Operation Manual

Model E Tubing Spider

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SAFETY

READ THIS MANUAL BEFORE USING EQUIPMENT

Equipment supplied by Texas International Oilfield Tools is intended for installation and use in controlled environments involving hazardous operations and situations.

Only authorized and trained personnel shall install, maintain, operate and/or repair equipment supplied by Texas International Oilfield Tools, LTD. Equipment shall be used only for the purpose for which it is intended.

The User is responsible for ensuring the equipment is in safe working order prior to use. Texas International Oilfield Tools, LTD is not responsible for injuries or equipment damage that arises from equipment neglect or misuse.

The User is responsible for ensuring the safety of all personnel within the vicinity of the equipment. Texas International Oilfield Tools recommends a hazard assessment be performed by qualified safety representatives prior to using equipment. All personnel shall possess and use Personal Protective Equipment (PPE) and must be trained at minimum on rig safety, rig procedures, and equipment operation.

Hazard Labels Used in this Manual

DANGER is represented by this hazard symbol and signifies the highest level of risk. Failure to observe and heed this information may result in serious bodily injury or death.

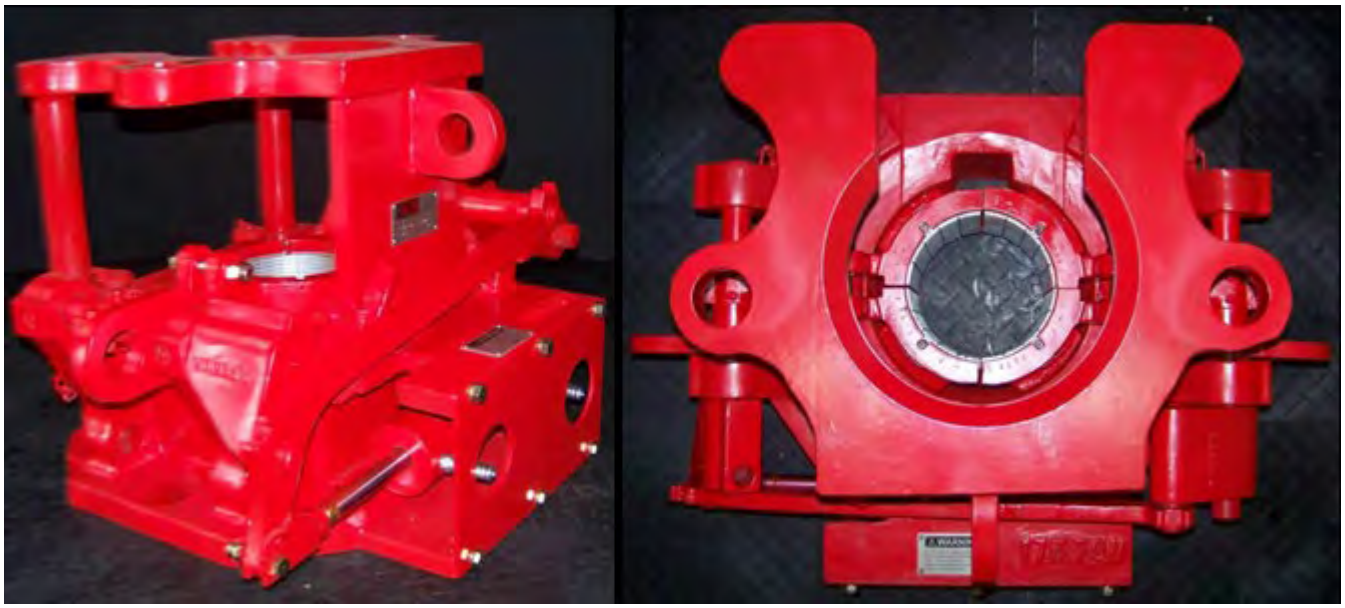
WARNING is represented by this hazard symbol and signifies potential hazards of medium risk. Failure to observe and heed this information may result in significant bodily injury, catastrophic equipment failure, and/or environmental contamination.

CAUTION is represented by this hazard symbol and signifies potential hazards of low risk. Failure to observe and heed this information may result in bodily injury and/or equipment damage.

NOTICE symbol denotes items of importance unrelated to personal injury which highlight additional information provided to aid the user during installation, commissioning, operating, and/or maintaining equipment.

Notes, cautions, warnings, explanations, and information are provided herein to advise readers to take deliberate action to protect personnel from potential injury or lethal conditions. Please pay close attention to these advisories.

INTRODUCTION



The purpose of a tubing spider is to hold the load of the tubing string as it is lowered or raised from the well. The spider is made up of 3 principal assemblies: the base, the slip and the actuator.

The base of the spider contains a machined taper that matches the slip bodies. It also has all of the mounts for the linkages that operate the slips. Installed on the slips are the inserts. The size of insert and slip matches the tubing string. During operation, a control valve is used to actuate a cylinder that opens or closes the slips. This actuator can be hydraulic or pneumatic.

SPECIFICATIONS

Load rating			350000 lbs (158757 kg)
Size range			2-3/8” to 7-5/8” (60.3 to 193.7 mm)
Material			Heat Treated Alloy Steel
Pressure requirements			
	Hydraulic		300 to 500 PSI (20.7 to 34.5 bar)
	Pneumatic		90 to 120 PSI (6.12 to 8.3 bar)
Weight			950 lbs (430.9 kg)
Dimensions			
	Gate Opening		8” (203.2mm)
	Bowl Opening		9-1/8” (231.7mm)
	Base		24” x 23-1/2” (609.6mm x 596.9mm)
	Height		21-1/2” (546.1mm)
	Base bolt slot		
		Slot centers	17” to 21” (431.8 to 533.4mm)
		Slot width	2” (50.8mm)

INSTALLATION

Before any attempt is made to operate the tubing spider, the following section should be read, understood, and then followed.

Control Valve
The tubing spider control valve is connected to the spider by a set of hoses. Always place this valve in a location that is easily accessed by the rig crew operator.

Hoses
Verify that the cylinder hoses do not present a trip hazard or interfere with any moving machinery. When connecting and disconnecting the hoses, ensure that there is no pressure on the lines.

Quick Disconnects
The hoses are fitted with quick disconnects. Before a connection is made, inspect the end faces of the quick disconnect. If any foreign material is present, then carefully remove the debris with a lint free rag or towel. Dust caps and plugs should be used with the quick disconnects to protect the ends and minimize contact with debris.

Inspection
Before moving the spider over the well, ensure the correct size slip assembly and inserts match the tube diameter.
After the lines are connected, cycle the cylinder and observe the linkage system to see if there are any functional problems. Disconnect the lines before moving the tubing spider.

Mount
The spider must be secured over the wellhead. The slotted holes in the base could be used to bolt the spider to an adapter plate. There are also eyes on the spider where it can be chained down.

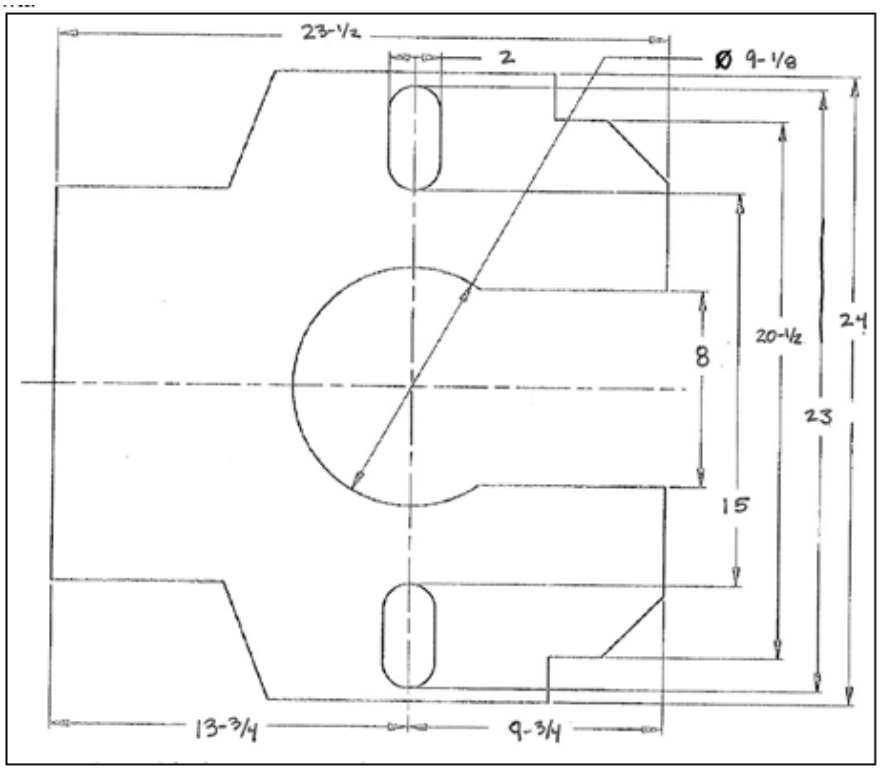


Figure 1: Base Dimensions

OPERATION

Operation

Verify the following before and during operation of the spider.

- Keep the insert teeth clean from buildup of mud, grease, sand, or other debris.
- Lubricate the bushings via the grease fittings found along the linkage assembly.

Depending on the operation of the control valve, pressure applied to the cylinder will either cause it to extend or retract. This cylinder moves the slip assembly via lift arms, crank shafts, and links.

Opening the Slips

Retracting the cylinder prevents the insert teeth from engaging and supporting the tubing string by moving the slip up and out of the way.

Closing the Slips

To engage the insert teeth on the tubing string, the cylinder is extended. Then, the load of the tubing string can be held if it is lowered slightly thereby transferring the load from the hook to the spider.

Objects Larger than Spider Bore

When an object is coming in or out of the well that has a diameter larger than the bore of the spider, then the tubing spider has to be removed. Ensure the weight of the tubing string is not being held by the spider. Remove the gate so the spider can be removed from the string. Pass the object, and reinstall the tubing spider over the well. Install the gate back onto the spider and pin it in place.

Slip Assembly

The slip assembly must correlate with the size of tubing being held. The following instructions are for the replacement of the slip assembly or inserts. Refer to the warning section of the manual before working on the spider.

Slip Replacement

Follow the steps below. Refer to the parts drawing in this manual for a visual aid.

1. Use the pneumatic or hydraulic system to hold the slip body in the raised position.

2. Loosen and remove the nut from the bolt that secures the slip to the lift arm. Lift the slip assembly out of the spider. Repeat for the other side.

3. Replace with the new slip assembly with inserts already installed. Note: The slip assembly halves are a machined set and must always be kept together. Align the bottom slip hole with the hole in the lift arm and secure using a new bolt and nut. Tighten the nut until the end of the bolt is flush with the end of the nut. Repeat for the other side. Do not over tighten as it is necessary for the slip to float relative to the lift arm.

4. Function test the slip to verify correct operation before usage.

Insert Replacement

Use the following steps as a guide. Refer to the parts drawing in this manual for a visual aid.

1. Use the pneumatic or hydraulic system to hold the slip bodies in the raised position.

2. Remove the four cotter pins.

3. Using a 3/16" or 7/32" drift pin, remove the four retainer pins that are located in the hole formed between the slip body and slip insert.

4. Slide or drive the four slip inserts out of the slip body dove tail groove.

5. Clean the built-up debris out of the slip body. Apply a new coating of grease to the slip body.

6. Install the new slip inserts by aligning the vertical groove in the insert with the slip body. Note: Always replace inserts in a full set.

7. Knock the retainer pins back into their corresponding holes.

8. Reinstall the four cotter pins or replace with new ones. Spread the legs of the pins to keep them from falling out.

9. Function test the slip to verify correct operation before usage.

Troubleshooting

The following table addresses possible solutions to problems that may occur during operation.

Table 1: Troubleshooting the Spider

Problem	Solution
Slip insert teeth are not gripping tubing	1) Clean the teeth. Verify they are clean from built up debris such as dirt, mud, grease, sand, etc. 2) Inspect the teeth for damage. Replace inserts if any of the teeth are worn, broken or chipped. 3) Verify the insert is not too loose in the slip body. If the insert can move vertically 1/10" or more, then it is too loose. Replace the slip body assembly. 4) Verify the correct size slip assembly and inserts are being used for the diameter of the tubing string.
Spider lift arms contact the spider body when the tubing is engaged	1) Inspect the bottom of the spider assembly. If the slip assembly extends past the bottom of the bowl, then replace the slip assembly. If the arms still contact the body, then inspect the bottom of the spider again. If the new slip extends below the bowl, then the spider base needs to be replaced.

Actuating cylinder does not function properly	1) Verify the pressure to the cylinder meets system requirements. 2) The seals could be worn inside the cylinder. Replace with new seals or replace the entire cylinder.
Linkage assembly loose or does not function properly	1) Inspect all bushings to see if they are worn and too loose on the pins. Replace with new bushings. 2) Inspect the crank shafts for wear. Replace if necessary. 3) Inspect the bolts at both end of the cylinder. Replace if there is any wear present.

Service

It is important to maintain the spider in a condition that will provide continued safe operation. The following sections highlight items that need to be addressed over the life of the unit.

Daily

1. Grease all fittings on the tubing spider.
2. Inspect inserts for debris or wear.
3. Verify linkages operate properly.

Semi-annual Maintenance

1. Perform all activities listed in the daily section.
2. Perform a Nondestructive Evaluation (NDE) on all exposed critical areas of the slip bodies, spider base, gate and door pins.
3. Replace the crank and link bushings.
4. Rebuild the cylinder with new seals.
5. Function test the spider to verify proper operation.
6. Record the maintenance activities on a log or report that is kept on file and can be traced back to the serial number of the spider.

Annual Maintenance

1. Perform all activities listed in the daily section.
2. Completely disassemble the spider.
3. NDE all critical components such as slip assembly, lift arms, cranks, link, gate door pins and attachment points on the spider base. Replace any worn or damaged parts.
4. Replace the crank shafts.
5. Replace the crank and link bushings.
6. Replace the cylinder.
7. Inspect the fit between the door pins and the gate and body. Replace the pins if too loose.
8. Assemble the tubing spider with the good or replacement parts.
9. Function test the spider to verify proper operation.
10. Record the maintenance activities on a log or report that is kept on file and can be traced back to the serial number of the spider.

Instructions for replacing the crank shafts and bushings can be found in the following text.

Bushing Replacement

Use the following steps as a guide. Refer to the parts drawing in this manual for a visual aid.

1. Use the pneumatic or hydraulic system to hold the slip bodies in the raised position.

2. Remove the slip assembly per the instructions found in the operation section.

3. Release the pressure on the cylinder allowing it to extend. Bleed any remaining pressure out of the cylinder.

4. Loosen and remove the nut on the bolt that pins the cylinder yoke to the link. Remove the bolt and rotate the cylinder so that the yoke is away from the link.

5. The link is held onto the left - and right-hand crank shafts by two external retaining rings. Remove these rings so the link can be removed.

6. There are two bushings in the link. Using a press or bushing puller, remove these bushings from the link and discard. Install two new bushings into the link. Set the link aside.

7. Rotate the lift arms so the bolts and taper pins are exposed. Remove the bolts and nuts, and drive out the taper pins and set the items aside.

8. Remove the crank shafts from the spider by lightly tapping the ends. Set these aside along with the lift arms and spacers.

9. Bushings are located in the spider body in four locations. Using a press or bushing puller, remove these bushings from the body and discard. Install four new bushings into the body.

10. Reassemble the tubing spider.

a. Install the left-hand crank shaft into the spider body. When inserting the shaft, put the spacer and lift arm back in their correct positions.

b. Repeat for the right-hand crank shaft.

c. Install the link onto the left - and right-hand crank shafts. Hold the link arm onto the shafts by the two retaining rings.

d. Move the link to the left. Rotate and shift the lift arm on the crank shaft until the holes for the taper pins are aligned. Drive the taper pins back through the lift arm and crank shaft. Install the bolts and nuts and tighten.

e. Repeat the above for the right-hand crank shaft.

f. Align the cylinder yoke with the hole in the link. Insert the bolt and tighten the nut until the nut edge is flush with the end of the bolt.

g. Install the slip assembly back onto the lifting arms.

h. Function test the spider to verify proper operation.

Crank Shaft and Lift Arm Replacement

Use the following steps as a guide. Refer to the parts drawing in this manual for a visual aid. Note: The following procedure can be difficult. If there are any doubts to the successful completion of the repair, then consult with an authorized repair facility.

1. Replace the old cranks shafts and lift arms with new ones using the instructions in the bushing replacement section. Reassembly will stop when the taper pins are to be installed. The replacement crank shafts and lift arms do not have holes drilled through them.

2. Ensure the crankshafts are slid into the spider body until they bottom out.

3. Install the link onto the left- and right-hand crank shafts. Hold the link arm onto the shafts by the two retaining rings.

4. Rotate the crank shaft and link arm assembly until the back side of the link arm is approximately 1/8" (3.2 mm) from the head of the safety latch bolt.

5. Position the lifting arms on the crank shaft so their midlines are centered with the bore of the spider body. Turn the lift arms in toward the spider body until they rest on top of the bowl.

6. Tighten the lift arm bolts and nuts to lock down its position relative to the crank shafts. Secure the position of the lift arms with tie downs so they may not move while being drilled.

7. Using the lift arm holes as a guide, center punch the crank shafts. Drill the four holes with an 11/32" drill bit. Ream the holes with a #7 tapered reamer.

8. Drive the taper pins back through the lift arm and crank shaft.

a. Align the cylinder yoke with the hole in the link. Insert the bolt and tighten the nut until the nut edge is flush with the end of the bolt.

b. Install the slip assemblies back onto the lifting arms.

c. Function test the spider to verify proper operation.

PARTS

One Year Spares

Below is a list of recommended spares for one year of operation.

Table 2: Pneumatic Tubing Spider One Year Spares		
Part Number	**Qty**	**Description**
T65107	1	YOKE
T66116	4	HEX HEAD CAP SCREW
T65122	4	SHAFT RETAINING CLIP
T65124	4	CRANK SHAFT BUSHING
T65125	2	LINK BUSHING
T65136	2	SAFETY BOLT
T66140K	2	PNEUMATIC CYLINDER REPAIR KIT
T66140	1	PNEUMATIC CYLINDER
T66601	12	RETAINER PIN
T992005-07	4	HEX HEAD CAP SCREW
T992005-09	4	HEX HEAD CAP SCREW
T992012-44	12	COTTER PIN
T992073-01	12	GREASE FITTING
T992089-09	4	HEX NUT
T992089-13	8	HEX NUT
T992166-10	8	HEX NUT
T992292-06	8	HEX HEAD CAP SCREW
T992161-06	4	LIFT ARM TAPER PIN

Table 3: Hydraulic Tubing Spider One Year Spares		
Part Number	**Qty**	**Description**
T65107	1	YOKE
T66116	4	HEX HEAD CAP SCREW
T65122	4	SHAFT RETAINING CLIP
T65124	4	CRANK SHAFT BUSHING
T65125	2	LINK BUSHING
T65136	2	SAFETY BOLT
T66140HK	2	HYDRAULIC CYLINDER REPAIR KIT
T66140H	1	HYDRAULIC CYLINDER
T66601	12	RETAINER PIN
T992005-07	4	HEX HEAD CAP SCREW
T992005-09	4	HEX HEAD CAP SCREW
T992012-44	12	COTTER PIN
T992073-01	12	GREASE FITTING
T992089-09	4	HEX NUT
T992089-13	8	HEX NUT
T992166-10	8	HEX NUT
T992292-06	8	HEX HEAD CAP SCREW
T992161-06	4	LIFT ARM TAPER PIN

Table 4: Tubing Spider Parts List			
Item	**Part Number**	**Qty**	**Description**
1&2	T66000-100	1	MODEL E SPIDER ASSEMBLY, PNEUMATIC
	T66000H-100	1	MODEL E SPIDER ASSEMBLY, HYDRAULIC
3	T66103	1	LINK (INCLUDES TWO 65125 LINK BUSHINGS AND TWO 992073-4 GREASE FITTINGS)
4	T66104	1	LEFT HAND CRANK SHAFT
5	T66105	1	RIGHT HAND CRANK SHAFT
6	T66106	2	LIFT ARM
7	T66107	1	YOKE
8	T66108	1	SAFETY GUARD
9	T992073-4	2	GREASE FITTING
10	T992005-09	1	HEX HEAD CAP SCREW
11	T992005-07	1	HEX HEAD CAP SCREW
12	T992089-09	2	HEX NUT
13	T992005-01	4	HEX HEAD CAP SCREW
14	T992161-06	4	LIFT ARM TAPER PIN
15	T992051-17	2	LOCK WASHER
16	T992027-10	2	SOCKET HEAD CAP SCREW
17	T66114	2	DOOR PIN WITH CHAIN
18	T992166-10	4	HEX NUT
19	T992292-06	4	HEX HEAD CAP SCREW
20	T992007-05	4	HEX HEAD CAP SCREW
21	T992051-15	4	LOCK WASHER
22	T65122	2	SHAFT RETAINING CLIP
23	T992073-01	4	GREASE FITTING
24	T66124	4	CRANK SHAFT BUSHING
25	T65125	2	LINK BUSHING
26	T66126	2	SPACER
27	T46053	2	PIPE NIPPLE
28	T992285-MH-6-6	2	MALE DISCONNECT
29	T992089-13	4	HEX NUT
30	T66116	4	HEX HEAD CAP SCREW
31	T66601	4	RETAINER PIN
32	T992012-44	4	COTTER PIN
33	**Slip Bodies**		
	T66621-100	1	2-3/8” TO 3-1/2" SLIP BODY ASSEMBLY
	T66623-100	1	4" TO 5-1/2" SLIP BODY ASSEMBLY
	T66624-100	1	5-1/2” TO 7” SLIP BODY ASSEMBLY
	T66625-100	1	7-5/8” SLIP BODY, INTEGRAL

34	**Insert Sets (Specify Standard Tooth, Straight Tooth or Non-Marking)**		
	T66651-1	1	3-1/2” X 2-3/8” INSERT SET
	T66651-2	1	3-1/2” X 2-7/8” INSERT SET
	T66651-3	1	3-1/2” X 3-1/2” INSERT SET
	T66653-1	1	5-1/2” X 4” INSERT SET
	T66653-2	1	5-1/2” X 4-1/2” INSERT SET
	T66653-3	1	5-1/2” X 5” INSERT SET
	T66653-4	1	5-1/2” X 5-1/2” INSERT SET
	T66654-1	1	7” X 5-1/2” INSERT SET
	T66654-2	1	7” X 6-5/8” INSERT SET
	T66654-3	1	7” X 7” INSERT SET
35	T65135	1	SAFETY LATCH
36	T65136	1	SAFETY BOLT
37	T992051-15	6	LOCK WASHER
38	T992107-15	1	JAM NUT
	Pneumatic Cylinder		
40	T66140	1	PNEUMATIC CYLINDER
41	T66141	1	BARREL
42	T66142	1	PISTON ROD
43	T66143	1	END SEAL
50	T66150	1	CYLINDER END CAP
51	T66151	1	PISTON HEAD
	T66140K	1	PNEUMATIC CYLINDER REPAIR KIT NOTE: SEALS ARE NOT SOLD INDIVIDUALLY. THE REPAIR KIT COMES COMPLETE WITH O- RINGS AND SEALS FOR THE END SEAL AND END CAP, PISTON SEALS AND THE RETAINING RINGS.
	Hydraulic Cylinder		
40	T66140H	1	HYDRAULIC CYLINDER
41	T66141H	1	BARREL
42	T66142	1	PISTON ROD
43	T66143H	1	END SEAL
44	T992154-326	1	O-RING
45	T992154-224	2	O-RING
46	T992154-212	1	O-RING
47	T992253-306	2	RETAINING RING - INTERNAL
48	T992116-13	1	PISTON LOCK NUT
49	T992154-014	1	O-RING
50	T66150H	1	CYLINDER END CAP
51	T66151H	1	PISTON HEAD
	T66140HK	1	HYDRAULIC CYLINDER REPAIR KIT

Optional Parts			
	T65200-100	1	PNEUMATIC FOOT CONTROL VALVE ASSEMBLY
	T65200H-100	1	HYDRAULIC FOOT CONTROL VALVE ASSEMBLY
	T65220-200	1	PNEUMATIC HAND CONTROL VALVE ASSEMBLY
	T65241-200	1	HYDRAULIC HAND CONTROL VALVE ASSEMBLY WITH RELIEF VALVE AND GAUGE
	T992311	1	FILTER/REGULATOR/LUBRICATOR ASSEMBLY WITH GAUGE
	T65300	1	SET OF PNEUMATIC HOSES (THREE 180" WITH QDS)
	T65300H	1	SET OF HYDRAULIC HOSES (FOUR 180" WITH QDS)
	T992285-FH-6-6	6	QUICK DISCONNECT (QD), FEMALE

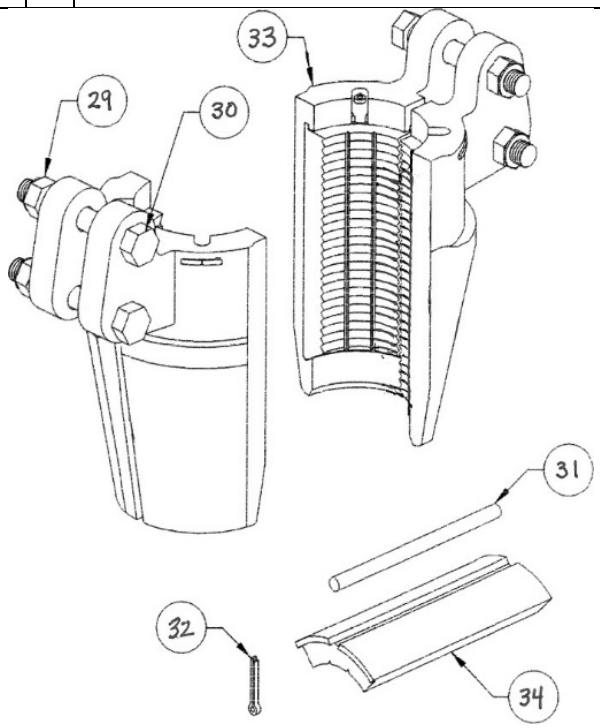


Figure 2: Slip Body Parts

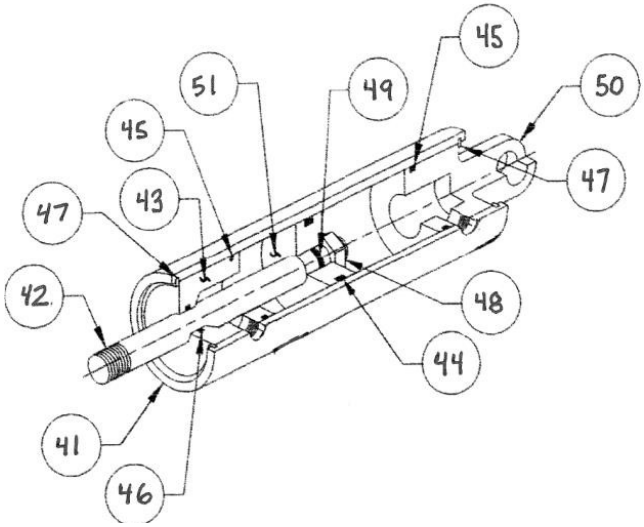


Figure 3: Cylinder Parts

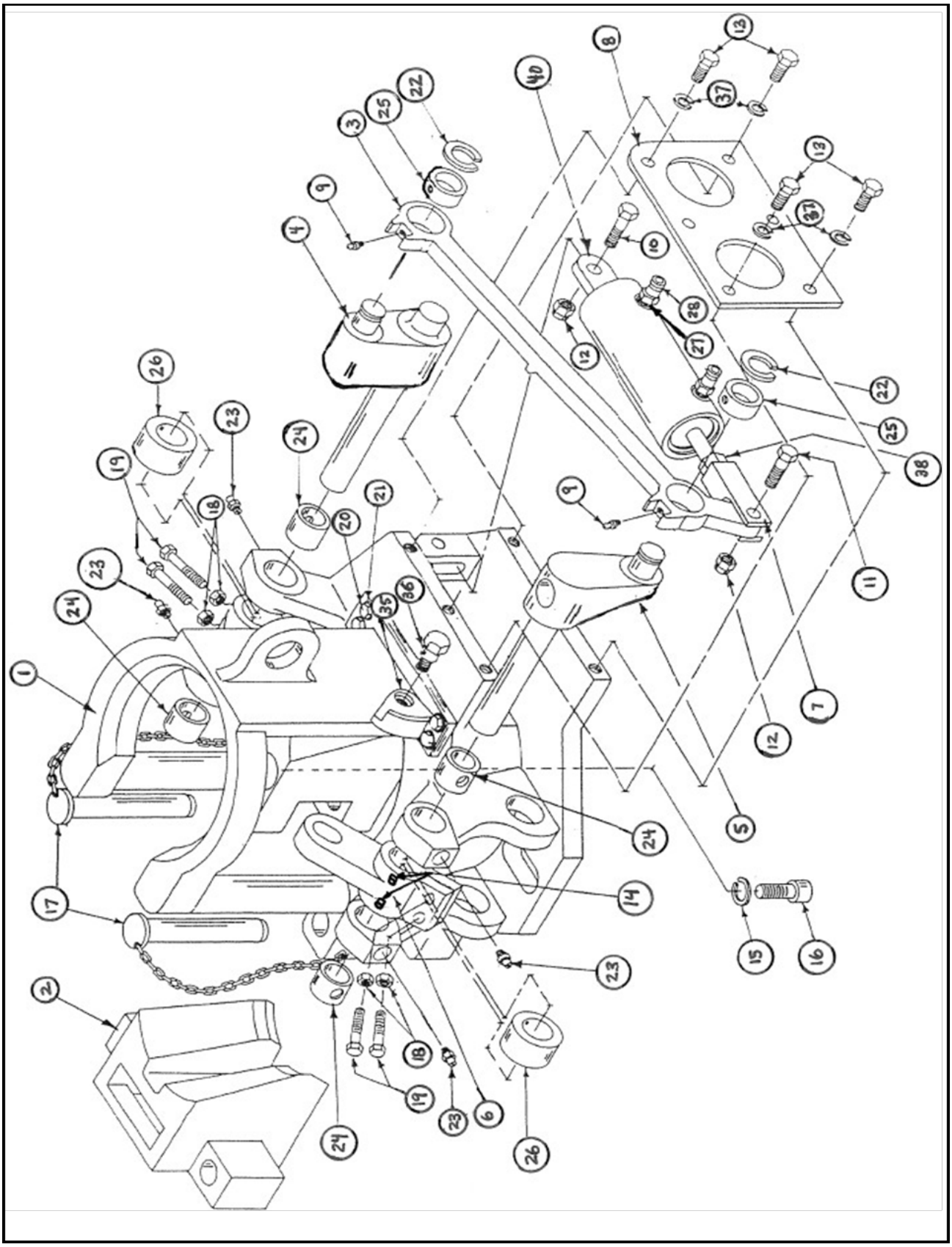


Figure 4: Spider Parts

Every Company has to have a Toolbox.

At Texas International Oilfield Tools,

We provide the tools to fuel the World!