084-089-09/KS	5,000 PSI	0°F	350°F	131,332 lbs
C084-113-24	3.313”	3.11” - 3.16” Keys	0.72”	STD	2 ⅜” DSI PAC Box x Pin	44.125”	C084-113-24/KS	5,000 PSI	0°F	350°F	127,500 lbs
C084-077-23	3.688”	3.66” - 4.15” Keys	0.437”	STD	2 ⅜” PAC Box x Pin	28”	C084-077-23/KS	5,000 PSI	0°F	350°F	103,148 lbs
C084-077-24	3.688”	3.66” - 4.15” Keys	0.39”	STD	2 ⅜” DSI PAC Box x Pin	24”	C084-077-24/KS	5,000 PSI	0°F	350°F	103,000 lbs
C084-119-23	3.812”	3.74” - 4.07” Keys	0.72”	STD	2 ⅜” PAC Box x Pin	33.25”	C084-119-23/KS	5,000 PSI	0°F	350°F	160,149 lbs
C084-119-24	3.812”	3.74” - 4.07” Keys	0.72”	STD	2 ⅜” DSI PAC Box x Pin	35.70”	C084-119-24/KS	5,000 PSI	0°F	350°F	153,900 lbs
C084-145-24	4.437”	4.40” - 4.89” Keys	0.72”	STD	2 ⅜” DSI PAC Box x Pin	28.35”	C084-145-24/KS	5,000 PSI	0°F	350°F	145,800 lbs
C084-121-09	4.562”	4.52” - 4.99” Keys	0.72”	STD	1 ½” AMMT Box x Pin	30.50”	C084-121-09/KS	5,000 PSI	0°F	350°F	206,747 lbs
C084-117-24	4.562”	4.52” - 4.99” Keys	0.72”	STD	2 ⅜” DSI PAC Box x Pin	48.25”	C084-117-24/KS	5,000 PSI	0°F	350°F	145,800 lbs

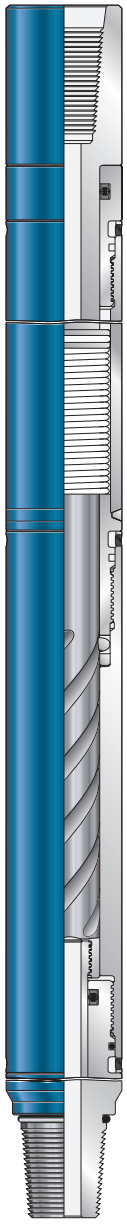
Kick-Off Tool

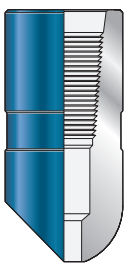
This unique tool is used to get the tip of coiled tubing past wellhead ledges, across liners or around other restrictions in the well. Pump or spring open and push down to activate, giving it a 380° rotation.

The kick-off tool features pump-through and easy serviceability. Half- and full-mule shoes and some drilling bits are available to complement the use of this tool.

Features and Benefits

- Simple mechanical design
- Automatic reset with release of pressure
- Utilizes a variety of wash shoes
- Easy redress





Kick-Off Tool

Kick-Off Tool Technical Specifications

Part Number	Size	OD	ID	Service	Connections	Length	Service Kits	Min Temp Rating	Max Temp Rating	Tensile Strength
811-050	1 1⁵⁄₁₆"	1.687"	0.625"	H^2S	1" AMMT Box x Pin	21"	811-050-RDK	0°F	350°F	24,080 lbs
812-050	2 ⅛"	2.125"	0.625"	H^2S	1 ½" AMMT Box x Pin	22.625"	812-050-RDK	0°F	350°F	42,540 lbs
813-000	2 ⅞"	2.875"	0.687"	H^2S	2 ⅜" PAC Box x Pin	25.50"	813-000-RDK	0°F	350°F	118,430 lbs

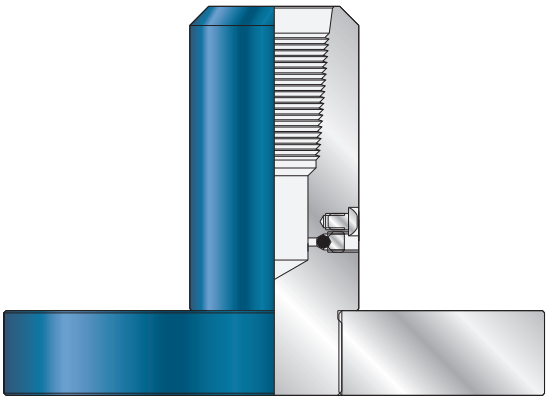
Pull Test Plate

In coiled tubing (CT) toolstring intervention operations, once the tubing has been fed from the reel, over the goose neck and through the CT Injector, a CT connector is fitted. The NOV CT pull test plate can be threaded onto the bottom of a CT connector, which enables the CT operator to take a pull in order to proof test the strength of the connector joint. The CT connector pressure integrity can also be tested at this point.

An integral bleed off port is incorporated to allow for the possibility of bleeding down trapped residual CT pressure.

Features and Benefits

- Detachable and available in different diameters
- Connector/bleed sub is toolstring diameter
- Bleed off port utilizes a ball seat and has a captive bleed screw to prevent it from completely backing out of the sub body



Pull Test Plate

Pull Test Plate Technical Specifications

Part Number	Size	Service	Connections	Working Pressure
C161-021-08	Pull Test Plate 8”	STD	1” AMMT	10,000 PSI
C161-021-09	Pull Test Plate 8”	STD	1 ½” AMMT	10,000 PSI
C161-021-10	Pull Test Plate 8”	STD	2 ⅜” REG	10,000 PSI
C161-021-23	Pull Test Plate 8”	STD	2 ⅜” PAC SPEC	10,000 PSI

Strong Arm Orientation Tool

The Strong Arm orientation tool was developed to deliver a higher torque turn than existing indexing tools on the market of comparable size.

The Strong Arm orientation tool is suitable for most coiled tubing (CT) applications where a downhole rotation of the lower string is required, such as hookwall overshot use for fishing below the tailpipe.

By increasing the flow rate, a pressure increase is achieved at the tool, typically in the range of 1000 psi. Once this pressure is achieved, a piston will stroke downwards, rotating a drive shoe by means of a helical drive shaft, converting linear motion into torque. The degree of orientation imparted is dependent upon the distance the piston moves, ensuring that rotation is truly stepless.

The drive shoe normally rotates a maximum 45° in a single cycle (drive shoes with a maximum rotation of less than 45° can be supplied). During CT drilling operations, this rotation would be monitored using MWD.

To repeat the cycle, reduce the flow rate back to normal circulation, causing the tool to stop rotating and become rigid. This will cause the piston to automatically return to its start position, resetting the tool. The indexing cycle can then be repeated.

Features and Benefits

- Stepless clockwise orientation
- Simple and robust orientation mechanism
- Precise rotational control

Strong Arm Orientation Tool

Strong Arm Orientation Tool Technical Specifications

Part Number	Size	OD	ID	Service	Connections	Length	Service Kits	Activation Pressure	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
C163-038-08	1 1⁄16”	1.690”	0.312”	STD	1” AMMT Box x Pin	59”	C163-038-08/KS	500 - 1,000 PSI	5,000 PSI	0°F	350°F	26,550 lbs
C163-030-08	1 ¾”	1.750”	0.312”	STD	1” AMMT Box x Pin	59”	C163-030-08/KS	500 - 1,000 PSI	5,000 PSI	0°F	350°F	42,780 lbs
C163-031-09	2 ¼”	2.250”	0.390”	STD	1 ½” AMMT Box x Pin	56”	C163-031-09/KS	500 - 1,000 PSI	5,000 PSI	0°F	350°F	42,942 lbs
C163-032-10	3 ⅛”	3.125”	0.937”	STD	2 ⅜” REG Box x Pin	63.125”	C163-032-10/KS	1,000 - 4,000 PSI	5,000 PSI	0°F	350°F	96,691 lbs
C163-036-09	2 ⅛”	2.125”	0.390”	H^2S	1 ½” AMMT Box x Pin	56”	C163-036-09/KS	500 - 1,000 PSI	5,000 PSI	0°F	350°F	45,919 lbs
C163-032-24	3 ⅛”	3.125”	0.937”	STD	2 ⅜” PAC DSI Box x Pin	63.125”	C163-032-24/KS	1,000 - 4,000 PSI	5,000 PSI	0°F	350°F	90,000 lbs
C163-041-24	2 ⅞”	2.875”	0.750”	STD	2 ⅜” PAC DSI Box x Pin	64.45”	C163-041-24/KS	1,000 - 3,500 PSI	5,000 PSI	0°F	350°F	90,000 lbs
C163-042-23	2 ⅞”	2.875”	0.750”	H^2S	2 ⅜” PAC Box x Pin	65”	C163-042-23/KS	1,000 - 3,500 PSI	5,000 PSI	0°F	350°F	60,931 lbs

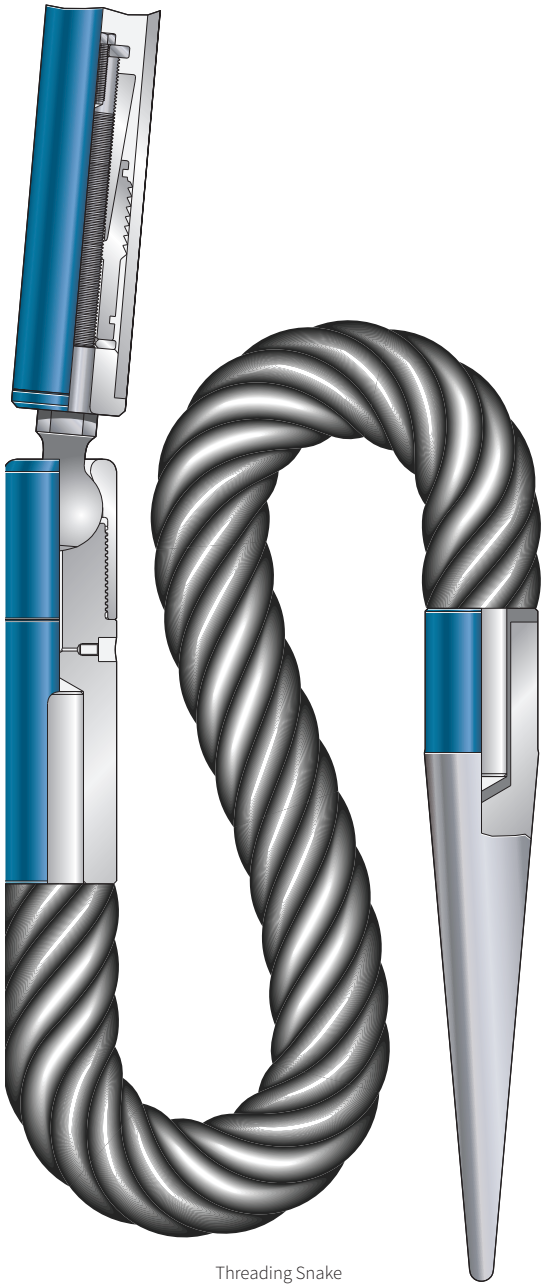
Threading Snake

This special tool is a must when handling larger pipe or when stabbing pipe into the injector. To use, attach the slip-end to the coiled tubing on the spool and place the nose cone into the top of the injector. Simply start up the injector to pull coil through chains.

Once the coil is out of the bottom of the injector, simply release slips and remove the threading snake.

Features and Benefits

- Easy to use
- Allows for easy stabbing of tubing into injector



Threading Snake

Threading Snake Technical Specifications

Part Number	Coiled Tubing Size	OD	Connector Type	Cable Length	Service Kits
801-100	1 ¼"	1.250"	Roll On Connector	15 ft	801-100-RDK
802-000	1 ½"	1.500"	Slip Connector	20 ft	802-000-RDK
803-000	1 ¾"	1.750"	Slip Connector	20 ft	803-000-RDK
804-000	2"	2"	Slip Connector	20 ft	804-000-RDK
806-000	2 ⅜"	2.375"	Slip Connector	20 ft	806-000-RDK
809-000	2 ⅞"	2.625"	Slip Connector	20 ft	809-000-RDK

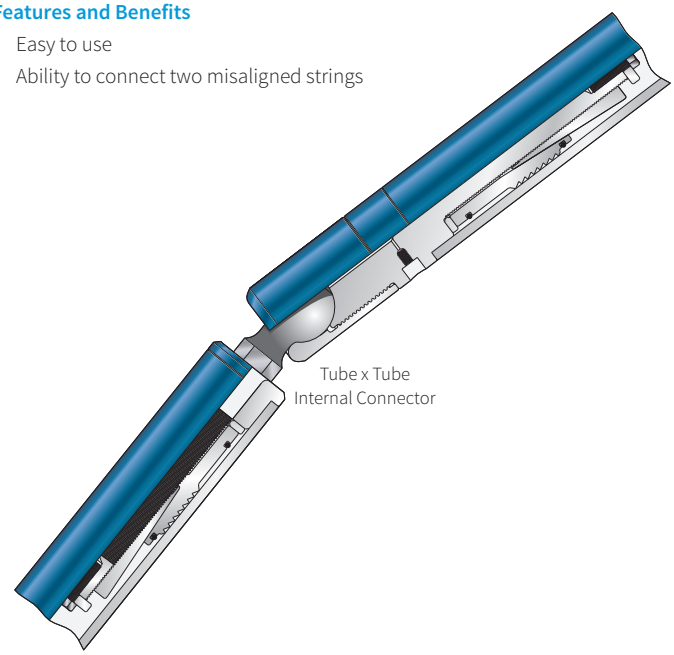
Tube x Tube Internal Connector

This unique tool is designed for specialty applications where large and heavy wall tubing is being manipulated at the surface. Stabbing into injectors, spooling, loading or unloading pipe are common uses for this tool. Simple insertion and tightening of the slips after both tubes are brought together will fully assemble this handy tool.

The center ball joint gives total flexibility against stiff pipe.

Features and Benefits

- Easy to use
- Ability to connect two misaligned strings



Tube x Cable Internal Connector

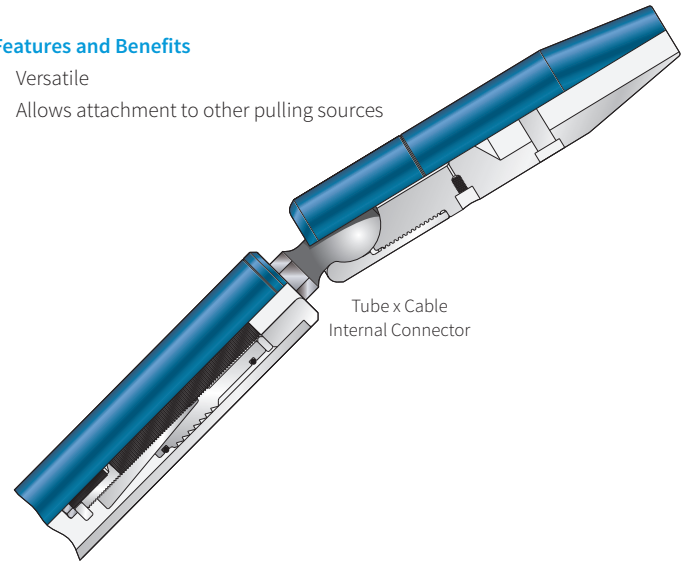
This unique tool is designed for specialty applications where large and heavy wall tubing is being manipulated at the surface. Stabbing into injectors, spooling, loading or unloading pipe are common uses for this tool. Simple insertion and tightening of the slips after both tubes are brought together will fully assemble this handy tool.

The center ball joint gives total flexibility against stiff pipe.

The tube x cable connector allows the operator to thread a winch cable through his injector in reverse and tie into this unique tool. Using the pull of the winch, the coil can now be threaded into the injector safely.

Features and Benefits

- Versatile
- Allows attachment to other pulling sources



Tube x Tube Internal Connector Technical Specifications

Part Number	Tool Description	Coiled Tubing Size	Service Kits
8095-500	2" Tube x 2" Tube - Double Joint Type	2"	8095-500-RDK
8095-000	2" Tube x 2" Tube Connector - Ball Joint Type	2" x 2"	8095-000-RDK
8092-000	2 ⅜" Tube x 2 ⅜" Tube Connector - Ball Joint Type	2 ⅜" x 2 ⅜"	8092-000-RDK
8093-000	2 ⅝" Tube x 2 ⅝" Tube Connector - Ball Joint Type	2 ⅝" x 2 ⅝"	8093-000-RDK
8094-000	2 ⅞" Tube x 2 ⅞" Tube Connector - Ball Joint Type	2 ⅞" x 2 ⅞"	8094-000-RDK
8094-500	2 ⅞" Tube x 2 ⅞" Tube - Double Joint Type	2 ⅞"	8094-500-RDK
8087-500	3 ¼" Tube x 3 ¼" Tube - Double Joint Type	3 ¼"	8087-500-RDK
8097-000	3 ¼" Tube x 3 ¼" Tube Connector - Ball Joint Type	3 ¼" x 3 ¼"	8097-000-RDK
8096-000	3 ½" Tube x 3 ½" Tube Connector - Ball Joint Type	3 ½" x 3 ½"	8096-000-RDK

Tube x Cable Internal Connector Technical Specifications

Part Number	Coiled Tubing Size	Cable Range (max/min)	Service Kits
8085-000	2"	¼" - 15⁄16"	8085-000-RDK
8082-000	2 ⅜"	¼" - 15⁄16"	8082-000-RDK
8083-000	2 ⅝"	¼" - 15⁄16"	8083-000-RDK
8084-000	2 ⅞"	¼" - 15⁄16"	8084-000-RDK
8087-000	3 ¼"	¼" - 15⁄16"	8087-000-RDK

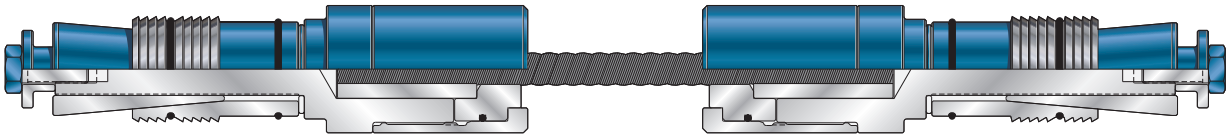
Tube x Cable x Tube Connector

A special application tool for the manipulation of large and heavy walled tubing during surface operations. Operations such as stabbing into injectors, spooling, loading, or unloading pipes are common uses of this tool. Simple insertion and tightening of the slips makes it easy to use.

The center cable allows for more flexibility when working with stiff pipe.

Features and Benefits

- Easy to use
- Allows connection of misaligned tubing



Tube x Cable x Tube Connector

Tube x Cable x Tube Internal Slip Connector Technical Specifications

Part Number	Tool Description	Coiled Tubing Size	OD	Service Kits
8094-600	2 ⅞" Tube X Cable X Tube W/ ⅝" Cable Button 8.5" Long	2 ⅞" Tube x ⅝" Cable x 2 ⅞" Tube	2.875"	8094-600-RDK

Part Number	Tool Description (without Cable)	Coiled Tubing Size	Cable Size & Length	Service Kits
8081-000	1 ¼" Tube Slip Connector X Cable For ⅜" Cable Button - No Cable Included	1 ¼"	⅜" Cable OD & No Cable	8081-000-RDK
8088-100	1 ½" Tubing Slip Connector X Cable For ⅜" Cable Button - No Cable Included	1 ½"	⅜" Cable OD & No Cable	8088-100-RDK
8095-300	2" Tube X Cable - Ball Joint Type For ⅜" Cable Button - No Cable Included	2"	⅜" Cable OD & No Cable	8095-300-RDK
8094-100	2 ⅞" Tube X Cable - Ball Joint Type For ⅜" Cable Button - No Cable Included	2 ⅞"	⅜" Cable OD & No Cable	8094-100-RCK

Part Number	Tool Description (with Cable)	Coiled Tubing Size	Cable Size & Length	Service Kits
8084-200	2 ⅞" Tube X Cable - Button Style w/ ⅝" Cable Button 20 ft Long	2 ⅞"	⅝" Cable OD & 20 ft Long Cable	8084-200-RDK
8087-200	3 ¼" Tube X Cable - Button Style w/ ⅝" Cable Button 20 ft Long	3 ¼"	⅝" Cable OD & 20 ft Long Cable	8087-200-RDK
8086-200	3 ½" Tube X Cable - Button Style w/ ⅝" Cable Button 20 ft Long	3 ½"	⅝" Cable OD & 20 ft Long Cable	8086-200-RDK

Tube x Cable Connector (Button Style)

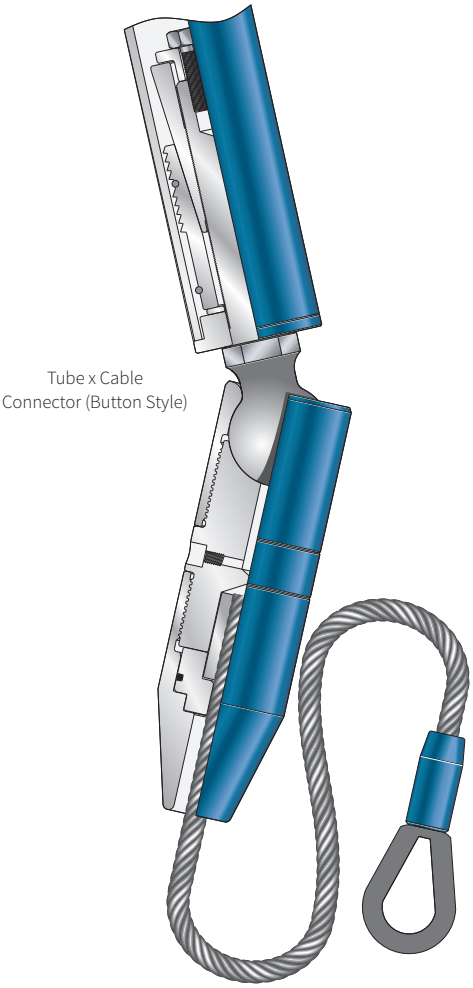
In response to industry demand, NOV has developed and tested this addition to our line of tubing handling equipment.

Featuring a failsafe tubing slip insert to anchor to the tubing end and a cable loop for pulling and threading on the other end, this unique omnidirectional swivel offers flexibility of angles for ease of operation.

Available for coil sizes 1", 2 ⅜", 2 ⅝", 2 ⅞", 3 ¼", 3 ½" and cable sizes 7/16" x 10 ft to 40 ft and 2" x 10 ft to 40 ft.

Features and Benefits

- Easy installation
- Easy to use



Tube x Cable Connector (Button Style)

Tube X Cable Connector (Button Style) Technical Specifications

Part Number	Tool Description (Without Cable)	Coiled Tubing Size	Cable Size & Length	Service Kits
8081-000	1 ¼" Tube Slip Connector X Cable for ⅜" Cable Button - No Cable Included	1 ¼"	⅜" Cable OD & No Cable	8081-000-RDK
8088-100	1 ½" Tubing Slip Connector X Cable for ⅜" Cable Button - No Cable Included	1 ½"	⅜" Cable OD & No Cable	8088-100-RDK
8095-300	2" Tube X Cable - Ball Joint Type for ⅜" Cable Button - No Cable Included	2"	⅜" Cable OD & No Cable	8095-300-RDK
8094-100	2 ⅞" Tube X Cable - Ball Joint Type for ⅜" Cable Button - No Cable Included	2 ⅞"	⅜" Cable OD & No Cable	8094-100-RCK

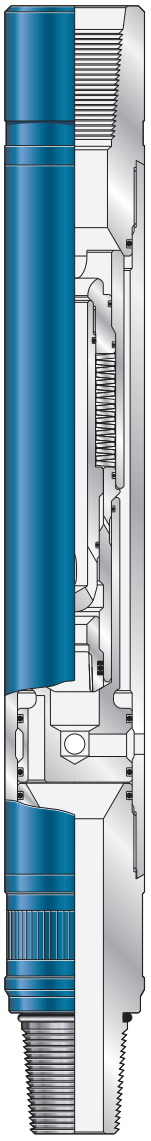
Part Number	Tool Description (With Cable)	Coiled Tubing Size	Cable Size & Length	Service Kits
8084-200	2 ⅞" Tube X Cable - Button Style w/ 19/32" Cable Button 20 ft Long	2 ⅞"	⅝" Cable OD & 20 ft Long Cable	8084-200-RDK
8087-200	3 ¼" Tube X Cable - Button Style w/ 19/32" Cable Button 20 ft Long	3 ¼"	⅝" Cable OD & 20 ft Long Cable	8087-200-RDK
8086-200	3 ½" Tube X Cable - Button Style w/ 19/32" Cable Button 20 ft Long	3 ½"	⅝" Cable OD & 20 ft Long Cable	8086-200-RDK

Sequencing Valve

The flow-activated sequencing valve is designed to actuate downhole coiled tubing (CT) tools at a predetermined pressure, and to operate as a controlled bleed valve when bleeding down internal coil pressure.

The flow-activated sequencing valve is a normally open valve that allows circulation through the tool to the annulus while running into the well. Once a pre-determined differential pressure is exceeded, the flow path to the annulus is closed and diverted into the internal bore of the toolstring. This enables hydraulic activation of any tools in the lower and upper ends of the toolstring.

When pulling a toolstring out of the well, a sequencing valve can be used to safely bleed off internal coil pressure. When the coil pressure is decreased to a pre-determined pressure, the sequencing valve opens and allows bleed through its bypass ports. During bleed down the internal/external pressures are balanced, thus eliminating the possibility of prematurely releasing flow-activated manipulation tools in the lubricator.



Sequencing Valve

Features and Benefits

- Normally open-type valve allowing circulation to the annulus while running into wellbore.
- Flow-activated; no drop ball required
- Simple field adjustment of closing differential pressure
- Quick to dump internal coil pressure at the tool
- Eliminates the possibility of dropping tools in the lubricator
- Suitable for fluid and gas applications

Sequencing Valve Technical Specifications

Part Number	Size	OD	ID	Service	Connections	Length	Operating Pressure	Service Kits	Min Temp Rating	Max Temp Rating	Tensile Strength
C168-028-08	1 1⁄16”	1.687”	0.250”	H^2S	1” AMMT Box x Pin	14.25”	5,000 PSI	C168-028-08	0°F	350°F	36,624 lbs
C168-029-08	1 ¾”	1.687”	0.250”	H^2S	1” AMMT Box x Pin	14.25”	5,000 PSI	C168-029-08	0°F	350°F	47,445 lbs
C168-027-09	2 ⅛”	2.125”	0.393”	H^2S	1 ½” AMMT Box x Pin	15.50”	5,000 PSI	C168-027-09	0°F	350°F	47,000 lbs
C168-030-09	2 ¼”	2.250”	0.375”	H^2S	1 ½” AMMT Box x Pin	16”	5,000 PSI	C168-030-09	0°F	350°F	74,364 lbs
C168-031-23	2 ⅞”	2.875”	0.375”	H^2S	2 ⅜” PAC Box x Pin	17.75”	5,000 PSI	C168-031-23	0°F	350°F	93,384 lbs
C168-032-23	3 ⅛”	3.125”	0.375”	H^2S	2 ⅜” PAC Box x Pin	17.25”	5,000PSI	C168-032-23	0°F	350°F	168,531 lbs

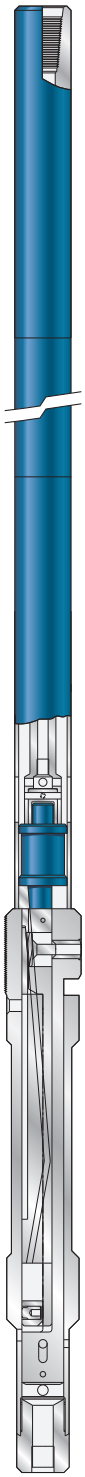
Single Shot Tubing Punch

The single shot tubing punch is a specialized hydra-mechanical tool that consists of a piston assembly designed to be run with coiled tubing. The piston assembly is combined with a field-proven wireline-type mechanical punch perforator by a safety shear sub. The tool is capable of perforating most weights/types of tubing for its designed size.

This tool is ideally suited for applications where it is desirable to communicate through the tubing to the annulus without aid of explosives. The complete assembly is designed to be run below a standard CT bottomhole assembly in conjunction with the sequencing tool.

Features and Benefits

- Easy to use
- No explosives required to punch through the tubing

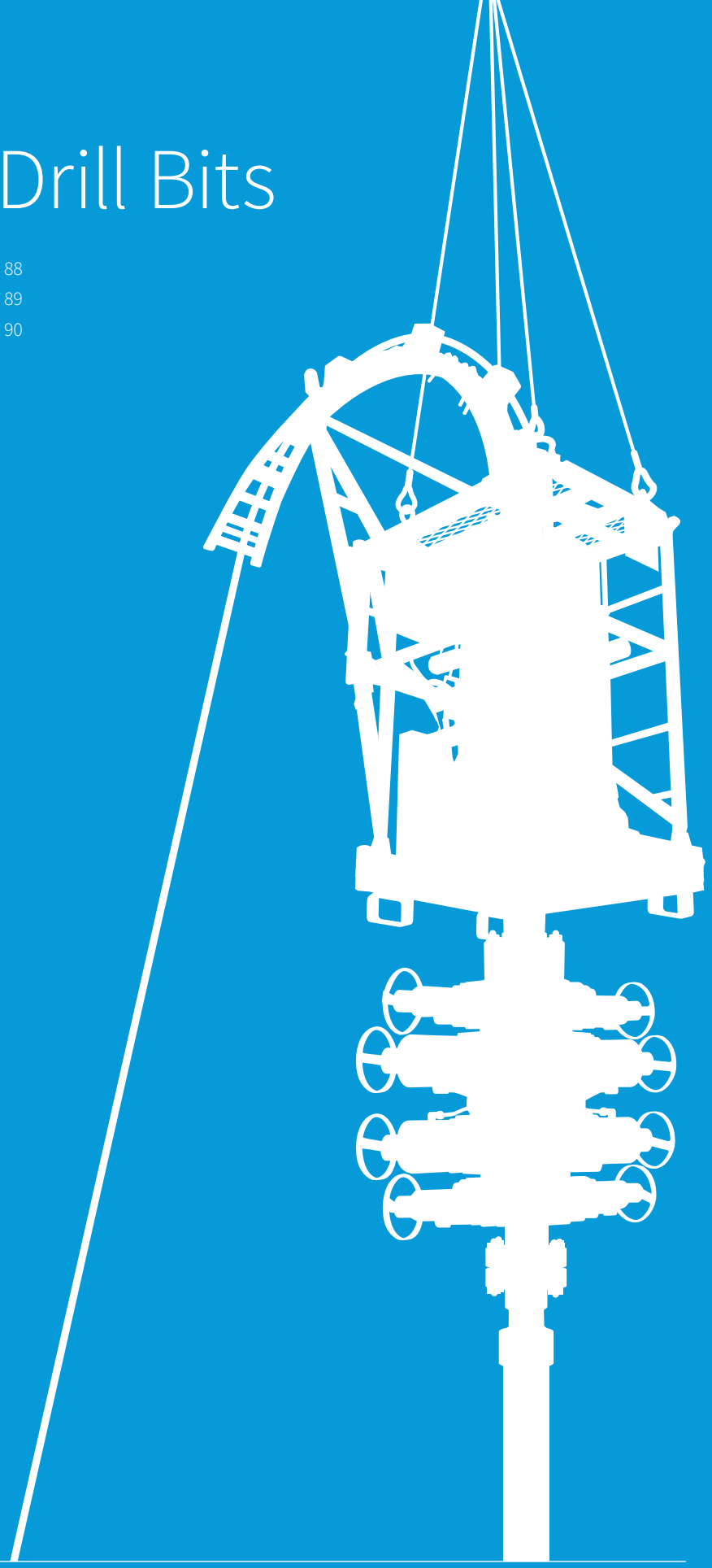


Single Shot Tubing Punch

Single Shot Tubing Punch Technical Specifications

Part Number	Size	OD	Service	Connection	Length	Service Kits	Operating Pressure	Min Temp Rating	Max Temp Rating	Tensile Strength
C207-005-08	2 ⅜"	1.840"	STD	1" AMMT Box	84"	C207-005-08/KS	5,000 PSI	0°F	350°F	28,000 lbs
C207-006-09	2 ⅞"	2.39"	STD	1 ½" AMMT Box	85"	C207-006-09/KS	5,000 PSI	0°F	350°F	61,600 lbs

Coiled Tubing Drill Bits



ShredR™ Drill Bits

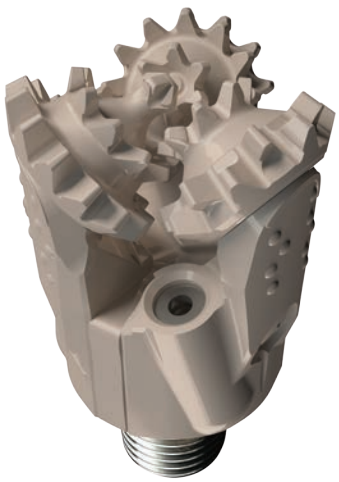
ShredR™ small-diameter mill tooth drill bits have an exceptional performance record for drilling numerous composite plugs in one run.

Popular sizes are available with an API or PAC connection. The PAC connection eliminates the need for a crossover sub when making up to small diameter motors. Shirttail protection is available for horizontal or tortuous applications.

Features and Benefits

- **Premium silver plated journal bearing** - provides reliable performance
- ***ArmorClad*™ II hardmetal** - bit stays sharper longer
- **Self-sharpening hardmetal** - stays sharp as the cutting structure wears
- **Full ring heel protection** - increases gauge durability
- **Shirttail protection (optional)** - reduces gauge wear and support bearing and seal reliability
- **Directed nozzles** - delivers efficient cuttings evacuation

ShredR™
Drill Bits



ShredR™ Drill Bits Technical Specifications

Bit Size	Bit Type	Part Number	Connection		IADC Code	WOB (klb)	RPM
			Size	Type			
3.500"	SH21	400F481	2 3⁄8"	PAC Pin	216	3 - 10	60 - 500
	SH21P	4H0F481	2 3⁄8"	PAC Pin	216	3 - 10	60 - 500
3.625"	SH21	400F263	2 3⁄8"	API Reg Pin	216	3 - 10	60 - 500
	SH21P	4H0F263	2 3⁄8"	API Reg Pin	216	3 - 10	60 - 500
	SH21	400F448	2 3⁄8"	PAC Pin	216	3 - 10	60 - 500
	SH21P	4H0F448	2 3⁄8"	PAC Pin	216	3 - 10	60 - 500
3.750"	SH21	400G630	2 3⁄8"	API Reg Pin	216	3 - 10	60 - 500
	SH21P	4H0G630	2 3⁄8"	API Reg Pin	216	3 - 10	60 - 500
	SH21	400G631	2 3⁄8"	PAC Pin	216	3 - 10	60 - 500
	SH21P	4H0G631	2 3⁄8"	PAC Pin	216	3 - 10	60 - 500
3.875"	SH21	400G632	2 3⁄8"	API Reg Pin	216	3 - 10	60 - 500
	SH21P	4H0G632	2 3⁄8"	API Reg Pin	216	3 - 10	60 - 500
	SH21	400G633	2 3⁄8"	PAC Pin	216	3 - 10	60 - 500
	SH21P	4H0G633	2 3⁄8"	PAC Pin	216	3 - 10	60 - 500
4.000"	SH21	400G634	2 3⁄8"	API Reg Pin	216	3 - 10	60 - 500
	SH21P	4H0G634	2 3⁄8"	API Reg Pin	216	3 - 10	60 - 500
4.125"	SH21	400G635	2 3⁄8"	API Reg Pin	216	3 - 10	60 - 500
	SH21P	4H0G635	2 3⁄8"	API Reg Pin	216	3 - 10	60 - 500
	SH21	400G636	2 3⁄8"	PAC Pin	216	3 - 10	60 - 500
	SH21P	4H0G636	2 3⁄8"	PAC Pin	216	3 - 10	60 - 500
4.250"	SH21	400G637	2 3⁄8"	API Reg Pin	216	3 - 10	60 - 500
	SH21P	4H0G637	2 3⁄8"	API Reg Pin	216	3 - 10	60 - 500
	SH21	400G638	2 3⁄8"	PAC Pin	216	3 - 10	60 - 500
	SH21P	4H0G638	2 3⁄8"	PAC Pin	216	3 - 10	60 - 500
4.375"	SH21	400F330	2 3⁄8"	API Reg Pin	216	3 - 10	60 - 500
	SH21P	4H0F330	2 3⁄8"	PAC Pin	216	3 - 10	60 - 500
	SH21	400F485	2 3⁄8"	API Reg Pin	216	3 - 10	60 - 500
	SH21P	4H0F485	2 3⁄8"	PAC Pin	216	3 - 10	60 - 500
4.500"	SH21	400F315	2 3⁄8"	API Reg Pin	216	3 - 10	60 - 500
	SH21P	4H0F315	2 3⁄8"	API Reg Pin	216	3 - 10	60 - 500
	SH21	400F357	2 3⁄8"	PAC Pin	216	3 - 10	60 - 500
	SH21P	4H0F357	2 3⁄8"	PAC Pin	216	3 - 10	60 - 500
4.625"	SH21	400F316	2 3⁄8"	API Reg Pin	216	3 - 15	60 - 500
	SH21P	4H0F316	2 3⁄8"	API Reg Pin	216	3 - 15	60 - 500
	SH21	400F356	2 3⁄8"	PAC Pin	216	3 - 15	60 - 500
	SH21P	4H0F356	2 3⁄8"	PAC Pin	216	3 - 15	60 - 500
4.750"	SH21	400F318	2 3⁄8"	API Reg Pin	216	3 - 15	60 - 500
	SH21P	4H0F318	2 3⁄8"	API Reg Pin	216	3 - 15	60 - 500
	SH21	400F319	2 7⁄8"	API Reg Pin	216	3 - 15	60 - 500
	SH21P	4H0F319	2 7⁄8"	API Reg Pin	216	3 - 15	60 - 500

Note: All bit types containing "P" include shirttail protection

ShredR™ CT Drill Bits

ShredR™ CT bits have been designed specifically for coiled tubing operations.

Designs are available with an API or PAC connection. The PAC connection eliminates the need for a crossover sub when making up to small diameter motors.

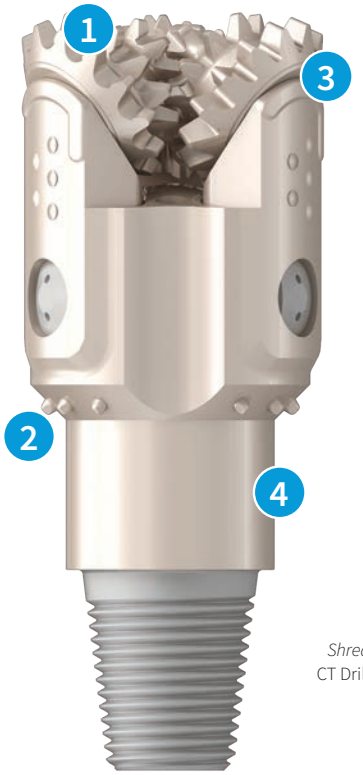
Features and Benefits

- Upreaming inserts in the shoulder reduce the chance of the BHA sticking downhole.
- Shirttail protection comes standard to prevent excessive wear in horizontal or tortuous applications.
- 2 ¼" safety neck is located between the shoulder and the threaded pin for bit makeup. The safety neck provides a smooth gripping surface, which greatly reduces the chance of pipe wrench slippage and potential injury.

ShredR™ CT Technical Specifications

Bit Size	Bit Type	Part Number	Connection		WOB (klb)	RPM
			Size	Type		
4.500"	SH2	10117641	2.375"	API Reg Pin	3 - 10	60 - 500
	SH2P	10117642	2.375"	API Reg Pin	3 - 10	60 - 500
	SH2PB	10117643	2.375"	API Reg Pin	3 - 10	60 - 500
	SH2 A1	10117647	2.375"	API Reg Pin	3 - 10	60 - 500
	SH2P A1	10119635	2.375"	API Reg Pin	3 - 10	60 - 500
	SH2	10117644	2.375"	PAC Pin	3 - 10	60 - 500
	SH2P	10117645	2.375"	PAC Pin	3 - 10	60 - 500
	SH2PB	10117646	2.375"	PAC Pin	3 - 10	60 - 500
4.625"	SH2	10120402	2.375"	API Reg Pin	3 - 10	60 - 500
	SH2P	10120403	2.375"	API Reg Pin	3 - 10	60 - 500
	SH2PB	10120404	2.375"	API Reg Pin	3 - 10	60 - 500
	SH2	10120405	2.375"	PAC Pin	3 - 10	60 - 500
	SH2P	10120406	2.375"	PAC Pin	3 - 10	60 - 500
	SH2PB	10120407	2.375"	PAC Pin	3 - 10	60 - 500
4.750"	SH2	10120371	2.375"	API Reg Pin	3 - 10	60 - 500
	SH2P	10120372	2.375"	API Reg Pin	3 - 10	60 - 500
	SH2PB	10120373	2.375"	API Reg Pin	3 - 10	60 - 500
	SH2	10120377	2.375"	PAC Pin	3 - 10	60 - 500
	SH2P	10120378	2.375"	PAC Pin	3 - 10	60 - 500
	SH2PB	10120379	2.375"	PAC Pin	3 - 10	60 - 500

Note: All bit types include shirttail protection

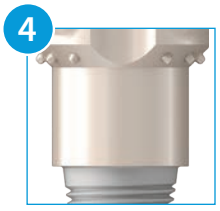


ShredR™
CT Drill Bits

Robust cutting structure

Backreaming inserts (optional)

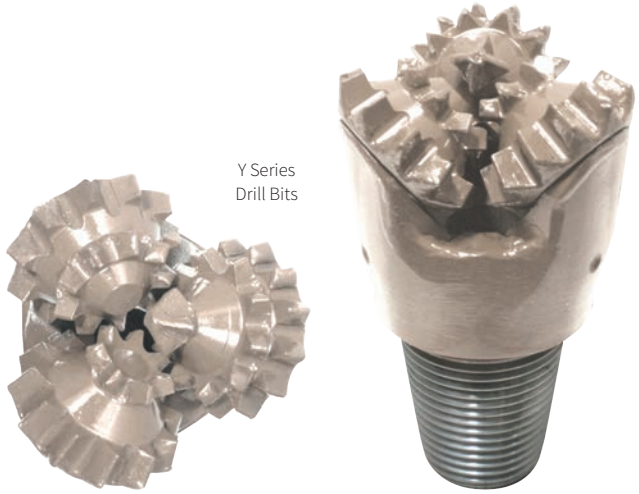
Heel Protection



2 ¼" Safety Neck

Y Series Drill Bits

Y series drill bits are small diameter roller cone drill bits for drilling cement, bridge plugs, or other limited time drilling operations. These bits feature a single center port for fluid circulation as well as milled teeth and unsealed bearings. In addition, Y Series bits are available with a welded and skirted feature with the skirt welded between the lugs to limit the infiltration of debris and prevent plugging of the port.



Y Series Drill Bits

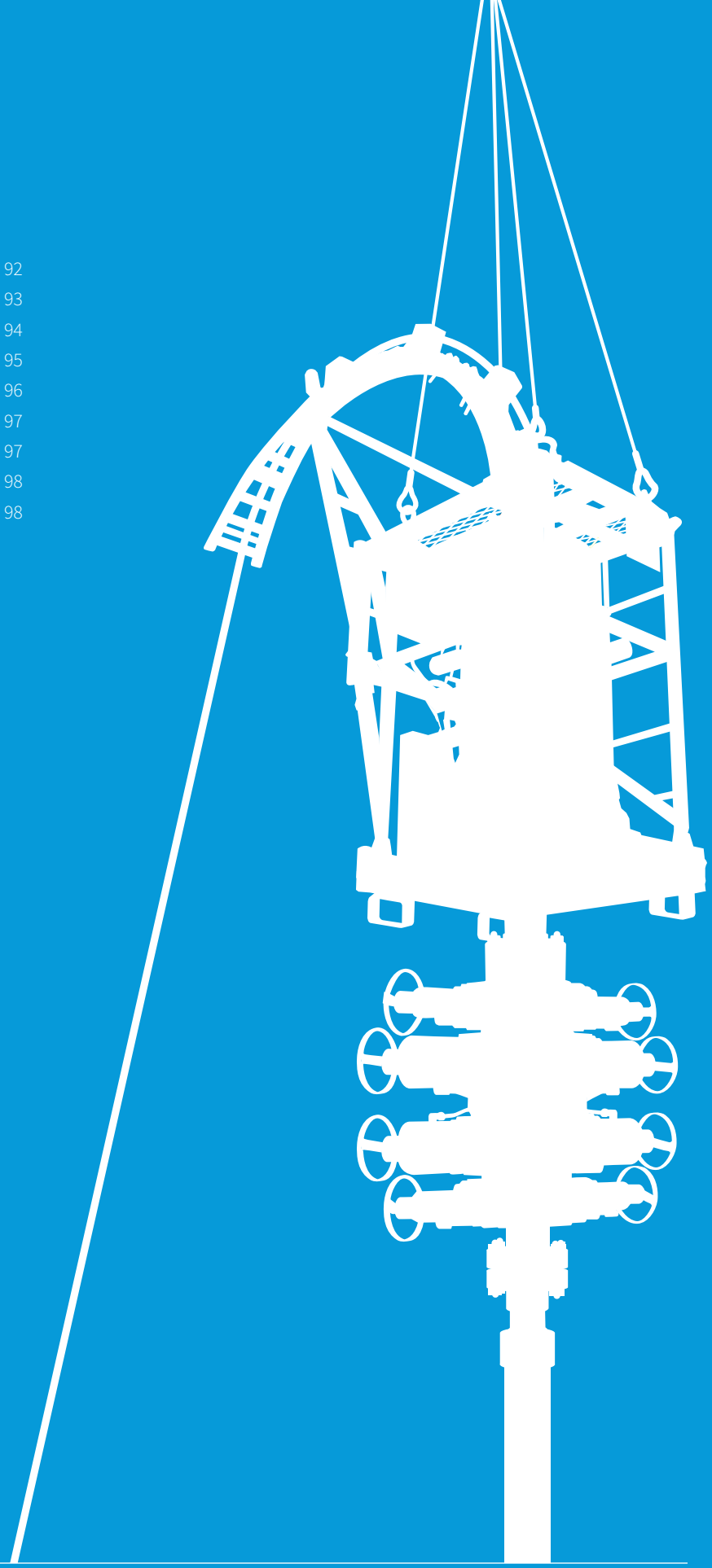
Y Series Drill Bits Technical Specifications

Bit Size	Bit Type	Part Number	Connection	Lifecycle	IADC Code
3.375”	Y21	400F980	2 ⅜” API	Non-Standard	211
3.375”	Y32	400F981	2 ⅜” API	Non-Standard	321
3.500”	Y21	400F982	2 ⅜” API	Non-Standard	211
3.500”	Y31	400F983	2 ⅜” API	Non-Standard	311
3.500”	Y32	400F984	2 ⅜” API	Non-Standard	321
3.625”	Y21	400F782	2 ⅜” API	Non-Standard	211
3.625”	Y22	400F798	2 ⅜” API	Non-Standard	221
3.625”	Y23	400F807	2 ⅜” API	Non-Standard	231
3.625”	Y31	400F816	2 ⅜” API	Non-Standard	311
3.625”	Y32	400F825	2 ⅜” API	Non-Standard	321
3.750”	Y21	400F783	2 ⅜” API	Non-Standard	211
3.750”	Y22	400F799	2 ⅜” API	Non-Standard	221
3.750”	Y23	400F808	2 ⅜” API	Non-Standard	231
3.750”	Y31	400F817	2 ⅜” API	Non-Standard	311
3.750”	Y32	400F826	2 ⅜” API	Non-Standard	321
3.875”	Y11	400F791	2 ⅜” API	Non-Standard	111
3.875”	Y21	400F784	2 ⅜” API	Non-Standard	211
3.875”	Y21WS	400F854	2 ⅜” API	Non-Standard	211
3.875”	Y22	400F800	2 ⅜” API	Non-Standard	221
3.875”	Y23	400F809	2 ⅜” API	Non-Standard	231
3.875”	Y31	400F282	2 ⅜” API	Non-Standard	311
3.875”	Y31	400F818	2 ⅜” API	Non-Standard	311
3.875”	Y31WS	400F852	2 ⅜” API	Non-Standard	311
3.875”	Y32	400F827	2a” API	Non-Standard	321
4.000”	Y23	400F857	2 ⅜” API	Non-Standard	231
4.000”	Y23WS	400F858	2 ⅜” API	Non-Standard	231
4.125”	Y11	400F792	2 ⅜” API	Non-Standard	111
4.125”	Y21	400F785	2 ⅜” API	Non-Standard	211
4.125”	Y22	400F801	2 ⅜” API	Non-Standard	221
4.125”	Y23	400F810	2 ⅜” API	Non-Standard	231
4.125”	Y31	400F819	2 ⅜” API	Non-Standard	311
4.125”	Y32	400F828	2 ⅜” API	Non-Standard	321
4.250”	Y11	400F793	2 ⅜” API	Non-Standard	111
4.250”	Y21	400F786	2 ⅜” API	Non-Standard	211
4.250”	Y22	400F802	2 ⅜” API	Non-Standard	221
4.250”	Y23	400F811	2 ⅜” API	Non-Standard	231
4.250”	Y31	400F820	2 ⅜” API	Non-Standard	311
4.250”	Y32	400F829	2 ⅜” API	Non-Standard	321
4.375”	Y11	400F794	2 ⅜” API	Non-Standard	111
4.375”	Y21	400F787	2 ⅜” API	Non-Standard	211
4.375”	Y22	400F803	2 ⅜” API	Non-Standard	221
4.375”	Y23	400F812	2 ⅜” API	Non-Standard	231
4.375”	Y31	400F821	2 ⅜” API	Non-Standard	311
4.375”	Y32	400F830	2 ⅜” API	Non-Standard	321
4.500”	Y11	400F795	2 ⅜” API	Non-Standard	111
4.500”	Y21	400F788	2 ⅜” API	Non-Standard	211
4.500”	Y22	400F804	2 ⅜” API	Non-Standard	221
4.500”	Y23	400F813	2 ⅜” API	Non-Standard	231
4.500”	Y31	400F822	2 ⅜” API	Non-Standard	311
4.500”	Y32	400F831	2 ⅜” API	Non-Standard	321
4.625”	Y11	400F796	2 ⅞” API	Non-Standard	111
4.625”	Y21	400F789	2 ⅞” API	Non-Standard	211
4.625”	Y22	400F805	2 ⅞” API	Non-Standard	221
4.625”	Y23	400F814	2 ⅞” API	Non-Standard	231
4.625”	Y31	400F823	2 ⅞” API	Non-Standard	311
4.625”	Y32	400F832	2 ⅞” API	Non-Standard	321
4.750”	Y11	400F797	2 ⅞” API	Non-Standard	111
4.750”	Y21	400F790	2 ⅞” API	Non-Standard	211
4.750”	Y21WS	400F855	2 ⅞” API	Non-Standard	211
4.750”	Y22	400F806	2 ⅞” API	Non-Standard	221
4.750”	Y22WS	400F914	2 ⅞” API	Non-Standard	221
4.750”	Y23	400F815	2 ⅞” API	Non-Standard	231
4.750”	Y31	400F824	2 ⅞” API	Non-Standard	311
4.750”	Y31WS	400F853	2 ⅞” API	Non-Standard	311
4.750”	Y32	400F833	2 ⅞” API	Non-Standard	321
4.875”	Y21	400F838	2 ⅞” API	Non-Standard	211
4.875”	Y22	400F912	2 ⅞” API	Non-Standard	221
4.875”	Y22WS	400F913	2 ⅞” API	Non-Standard	221
5.250”	Y11	400F930	2 ⅞” API	Non-Standard	111
5.250”	Y21	400F931	2 ⅞” API	Non-Standard	211
5.250”	Y31	400F932	2 ⅞” API	Non-Standard	311
5.250”	Y32	400F933	2 ⅞” API	Non-Standard	321
5.750”	Y21	400F970	3 ½” API	Non-Standard	211
6.000”	Y22	400F927	3 ½” API	Non-Standard	221
6.000”	Y31	400F926	3 ½” API	Non-Standard	311
6.000”	Y31WS	400F975	3 ½” API	Non-Standard	311
6.125”	Y21	400F985	3 ½” API	Non-Standard	211
6.125”	Y22	400F919	3 ½” API	Non-Standard	221
6.125”	Y32	400F920	3 ½” API	Non-Standard	321
6.125”	Y32WS	400F935	3 ½” API	Non-Standard	321
6.250”	Y31	400F928	3 ½” API	Non-Standard	311
7.875”	Y21	400F847	4 ½” API	Non-Standard	211

Note: All Bit Types containing WS are Welded and Skirted

Note: Other Bit Sizes and Types are available upon Request

Service Tools



8079 Mini Service Center

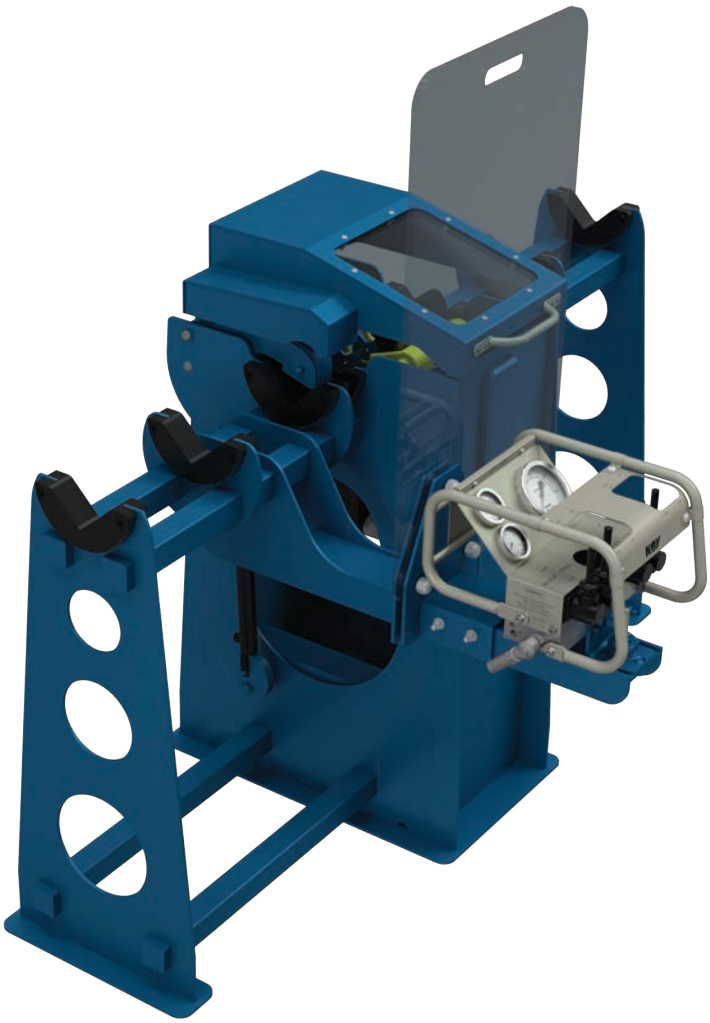
The 8079 Mini Service Center provides a safe and easy way to make-up and break-out tool joint connections on small OD tools and pipes. This fully hydraulic system is designed for practicality and with service shop safety in mind.

The back-up and tong are mounted into a compact, rigid frame that integrates the unit controls, making it easily handled and operated by one person. A single set of jaws can grip the full 1.69" - 3.50" OD range and the unit can accommodate a different OD on either side of the connection.

The Mini Service Center operates at a low working pressure and can be powered by a variety of power sources.

Features and Benefits

- **Operated by one person** – Safe and easy to use
- **Open mouth design** – Allows for easy loading and unloading of the work piece
- **Rigid, compact design** – Easily maneuverable to accommodate various shop layouts
- **Adjustable clamp force** – Reduces the risk of crushing thin-walled tools
- **Clamp force proportional to torque** – Reduces risk of slippage during make/break operations
- **Clamp arm** – Secures work piece into service center
- **Tong dies** – One set for the entire OD range; can be easily changed when worn



8079 Mini Service Center Technical Specifications

Description	8079 Mini Service Center
Part No.	8079-0001
Tool OD Range	1.69" - 3.50"
Dimensions (L x W x H)	68" x 28" x 29"
Distance Between Jaws	3"
Operating Pressure	2,900 psi
Required Flow	4.0 USGal/min
Minimum Torque	400 lb-ft
Maximum Torque	4,500 lb-ft
Weight	750 lb

8079 Mini Service Center Optional Accessories

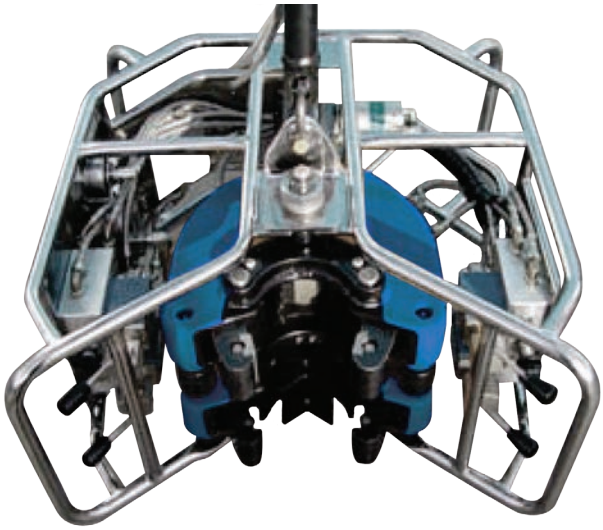
Optional Accessory	Part Number
Safety Shield	8079-B-24
Electric Power Pack - Shop Version	8039-B-2
Electric Power Pack - Explosion Proof	8044-0001
Pneumatic Power Pack	8123-B-1
Log II Computer System	8090-B-59

8071 Little Jerk II Mini Tong

The 8071 Little Jerk II Mini Tong provides a safe and easy way to make up and break out tool joint connections on small OD tools and pipes. This portable compact service tool offers a fully hydraulic system designed for practicality and with rig floor and service shop safety in mind.

The back-up and tong are mounted into a durable crash frame that integrates the unit controls, making it easily handled and operated by one person. A single set of jaws can grip the full 1.69” - 3.50” OD range and the unit can accommodate a different OD on either side of the connection.

The Little Jerk II Mini Tong operates at a low working pressure and can be powered by a variety of power sources.



Features and Benefits

- **Operated by one person** – Safe and easy to use
- **Open mouth design** – Allows for easy loading and unloading of the work piece
- **Rigid, compact design** – Easily maneuverable and operable in various horizontal or vertical positions
- **Hydraulic lifting cylinder** – Hydraulically adjust the vertical position of the tong when operated from a suspended position
- **Adjustable clamp force** – Reduces risk of crushing thin-walled tools
- **Clamp force proportional to torque** – Reduces risk of slippage during make/break operations
- **Tong dies** – One set for entire OD range; can be easily changed when worn

8071 Little Jerk II Mini Tong Technical Specifications

Description	8071 Little Jerk Mini Tong II c/w Lift Cylinder
Part No.	8071-B-15
Tool OD Range	1.69” - 3.50”
Dimensions (L x W x H)	22.5” x 20.5” x 23”
Distance Between Jaws	3”
Operating Pressure	2,900 psi
Required Flow	4.0 USGal/min
Minimum Torque	400 lb-ft
Maximum Torque	4,500 lb-ft
Weight	250 lb

8071 Little Jerk II Mini Tong Optional Accessories

Optional Accessory	Part No.
Electric Power Pack - Shop Version	8039-B-2
Electric Power Pack - Explosion Proof	8044-0001
Pneumatic Power Pack	8123-B-1

1289 *TorqueMaster*™ Jr. Make-up and Break-out Unit

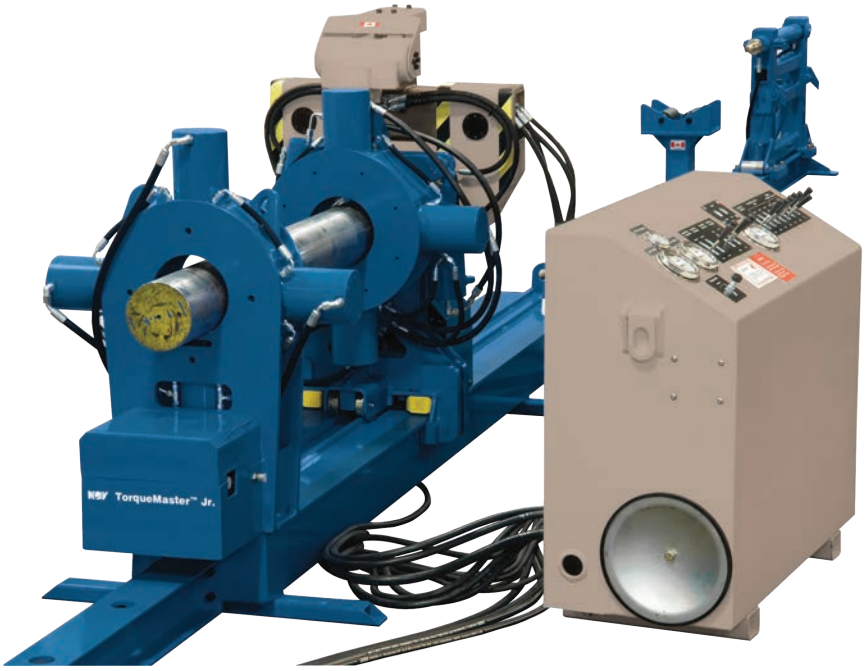
The 1289 *TorqueMaster*™ Jr. make-up and break-out unit provides a safe and easy way to make up and break out tubular tool joint connections. This fully hydraulic unit is designed for practicality and with service shop safety in mind.

Consisting of a standard fixed headstock and a traversing tailstock chuck, the unit can be custom configured to include various optional accessories, including extensions beams, rolling tool support jacks, a spinner assembly, a push/pull assembly and torque logging systems, all of which have been designed to increase the functionality of the unit. A single set of tong dies is used over the full 2.63" to 8.75" OD range of the unit, eliminating the need to constantly change them as the tool OD changes.

The *TorqueMaster*™ Jr. make up and break out unit is safely and efficiently operated by one person from a low pressure, electrically powered, standalone hydraulic control console.

Features and Benefits

- **Operated by one person** – Safe and easy to use
- **Fully customizable** – Accessories – Can be chosen to suit the exact requirements of the shop
- **Compact design** – Ideal for shops where space is limited
- **Increased shop floor efficiency** – Provides fast and accurate make/break capabilities that will increase shop production
- **Clamp force proportional to torque** – Reduces the risk of slippage during make/break operations
- **Self-centering clamp cylinders** – Ensures torque is applied about axial center line of the tool, ensuring accurate torque measurements and preventing thread damage
- **Tong dies** – One set for the full OD range; can be easily changed when worn



1289 *TorqueMaster*™ Jr. Technical Specifications

Tool OD Range	**2.625" to 8.75" (Standard tong die)** **1.625" to 7.75" (Extra-tall tong die)**
Breakout Dimensions (L x W x H) - 12 ft bed only	156.5" x 40" x 59.25"
Dimensions of HPU and Console (L x W x H)	48.375" x 2.125" x 44"
Minimum Distance Between Jaws	16"
Operating Pressure	3250 psi
Required Flow	10 USGal/min
Minimum Torque	1,000 lb-ft
Maximum Torque	56,000 lb-ft (Make) / 70,000 lb-ft (Break)
Weight	3,900 lb (Breakout -12 ft Bed Only) 1,240 lb (Console)

1387 Mini-Torque II

The 1387 Mini-Torque II provides a safe and easy way to make up and break out tubular tool joint connections. This fully hydraulic unit is designed for practicality and with service shop safety in mind.

The compact, self-contained design incorporates a fixed headstock and tailstock and offers fully integrated controls allowing for safe and efficient operation by one person. A single set of tong dies is used over the full 2.63” to 8.75” OD range of the unit, eliminating the need to constantly change them as the tool OD changes.

The Mini-Torque II operates at a low working pressure and comes complete with a standalone electric driven HPU.

Features and Benefits

- **Operated by one person** – Safe and easy to use
- **Rigid, compact design** – Easily maneuverable and operable while suspended from a crane or resting on the ground
- **Clamp force proportional to torque** – Reduces risk of slippage during make/break operations
- **Self-centering clamp cylinders** – Ensures torque is applied about axial center line of the tool, ensuring accurate torque measurements and preventing thread damage
- **Tong dies** – One set for entire OD range; can be easily changed when worn

1387 Mini-Torque II Technical Specifications

Part No.	1387-D-1
Tool OD Range	2.63” - 8.75” (Standard tong die) - 1.625” - 7.75” (Extra-tall tong die)
Breakout Dimensions (L x W x H)	24” x 36” x 34”
HPU Dimensions (L x W x H)	36” x 18” x 31”
Distance Between Jaws	11.63”
Operating Pressure	3,250 psi
Required Flow	10 USGal/min
Minimum Torque	3,000 lb-ft
Maximum Torque	56,000 lb-ft(Make) / 70,000 lb-ft (Break)
Weight	1900 lb Breakout (350 lb HPU)

8118 Coiled Tubing (CT) Motor Test Stand

The 8118 Coiled Tubing (CT) motor test stand is a CT motor dynamometer used to verify the performance of coiled tubing motors.

The complete unit is designed to be operated safely and efficiently by one person, and its modular design allows the flexibility to place the frame, control console, HPU and fluid tank to accommodate the available shop space.

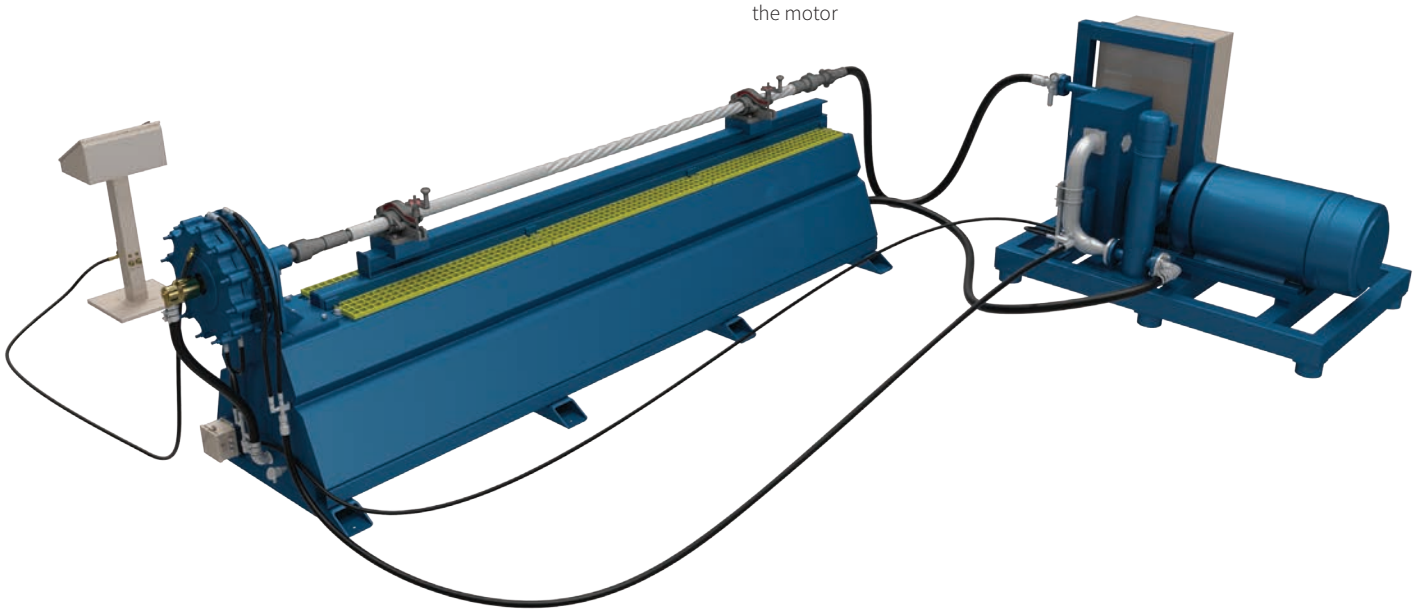
The frame and brake system utilizes two clamps for securing the test piece with a fast and simple means to connect the motor to both the brake system and the fluid supply line. A pneumatically-modulated disc brake provides accurate, repeatable load application and the precise control required to evaluate small diameter motors at low torque and slow speed.

The pump unit includes a suction strainer to remove contaminants in the test loop that may otherwise cause damage to the pump if left to flow through the system. An accumulator reduces flow pulsation created by the pump, allowing for more accuracy during testing.

The control console incorporates a custom-designed touchscreen data acquisition system. The system compiles operator and motor information, records and stores the motor test results in a searchable database and provides the option to print the test results in both imperial and metric units.

Features and Benefits

- **Safe and easy to use** – Can be operated by one person
- **Modular design** – Component orientation can be altered to best suit the shop space
- **Accurate and reliable** – Return line suction strainer removes fluid contaminants and an accumulator reduces flow pulsations, ensuring more accurate test results
- **Fully electronic control console** – Touchscreen system provides precise control of system flow and torque
- **Custom designed software** – Captures test results and stores in a searchable database for future reference
- **Verified motor performance** – Instant test results confirm the performance of the motor



8118 CT Motor Test Stand Technical Specifications

	3 Barrels per min - Imperial	3 Barrels per min - Metric	4 Barrels per min - Imperial	4 Barrels per min - Metric
Tool OD Range	1.69" - 3.50"	43 mm to 90 mm	1.69" - 3.50"	43 mm to 90 mm
Torque Capacity	0 to 3,740 lb-ft	0 to 5,070 N-m	0 to 3,740 lb-ft	0 to 5,070 N-m
Fluid Capacity (at max flow)	124 USgal/min @ 2,100 psi	470 L/min @ 145 bar	168 USgal/min @ 2,100 psi	636 L/min @ 145 bar
Fluid Capacity (at min flow)	50 USgal/min @ 2,900 psi	190 L/min @ 200 bar	25 USgal/min @ 2,300 psi	95 L/min @ 159 bar
Electrical	200 hp, 460V, 3PH, 292 Amp	149 kW, 460V, 3 PH, 292 Amp	300 hp, 460V, 3PH, 435 Amp	223kW, 460V, 3PH, 435 Amp
Tank Capacity	500 US gal	2,090 L	500 US gal	2,090 L
Frame Dimensions	175" x 50" x 60"	445 mm x 128 mm x 153 mm	175" x 50" x 60"	445 mm x 128 mm x 153 mm
HPU Dimensions	88" x 58" x 65"	224 mm x 148 mm x 165 mm	88" x 58" x 65"	224 mm x 148 mm x 165 mm
Console Dimensions	21" x 18" x 48"	53 cm x 46 cm x 122 cm	21" x 18" x 48"	53 cm x 46 cm x 122 cm

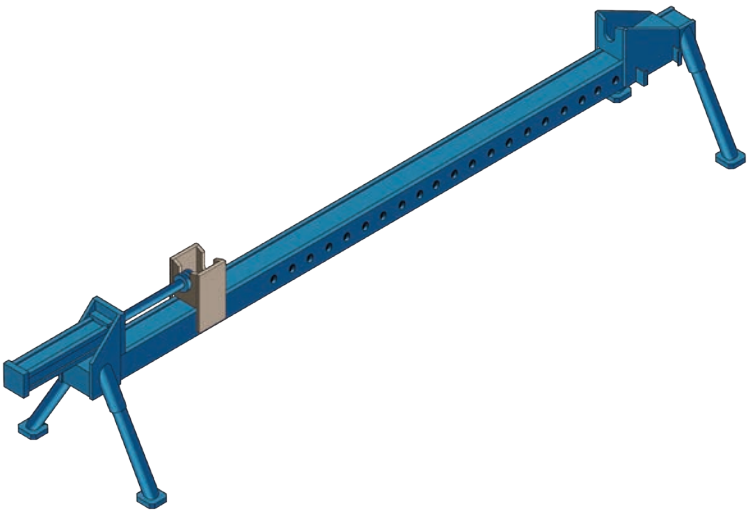
Coiled Tubing (CT) Jar Tester

The Coiled Tubing (CT)Jar Tester is a rugged, self-contained unit designed to test the operation of CT drilling jars. The horizontal main frame includes a hydraulic cylinder that applies tension and compression forces in direct axial alignment with the test piece.

The cylinder is balanced and applies the same force in both tension and compression. This allows for use with an optional chart recorder to record the load applied by the cylinder. The CT Jar Tester is safely and efficiently operated by one person from a low pressure, electric-powered standalone hydraulic control console.

Features and Benefits

- **Operated by one person** – Safe and easy to use
- **Compact design** – Simple frame design and standalone console can accommodate any shop space
- **Recordable test results** – Optional chart recorder available to record test data



Coiled Tubing Jar Tester Technical Specifications

Part Number	504865/005 Electric 504865/006 Pneumatic
Tool OD Range	1.69" to 12"
Tester Dimensions (L x W x H)	224" x 46" x 36"
Stroke	2 ft
Tool Length Capacity	2 ft - 11 ft
Maximum Tension	50,000 lb
Maximum Compression	50,000 lb
Operating Pressure	3,000 psi
Required Flow	3.25 USGal/min
Tester Weight	1,340 lb

*Test nubbins are required for testing and are sold separately

1609 Service Vise

The 1609 Service Vise is a floor mounted vise designed to hold a variety of tubular components while service work is carried out.

The work piece rests on a V-shaped tool support plate containing a series of tong dies and is secured to the vise by a heavy duty leaf chain. A floor mounted air-over-hydraulic pump controls a hydraulic cylinder that is used to engage the chain latch and secures the work piece.

Features and Benefits

- **Operated by one person** – Safe and easy to use
- **Simple and robust design** – Allows for easy loading and unloading of the work piece and requires minimal maintenance
- **Air over hydraulic operation** – No external HPU required

1609 Service Vise Technical Specifications

Part No.	1609-B-41
Tool OD Range	3.75" - 12"
Working Height	3 ft
Dimensions (L x W)	29" x 18.25"
Torque Capacity	20,000 lb-ft
Weight (No Mount)	460 lbs

1609 Service Vise Optional Accessories

Optional Accessory	Part Number
Light Duty Rolling A-Frame Support	1388-C-1
Foundation Mount	1609-B-39
Nubbin for Foundation Mount	1609-A-3
1.50" - 3.50" Adapter	1609-A-14

Rotor and Stator Measuring Tools

Regular monitoring of rotor and stator measurements provides valuable information on stator and rotor wear resulting in reduced downhole power section failure and increased confidence in power section performance.

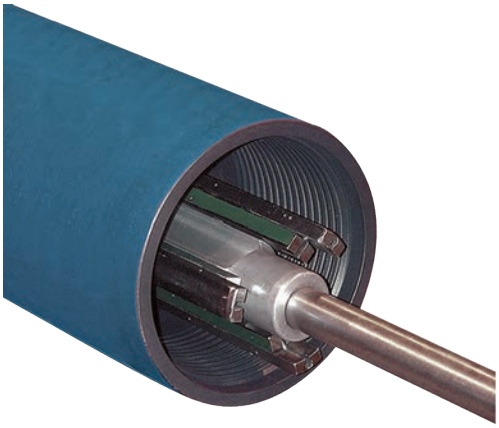
Stator Measurement Tools

The NOV Stator Measurement Tools (SMT) provide an easy and accurate method to measure downhole motor stator sizes. These tools are manufactured to a tight tolerance and offer precise measurement to an accuracy of +/- 0.002" with a very high rate of repeatability.

Accurately measuring rotor and stator clearance to adjust interference for elevated hole temperatures greatly increases stator life. Adequate temperature compensation can even result in successful motor performance at temperatures which exceed manufacturer recommendations.

Features and Benefits

- **Easy to Use** – Measurements can be taken easily by one person.
- **Compact Design** – Can be collapsed for quick and easy storage to prevent damage when not in use.
- **Precise Measurements** – Determine initial stator and rotor interference for quality assurance and evaluate the need for interference adjustments for hot-hole conditions.
- **Reliable Performance** – Enable monitoring of stator wear life with successive measurements between field runs.



Rotor Measurement Tool Technical Specifications

Part Number	Description	Size Range
5241	Rotor Measurement Tool	2 ⅞" – 1¼"

Stator Measurement Tools and Kits Technical Specifications

Part Number	Description	Tool Length	Tool Measurement Range
77-SMT2-0[1]	Kit – Standard	63.5"	0.770" - 1.550"
77-SMT2-2[3]	Tool Only – Standard	63.5"	0.770" - 1.550"

Safety Pipe Wrench

The NOV safety pipe wrench provides a safe and effective means to manually make and break tool joint connections on downhole tools. The wrench is designed using lightweight, ductile material and eliminates the risk of unexpected catastrophic wrench failure that is commonly experienced while torqueing with other brand pipe wrenches. The balanced aluminum alloy carry-handle has been ergonomically designed and features four gripping locations for easy handling.

To further enhance the safety and reliability of the NOV safety pipe wrench, NOV recommends the use of a digital alarmed load scale to measure the force applied to the wrench while torquing a connection. The scale has an 80 dB audible alarm that sounds once a pre-programmed force had been reached and will reduce the risk of overloading the wrench when tightening tool joint connections.

Features and Benefits

- **Lightweight aluminum alloy handle** – Almost 5 lb lighter than a standard 60" pipe wrench
- **Up to 8" outside diameter (OD) tong areas** – Completely replaces need for standard wrenches
- **No critical load bearing cast parts** – Tool yield is predictable
- **Only ductile alloy materials used** – Brittle failures no longer a concern
- **Industry leading load rating** – 8,500 ft-lb (3" – 8" OD Parts) and 6,500 ft-lb (0" - 3" OD Parts)
- **Easily inspected** – Tool designed for easy disassembly and inspection
- **Balanced carry handle** – Oriented for use with load scale and crane
- Fewer pinch points than competition

Safety Pipe Wrench Technical Specifications

Part Number	Description
506600/005	Safety Pipe Wrench - 2" to 8" O.D. Range
506600/006	Safety Pipe Wrench - 0" to 5" O.D. Range
505629/005	5,000 lb Alarm Scale (Standard)
505629/010	10,000 lb Alarm Scale

Part Number	Optional Accessory Description
505630/005	Padded Carry Case for Alarm Scales

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