

Quality Thru-Tubing Service
Responsive. Reliable. Professional.

Standard Tools





Cost Effective. Responsive. Reliable.

We provide thru-tubing tools, service and personnel for the completion, workover and gas storage markets. We currently operate in the Bakken, Marcellus, Eagle Ford, Permian and Utica basins, with headquarters in Houston, Texas.

Our thru-tubing services are backed by professional teams and quality tools that deliver consistently every day.

- Milling, Toe Prep, Cleanout
 - Fishing, Acid Wash, Nitrogen Lift
 - Coil Tubing and Workover
 - Gas Storage
-
- Tools designed, manufactured and maintained by us
 - Speciality technology supplied by Ashmin
 - Minimal hours
 - Premium performance
 - Unique capabilities

Motors

The simplicity and durability of our motors provides us with a consistently reliable, high-performance, cost-effective motor. For our customers, this means less non-productive time and fast, clean mill outs.

- » Mud lubricated (no risk of seals failing)
- » Bearing balls act as wear component to extend the life of the motor
- » Reliable and consistent
- » Compatible with single or dual phase liquids (or air)
- » Temperature limited only by the power section elastomers
- » Works with any industry available power sections (high torque, flow and speed)

Tool size, in [mm] ¹	1-11/16 [43]	2-1/8 [54]	2-7/8 [73]	2-7/8 [73]	3-1/8 [79]	3-1/8 [79]	3-1/2 [89]
POWR Series	170	213	288	288-CV	313	313-CV	350
Tool size, in [mm]	1.70 [43]	2.13 [54]	2.88 [73]	2.88 [73]	3.13 [80]	3.13 [80]	3.5 [89]
Overall length, ft [m] ²	7.4 [2.26]	11.1 [3.38]	12.5 [3.81]	12.5 [3.81]	13.1 [3.99]	13.1 [3.99]	15.6 [4.75]
Top connection ³	1 AM MT Box	1-1/2 AM MT Box	2-3/8 PAC Box	2-3/8 PAC Box	2-3/8 PAC Box	2-3/8 PAC Box	2-3/8 PAC Box
Bottom connection ³	1 AM MT Box	1-1/2 AM MT Box	2-3/8 PAC Box	2-3/8 PAC Box	2-3/8 PAC Box	2-3/8 PAC Box	2-3/8 PAC Box
Maximum weight on bit, lbf [daN]	7,300 [3,250]	9,900 [4,400]	26,000 [11,570]	26,000 [11,570]	28,000 [12,460]	28,000 [12,460]	22,400 [9,960]
Maximum backreaming, lbf [daN]	10,500 [4,670]	14,300 [6,360]	37,600 [16,730]	37,600 [16,730]	39,800 [17,700]	39,800 [17,700]	32,400 [14,410]
Max allowable overpull for re-running, lbf [daN]	16,300 [7,250]	23,700 [10,540]	40,000 [17,790]	40,000 [17,790]	63,200 [28,110]	63,200 [28,110]	59,200 [26,330]
Absolute allowable overpull, lbf [daN]	39,200 [17,440]	62,700 [27,890]	128,000 [56,940]	128,000 [56,940]	138,000 [61,390]	138,000 [61,390]	203,000 [90,300]
Recommended operating torque, lbf.ft [N.m]	270 [366]	360 [488]	1,000 [1,356]	1,200 [1,627]	2,300 [3,118]	2,500 [3,390]	2,900 [3,932]
Max bit pressure drop, psi [kPa]	1,500 [10,340]	1,500 [10,340]	1,500 [10,340]	1,500 [10,340]	1,500 [10,340]	1,500 [10,340]	1,500 [10,340]

¹ Dimensions shown are subject to change without notice ³ Other optional connections available on request
² OD may vary based on choice of stabilizers and wear pads

Top Sub

- Integrated Rotor Catch
- Available in all standard connections

Power Section

- Can support any industry available power section
- Temperature limited only by the power section elastomers

Transmission

- C-V Joint or
- Flex-shaft

Bearing Section

- Mud lubricated
- Load sharing ball and race design
- Replaceable balls engineered to serve as wear component to increase life of bearing section
- Radial bearings include female carbide sleeves with a male direct applied component designed for reliability and consistent performance



Coil Tubing Connector

Our Coiled Tubing Connector is a high-strength, external slip-type connector that uses the mechanical wedging action of a grapple to securely grip the coiled tubing. An integral stop in the connector prevents the slip from crushing the pipe during severe operations. Additional hardfacing reduces wear and long-term costs.

Dual o-ring seals in the bottom sub insure pressure integrity and its replaceable slips are proof tested by lot and certified for compliance with our overpull limit. It's compact design minimizes BHA length, making it ideal for all thru-tubing operations, and a large ID allows free passage of drop balls. Grub screws standard to prevent rotation.

- » External slip-type connector
- » Grapple with integral stop prevents crushing during overpull
- » Dual o-ring seals to insure pressure integrity
- » Unrestricted, large ID for free passage of drop balls
- » Replaceable, carburized high-tensile slips
- » Grub screws to prevent rotation
- » Hardfacing to extend tool life and reduce costs

Tool Size, in [mm]	1-11/16 [43]	1-11/16 [43]	2-1/8 [54]	2-1/8 [54]	2-7/8 [73]	2-7/8 [73]	2-7/8 [73]	3-1/8 [79]
Coil Size, in [mm]	1 [25]	1-1/4 [32]	1-1/4 [32]	1-1/2 [38]	1-1/2 [38]	1-3/4 [45]	2 [51]	2-3/8 [60]
Bottom Pin Connection, in	1 AM MT	1 AM MT	1-1/2 AM MT	1-1/2 AM MT	2-3/8 PAC	2-3/8 PAC	2-3/8 PAC	2-3/8 PAC
Pass Thru ID, in [mm]	0.75 [19]	0.81 [20]	1.00 [25]	1.00 [25]	1.25 [32]	1.38 [35]	1.38 [35]	1.38 [35]
Shoulder to Shoulder Length, in [mm]	9.60 [244]	9.80 [249]	10.00 [254]	10.30 [262]	13.90 [353]	13.65 [347]	13.65 [347]	12.67 [322]
Tensile Yield, lbf [daN]	39,000 [17,350]	32,000 [14,230]	83,000 [36,920]	46,000 [20,460]	112,000 [49,820]	125,000 [55,600]	84,000 [37,370]	120,000 [53,380]
Torsional Yield, ft-lbs [N.m]	1,700 [2,300]	1,700 [2,300]	4,600 [6,240]	3,000 [4,070]	7,300 [9,900]	9,500 [12,880]	7,200 [9,760]	9,500 [12,880]
Pressure Rating, psi [kPa]	10,000 [68,950]	10,000 [68,950]	10,000 [68,950]	10,000 [68,950]	10,000 [68,950]	10,000 [68,950]	10,000 [68,950]	10,000 [68,950]
Max Certified Overpull, lbf [daN] ¹	30,000 [13,350]	30,000 [13,350]	45,000 [20,020]	45,000 [20,020]	70,000 [31,140]	70,000 [31,140]	70,000 [31,140]	70,000 ¹ [31,140]

- Hardfacing reduces wear on the top sub, extending life and value
- Grub screws prevent rotation
- Replaceable, carburized high-tensile slip and brass ring ensure consistent max overpull ratings
- Secondary band of set screws add additional resistance to torsional slippage – a must with today's high torque motors
- Dual o-rings ensure pressure integrity



Flapper Safety Valves

Our Dual and Quad Flapper Safety Valves are a safety component housed in the bottom hole assembly (BHA) that prevents well fluids and gas from returning up the coil tubing. These valves increase our factor of safety significantly at minimal additional cost.

The flappers, housed in a sub, provide a uni-direction check valve that allows operators to pump fluid down through the coil tubing while preventing return flow. The flappers ensure a positive seal for continuous safety during operations. If back pressure occurs, flappers swing up to create seal and block downhole fluid and gas. The flapper lids are spring loaded in the closed position, ensuring the valves actuate if backpressure occurs.

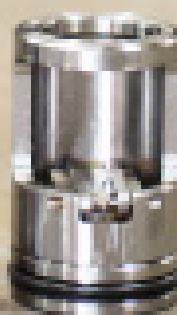
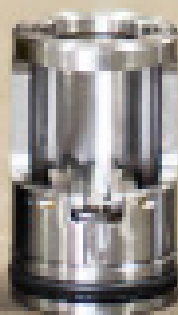
- » High strength, two-piece replaceable alloy valve cartridges
- » Redundant (dual or quad) valve system for increased reliability
- » Cartridges are pressure tested and certified by lot for compliance to pressure limits
- » Consumable parts kits are available for field redressing
- » Large thru bore for use with drop ball type subs and balls, darts or wiper plugs

Dual or
Quad
Flapper
Valves



Tool Size, in [mm]	1-11/16 [43]	2-1/8 [54]	2-7/8 [73] ¹	2-7/8 [73] ²	3-1/8 [79] ¹	3-1/8 [79] ²
Series	170	213	288-DF	288-QF	313-DF	313-QF
Max OD, in [mm]	1.70 [43.2]	2.13 [54.1]	2.88 [73.2]	2.88 [73.2]	3.13 [79.5]	3.13 [79.5]
Min ID, in [mm]	0.70 [17.7]	1.02 [25.9]	1.02 or 1.31 ³ [25.9 or 33.2]	1.02 [25.9]	1.31 [33.2]	1.31 [33.2]
Overall Tool Length, in [mm]	15.5 [393.7]	16.38 [416.1]	17.29 or 19.54 ³ [439.2 or 496.3]	22.79 [578.9]	20.29 [515.4]	28.54 [724.9]
Shoulder to Shoulder Length, in [mm]	14 [355.6]	14.51 [368.6]	15.04 or 17.29 ³ [382.0 or 439.2]	20.54 [521.7]	18.04 [458.2]	26.29 [667.8]
Torque, ft-lbs [N.m]	450 [610]	1,000 [1,360]	2,250 [3,050]	2,250 [3,050]	3,700 [5,020]	3,700 [5,020]
Top Connection, in	1 AM MT Box	1-1/2 AM MT Box	2-3/8 PAC Box	2-3/8 PAC Box	2-3/8 PAC Box	2-3/8 PAC Box
Bottom Connection, in	1 AM MT Pin	1-1/2 AM MT Pin	2-3/8 PAC Pin	2-3/8 PAC Pin	2-3/8 PAC Pin	2-3/8 PAC Pin
Max Overpull, lbf [daN]	60,500 [26,910]	83,000 [36,920]	120,000 [53,380]	120,000 [53,380]	135,000 [60,050]	135,000 [60,050]

¹ Dual Flapper Valves
² Quad Flapper Valves



Dual Circulation Sub

Our Dual Circulation Sub provides a method to restore flow to the BHA when conventional circulation is lost. We can simply pressure up the coil to burst the rupture disc and regain enough circulation to pump a ball.

After a drop ball is pumped down, pressure can be applied to the tubing to shear the shear screws, allowing the piston to move and open the circulation ports. Higher rates can be utilized once the ports are open. Pressure can also be adjusted at which the sub activates by changing the number of shear screws used.

Piston with
shear screw

Rupture disk



- » Assists hole cleaning
- » Simple design and operation for reliable performance
- » Large flow area to annulus
- » Variable activation pressures based on number of shear screws used
- » Variety of burst pressures to suit all applications
- » Field redressable

Tool Size, in [mm]	1-11/16 [43]	2-1/8 [54]	2-7/8 [73]
Series	170	213	288
Min ID, in [mm]	0.41 [10.4]	0.51 [12.9]	0.56 [14.2]
Overall tool length, in [mm]	12.50 [317.5]	15.50 [393.7]	14.00 [355.6]
Ball size, in [mm]	0.44 [11.1]	0.56 [14.2]	0.63 [16.0]
Pressure to shear screws, psi (no. screws) [kPa]	690 - 4,100 [4,760 - 28,270]	740 - 4,400 [5,100 - 30,340]	480 - 3,850 [3,310 - 26,540]
Disc burst pressures available, psi [kPa]	2,000 - 9,000 [13,790 - 62,050]	2,000 - 9,000 [13,790 - 62,050]	2,000 - 9,000 [13,790 - 62,050]
Top connection, in	1 AM MT Box	1-1/2 AM MT Box	2-3/8 PAC Box
Bottom connection, in	1 AM MT Pin	1-1/2 AM MT Pin	2-3/8 PAC Pin
Max overpull, lbf [daN]	45,000 [20,020]	96,500 [42,930]	135,000 [60,050]

Tested.
Verified.



Hydraulic Disconnect

Our Hydraulic Disconnect allows the upper BHA to be reliably detached from a stuck component during routine tripping, milling or jarring operations.

The Hydraulic Disconnect is a torque through disconnect activated by pumping a drop ball down to the tool where it seats and creates a pressure differential. This differential shears the screws in the piston. This allows the upper portion to disengage. After the upper portion is retrieved, a standard internal fishing neck remains to allow for retrieval operations. We can adjust the pressure required by varying the number of shear screws.

- » Ball drop
- » Adjustable disconnect pressure via number of shear screws
- » Standard internal GS fishing profile
- » Field redressable
- » Transmits high torque loads
- » Able to withstand torsional changes to tensile loads exerted during jarring and pulling operations



Drop ball —

Flow port —

Shear screws —

Standard GS fishing profile —

Tool Size, in [mm]	1-11/16 [43]	2-1/8 [54]	2-7/8 [73]	3-1/8 [79]
Series	170	213	288	313
Min ID, in [mm]	0.47 [11.9]	0.59 [14.9]	0.80 [20.3]	0.80 [20.3]
Shoulder to Shoulder length, in [mm]	16.82 [427]	20.11 [511]	26.66 [677]	26.66 [677]
Ball size, in [mm]	0.50 [12.7]	0.63 [16.0]	0.88 [22.3]	0.88 [22.3]
Pressure to shear pins, psi [kPa]	750-7,500 [5,170-51,710]	688-6,900 [4,740-47,570]	610-6,100 [4,210-42,060]	610-6,100 [4,210-42,060]
Fishing neck	2 GS	2-1/2 GS	3 GS	3 GS
Torque, ft-lbs [N.m]	375 [510]	750 [1,020]	1,700 [2,300]	3,000 [4,070]
Top connection, in	1 AM MT Box	1-1/2 AM MT Box	2-3/8 PAC Box	2-3/8 PAC Box
Bottom connection, in	1 AM MT Pin	1-1/2 AM MT Pin	2-3/8 PAC Pin	2-3/8 PAC Pin
Max overpull, lbf [daN]	39,100 [17,390]	59,100 [26,290]	90,700 [40,350]	90,700 [40,350]

Motor Head Assembly

Our Motor Head Assembly (MHA) combines the benefits of our standard CT tools in a shorter package.

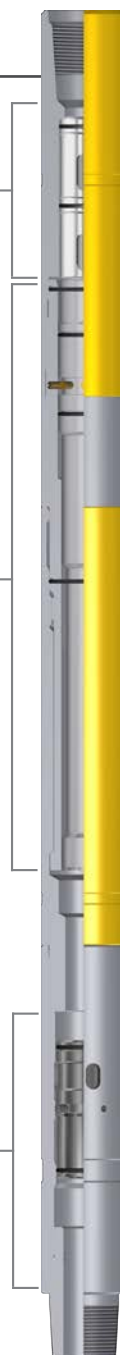
By running a single assembly that includes our Flapper Safety Valves, a Dual Circulation Sub and a Hydraulic Disconnect, you're getting the best long-term value and highest quality available on the market in a shorter package.

Tool Size, in	1-11/16 [43]	2-1/8 [54]	2-7/8 [73]	3-1/8 [79]
Min ID, in [mm]	0.41 [10.4]	0.52 [13.2]	0.56 [14.2]	0.69 [17.5]
Overall tool length, in [mm]	28.54 [725]	34.45 [875]	43.21 [1,098]	46.11 [1,171]
Fishing neck	2 GS	2-1/2 GS	3 GS	3 GS
Torque, lbf.ft [N-m]	375 [508]	750 [1,020]	1,700 [2,300]	3,000 [4,070]
Top connection, in	1 AM MT Box	1-1/2 AM MT Box	2-3/8 PAC Box	2-3/8 PAC Box
Bottom connection, in	1 AM MT Pin	1-1/2 AM MT Pin	2-3/8 PAC Pin	2-3/8 PAC Pin
Max overpull, lbf [daN]	39,100 [17,390]	59,100 [26,290]	90,700 [40,350]	90,700 [40,350]

Dual / quad
flapper safety
valves

Hydraulic
disconnect

Dual
circulation
sub



Single IMPACTR

Our Single IMPACTR delivers high energy impacts downwards with optional rotation while removing the need for a power section. Powered by fluid pumped through the workstring, impact frequency is controlled by volume and weight on bit. Resistance at the bit/mill head initiates continuous reciprocating of the impactor bit/mill without the need to work the string. If the rotational feature is engaged, a rotation of the bit/mill is completed on each upward stroke.

Applications

- » Opening collapsed casing
- » Quick removal of sludge, cement, sand and gravel
- » Milling scale
- » Fracturing ceramic disks
- » Shifting sleeves (without rotational feature engaged)
- » Pushing debris to bottom
- » Jarring

Benefits

- » Produces high energy impacts
- » No elastomers (for harsh environments)
- » Compatible with most bits/mills and fluids
- » Full flow capability on or off bottom
- » Optional rotation
- » Remains in neutral position until resistance encountered
- » Temperature rated to 500F
- » Impact and frequency adjusted by flow rate

Tool Size, in [mm]	1-11/16 [43]	2-1/8 [54]	2-7/8 [73]
Series	170	213	288
Operational flow range, gpm [lpm]	20 - 60 [75 - 227]	20 - 60 [75 - 227]	20 - 80 [75 - 303]
Rotation per impact, degrees	15 - 60	15 - 60	15 - 60
Frequency of impact, Hz	10	10	10
Max impact force, lbf [daN]	15,000 [6672]	15,000 [6672]	20,000 [8896]
Load required to activate, lbs [kg]	65 [30]	65 [30]	65 [30]
Top connection, in [mm]	1 AM MT Box	1-1/2 AM MT Box	2-3/8 PAC Box
Bottom connection, in [mm]	Ø 0.992-10 Sub Acme-2G Pin	Ø 0.992-10 Sub Acme-2G Pin	Ø 1.608-6 Sub Acme-2G Pin
Max overpull, lbf [daN]	43,450 [19,328]	83,370 [37,085]	51,060 [22,713]



Thru-tubing

Single IMPACTR
Impact testing

15K to 20K
Impact Force.
With optional
rotation.





WorkoverSolutions.com

About Workover Solutions

We provide professional, reliable thru-tubing services to the oil and gas industry. Our focus is on training and retaining experienced, professional staff backed by quality engineered and manufactured tools to deliver a consistently high level of service.

Headquarters

100 I-45 North
Suite 610
Conroe, Texas, 77301
USA
+1 (607) 346 2891

Visit our website for additional
locations and contact information.

Rev. 1.4