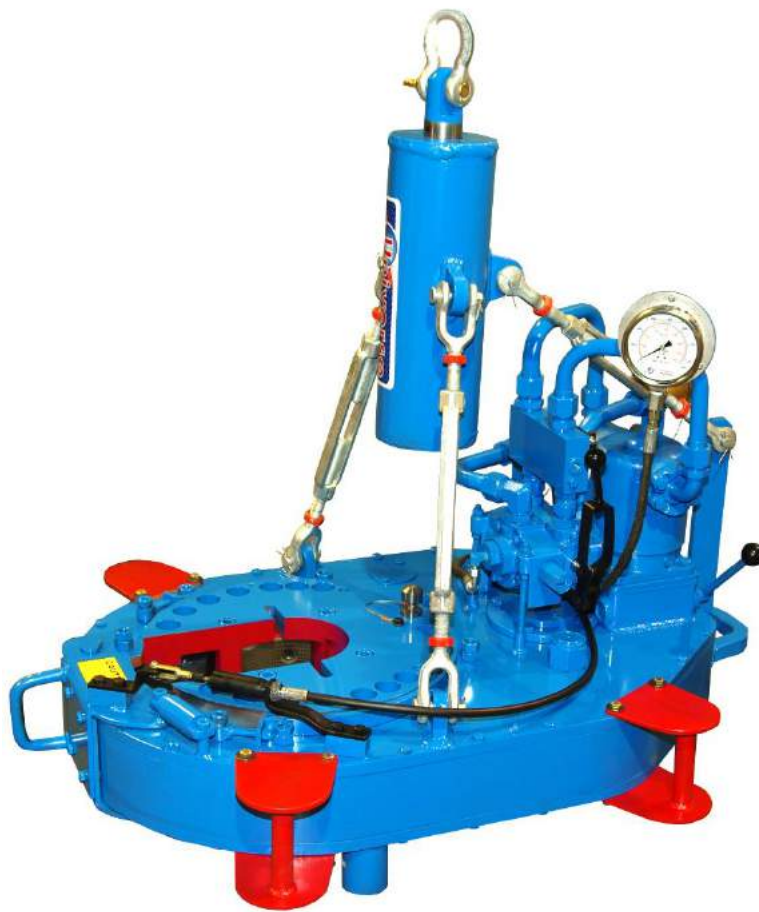


UNIVERSE

5-1/2 POWER TONG

MODEL 01F05C MANUAL



Universe Machine Corporation
5545 - 91 STREET
EDMONTON, ALBERTA, CANADA T6E 6K4
PHONE:(780) 468-5211 - FAX(780) 468-5430
www.umcorp.com

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While Universe Machine Corporation strives for accuracy in this manual, all contents are subject to change without notice.

Patents: CND: 2,016,319 USA: 5,144,868 & 8,418,586 B2

1.0 INTRODUCTION

The Universe 5-1/2 Power Tong is used on drilling rigs to screw and unscrew tubing or casing to a specific torques. The Tong may be used on other specialized applications that require threaded tubular products to be “torqued” or “un-torqued” as well.

This unit is designed and built to be sturdy and reliable. The unit will provide years of trouble-free performance. Like any mechanical device, regular maintenance covered in this manual will help extend the life and performance of this unit. It will also provide for safe and efficient operation.

It is therefore very important to read this manual carefully before using this Power Tong.

This manual also covers the major components that make up the 5-1/2 Compact Power Tong. Although this machine is built to meet rigorous and tough working conditions, some parts over time may wear out and need replacing. If any replacement parts are required, or if you experience problems that this manual does not cover and need assistance, please contact any of our Universe dealers.

2.0 SPECIFICATIONS

2.1 5-1/2 POWER TONG

Maximum Torque at 2,500 psi (17,237 kPa):	Low Gear:	15,000 ft-lbs. (2,074 kg-m)
	High Gear:	3,900 ft-lbs. (539 kg-m)

Speed at 65 GPM (246 LPM):	Low Gear:	26 RPM
	High Gear:	102 RPM

See Tong Engineering Data Charts for other torques and speeds.

Tong Specs:	Length:	45" (1.14 m)
	Overall Width:	24-1/2" (0.62 m)
	Torque Arm:	26" (0.66 m)
	Weight:	850 lbs. (385 Kg)
	Pull force:	6,925 Lb. (f) (based on the maximum tong output torque and torque arm)

Jaw Sizes / Range Available with Wraparound Dies:

JAW SIZE	RANGE	*MAX TORQUE
5-1/2" (139.7 mm)	4-1/4" to 5-1/2" (108 mm to 139.7 mm)	15,000 ft-lbs. (2,074 kg-m)
4-1/8" (104.8 mm)	2-1/16" to 4-1/8" (52.4mm to 104.8 mm)	10,000 ft-lbs. (1,313 kg-m)

*NOTE: This is the maximum torque the jaw size is rated to.

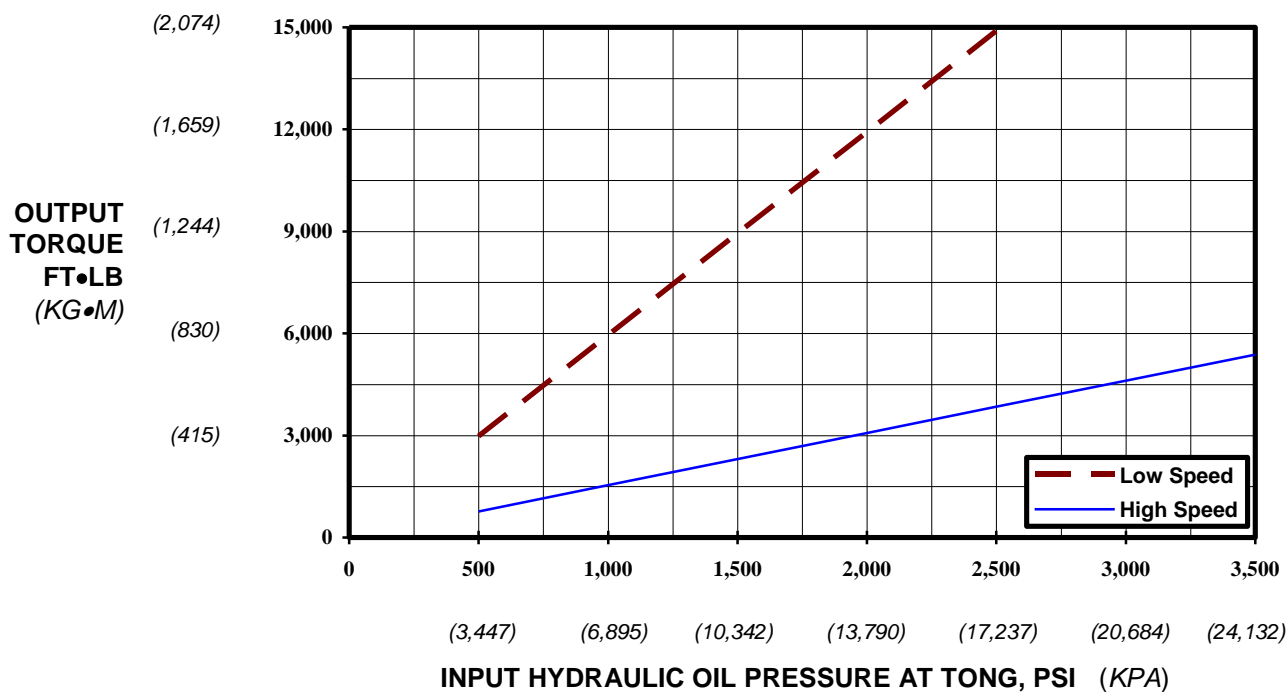
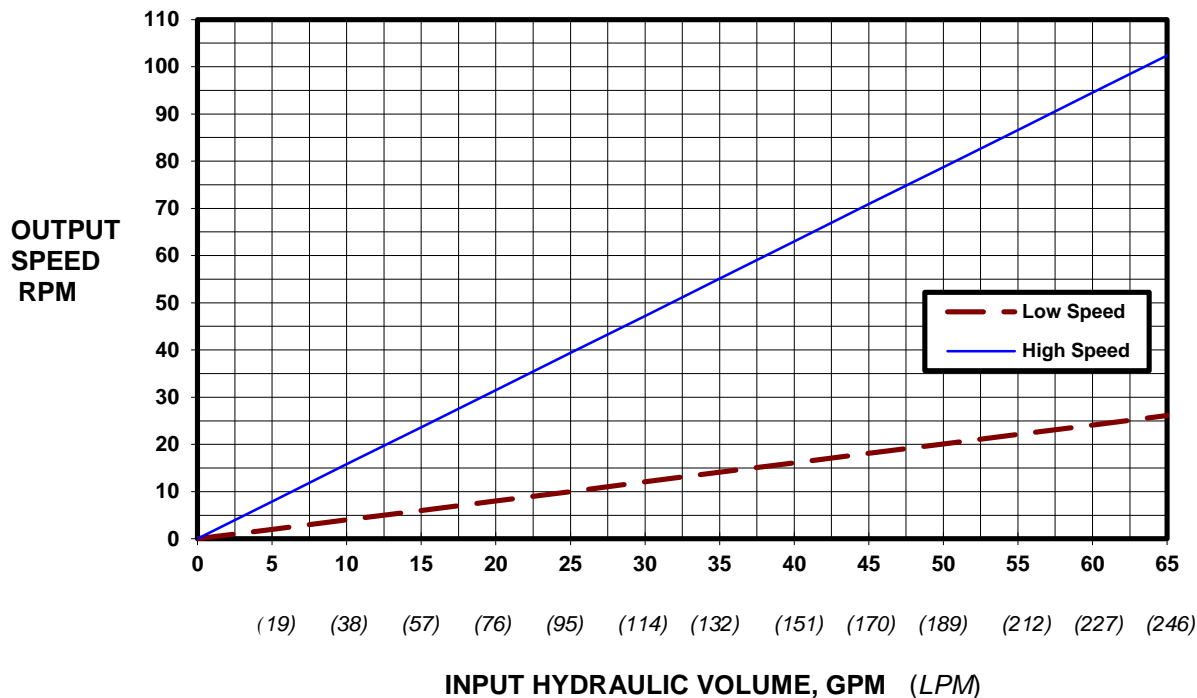
POWER TONG ENGINEERING DATA SHEET (Standard Motor)

MOTOR: 015 61 015

GEAR RATIO: 38

POWER TONG: 5-1/2

MODEL: 01F05C



NOTE: 1. THE ABOVE VALUES ARE DERIVED FROM CALCULATION AND MAY VARY.
2. FOR SMALLER TUBING THE JAWS CAN BE DAMAGED IF THE TONG IS TAKEN TO THE MAX TORQUE. THEREFORE DO NOT EXCEED THE MAXIMUM RATING OF THE JAWS.

2.2 HYDRAULIC OIL (Factory Default)

For normal operation (approximately between -18 to 40 deg. °C (0 to 104 deg. °F)), the hydraulic oil should be based on the following specifications:

- Mineral based oil 22cST – 56cSt (100 SSU – 250 SSU) at 40 °C (104 °F).
- Additives to resist corrosion, oxidation and foaming.
- Viscosity should remain at 22 cSt (100 SUU) at 21 °C (70 °F).

NOTE: Specifications of hydraulic oil may vary depending on environmental conditions. It is recommended to refer to a hydraulic fluid consultant to ensure the proper oil is specified for harsh or extreme environments.

3.0 AVAILABLE OPTIONS

3.1 LIFT CYLINDER

Used mainly in conjunction when a Tong is equipped with a Hydraulic Back. The lift cylinder is used to lower or raise the Tong unit so that the jaws can bite above or below the joint. Lift cylinders come in a variety of lengths and are attached in between the built in spring hanger and the Tong supporting line. They are controlled by the addition of an extra valve bank on the Power Tong.

Refer to Appendix A for an overview of the lift cylinder.

3.2 PRESSURE TORQUE GAUGE

This gauge is connected to the hydraulic line in and converts the pressure to a torque reading. It is based on the values used for the Power Tong Engineering Data Sheet charts for torque.

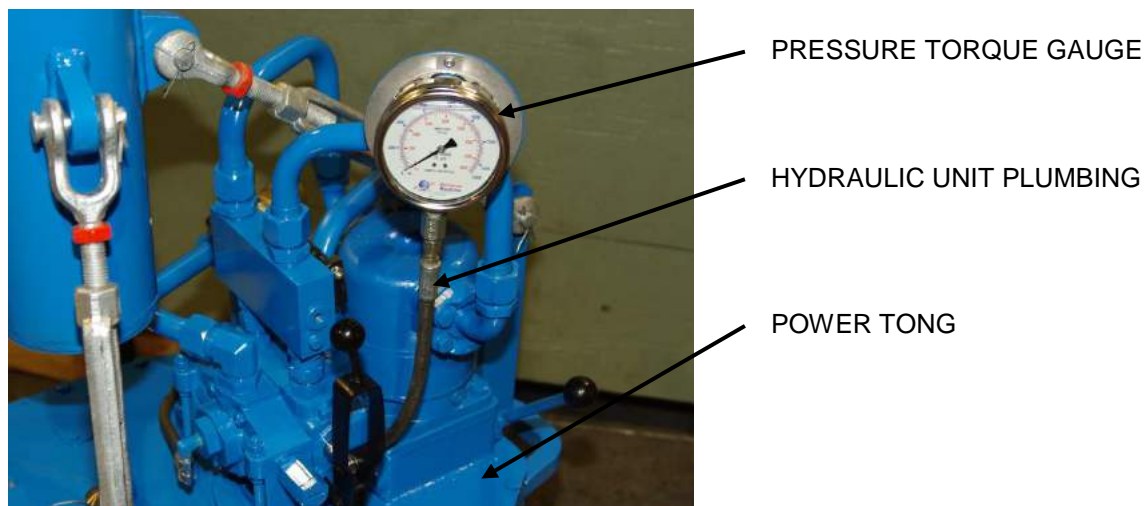


FIGURE 3.21: OPTIONAL PRESSURE TORQUE GAUGE

3.3 TENSION LOAD CELL & GAUGE

This uses a tension load cell that attaches between the back handle of the Tong and the anchor line. It is the most accurate way to read the output torque of the Tong.

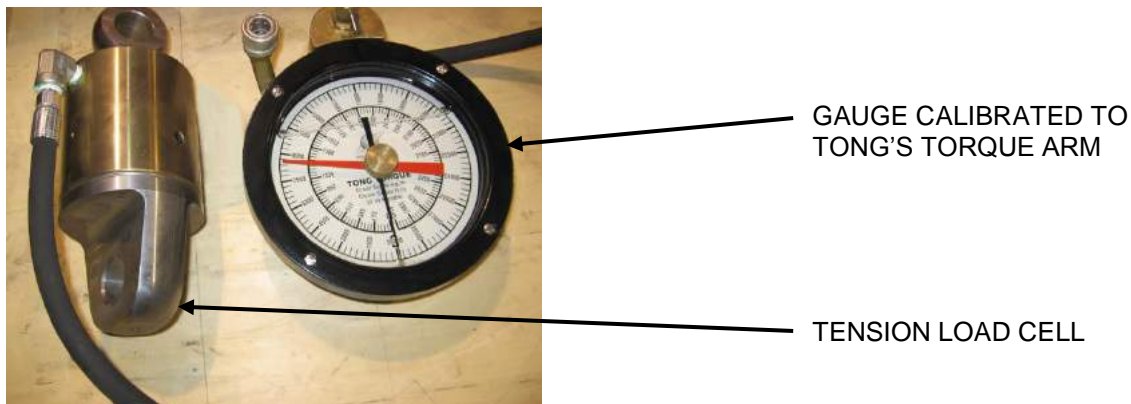


FIGURE 3.31: TENSION LOAD CELL & GAUGE

3.4 INTEGRATED HYDRAULIC BACKUP

The Tong can be easily integrated with Universe's 5-1/2 Hydraulic Backup. The Backup is controlled with an additional four way, three position valve mounted beside the Tong control valve. The Backup can easily be removed from the Tong by detaching the quick couplers of the two hoses going to the Backup and removing the two bolts holding the front legs and the two larger bolts in the back.

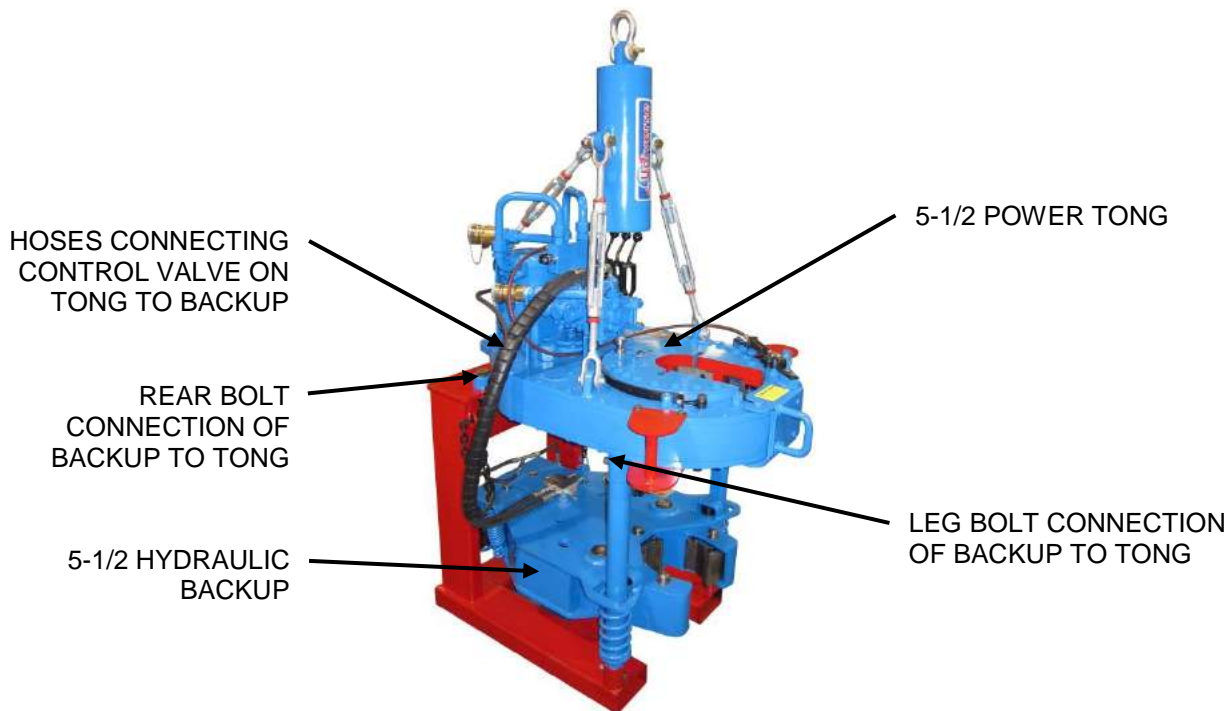


FIGURE 3.41: 5-1/2 POWER TONG WITH HYDRAULIC BACKUP

4.0 LEVELING AND ATTACHMENT

The Power Tong comes equipped with a built in spring hanger connected to the Tong with turnbuckles (see Figure 4.01). Before each job and operation of the Tong ensure that the unit is correctly secured to the support cable and all lifting components (turnbuckles, shackles, etc.) are in working order.

The Tong can be safely lifted up and moved by placing a lift line on the lift line shackle. Ensure to always use the red side handles on the tong to handle the unit when moving to avoid any sudden movements.

For all components that hold up the Tong, as well as any backup lines, ensure that all components are rated for the maximum forces they will experience and in proper working order. Inspection of the turnbuckles and shackles should be done prior to operation and replaced if found defective or damaged. This includes, but is not limited to, the following:

- Stretched, bent or deformed.
- Cracks or breaks.
- Corroded components or areas.
- Worn or ground sections.
- Excessive nicks, notches or impact damage.
- Non-operational (i.e. cannot adjust turnbuckles).
- Tampered with or welded to.

Welded components such as the spring hanger or turnbuckle eyes should be inspected on an annual basis (at least once per year, but may need more frequent checks depending on amount of use, environmental conditions, etc.). Welds should be checked for signs of cracking, corrosion, erosion or damage by MPI (Magnetic Particle Inspection). Any weld repairs should be done by a certified welding procedure and qualified welders suitable for lifting applications that satisfy any jurisdictional requirements of where the Tong is being used.

WARNING: Modifying or welding onto any of the lifting components including the spring hanger will void the warranty and may compromise the integrity and lift capacity.

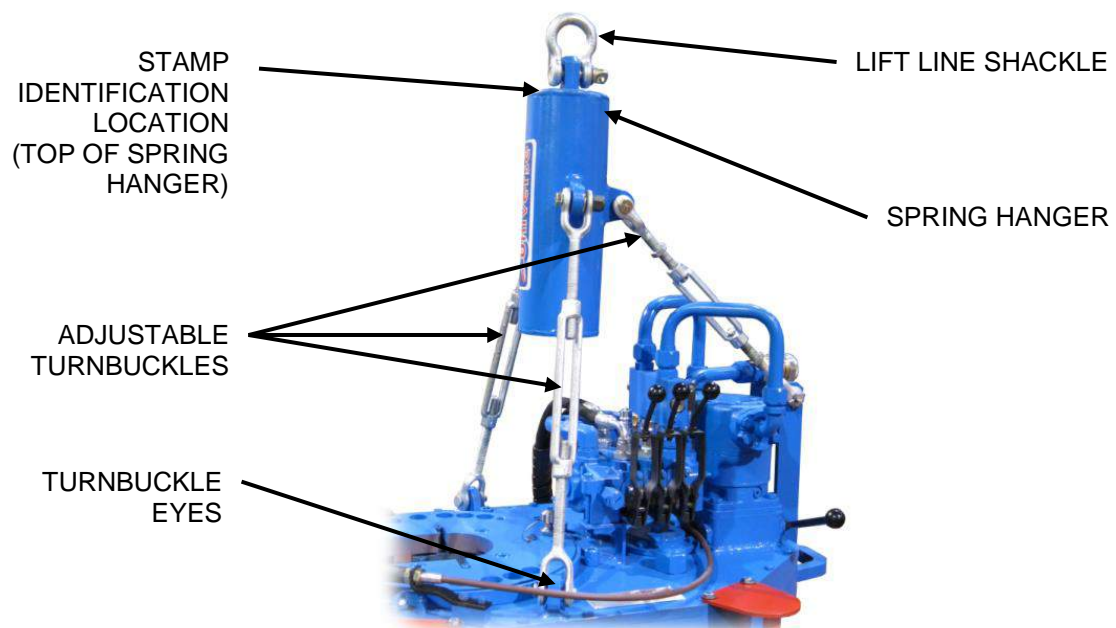


FIGURE 4.01: TONG SUPPORT ASSEMBLY

4.1 SPRING HANGER

The built in spring hanger allows the Tong to move downwards when making up a threaded connection reducing cable strain. The spring(s) in the unit are factory sealed and should provide years of trouble free operation. However, it is important to ensure the maximum travel and capacity of the spring hanger is not exceeded to avoid possible damage to the unit.

The spring hanger capacities and travel are as follows:

Model #	Stamp Identification (see Fig. 4.01)	Capacity per Inch	Total Travel From No Load	Maximum Capacity (Total)	Default On
703F0020	2,000	250 lbs. / inch	8-1/4 inches	2,000 lbs.	5-1/2 to 17 Tongs
703F0020-1	3,000	400 lbs. / inch		3,000 lbs.	Tong with Backup
703F0020-2	7,300	1,250 lbs. / inch	5-3/4 inches	7,300 lbs.	20 & Up Tongs

WARNING: *The Tong is not designed to support the tubular in thrust loading. Never exceed the maximum capacities as listed in the above table as this may cause the spring hanger to fail.*

To ensure the proper full maximum rating is maintained, always use the line shackle that comes with the spring hanger to hang the unit.

4.2 LEVELING

The Tong is supported by the use of three turnbuckles as shown in Figure 4.01. To ensure the proper operation of the Tong, make sure to level the unit by adjusting the three turnbuckles.

4.3 BACKUP LINE

When using the Tong without an attached backup unit, the back of the Tong will need to be connected to a backup line to prevent it from rotating. The Tong should be connected to the backup line with the use of a shackle attached to the rear handle as shown in figure 4.31. Once the Tong is leveled, ensure the backup line is parallel with the Tong in the vertical plane (i.e. when looking straight on the Tong from the back) and 90 degrees to the Tong along its length to ensure proper operation and torque reading when using a Tension Load Cell.

All the components used to make up the backline should be rated to the maximum pull force the Tong can exert (see Section 2.1). Provisions for shock loading and environmental conditions should also be taken into considered as well.

If using a Tension Load Cell, ensure to place it between the shackle connected to the Tong and the backup line.

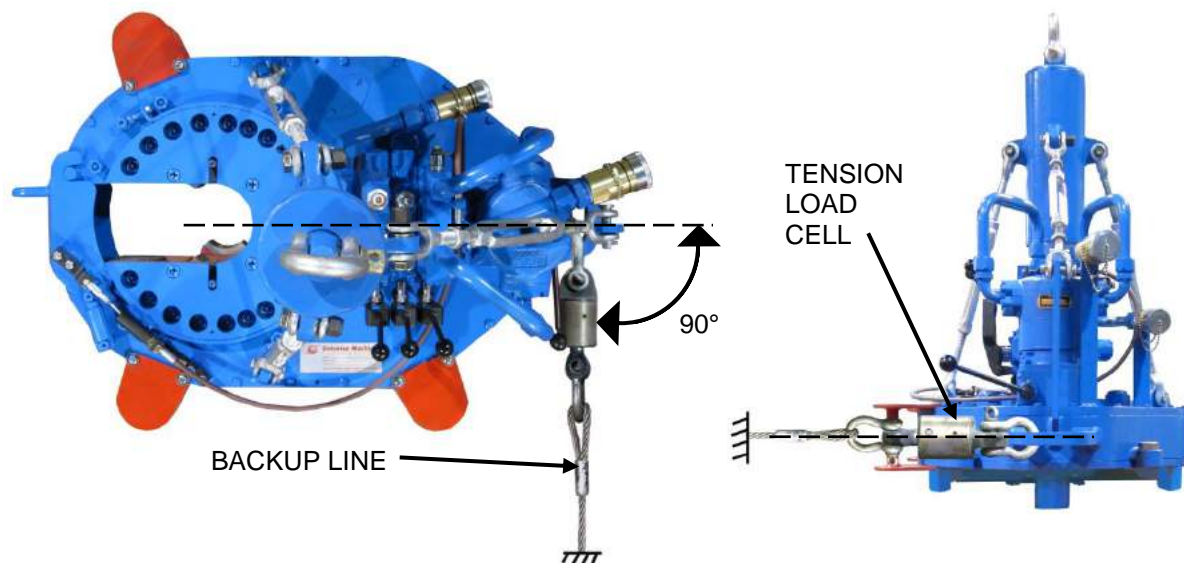


FIGURE 4.31: BACKUP LINE TYPICAL ASSEMBLY

5.0 JAWS AND DIES

The Power Tong uses two jaws as shown in figure 5.01. Wraparound dies are used to bite tubular diameters of 2-1/6" to 5-1/2". Optional Insert die jaws are available upon request. For a summary of dies available, refer to Section 14.3.



FIGURE 5.01: JAW USED IN THE TONG

5.1 INSTALLATION OF JAWS

The Power Tong unit uses a quantity of two jaws. Installation can be done by sliding in the Tong jaw pocket and fastening the shoulder bolt through the jaw spring bushing onto the jaw (See Figure 5.11).

It is important to ensure the jaw rollers and jaws pin bores are properly greased to prevent contamination or moisture penetration that can lead to rusting and/or seizing of the pin or rollers. Ensure the jaw slots are also greased before placing the jaws inside. Make sure to install the wraparound jaws in the orientation as shown in Figure 5.11. Use a wire brush to keep the dies free of debris. Dies should be replaced if they fail to bite or start to constantly slip when biting the tubular.

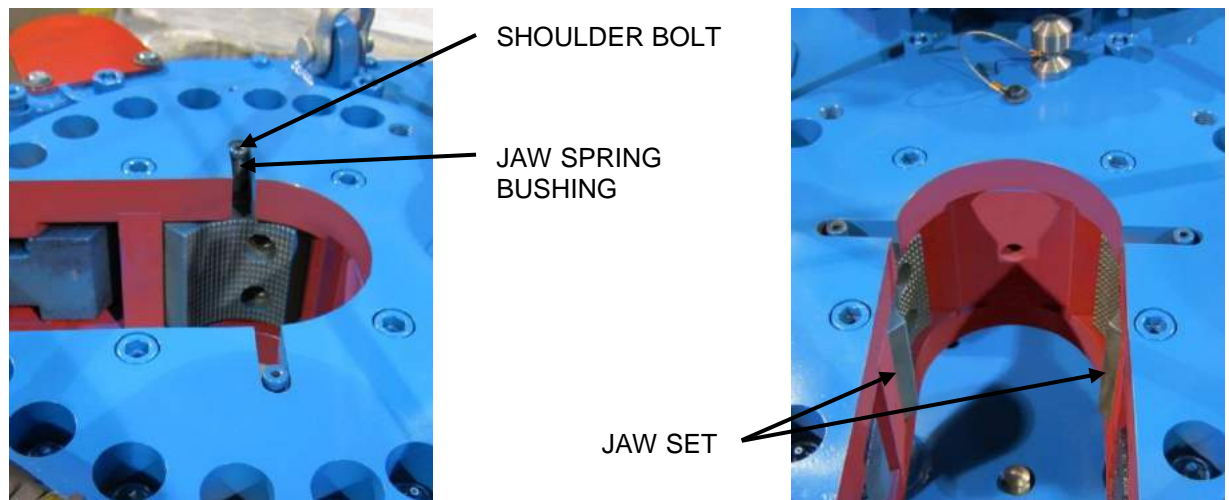


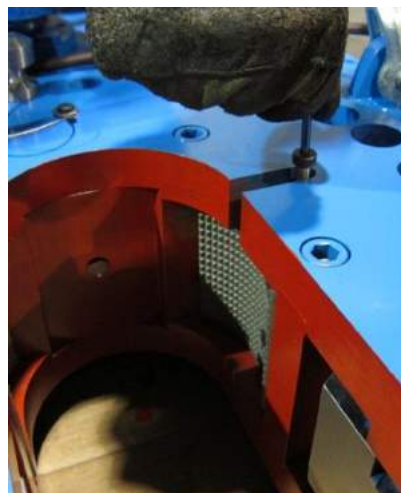
FIGURE 5.11: JAWS INSTALLED IN TONG

5.2 REMOVAL OF JAWS

The jaws should be relatively easy to remove by grabbing them by the jaw block or dies and sliding them out of the slot. However, in cases where it may be difficult to grab the jaws, especially the 5-1/2" jaw frame and dies the following method should be used to remove them:

1. Remove the shoulder bolt holding the jaw to the jaw bushing and spring (see Figure 5.21)
2. Rotate the Tong until the jaws are as far as possible out of the slot (Always ensure hands are clear of all rotating parts).
3. Stop the Tong; open the door to ensure ring gear cannot be rotated
4. Grab the jaw frame or die and pull jaw out.
5. If the jaw still does not want to come out, use a screw driver in the shoulder bolt threaded hole on the jaw frame to assist in wiggling out the jaw (see figure 5.21).

NOTE: Ensure not to damage the threads of the hole.



REMOVING SHOULDER BOLT
HOLDING BUSHING AND SPRING



ROTATE RING GEAR TO
BRING JAWS OUT OF SLOT



REMOVAL OF JAW WITH
HELP OF SCREWDRIVER

FIGURE 5.21: REMOVAL OF JAWS

6.0 BRAKE BANDS

The Tong uses two brake bands to hold back the cage plates from moving in order to initiate the jaws to bite the tubular. These brake bands use a friction material that over time will wear; at which point the brake bands will need to be replaced.

Break bands can be installed onto the Tong as follows:

1. When putting on the bottom brake band you will need to support it prior to tightening it so it does not fall off.
2. If not already in place, put the brake band eye bolts in position and screw in the shoulder bolts.
3. Put the brake band holes on the ends through the eye bolts and screw on the locknuts onto the eye bolts. This should hold the brake bands in place.
4. Tighten all four locknuts as equally as possible and ensure they are only snug tight.

You should not need to tighten the brake bands any further unless the Tong jaws slip or don't initially bite on a particular tubular, or as the wear material in the brake band wears down.

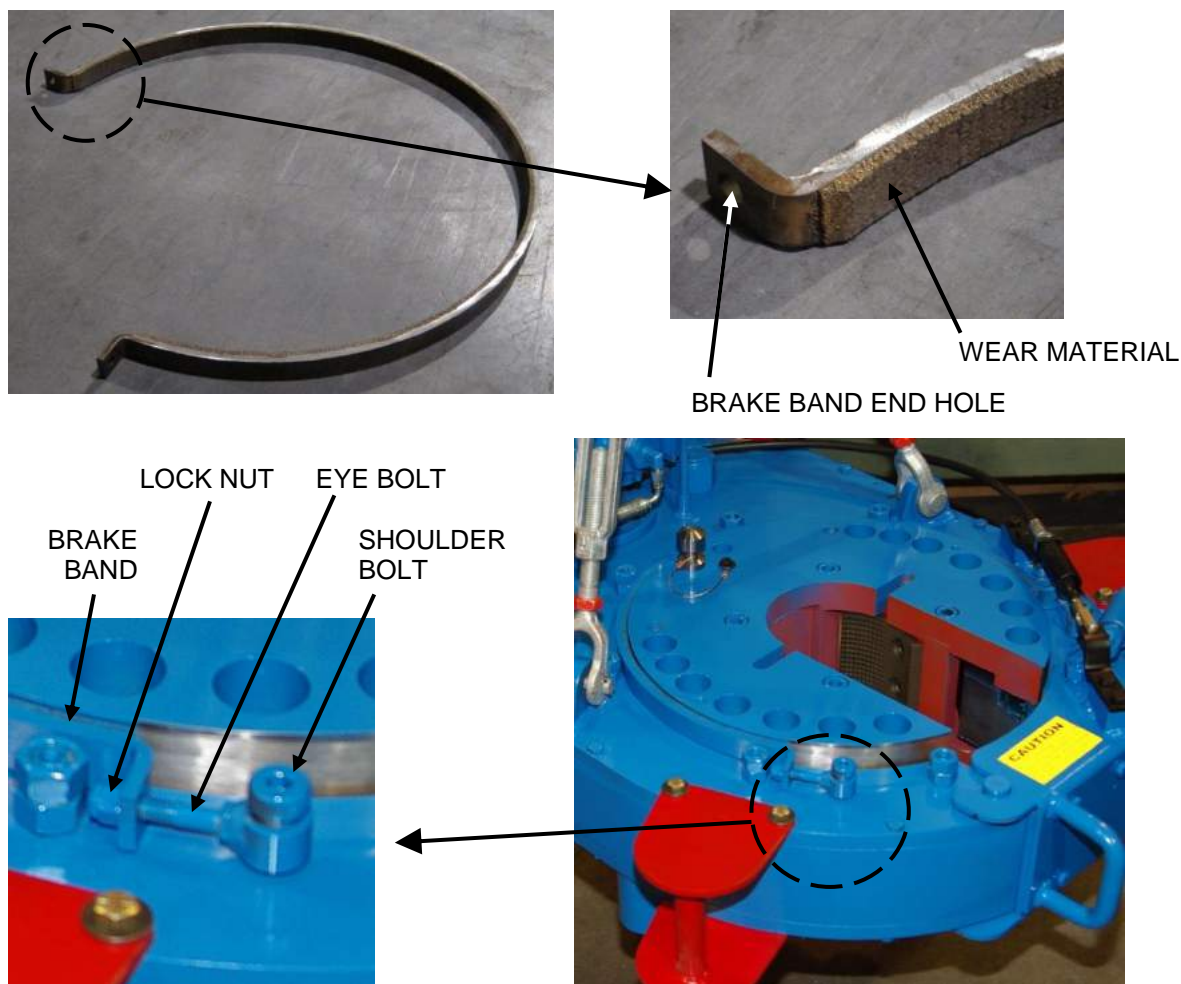


FIGURE 6.01: BRAKE BAND OVERVIEW

7.0 CHECKS PRIOR TO OPERATION

In order to prevent injury to personnel and/or damage to this unit, the following steps must be taken prior to the use of this unit:

1. Periodic checks should be made to all hydraulic fittings and any connected hoses to ensure they are all tightly fastened and are not leaking or damaged.
2. Jaws and all moving parts should be greased and lubricated as shown in the maintenance section of this manual.
3. Ensure the brake bands are snug and not too loose or over tightened.
4. Make sure the door opens and closes properly. The door spring unit should prevent the door from closing on its own in the open position and opening in the closed position.
5. Ensure The Door Safety Interlock it is working properly.
6. Since this device operates with large forces, ensure that everyone except the operator is standing clear of the unit.
7. Hookup the hydraulic power unit to the Tong (refer to Figure 7.01 for hookup locations and fitting sizes). Ensure the wing quick couplers are screwed tight all the way until the o-ring on the male end is fully covered by the wing nut. Ensure that the oil can freely flow through the Tong.

WARNING: *So the motor seal is not blown or damaged, ensure the return line is connected and the oil is flowing freely back to the tank.*

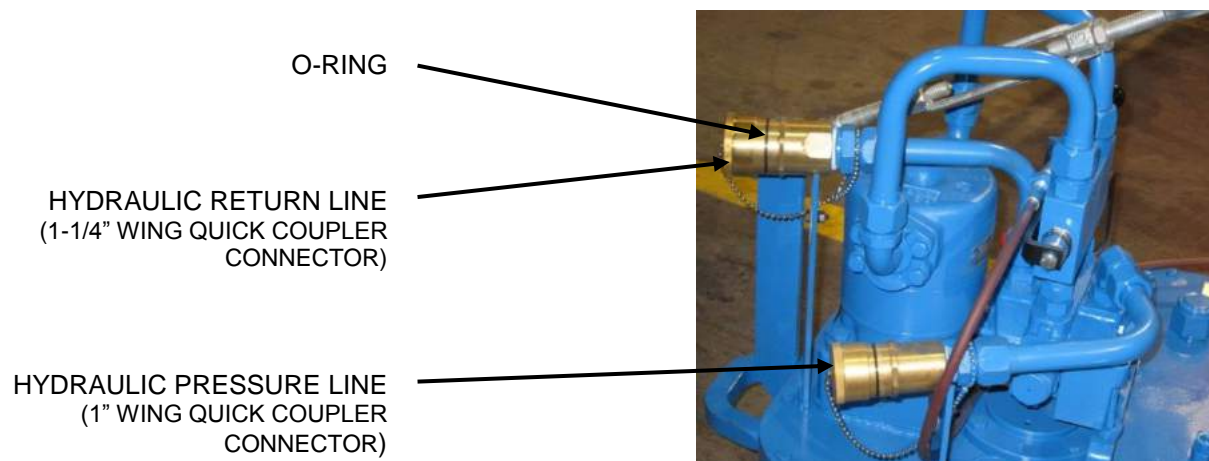


FIGURE 7.01: HYDRAULIC LINE CONNECTORS

8.0 UNIT CONTROLS

The basic Tong comes with two primary controls; the four way three position valve for controlling rotation of the ring gear for makeup and breakout of tubular, and the high / low speed shift control. Additional valve banks may be installed to control the backup and/or a lift cylinder.

WARNING: *To avoid damage to the unit or injury to the operator, use the proper control levers.*

8.1 TONG VALVE BANK CONTROLS

The four way three position valve bank(s) control where the hydraulic oil is diverted to. In their neutral position they allow the flow to return directly to the return line and tank. Hence, when the hydraulic power unit is turned there should be no pressure buildup in the Tong except for any minor back pressure that the fittings and hoses may cause.



FIGURE 8.11: TONG VALVE BANK CONTROLS

Tong Direction Control: Pulling the control towards the operator will spin the Tong counter-clockwise (breakout). Pushing the control away from the operator will spin the Tong clockwise (makeup).

Lift Cylinder Control: (If Equipped) Pulling the control towards the operator will lower the unit. Pushing the control away from the operator will raise the unit.

WARNING: *When operating the lift cylinder, ensure the unit is clear of any obstacles and that the flow valve is set for a safe moving speed.*

Hydraulic Backup Control: (If Equipped) Pulling the control towards the operator will close the jaws. Pushing the control away from the operator will open the jaws.

Letting go of the controls at any time will stop any of the above operations as the handle will automatically return to the neutral position.

8.2 HIGH / LOW SPEED HANDLE

This handle is used to shift the Tong gears giving the unit two speeds (high and low). The selected speed will affect the torque output of the Tong (refer to the Engineering Data Sheet Chart).



FIGURE 8.21: TONG HIGH / LOW SPEED HANDLE

In order to operate the control, ensure to stop the Tong and pull the lever towards the motor for high speed or towards the Tong for low speed. Ensure the lever is pushed or pulled all the way to the end of its travel or else the gears may not engage properly.

WARNING: Shifting gears while the Tong is still rotating may cause premature wear or damage to the gear teeth. Always ensure to stop the Tong before shifting gears.

9.0 DOOR SAFETY INTERLOCK

The Universe Door Safety Interlock is a hydraulic door lockout system that is designed to provide trouble free operation. Using industry standard parts, the system prevents the rotation of the Tong while the door is in the open position.

The Door Safety Interlock is made up of two major components, the door interface and the bypass block assembly. They are connected with a durable cable.

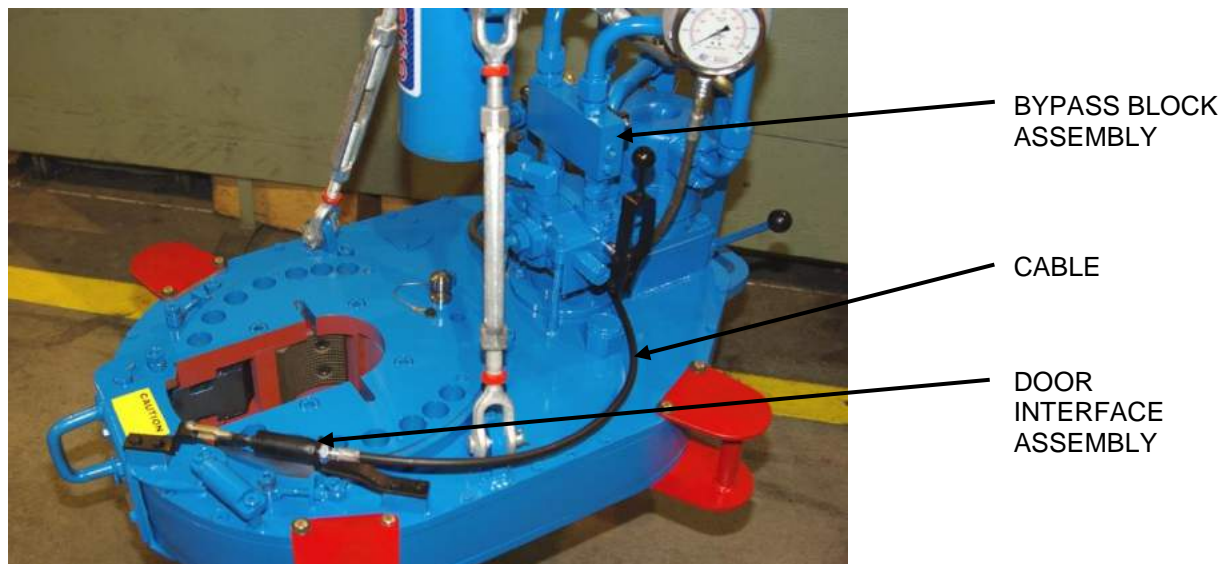


FIGURE 9.01: DOOR SAFETY INTERLOCK COMPONENTS

9.1 DOOR INTERFACE ADJUSTMENTS

Fine adjustment of the door interface cable may be made by loosening the cable nuts as shown in figure 9.11. Ensure to retighten the nuts on both sides after any adjustment.



FIGURE 9.11: DOOR INTERFACE ADJUSTMENT

9.2 BYPASS BLOCK POSITION AND ADJUSTMENTS

In order for the block to properly work, when the door is open or closed, the end connector of the cable must be positioned so that opening or closing the door shifts the bypass block's spool fully in the appropriate direction. Thus when the cable is to be re-installed to the bypass block or re-adjusted the following should be followed:

1. Place the 1/4" adjustment nut onto the threaded end of the cable.
2. Push the spool all the way out towards the side the sliding valve bar is connected to.
3. Screw the cable into the fixed nut until the 1/4" nut touches the valve bar.
4. Screw on a 1/4" locknut along with a lockwasher on the end of the threaded cable and tighten both nuts on each side of the sliding valve bar.
5. Re-attach the other end of the cable to the door interface (with the door closed) and test that the spool moves to the other position (approx. 7/16") when the door is opened.

For fine adjustment the position of the bypass block spool can also be adjusted by using the two 1/4" nuts.

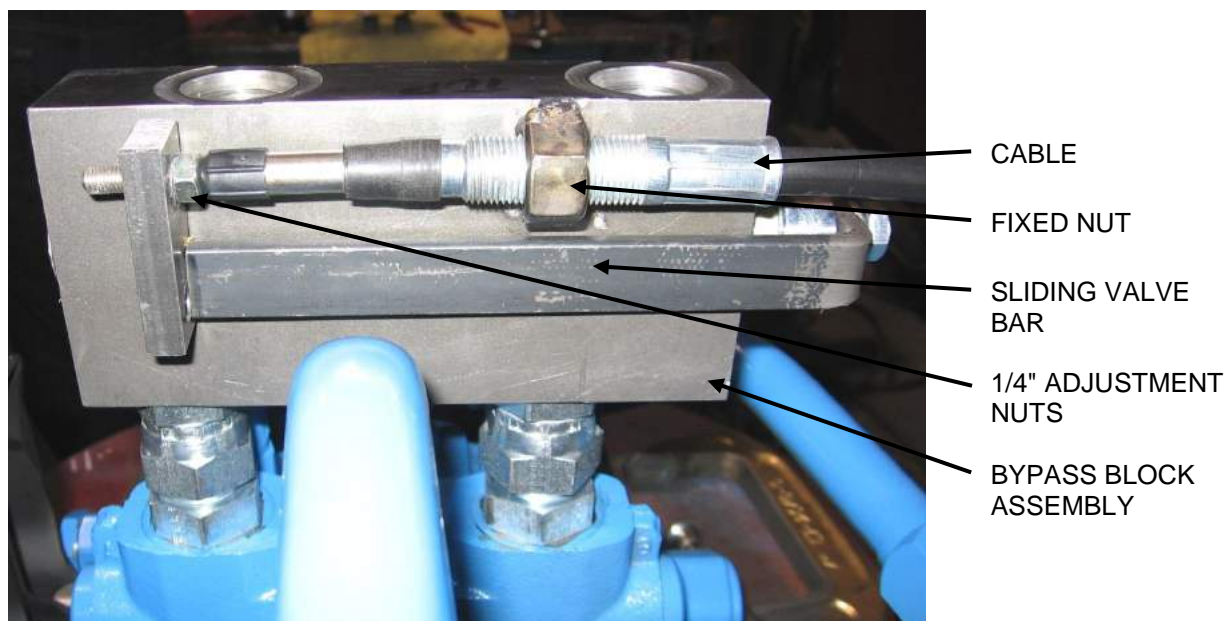


FIGURE 9.21: CABLE POSITION ON BYPASS BLOCK

10.0 UNIT OPERATION

Since the ring gear and cage plates rotate while the Tong is in operation, it is very important that only the operator is running the Tong and stays clear of all moving parts. Figure 10.01 identifies the rotating parts while the Tong is in operation.

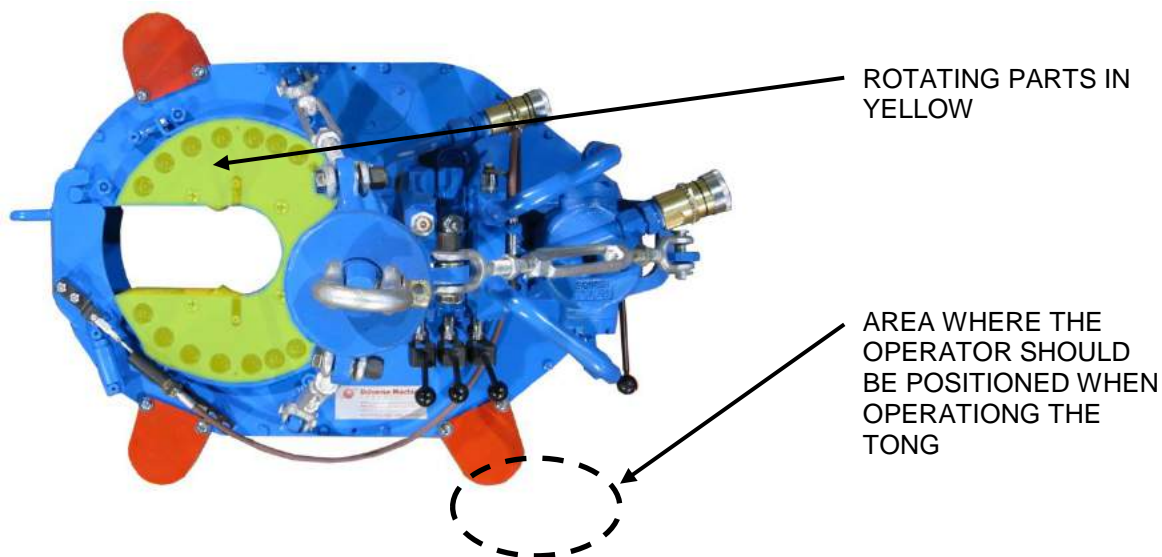


FIGURE 10.01: IDENTIFICATION OF ROTATING PARTS

The operator should ensure they are wearing appropriate PPE (Personal Protective Equipment) suitable for the environment when handling and running the Tong.

10.1 STANDARD OPERATION (TONG ONLY)

Operation of makeup or breakout of a joint is as follows:

MAKEUP:

1. Make sure the backing pin (See Figure 10.11) is in the makeup position and the correct size jaws and dies are installed.
2. Ensure the Tong ring gear and cage plates are in the fully open position.
3. Slowly place the tubular the Tong is to bite into the opening.
4. Close the door and ensure that everyone except the operator is standing clear of the unit.

WARNING: To avoid Injury, ensure hands and/or limbs stay clear of any moving parts while the Tong is in operation.

5. Bite the tubular with the Tong jaws (the Tong's jaws should come out onto the cam and bite the tubular while the Tong is rotating in a clockwise direction).
6. Once the Tong jaws bite the tubular, rotate the tong to makeup the threads (this can be either done in low or high speed depending on the length of threads and the required torque to screw the threads together).
7. When tightening the threads on the last turn it is recommended to have the Tong in low speed to reduce any sudden shock loads on the unit from stopping when the threading is fully engaged.
8. Release the Tong jaws, open the door and move the tong away from the tubular.
9. Move tubular to the next joint for makeup.

BREAKOUT:

1. Place the backing pin into the breakout position (see Figure 10.11).
2. Ensure the Tong ring gear and cage plates are in the fully open position.
3. Slowly place the tubular the Tong is to bite into the opening.
4. Close the Door and ensure that everyone except the operator is standing clear of the unit.

WARNING: To avoid injury, ensure hands and/or limbs stay clear of any moving parts while the Tong is in operation.

5. Bite the tubular with the Tong jaws (the Tong's jaws should come out onto the cam and bit the tubular while the Tong is rotating in a counter-clockwise direction).
6. When loosening any joint the torque should be built up smoothly on the Tong avoiding "jerks" of the control handle to try to "snap" apart the joint.

WARNING: Avoid shock (snap) loading when taking apart joints. This could result in failure or premature wear of the tong.

7. Release the Tong jaws, open the door, and move the Tong away from the tubular.
8. Move tubular to the next joint for breakout.



FIGURE 10.11: BACKING PIN

10.2 COLD WEATHER OR ENVIRONMENT OPERATION

If the unit is to be operated in cold weather or environments, the following considerations and precautions should be taken into account:

1. Lubrication grease needs to be compatible with the temperatures and environment of operation. Ensure to grease when the unit is free of moisture or condensation.
2. Hydraulic fluid should also be compatible with the temperatures and environment of operation.
3. Always allow the unit to run free for at least 15 minutes to allow hydraulic oil and lubrication to warm up.
4. In extreme low temperatures many components of the unit may be susceptible to brittle failures and therefore care is required in running the unit to avoid sudden or shock loading which may lead to failure or breakage.

NOTE: The tong comes pre-greased to run in temperature ranges of -30 to +40 °C (-22 to 104 °F). If the tong is to be run at a lower temperature, alternate grease rated to temperature of operation should be used.

At lower temperatures then -35 °C (-31 °F), the hydraulic oil should to be heated in order for the tong hydraulics to seal properly.

10.3 SETTING THE HYDRAULIC RELIEF VALVE (IF APPLICABLE)

The hydraulic relief valve on the valve control bank (If equipped - refer to Figure 10.31 for location of valve) is factory set to 2,500 psi and can be adjusted if required as follows:

1. Loosen the outer locking screw of the valve adjustment relief.
2. While torquing a joint (a piece of pipe can be used clamped by the Backup and torqued by the Tong), turn the adjustment screw clockwise with a flat head screwdriver to increase the pressure, or counterclockwise to decrease the pressure.
3. Once desired torque or pressure is obtained, tighten the outer locking screw.

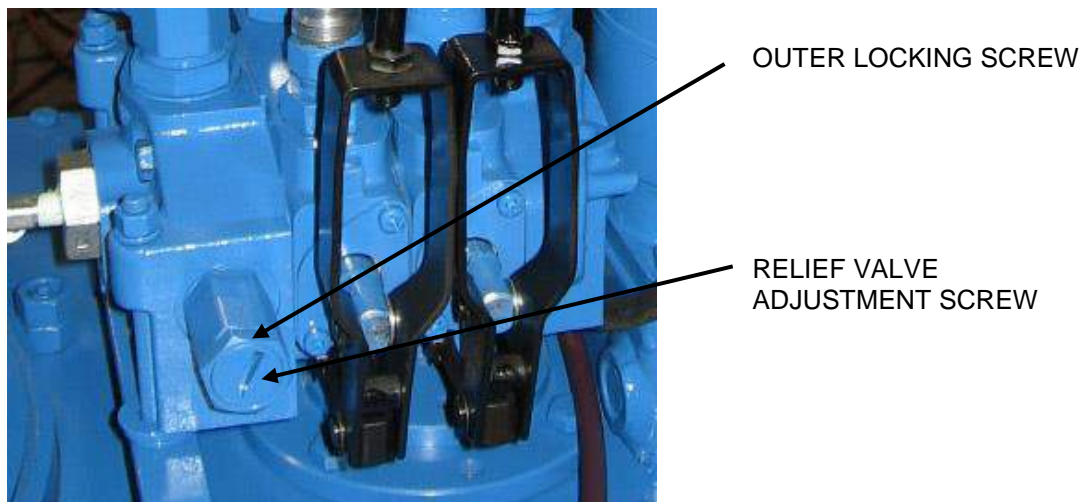
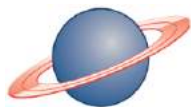


FIGURE 10.31: TONG RELIEF VALVE



11.0 MAINTENANCE

11.1 LUBRICATION

By lubricating the Tong its life can be greatly extended. The following serves as a simple guide that should be followed on a regular basis.

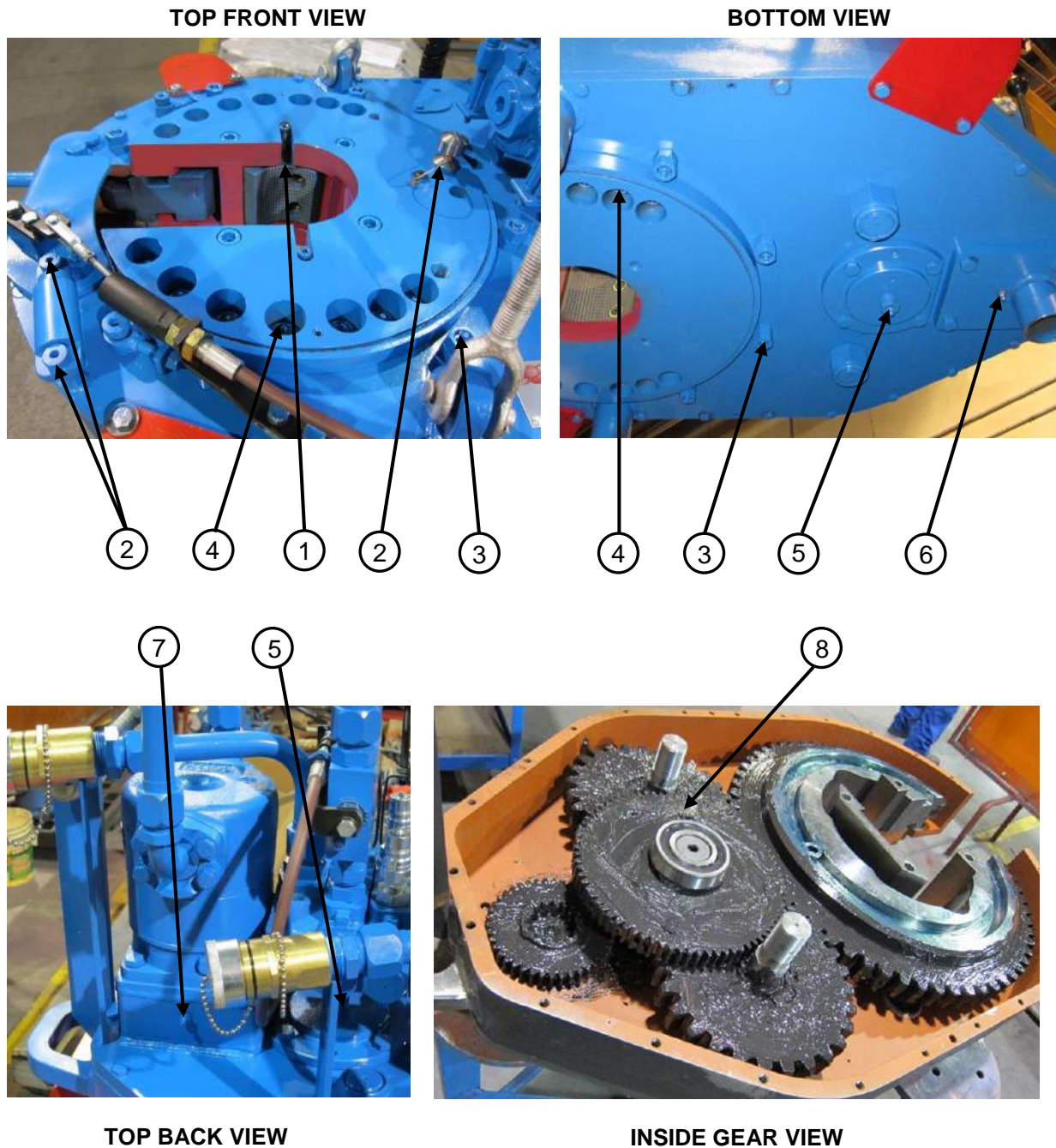


FIGURE 11.11: GREASE LOCATIONS

RECOMMENDED GREASE GUIDE:

LOC.	DESCRIPTION	GREASE TYPE	APPLICATION	FREQUENCY
1	Jaws Slots and Pins	ESSO Unirex EP2	Manually	As required during job
2	Backing Pin and Door Spring Cylinder Bolts			
3	Flanged Bearings		Grease Gun (1 pump)	Daily during job
4	Cage Plate Bearings		Grease Gun (1 pump)	
5	Pinion Gear Train		Grease Gun (2 pumps)	
6	Shift Gear Train Bearing		Grease Gun (2 pumps)	
7	High / Low Speed Shifting Box		Grease Gun (2 pumps)	
8	Internal Gears	ESSO Dynagear Extra	Manually (Cover all gear surfaces)	As required or during maintenance cycles

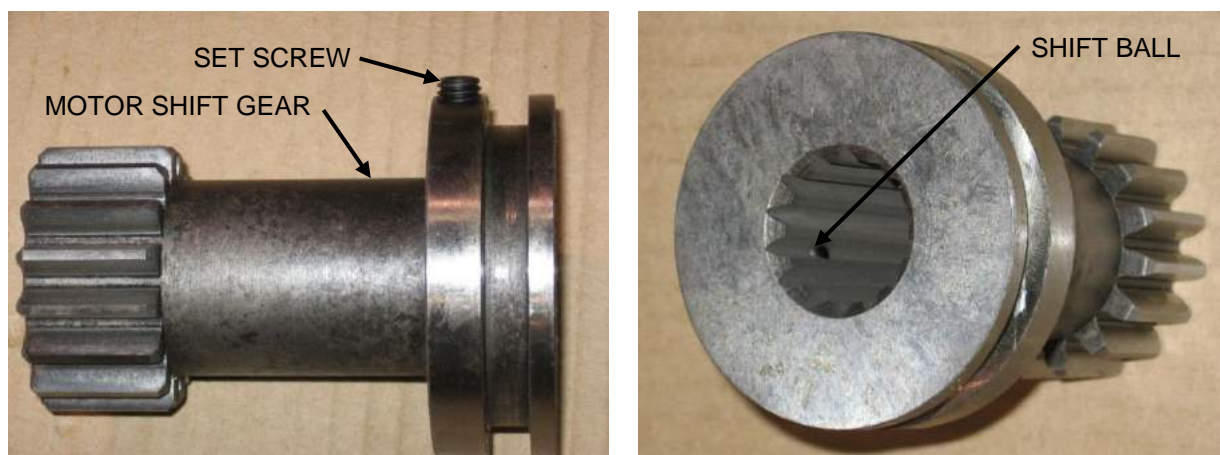
- NOTES: 1) Grease type is factory default and covers operation between -30 to +40 °C (-22 to 104 °F). For other environments consult a lubrication specialist.
2) Verification of grease on the gear train may vary depending on environment and job length.

11.2 MOTOR SHIFT GEAR ASSEMBLY

The high / low speed shifting assembly uses a spring and ball to position and maintain the motor gear in place on the motor shaft.

If the motor shift gear is too loose on the motor shaft (not holding position when in low or high shift position), the spring inside the motor shift gear may need to be adjusted or replaced.

To tighten the spring the set screw needs to be turned clockwise and ensure the shift ball is visible inside the spline of the motor shift gear (see Figure 11.21).


FIGURE 11.21: MOTOR SHIFT GEAR ASSEMBLY

If tightening the set screw does not work or the spring is damaged, replace the spring as follows:

6. Remove the old spring by loosening and removing the set screw (Figure 11.21).
7. Remove the spring and shift ball. Examine the shift ball to ensure there are no flat spots. If there are replace the shift ball as well.
8. As shown in figure 11.22, place the shift ball and spring into the spring hole. Ensure the shift ball is visible inside the spline of the motor shift gear (see Figure 11.21).
9. Tighten the set screw. Place the motor shift gear onto the motor shaft and ensure it holds in both positions (if not, tighten the set screw some more). Note that you should be able to move the motor shift gear by hand into the two (high/low) positions, as shown in Figure 11.23, otherwise the set screw is too tight and needs to be loosened.

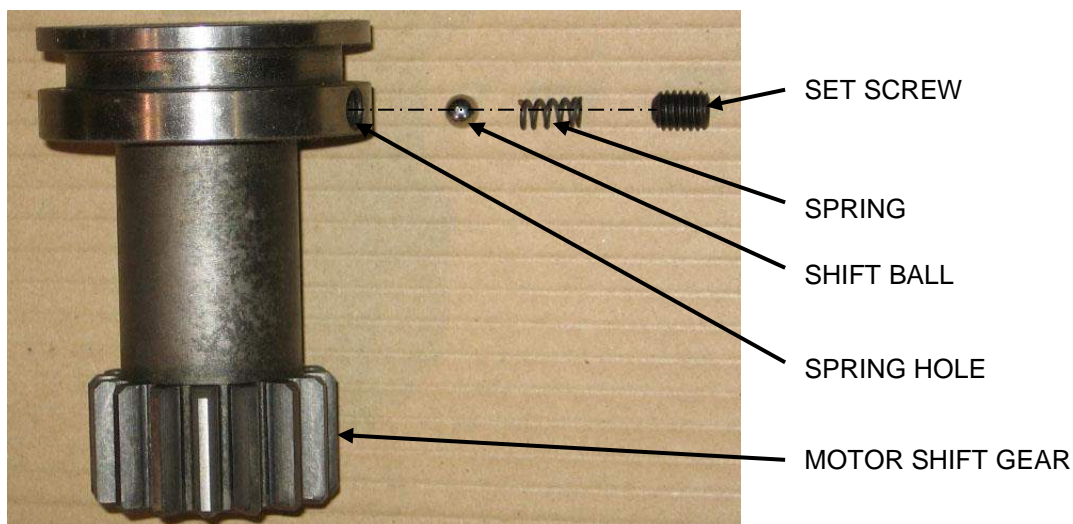


FIGURE 11.22: MOTOR SHIFT GEAR ASSEMBLY PARTS

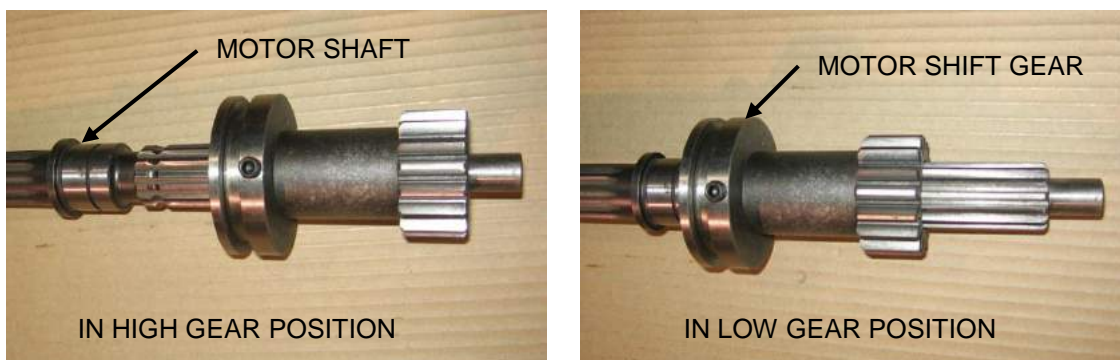


FIGURE 11.23: MOTOR SHIFT GEAR POSITIONS

11.3 DOOR SAFETY INTERLOCK

The Door Safety Interlock, if used properly, requires minimal maintenance.

CABLE

The outer casing of the cable that operates the valve spool in the block assembly when the door is open or closed should provide ample protection for the inner cable. Before the start of each job the

cable should be visually inspected to ensure there is no damage to the outer casing that may prevent the inner cable from operating properly. Over time cracks may appear on the outer casing. As long as the inner cable freely operates, there is no need to replace the cable. If damage to the outer casing prevents the cable from freely moving replace the entire cable assembly.

BYPASS BLOCK ASSEMBLY

If oil leaks out from the spool sides of the block assembly (refer to Figure 11.31), the O-rings that seal the spool may require changing. To change the O-rings, perform the following steps:

1. Disconnect the hydraulic unit of the Tong from any hydraulic power source.
2. Unfasten the 3/8" hex bolt holding the sliding valve bar to the spool and remove it along with the lockwasher.
3. Remove the snap rings on both sides of the spool.
4. Pull the spool out of the block.
5. Remove and replace the O-ring and backup ring on each side of the bore of the bypass block (Refer to Parts List section for specifications on O-ring and backup ring specifications). Ensure the backup rings are placed in the groove with the side facing the bore opening.
6. Re-insert the spool and put back the snap rings into the spool.
7. Re-fasten the sliding valve bar to the spool using the 3/8" hex bolt and lockwasher.
8. Open and close the door to ensure the spool is properly shifting.

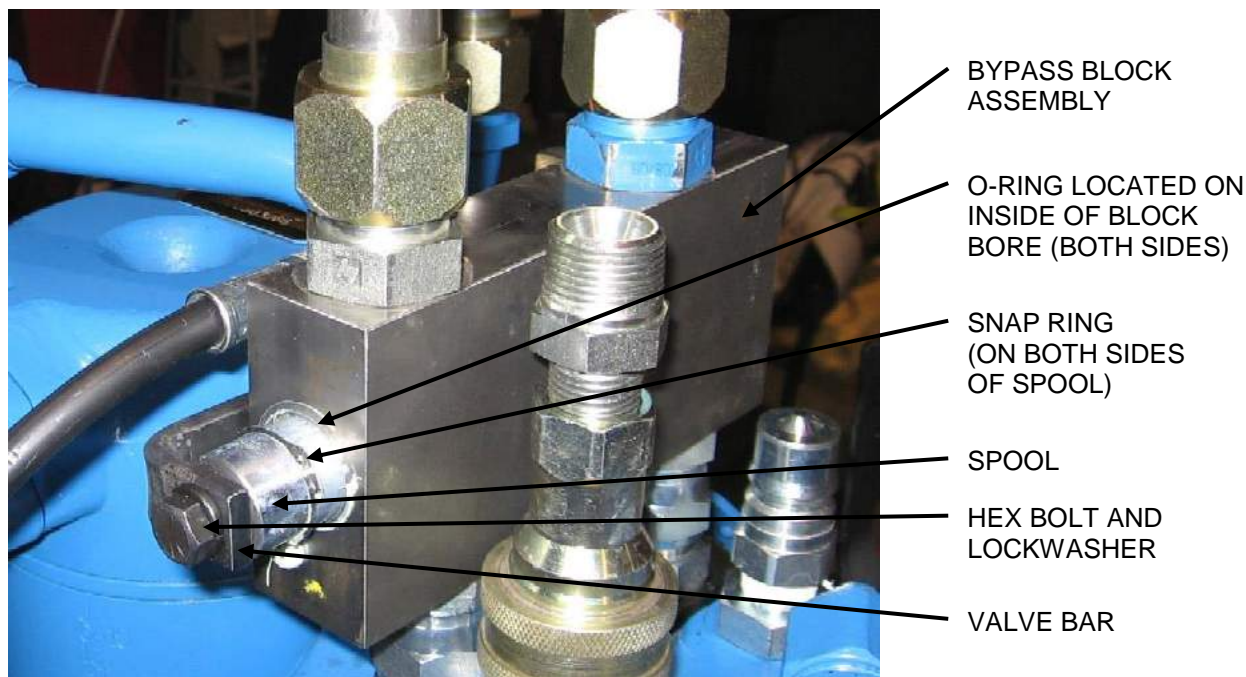


FIGURE 11.31: BYPASS BLOCK SPOOL

11.4 ADDITIONAL CHECKS

During maintenance cycles (when checking the internal gears for sufficient grease), it is recommended to check to ensure that all the bearings and cam followers are rotating smoothly by hand. Those that are seized or rotating rough should be replaced.

12.0 STORAGE

After each job the Tong should be properly cleaned with a petroleum based cleaning agent and the unit should be stored in a dry environment.

For long term storage the unit should be drained of all fluids and stored in a clean and dry environment. Before using, fully inspect all components of the unit and ensure to re-grease as per greasing guide.

13.0 TROUBLESHOOTING GUIDE

The following serve as a simple guide to some of the problems that may be encountered while using the Power Tong unit. If the problem persists, or is not listed here, please contact any authorized Universe Power Tong service centers.

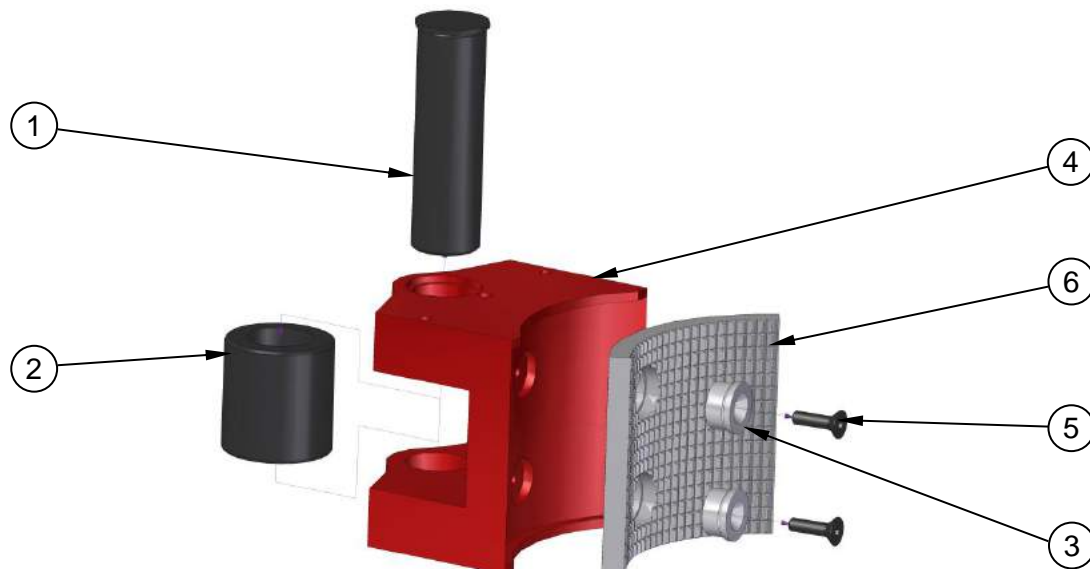
1. Jaws are slipping or not biting the tubular properly.
 - a) Check the pipe diameter and ensure proper sizes of jaws are being used.
 - b) Check to ensure that the jaw rollers are greased and not seized up.
 - c) Ensure that the jaw slot area is greased and the jaws freely slide in and out of the slot.
 - d) Check the jaws dies and replace them if they are worn out.
 - e) Ensure the brake bands are snug, and if necessary, tighten them. If the brake band friction material is worn out replace the brake bands.
 - f) If all of the above have been done and the jaws still slip, try to get an initial bite, then step up the torque incrementally until the desired torque is reached. This will cause the dies to dig into the tubular thus allowing higher torque.

2. The jaw locks onto the tubular after make up or breaking out a joint.
 - a) To unlock the Tong try to slightly jerk the ring gear in the opposite direction.
 - b) Check to ensure that both dies are of equal size (thickness).
 - c) Check to ensure that the jaw rollers are greased and not seized up.
 - d) Ensure that the jaw slot area is greased and the jaws freely slide in and out of the slot.
 - e) Ensure the brake bands are snug, and if necessary, tighten them. If the brake band friction material is worn out replace the brake bands.
 - f) Loosen the brake bands and try to rotate the cage plates by hand. If they do not move freely, or are hard to move, take them apart and check all rollers. Replace any rollers that are broken. Also check all sliding or rolling surfaces. If any burrs are found file them off.

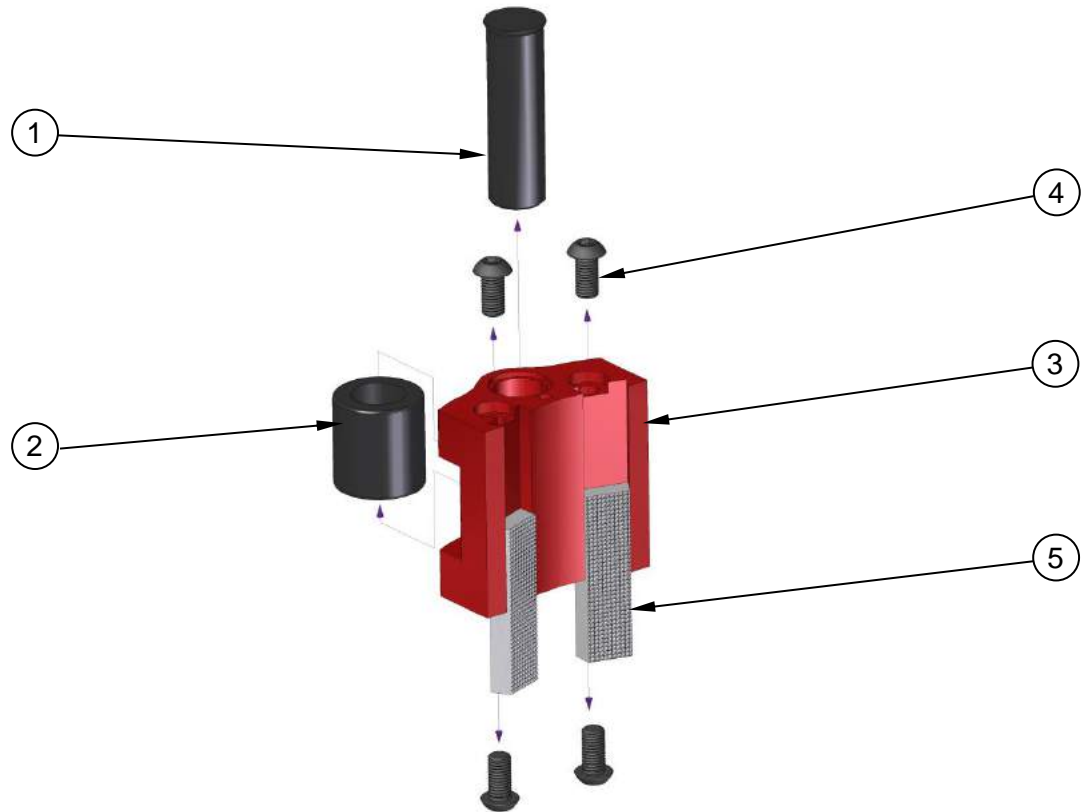
3. The motor runs in reverse or the bottom motor oil seal keeps blowing out.
 - a) Check to ensure that the pressure line is connected to the "PRESSURE IN" port on the Tong, and return line is connected to the "PRESSURE OUT" port on the Tong. Refer to the Tong Hydraulic Unit Assembly for port identification.

14.0 PART LISTS
14.11 JAW SETS

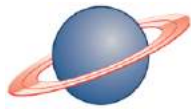
ITEM	QTY	DESCRIPTION	PART #
WRAPAROUND DIE JAW SETS:			
1	1	5-1/2" WRAPAROUND DIE JAW SET (5 - 5.5 IS STAMPED ON THE JAW BLOCK) (JAW RANGE: 4-1/4" to 5-1/2")	707 05405
	2	CONSISTS OF: - 5 - 5.5 WRAPAROUND DIE JAW ASSEMBLY	
2	1	4-1/8" WRAPAROUND DIE JAW SET (5 - 4.13 IS STAMPED ON THE JAW BLOCK) (JAW RANGE: 2-1/16" to 4-1/8")	707 05410
	2	CONSISTS OF: - 5 - 4.13 WRAPAROUND DIE JAW ASSEMBLY	
OPTIONAL INSERT DIE (DP) JAW SETS:			
3	1	5-1/2" INSERT DIE (DP) JAW SET (5 - 5.5DP IS STAMPED ON THE JAW BLOCK) (JAW RANGE: 4-3/8" to 5-1/2")	707 05415
	2	CONSISTS OF: - 5 - 5.5DP INSERT DIE JAW ASSEMBLY	
4	1	4" INSERT DIE (DP) JAW SET (5 - 4.0DP IS STAMPED ON THE JAW BLOCK) (JAW RANGE: 2-7/8" to 4")	707 05425
	2	CONSISTS OF: - 5 - 4.0DP INSERT DIE JAW ASSEMBLY	

14.12 WRAPAROUND DIE JAW ASSEMBLY


ITEM	QTY	DESCRIPTION	PART #
1	1	JAW PIN	707 05001
2	1	JAW ROLLER	707 05002
3	2	DIE HOLDER – FOR 707 05005 JAW BLOCK – FOR 707 05010 JAW BLOCK	707 05106 707 05110
4	1	JAW BLOCK – 5 - 5.5 (AS STAMPED ON JAW BLOCK) (JAW RANGE: 4-1/4" to 5-1/2") – 5 - 4.13 (AS STAMPED ON JAW BLOCK) (JAW RANGE: 2-1/16" to 4-1/8")	707 05005 707 05010
5	2	SOCKET FLAT CAP SCREW – 1/4" UNC X 1" (FOR 707 05005 JAW BLOCK) – 1/4" UNC X 3/4" (FOR 707 05010 JAW BLOCK)	N23 04083 N23 04063
6	1	WRAPAROUND DIE	SEE DIE SELECTION CHART

14.13 OPTIONAL INSERT DIE (DP) JAW ASSEMBLY


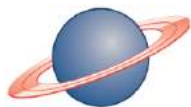
ITEM	QTY	DESCRIPTION	PART #
1	1	JAW PIN	707 05001
2	1	JAW ROLLER	707 05002
3	1	JAW BLOCK – 5 - 5.5DP (AS STAMPED ON JAW BLOCK) (JAW RANGE: 4-3/8" to 5-1/2") – 5 - 4.0DP (AS STAMPED ON JAW BLOCK) (JAW RANGE: 2-7/8" to 4")	707 05015 707 05025
4	4	SOCKET BUTTON CAP SCREW – 1/2" UNC X 1"	N47 08083
5	2	INSERT DIE	SEE DIE SELECTION CHART



14.2 DIE SELECTION CHART

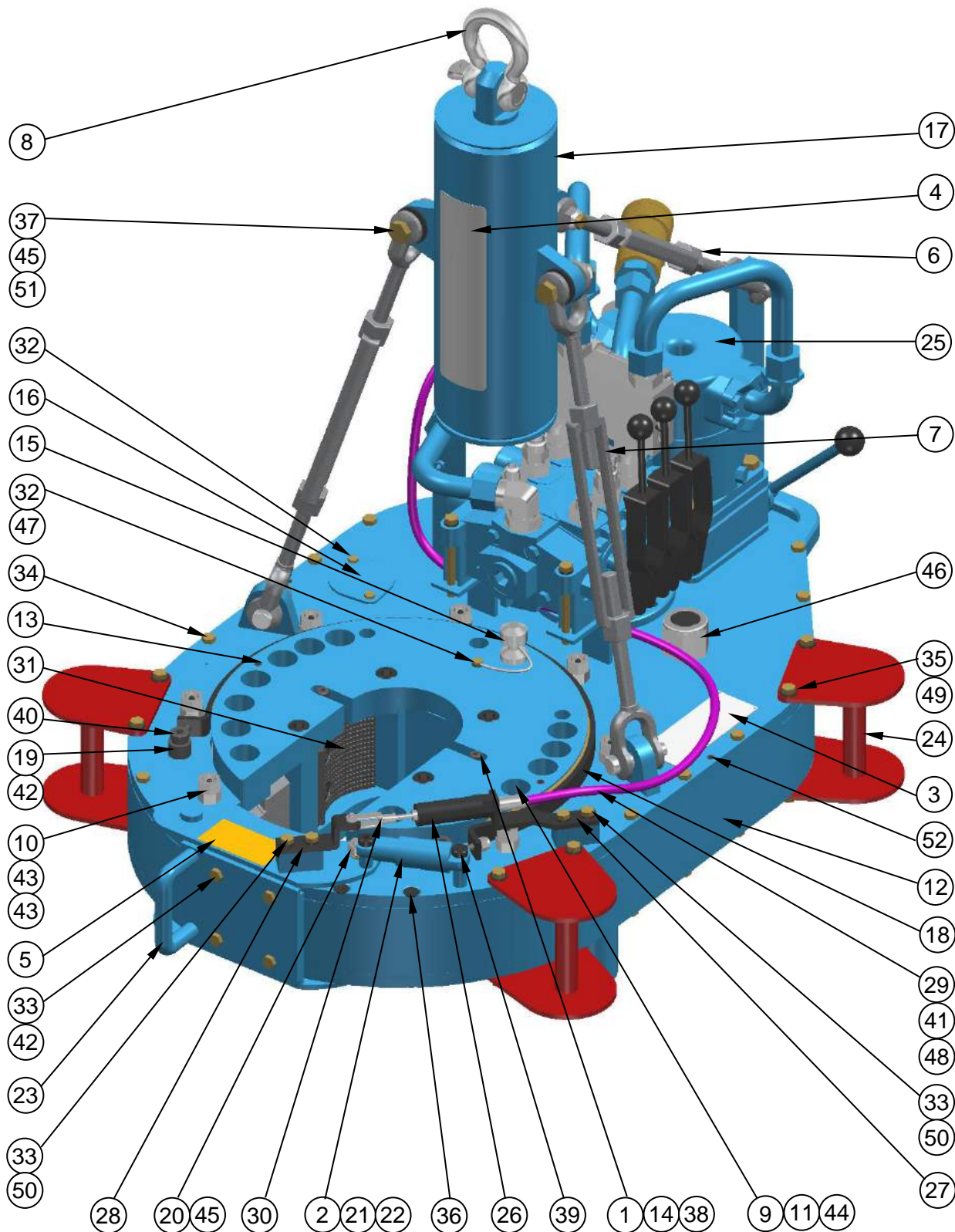
WRAPAROUND DIE SELECTION CHART		
JAW SIZE (As stamped on jaw block)	DIE SIZES (BITING DIAMETER) Inches (mm)	DIE PART NUMBER
5 - 5.50	5.50 (139.7)	707 05255-55
	5.25 (133.3)	707 05255-52
	5.00 (127.0)	707 05255-50
	4.75 (120.7)	707 05255-47
	4.63 (117.6)	707 05255-46
	4.50 (114.3)	707 05255-45
	4.25 (108.0)	707 05255-42
5 - 4.13	4.13 (104.9)	707 05260-31
	4.03 (102.4)	707 05260-17
	3.88 (98.4)	707 05260-27
	3.75 (95.3)	707 05260-21
	3.67 (93.2)	707 05260-20
	3.63 (92.1)	707 05260-24
	3.50 (88.9)	707 05260-04
	3.38 (85.7)	707 05260-14
	3.25 (82.6)	707 05260-13
	3.13 (79.4)	707 05260-11
	3.06 (77.7)	707 05260-18
	3.00 (76.2)	707 05260-07
	2.88 (73.2)	707 05260-03
	2.38 (60.5)	707 05260-02
	2.06 (52.4)	707 05260-01

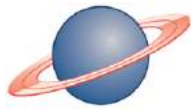
INSERT DIE SELECTION CHART (FOR OPTIONAL INSERT DIE (DP) JAWS)			
BITING DIAMETER (± 0.06 INCHES (1.5mm))		3.88 X 1.25 X DIE (98.6mm x 31.8mm) THICKNESS	DIE PART NUMBER
5 - 5.5DP (As stamped on jaw block) JAW SIZE	5 - 4.0DP (As stamped on jaw block) JAW SIZE		
5.50 (139.7)	4.00 (101.6)	0.50 (12.7)	707 08250-01
5.38 (136.5)	3.88 (98.6)	0.56 (14.3)	707 08250-22
5.25 (133.4)	3.75 (95.3)	0.63 (15.9)	707 08250-32
5.13 (130.3)	3.63 (92.2)	0.69 (17.5)	707 08250-42
5.00 (127.0)	3.50 (88.9)	0.75 (19.1)	707 08250-51
4.88 (124.0)	3.38 (85.9)	0.81 (20.6)	707 08250-61
4.75 (120.7)	3.25 (82.6)	0.88 (22.2)	707 08250-71
4.63 (117.6)	3.13 (79.5)	0.94 (23.8)	707 08250-81
4.50 (114.3)	3.00 (76.2)	1.00 (25.4)	707 08250-91
4.38 (111.1)	2.88 (73.2)	1.06 (26.9)	707 08250-90



14.3 PARTS BREAKDOWN DRAWINGS

14.31 5-1/2 TONG ASSEMBLY:

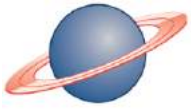




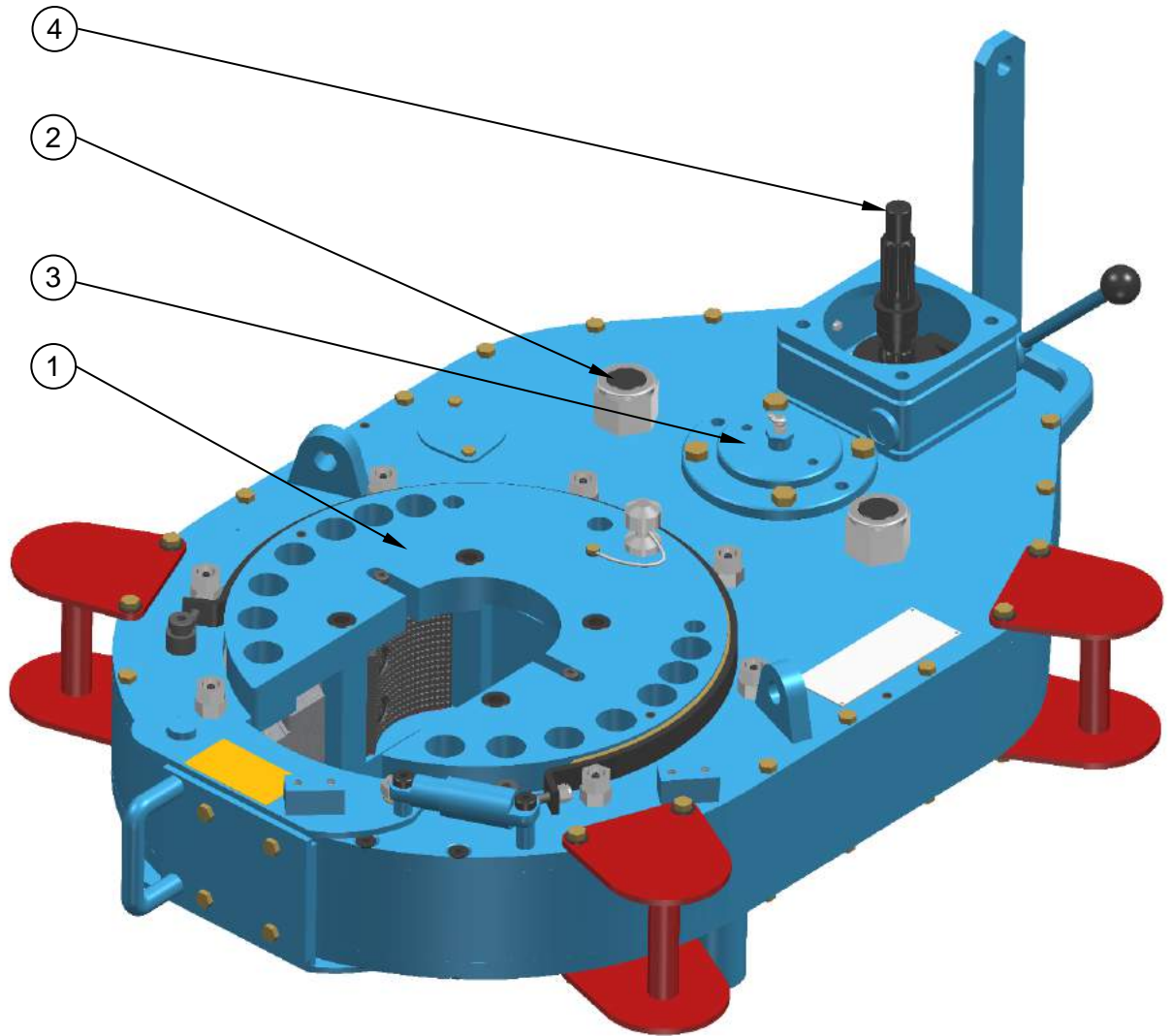
ITEM	QTY	DESCRIPTION	PART #
1	2	SPRING	015 53001
2	1	SPRING	015 81701
3	1	PLATE - UNIVERSE ID	049 00523
4	1	DECAL - UNIVERSE	049 00524
5	1	LABEL - TONG DOOR WARNING	049 00527
6	1	TURNBUCKLE - 3/4" X 6" JAW X JAW	067 12065
7	2	TURNBUCKLE - 3/4" X 9" JAW X JAW	067 12095
8	1	ANCHOR SHACKLE - 3/4"	068 12013
9	28	CAM FOLLOWER	085 11633
10	16	FLANGED BEARING UNIT	085F01452-3
11	28	GREASE NIPPLE - 3/16" PRESS FIT	094 00201
12	1	BODY UNIT	701F05001
13	2	SPRING HOLDING PIN	702 05012
14	2	SPRING BUSHING	702 05013
15	1	BACKING PIN	702 13001
16	1	COVER PLATE	703 05100
17	1	SPRING HANGER ASSEMBLY	703F00001
18	2	BRAKE BAND UNIT	703F05001
19	4	EYE BOLT UNIT	703F13010
20	2	DOOR BUSHING	705 05032
21	1	DOOR CYLINDER	705 13033
22	1	DOOR PISTON	705 13034
23	1	DOOR UNIT	705F05001
24	3	HANDLE ASSEMBLY	705F05050
25	1	TONG HYDRAULIC UNIT	SECTION 14.37
26	1	CABLE TUBE	707 00210
27	1	CABLE BULKHEAD	707 00215
28	1	DOOR BLOCK BRACKET	707 00230
29	1	CABLE ASSEMBLY	707 00240-1
30	1	CLEVIS - 1/4"	707 00245
31	1	JAW SET	SECTION 14.11
32	3	HEX BOLT - 1/4" UNC X 1/2"	N20 04043
33	8	HEX BOLT - 3/8" UNC X 1"	N20 06083
34	30	HEX BOLT - 3/8" UNC X 1-1/4"	N20 06103
35	12	HEX BOLT - 3/8" UNC X 1-1/2"	N20 06123
36	6	SOC. FLAT CAP SCREW - 3/8" UNC X 1-1/4"	N23 06103
37	3	HEX BOLT - 5/8" UNF X 3"	N30 10243
38	2	SHOULDER BOLT - 3/8" DIA. X 1-1/4"	N40 06103
39	2	SHOULDER BOLT - 1/2 DIA. X 1/2"	N40 08043
40	4	SHOULDER BOLT - 5/8" DIA. X 1"	N40 10083
41	1	NUT - 1/4" UNF	N66 04042

ITEM	QTY	DESCRIPTION	PART #
42	8	LOCKNUT - 3/8" UNC	N66 06522
43	28	NUT - 5/8" UNF	N66 10042
44	28	LOCKNUT - THIN - 5/8" UNF	N66 10552
45	5	LOCKNUT - CRIMPED - 5/8" UNF	N66 10582
46	4	LOCKNUT - 1-3/8" UNF	N66 22562
47	1	WASHER - 1/4" ID TYPE B	N67 04012
48	1	LOCKWASHER - 1/4" ID	N67 04022
49	12	WASHER - 3/8" ID TYPE B	N67 06012
50	4	LOCKWASHER - 3/8" ID	N67 06022
51	3	WASHER - 5/8" ID TYPE B	N67 10012
52	4	SPRING PIN - 3/8" DIA X 1-1/2"	N68 06122

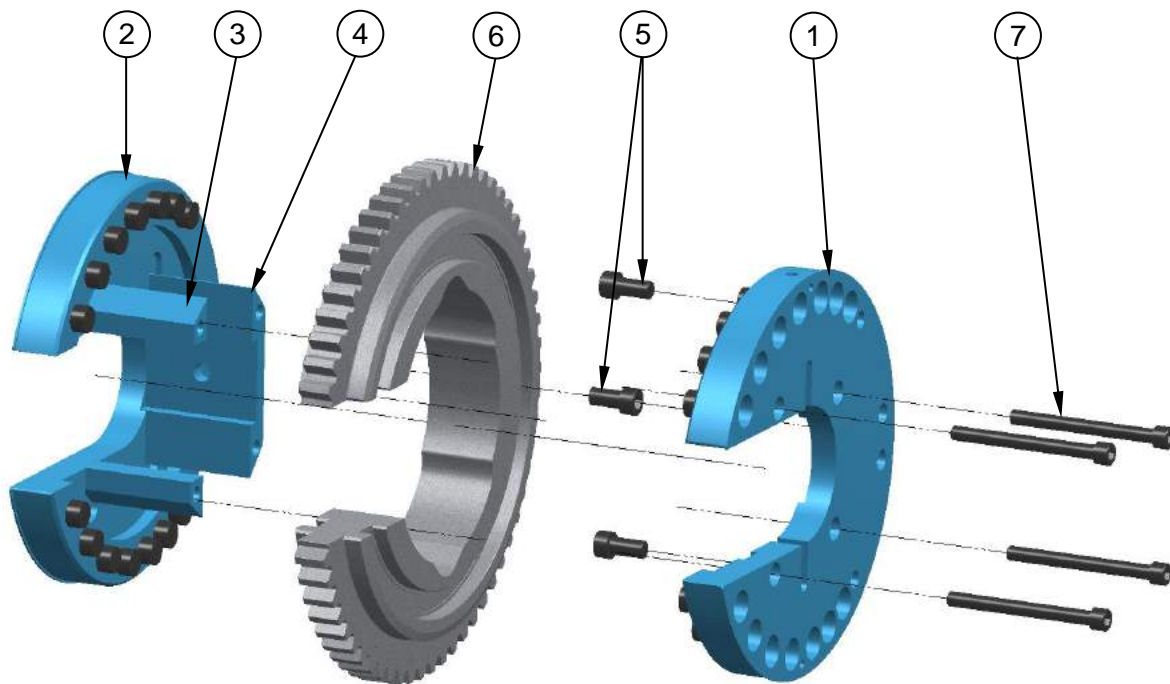
- NOTES:**
- 1) Unless otherwise stated, all hex bolts are grade 8 and plated.
 - 2) All nuts and washers are plated.



14.32 5-1/2 TONG ASSEMBLIES:

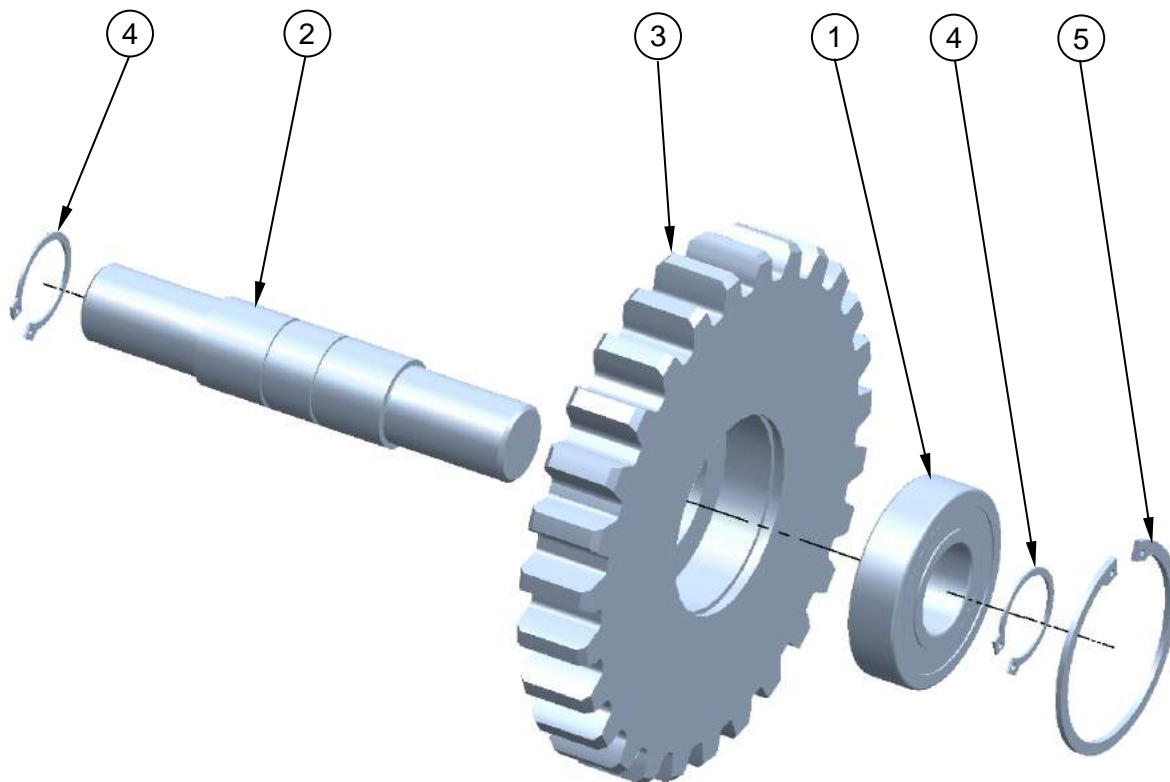


ITEM	QTY	DESCRIPTION	PART #
1	1	CAGE PLATE ASSEMBLY	SECTION 14.33
2	2	IDLER GEAR ASSEMBLY	SECTION 14.34
3	1	PINION GEAR ASSEMBLY	SECTION 14.35
4	1	SHIFT GEAR ASSEMBLY	SECTION 14.36

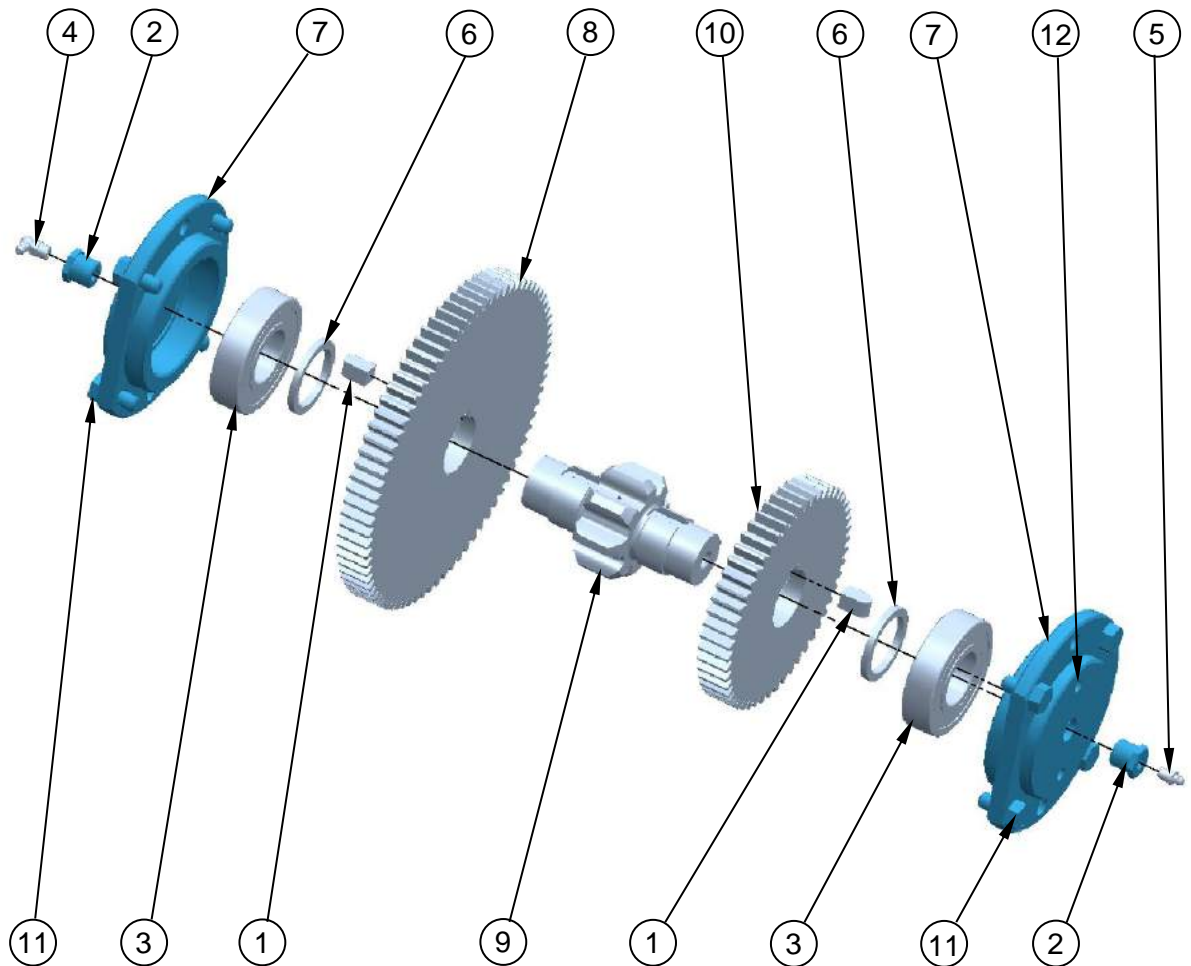
14.33 CAGE PLATE ASSEMBLY:


ITEM	QTY	DESCRIPTION	PART #
1	1	TOP CAGE PLATE	702 05007
2	1	BOTTOM CAGE PLATE	702 05008
3	2	FRONT CAGE PLATE BLOCK	702 05010
4	1	BACK CAGE PLATE BLOCK	702 05011
5	3	BACKING STOP BOLT	702 13010
6	1	RING GEAR	704 05006
7	4	SOCKET CAP SREW – 5/8" UNC x 6-1/2"	N45 10523

14.34 IDLER GEAR ASSEMBLY:

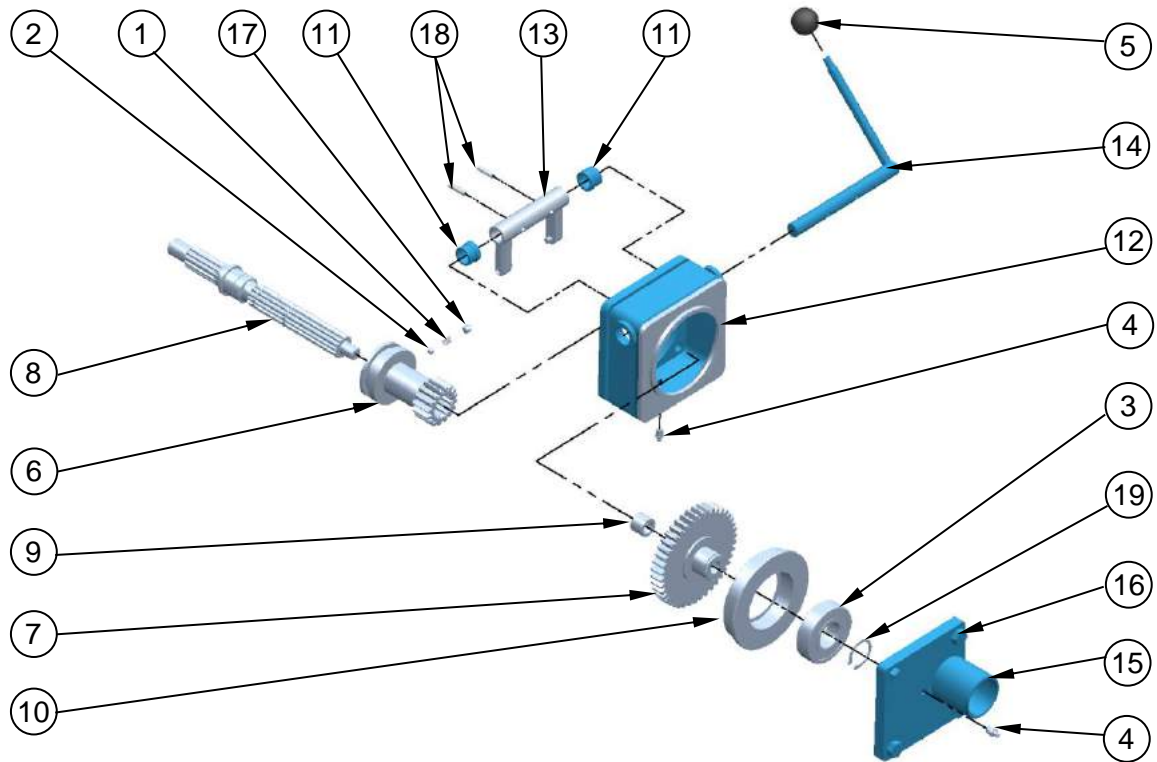


ITEM	QTY	DESCRIPTION	PART #
1	1	BEARING – 6308-2RS1	085 35091
2	1	IDLER SHAFT	702 05006
3	1	IDLER GEAR	704 05004
4	2	EXTERNAL SNAP RING – 5100-156	N69 25061
5	1	INTERNAL SNAP RING – N5000-354	N69 57112

14.35 PINION GEAR ASSEMBLY:


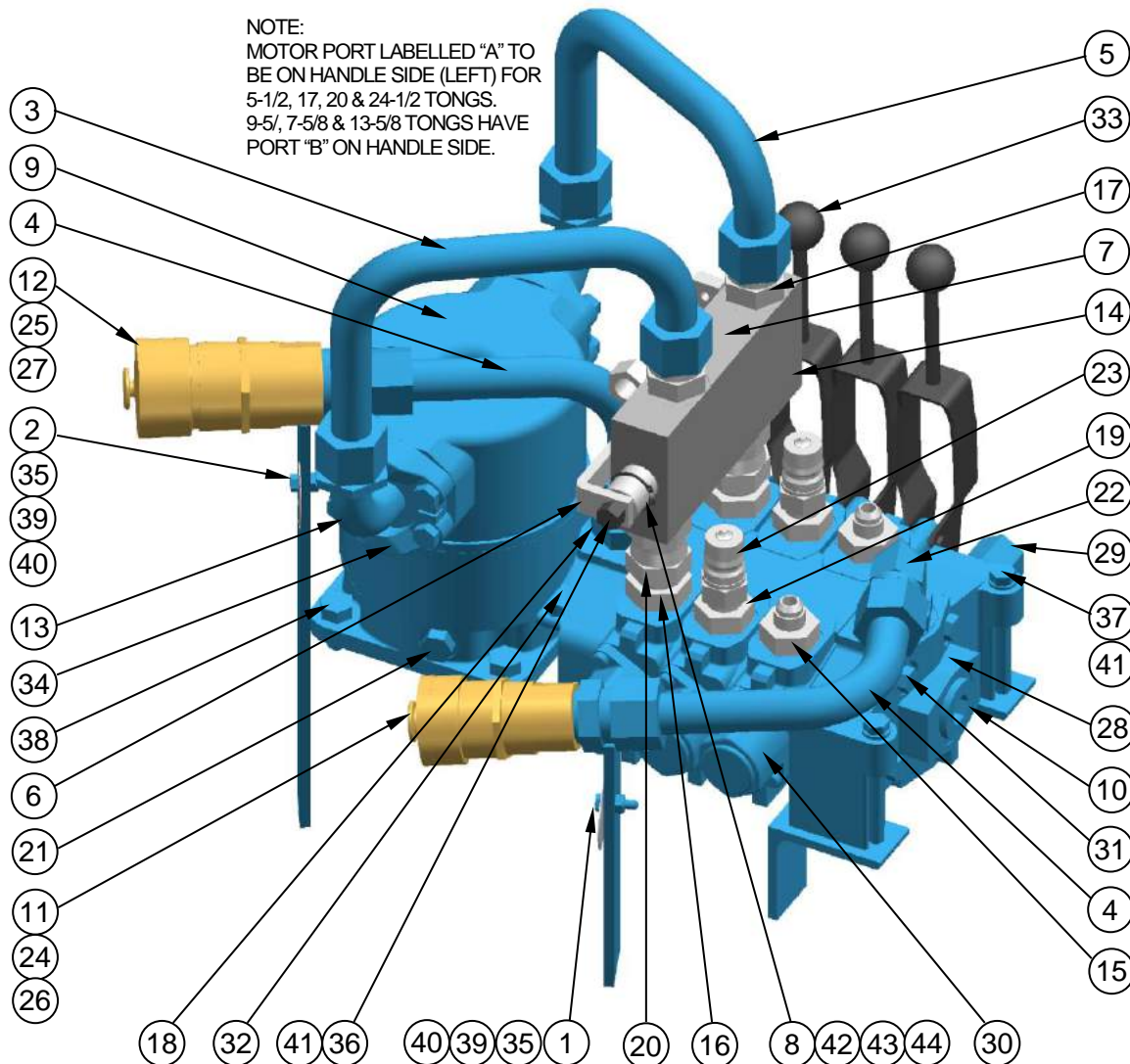
ITEM	QTY	DESCRIPTION	PART #
1	2	KEY	006 14001
2	2	REDUCER BUSHING – 08-02 BLACK	036 08001
3	2	BEARING – 6308-2RS1	085 35091
4	1	GREASE NIPPLE – 1/8" NPT X 90	094 00101
5	1	GREASE NIPPLE – 1/8" NPT	094 00102
6	2	PINION GEAR SPACER	702 05004
7	2	BEARING CAP	702 13003
8	1	TOP DRIVEN GEAR	704 05002
9	1	PINION GEAR	704 05003
10	1	BOTTOM DRIVEN GEAR	704 05008
11	8	HEX BOLT – 1/2" UNC X 1"	N20 08083
12	4	SET SCREW – 3/8" UNC X 1/2"	N53 06080

NOTES: 1) Unless otherwise stated, all hex bolts are grade 8 and plated.

14.36 SHIFTING GEAR ASSEMBLY:


ITEM	QTY	DESCRIPTION	PART #
1	1	SPRING	015 20501
2	1	BALL – 0.31" DIA.	030 31001
3	1	BEARING – 6307-2RS1	085 31081
4	2	GREASE NIPPLE – 1/8" NPT	094 00102
5	1	HANDLE	702 00001
6	1	SHIFT MOTOR GEAR	704 05001
7	1	BOTTOM MOTOR GEAR	704 05007
8	1	MOTOR SHAFT	704 05009
9	1	GEAR BUSHING	704 05012
10	1	SPACER BEARING HOUSING	706 05130
11	1	SHIFT SLEEVE	706 05132
12	1	ADAPTOR BOX	706F05100
13	1	SHIFT FORK ASSEMBLY	706F05110
14	1	SHIFT HANDLE ASSEMBLY	706F05120
15	1	BOTTOM BEARING CAP ASSEMBLY	706F05135
16	4	HEX BOLT – 1/2" UNC X 1"	N20 08083
17	1	SET SCREW – 3/8" UNC X 3/8"	N53 06060
18	2	SPRING PIN – 1/4" DIA. X 1"	N68 04082
19	1	EXTERNAL SNAP RING - 5100-137	N69 22051

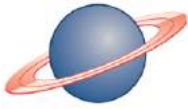
NOTES: 1) Unless otherwise stated, all hex bolts are grade 8 and plated.

14.37 HYDRAULIC UNIT:


ITEM	QTY	DESCRIPTION	PART
1	1	TAG - PRESSURE IN	049 00525
2	1	TAG - PRESSURE OUT	049 00526
3	1	TUBING - 16 JICF X 16 JICF MTR	706F00002
4	2	TUBING - 16 JICF X 16 JICF LIN	706F00004
5	1	TUBING - 16 JICF X 16 JICF MTR	706F00006
6	1	SLIDING VALVE BAR	707F00250
7	1	VALVE BODY	707S00205-C1
8	1	VALVE SPOOL	707S00206-C1
9	1	HYDRAULIC MOTOR - 15 CU	H015-61-015-30
10	2	PLUG - HEX SOCKET 16 ORB	H6409-16
11	1	FITTING - 16 JICM X 16 NPTM	H2404-16-16
12	1	FITTING - 16 JICM X 20 NPTM	H2404-16-20
13	2	TUBING - 16 JICM X 20 FLANGE X 90	H20FL-16MJ

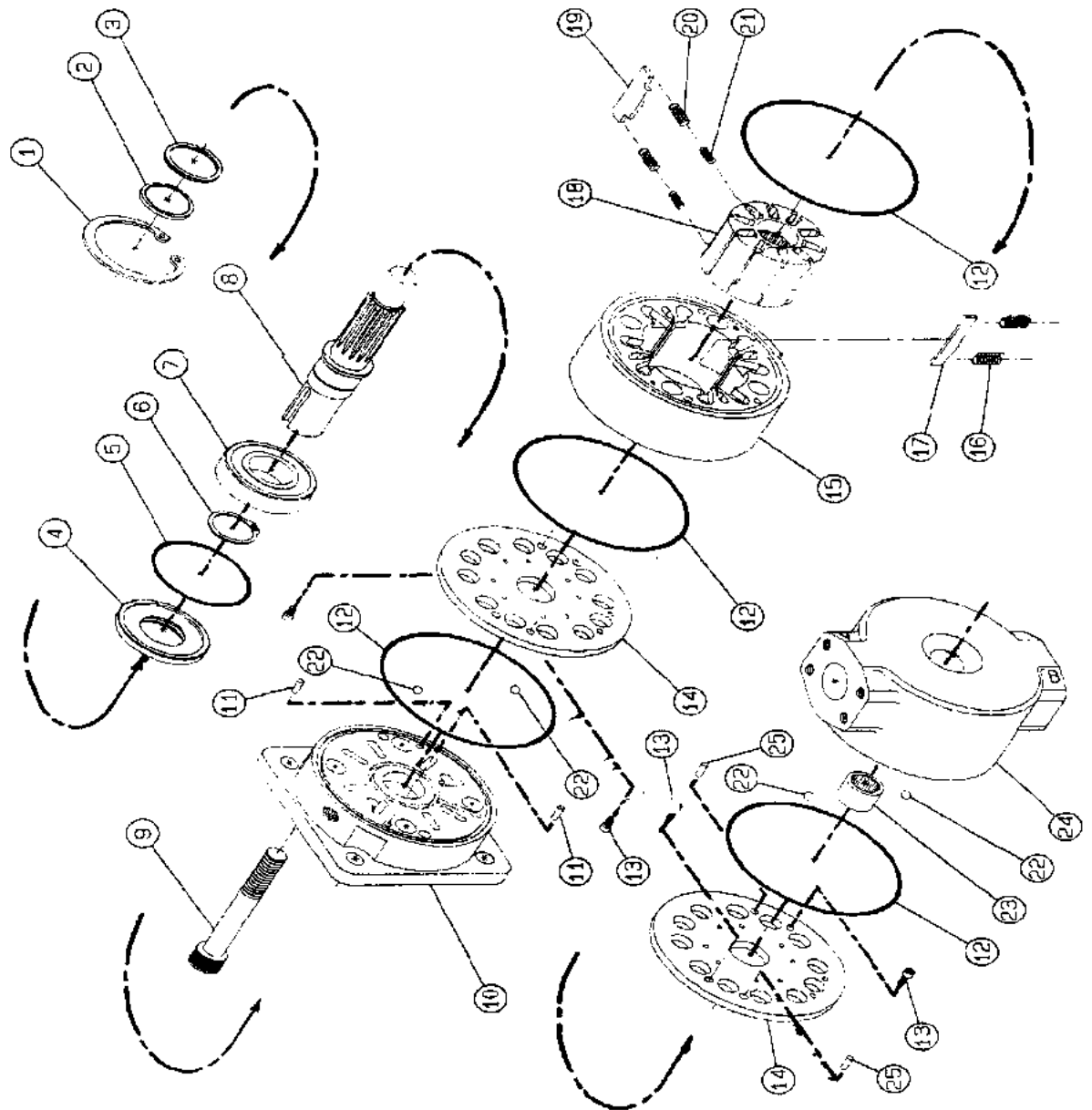
ITEM	QTY	DESCRIPTION	PART
14	4	HOLLOW HEX PIPE PLUG - 1/8" NPT	H5406-HP-02
15	2	FITTING – 8 JIFM X 12 ORBM (USED FOR BACKUP CONNECTION)	H6400-8-12
16	2	FITTING – 12 JICM X 12 ORBM	H6400-12-12
17	2	FITTING - 16 JICM X 12 ORBM	H6400-16-12
18	1	FITTING - 16 JICM X 16 ORBM	H6400-16-16
19	2	FITTING – 12 ORB X 8 NPT (USED FOR LIFT CYLINDER CONNECTION)	H6401-12-8
20	2	FITTING – 12 JICF X 12 ORBM	H6402-12-12
21	1	PLUG - 6 ORBM	H6408-6
22	1	FITTING - 16 JICM X 16 ORBM X 90	H6801-16-16
23	2	Q-COUPLER – 8 STD MALE (USED FOR LIFT CYLINDER CONNECTION)	H72-N-8F
24	1	DUST COVER - 1 IN. MALE	H78-DC-16
25	1	DUST COVER - 1-1/4" MALE	H78-DC-20
26	1	Q-COUPLER - 1" MALE WING	HB78N16-16F
27	1	Q-COUPLER - 1-1/4" MALE WING	HB78N20-20F
28	1	VALVE - SAE INLET	HDVA20-A880
29	1	VALVE - RELIEF - DVG20 MAIN	HDVG20-HMRV
30	1	VALVE – WORK SECTION (SINGLE BANK)	HDVA20-DA7
	2	VALVE – WORK SECTION (DOUBLE BANK)	
	3	VALVE – WORK SECTION (TRIPLE BANK)	
31	1	VALVE - STUD KIT (FOR SINGLE BANK)	HDVA20-SK-1
		VALVE - STUD KIT (FOR DOUBLE BANK)	HDVA20-SK-2
		VALVE - STUD KIT (FOR TRIPPLE BANK)	HDVA20-SK-3
32	1	VALVE - SAE OUTLET	HDVA20-TR88
33	1	VALVE - HANDLE KIT (SINGLE BANK)	HDVA20-H-8
	2	VALVE - HANDLE KIT (DOUBLE BANK)	
	3	VALVE - HANDLE KIT (TRIPLE BANK)	
34	2	FLANGE - 20 SAE	HFK20PA
35	2	HEX BOLT - 1/4" UNC X 3/4"	N20 04063
36	1	HEX BOLT – 3/8" UNC X 1"	N20 06083
37	2	HEX BOLT - 3/8" UNC X 4"	N20 06323
38	4	HEX BOLT – 1/2" UNC X 1"	N66 08083
39	2	NUT - 0.25 UNC	N66 04032
40	2	LOCKWASHER - 1/4" ID	N67 04022
41	3	LOCKWASHER - 3/8" ID	N67 06022
42	2	EXTERNAL SNAP RING – 5100-100	N69 16041
43	2	O-RING - #214 – NITRILE DURO 70	N90 21417
44	2	BACKUP RING – BUN #214	N92 21417

NOTES: 1) Unless otherwise stated, all hex bolts are grade 8 and plated.
2) All nuts and washers are plated.



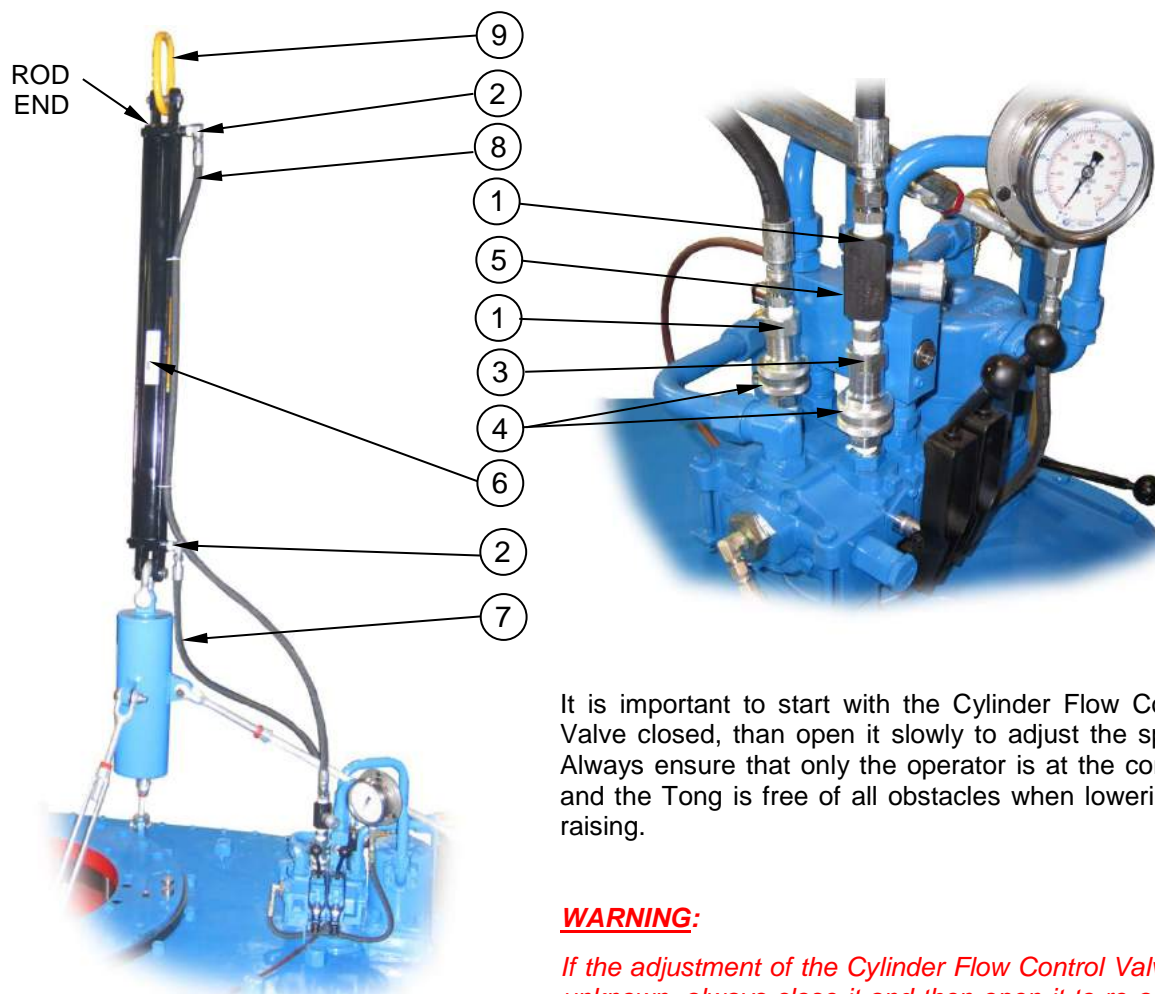
14.38 MOTOR ASSEMBLY (H015-61-015-30)

Item	Part No.	Description	Qty
1	0159111	Seal Ring - Seal Ring	1
2	0159112	Seal Ring - Seal Ring	1
3	0159113	Seal Ring - Seal Ring	1
4	0159114	Seal Ring - Seal Ring	1
5	0159114	Seal Ring - Seal Ring	1
6	0159230	Bearing - Seal Ring	1
7	0159210	Ball Bearing	1
8	0159201	Key - Seal Ring	1
9	0159202	Seal Ring - Seal Ring	1
10	0159801	Ball	4
11	0159802	Front Housing - Internal	1
12	0159428	Front Ring - Front	2
13	0159810	O - Ring	6
14	0159804	Flare Nut	4
15	0159400	Stator - CA 11.5	1
	0159401	Stator - CA 15	1
	0159402	Stator - CA 13	1
	0159403	Stator - CA 9.5	1
	0159404	Stator - CA 6.0	1
	0159406	Stator - CA 7.0	1
	0159407	Stator - CA 8	1
	0159409	Stator - CA 3.0	1
16	0159420	Stator - Seal Spring	8
17	0159410	Stator - Seal	4
18	0159000	Rotor	1
19	0159311	Rotor - Seal	10
20	0159320	Rotor - Seal Spring	20
21	0159321	Rotor - Seal Spring	20
22	0159802	Ball - Seal	4
23	0159220	Ball - Seal	1
24	0159800	Ball - Seal	1
25	0159429	Power - Seal	2



15.0 APPENDIX A – OPTIONAL ASSESSORIES

ITEM	QTY	DESCRIPTION	PART #
1	1	5-1/2 TONG LINE PRESSURE TORQUE GAUGE KIT	706 01007-05
2	1	5-1/2 TONG TENSION LOAD CELL & GAUGE	706 01000-05
3	1	HYDRAULIC LIFT CYLINDER KIT - 36"	706K00037
4	1	HYDRAULIC LIFT CYLINDER KIT - 66"	706K00036
5	1	DUMP VALVE KIT	706 00350

15.1 APPENDIX A – HYDRAULIC LIFT CYLINDER


It is important to start with the Cylinder Flow Control Valve closed, then open it slowly to adjust the speed. Always ensure that only the operator is at the controls and the Tong is free of all obstacles when lowering or raising.

WARNING:

If the adjustment of the Cylinder Flow Control Valve is unknown, always close it and then open it to re-adjust the speed to avoid any sudden movements.

ITEM	QTY	DESCRIPTION	PART
1	2	FITTING – 8 JICM X 8 NPTM	H2404-8-8
2	2	FITTING – 8 JICM X 8 NPTM X 90	H2501-8-8
3	1	FITTING – 8 NPTM X 8 NPTM	H5404-8-8
4	2	Q-COUPLER – 8 STD FEMALE	H72-C-8F
5	1	CYLINDER FLOW CONTROL VALVE – 8 NPTF NEEDLE VALVE	HN800S
6	1	CYLINDER – 36” STROKE CYLINDER – 66” STROKE	HR6-30A-36 HR6-20A-66
7	1	HOSE – 8 JICF X 8 JICF X 36	039 11082-036
8	1	HOSE – 8 JICF X 8 JICF X 72 (36” STROKE) HOSE – 8 JICF X 8 JICF X 100 (66” STROKE)	039 11082-072 039 11082-100
9	1	MASTER LINK – 3/4” DIA – GRADE 8	066 12083