MORSE

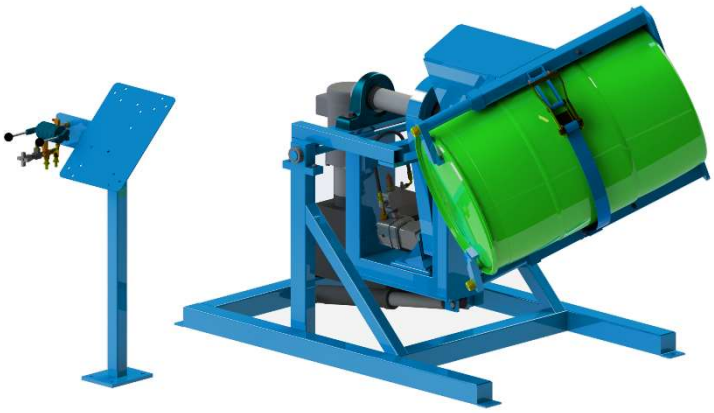
morsedrum.com

310 Series

Tilt-To-Load Drum Tumbler

Serial Number 419982 to _____

CONTENTS



Receiving Procedures

Every Morse drum handler is inspected prior to shipping. However, damage may be incurred during transit.

- Check for visible damage. If you choose to accept damaged freight, always sign noting the damage on the **BILL OF LADING**.
- Document the damage and have the truck driver sign. We recommend keeping a digital camera at your receiving dock for this purpose.
- Open packages expeditiously to check the condition of the goods. There is only a 24 hour window to notify the carrier of any concealed damage.
- **IMMEDIATELY REPORT ALL DAMAGE TO THE SHIPPING COMPANY!** Then you may contact Morse for assistance with your freight claim.
- Morse Manufacturing will not be held responsible for any damaged freight that is not signed for as damaged.

Delivery to non-business addresses without a loading dock result in additional freight charges. Residential delivery fees, inside delivery fees, re-delivery charges, and lift gate services will be added by the truck line, and are non-negotiable.

Limited 2 Year Warranty

Morse drum handling equipment is guaranteed against defects in workmanship or materials for **TWO YEARS** when used properly within its rated capacity. Warranty does not cover wear from normal use or damage from accident or abuse. Motors and other purchased parts carry the warranties of their manufacturers.

For warranty claims, contact your Morse Dealer to obtain a return authorization number, and for return freight advice. Return freight must be prepaid.

In all instances, liability is limited to the purchase price paid or to repairing or replacing the product. Customer assumes liability for any modifications, unauthorized repairs or parts substitution.

Safety Information

While Morse Manufacturing Co. drum handling equipment is engineered for safety and efficiency, a high degree of responsibility must be placed upon the machine operator to follow safe practices, based primarily on common sense, upon which true safety depends.

Failure to follow the safety precautions in this manual can result in personal injury or property damage. Observe the same precautions as with similar machinery where carelessness in operating or maintenance is hazardous to personnel. Carefully read the safety precautions below and throughout this manual.

Review the Material Safety Data Sheet(s) for the material(s) in the drum(s) and take all necessary precautions. Safety shoes, work gloves, hard hat and other personal protective devices are recommended.

Prior to initial use, inspect all moving parts and test rotation of drum holder with a weighted drum. Do NOT raise drum holder without a load, as it may become stuck due to the tight seals in the cylinder. Inspect drum holder for proper operation. Perform necessary inspections, operator training, etc.

DANGER - Indicates a situation which, if not avoided, will result in serious injury or death. This signal word is limited to the most extreme situations.

WARNING - Indicates a situation which, if not avoided, could result in serious injury or death.

CAUTION - Indicates a situation which, if not avoided, can result in damage to the machine.

	**DANGER -** Watch Out for Pinch Points. Stay clear of moving parts. Do Not Stand Near any Part of a Rotating Drum or Drum Holder. Operator should remain directly in front of the control station while operating the rotator. Morse Drum Rotators should be installed in accordance with OSHA subpart O, 1910.212 - "General requirements for all machines." "Revolving drums, barrels, and containers shall be guarded by an enclosure which is interlocked with the drive mechanism, so that the barrel, drum, or container cannot revolve unless the guard enclosure is in place." A safety enclosure can be ordered separately for any MORSE drum rotator.
	WARNING – 310 Series Drum are designed to handle one drum of the types listed in Machine Description. DO NOT attempt to handle any other type of drum or object. DO NOT exceed the weight capacity.
	WARNING - Level Floors Only. For operation only on clean, level floors of suitable bearing capacity. Do not use on sloped surfaces, ramps, irregular or debris strewn floors.
	WARNING - Properly Mount to Floor. Do Not put into service without proper floor mounting and leveling. Use the four mounting holes in each corner of the base to anchor to floor.
	WARNING - Do Not Modify the Unit. Under no circumstances should any modifications be made to the Morse machinery without factory authorization. Any modifications may void the warranty. This machine was designed to perform a specific job and alterations may result in injury to operator or machine.
	WARNING - No Loose Fitting Clothing. Wear close-fitting clothing and safety equipment appropriate to the job. Loose fitting clothing may become caught on the machinery and cause severe personal injury.
	CAUTION - Wear safety shoes with non-slip soles and hard toe protection.
	CAUTION - DO NOT allow drum to impact on floor, ground, etc.
	WARNING - Hydraulic Fluid Under Pressure Can Be Hazardous. Escaping hydraulic fluid under pressure can penetrate the skin, causing serious injury. Avoid the hazard by relieving pressure before disconnecting hydraulic lines. Keep hands and body away from pinholes and nozzles which eject fluid under high pressure. Use a piece of cardboard to search for leaks. If an accident occurs, see a doctor immediately and inform them of the nature of the accident.
	WARNING - This product can expose you to chemicals including barium sulfate, cobalt, titanium dioxide, and 2-methylimidazole, which are known to the State of California to cause cancer, and bisphenol-A, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov

Machine Description

The Morse 310 Series Tilt-to-Load Drum Rotators are designed to receive an upright steel, plastic or fiber drum at floor level, hydraulically tilt up to clear the floor, and rotate the drum "corner-over-corner". The maximum full drum capacity is 800 Lb. (363 kg). Capacity is derated to 400 Lb. (181 kg) for a half-full drum. Half-full Capacity is an indication of the capacity for tilting a bottom-heavy drum. A partially full drum with an unbalanced and shifting load is harder to tilt than a full drum.

WARNING - DO NOT exceed these ratings. Exceeding these ratings or handling a drum other than those mentioned above is unsafe and could result in equipment damage, excessive wear, motor overload and shortened service life of transmission components.

Controls

There are two powered functions for the operator to control. Each function is controlled separately by levers mounted on the control station.

1. The "LIFT" function, for vertical positioning of the drum holder. The lever on the right side is the "LIFT" control valve. Raising the lever will tilt the drum to vertical. Lowering the lever will tilt the drum to horizontal.
2. The "ROTATE" function, or the rotation of the drum holder. The lever on the left side is the "ROTATE" control valve. Raising this lever causes the drum to rotate. Lowering the lever away from the operator will stop the drum from rotating. The drum rotation speed can be varied with the metering valve. Turn the valve clockwise to increase speed counterclockwise to decrease speed.

AC Control Packages (sold separately)

NON-Explosion Proof AC Control Box

NON-explosion proof AC Control Packages (sold separately) include control box with timer, start and stop buttons, emergency stop button and lockable main disconnect.

Explosion Proof AC Control Box

Explosion Proof AC Control Packages (sold separately) include control box with start and stop buttons.

AIR Controls Included with Model 310-A

Air Control Package (included with model 310-A) includes Filter, Regulator, Lubricator (FRL) and on / off valve. Drum Tumbler rotates drum at 14 RPM and allows you to vary RPM with air flow and pressure.

Drum Holder

The drum holder is the component on the Tilt-To-Load Drum Rotator that securely holds the drum for rotating. The drum holder features the web strap and ratchet mechanism for tightening the drum at the middle and two top clamps for holding the drum end-to-end.

Installation Instructions

- Hydraulic fluid: Tilt-To-Load Drum Tumblers are shipped filled with hydraulic fluid (Dexron 3 or equivalent).
  IMPORTANT: Replace the **RED** shipping plug from the hydraulic reservoir with the supplied **BLACK** breather, and install hydraulic levers BEFORE operation.

- The base has four holes spaced 36" (91.44 cm) wide x 59.5" (151.13 cm) long. Morse recommends the rotator be secured to the floor using 5/8" x 3" lag bolts.

- Install all Morse Rotators in accordance with OSHA requirements for enclosure and safety interlock, etc. Drum rotator must automatically turn off when enclosure door is opened.

Control Station - Making Connections

- For the air motor powered rotator, a filter, regulator, lubricator is mounted on the control station. A shutoff ball valve is installed on the inlet of the regulator. The air connection should be made at the inlet of this valve.

  Ensure that the supply air lines are of sufficient size to provide proper air volume. The air motor requires 60 scfm, and 50-60 psi of compressed air. The proper air pressure will depend on the weight of the drum. See Air Motor Technical Info online at: https://morsedrum.com/ops/PLAIR.pdf

- For AC motor powered rotator, the main power must be wired into the control box.

- Models ordered with non-explosion proof motor and appropriate Morse Control Package have the control box wired to the motor.

- Models ordered with explosion proof motor and appropriate Morse Explosion-Proof Control Package have no wiring from the nema 7/9 control box to the motor. Please consult an electrician to complete the wiring. **The motor should turn clockwise when viewed from the fan end.** Jog the motor to determine proper rotation. Motor fan must turn clockwise.

- To reverse rotation if necessary.
  - For 3 phase motors: interchange any two input leads.
  - For 1 phase motors: interchange wires 5 & 8 in junction box.

- **Prior to initial use,** inspect all moving parts and test rotation of drum holder with a weighted drum. Do NOT raise drum holder without a load, as it may become stuck due to the tight seals in the cylinder.

Morse Control Packages (sold separately) include appropriate Control Station for each model.

Install all Morse Rotators in accordance with local requirements for enclosure and safety interlock, etc. One way to accomplish this is with a Morse enclosure with safety interlock, so the rotator automatically turns off when enclosure door is opened. Power connections and motor controls must also comply with applicable local codes.

For OSHA compliance in the USA, see OSHA subpart O.1910.212(a)(4) “Barrels, containers, and drums. Revolving drums, barrels, and containers shall be guarded by an enclosure which is interlocked with the drive mechanism, so that the barrel, drum, or container cannot revolve unless the guard enclosure is in place.”

Guard Enclosure Kits with Safety Interlock Switch are sold separately.

Important

1. Review the Material Safety Data Sheet(s) for the material(s) in the drum(s) and take all necessary precautions. Safety shoes, work gloves, hard hat and other personal protective devices are recommended.

2. Please read all instructions thoroughly before attempting to operate your new Morse drum handler.

3. When loading, unloading, operating, or maintaining your MORSE drum handler, always use care and good judgment. Maintain secure footing and a firm hold. Keep hands and loose clothing away from all moving parts. Never allow anyone to be below any part of a raised drum handler or drum. Read operating instructions and review the pictures in the sales brochure before operation.

Operating Instructions

Loading a Drum

1. Lower drum holder by lowering the lever on the right so the bottom loading plate is slightly above the floor.

   Swing hinged ratchet plate clear of the drum opening.

   Loosen top clamps to full open position.

Lower drum holder to floor level

2. A variety of drum handling methods can be used to set the drum into the drum holder.

   Ensure that the drum is fully seated against the back of the drum holder.

Load with drum truck

Load with below-hook lifter

3. Drape web strap across the face of the drum, and thread through slot in ratchet. Operate ratchet to tighten strap around drum.

4. Turn top clamps until they tighten against top of drum using separate hand crank. Then remove hand crank BEFORE raising drum to rotate.

Secure drum with web strap and two top clamps

Rotating a Drum

1. After ensuring that the drum is securely fastened into drum holder, close the guard enclosure to engage interlock switch.

2. Turn the motor on to activate hydraulics.
   For air motor version, open air shutoff ball valve.

3. Raise drum to top position by raising the lever on the right.

   Note: There is an interlock switch built into the tilt frame which is intended to prevent rotating when drum holder is not properly positioned at it's highest lift point. The true safety of this operation, however, depends on the operator correctly positioning the drum holder, and verifying that the tilt frame is fully raised.

Raise drum holder

DANGER - It is critical that the drum holder assembly is fully raised BEFORE rotating. If the drum holder is not in the fully raised position when rotating, it can interfere with the floor and frame, causing severe damage to equipment and/or serious injury or death.

4. To begin rotating, raise the lever on the left.

5. The drum rotation speed (RPM) can be varied with the metering valve. Turn the valve clockwise to increase speed. Turn the vale counter-clockwise to decrease speed.

   Alternate method on air motor version: With air shutoff ball valve in OFF position, raise the lever on the left valve to rotate position. Then, slowly open air shutoff ball valve to begin drum rotation. This can allow for more control over speed of rotation.

Start drum rotation by raising lever on left

Adjust drum rotation speed (RPM)

Unloading a Drum

1. Ensure drum is in correct orientation to lower to vertical upright position for unloading.
2. Lower drum holder to floor level.
3. Squeeze ratchet release lever and open all the way to unlock. Then release the tension on the strap. Allow enough slack in strap in order to remove it from ratchet.
4. Loosen top clamps and swing clear of drum.
5. Remove drum with appropriate drum handling equipment.

Preventative Maintenance

Periodic inspection for the general condition of structural and mechanical components is imperative for safe and efficient operation.

Monthly

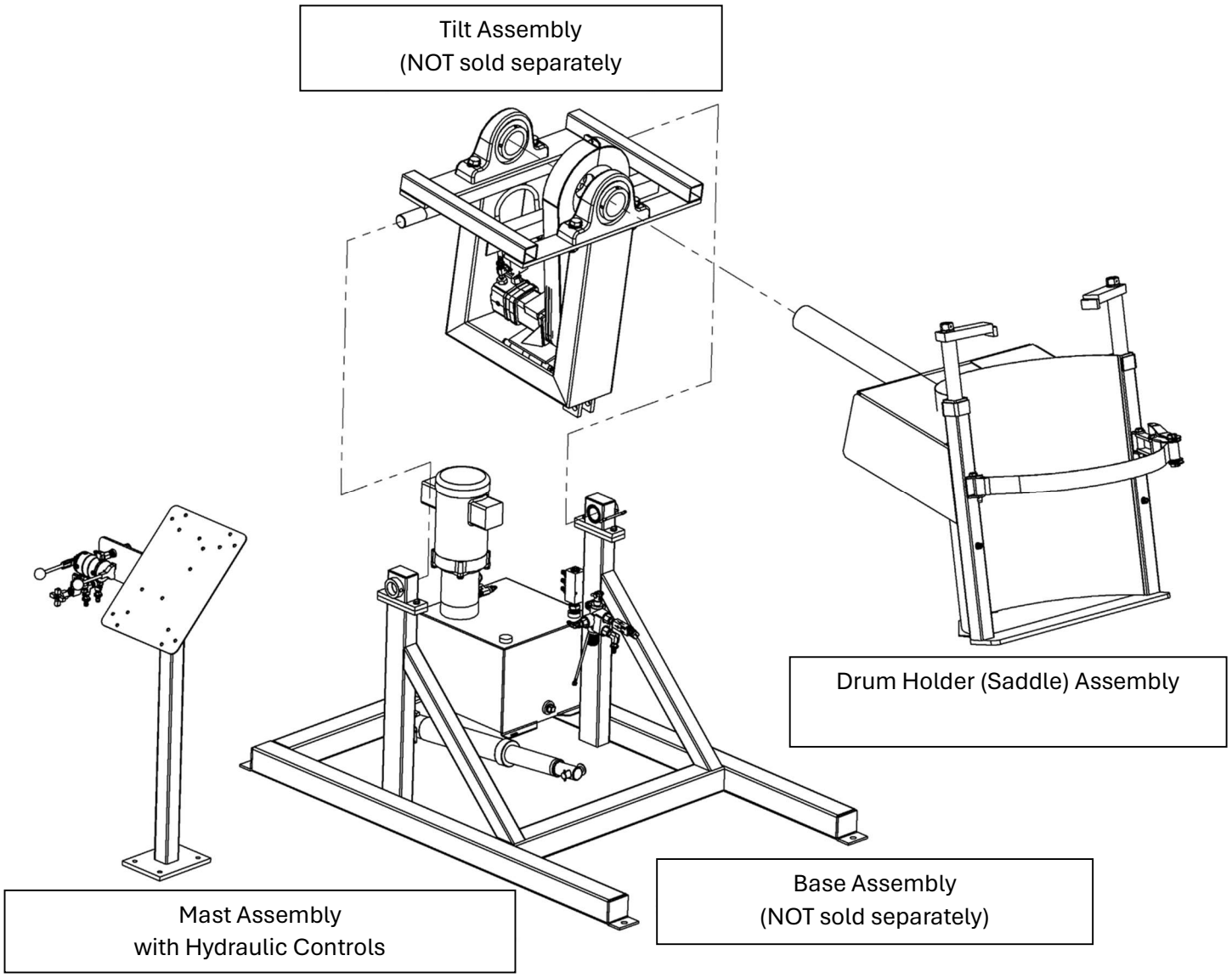
- Inspect the hydraulic system for oil drips, hose damage, or other signs of wear. Inspect the level and condition of the hydraulic fluid. Hydraulic fluid level should be within a ½" of the top of the reservoir when the cylinder is in the retracted position. Replace any parts that show signs of wear.
- Inspect all moving parts, framework, ratchet, web strap, fasteners and contact areas for signs of wear, fatigue, or loosening.
- The web strap should be removed from service and replaced if any of the following are visible:
    - Acid or caustic damage
    - Melting or charring of any part of the strap
    - Holes, tears, cuts, snags or embedded articles
    - Broken or worn stitching in load bearing splices
    - Excessive abrasive wear

Every 6 to 12 Months in Ordinary Environment (monthly in dirty conditions)

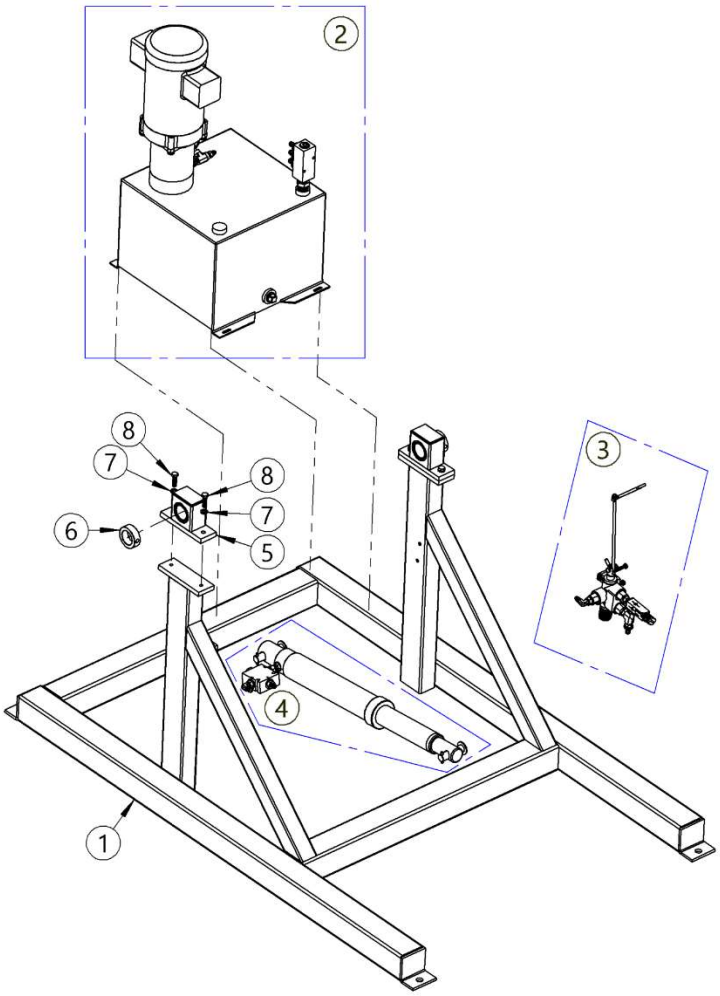
- Lubricate all moving parts.
- Pillow Block Bearings. See Bearing Lubrication Sheet for grease types and fill amounts at: https://morsedrum.com/ops/2654-P_bearing-grease.pdf
- Drive chain: Grease with multiservice lubricant such as Whitmore's Surtac® 2000 HD shown at: https://morsedrum.com/ops/MSDS_Surtac_2000.pdf
- Clamp Screws: Grease every 6-12 months with multiservice lubricant e.g. Whitmore's Surtac® 2000 HD shown at: https://morsedrum.com/ops/MSDS_Surtac_2000.pdf

Yearly

- Hydraulic Pump: Change oil with 6 gallons of ATF Dexron III or equivalent. For more oil information, see maintenance information on Hydraulic Pump Sheet at: https://morsedrum.com/ops/PLM404-310-P.PDF

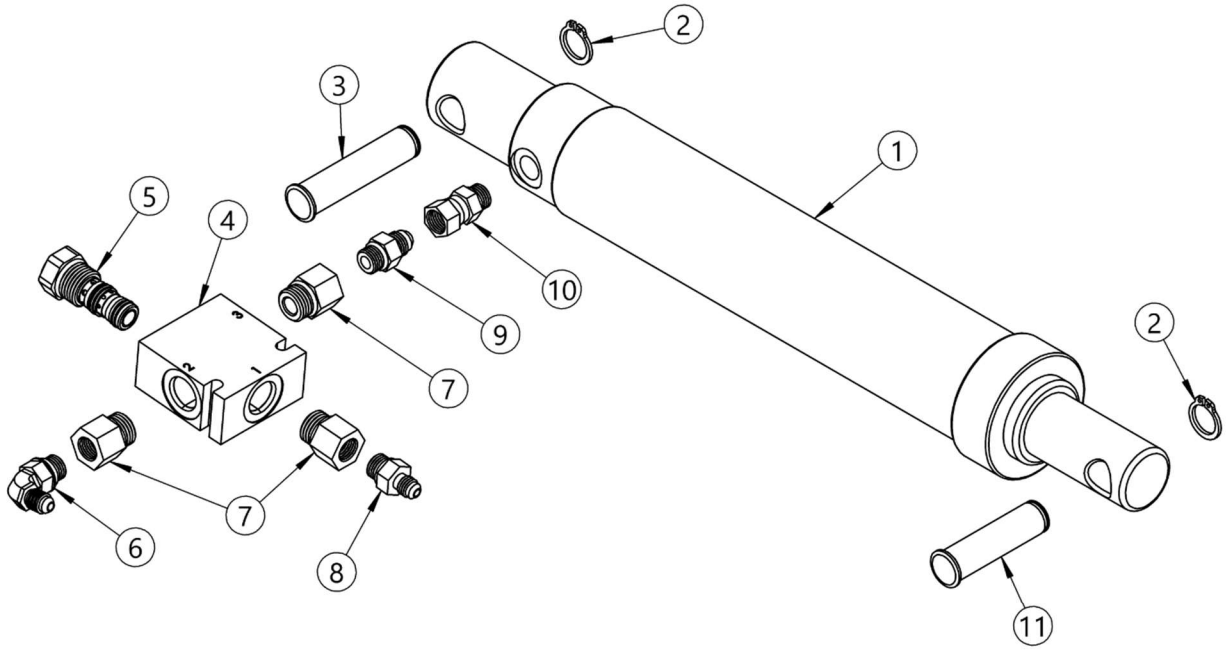

Tilt Assembly
(NOT sold separately
Drum Holder (Saddle) Assembly
Base Assembly
(NOT sold separately)
Mast Assembly
with Hydraulic Controls

Base Assembly



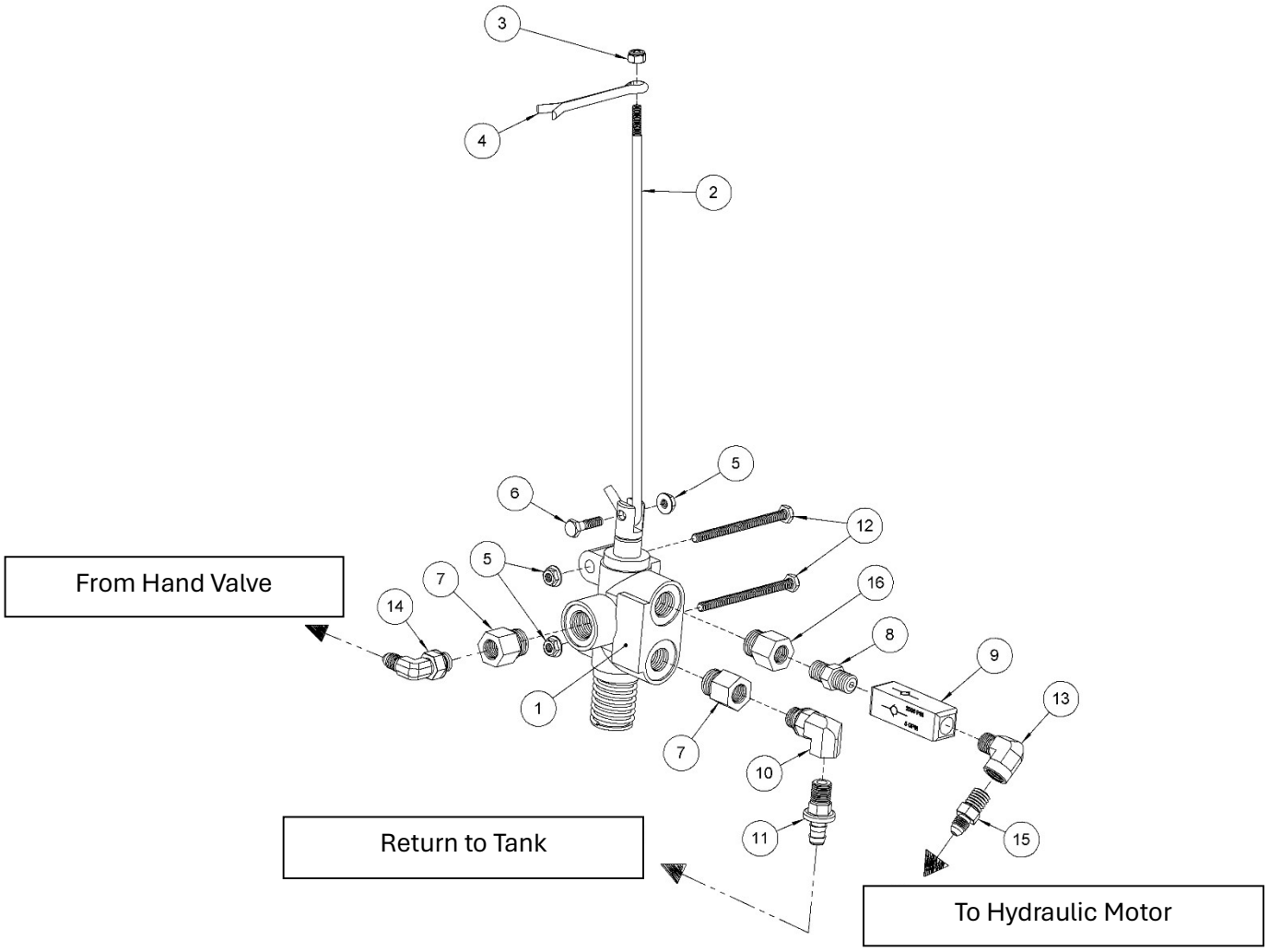
ITEM NO.	PART NUMBER	DESCRIPTION	Default/QTY.
1	4920-P	BASE WELD, 310	1
2	SEE HYDRAULIC POWER PACK PARTS LIST		1
3	SEE SAFETY LIMIT VALVE PARTS LIST		1
4	SEE CYLINDER ASSEMBLY PARTS LIST		1
5	595-P	IDLER BEARING ASM, 285GR	2
6	570-P	COLLAR, 1-1/2" ID	2
7	1474-P	WASHER, 3/8 SPLIT LOCK	4
8	535-P	HHCS, 3/8-16 X 1-1/4 GR 5 ZINC	4

Cylinder Assembly



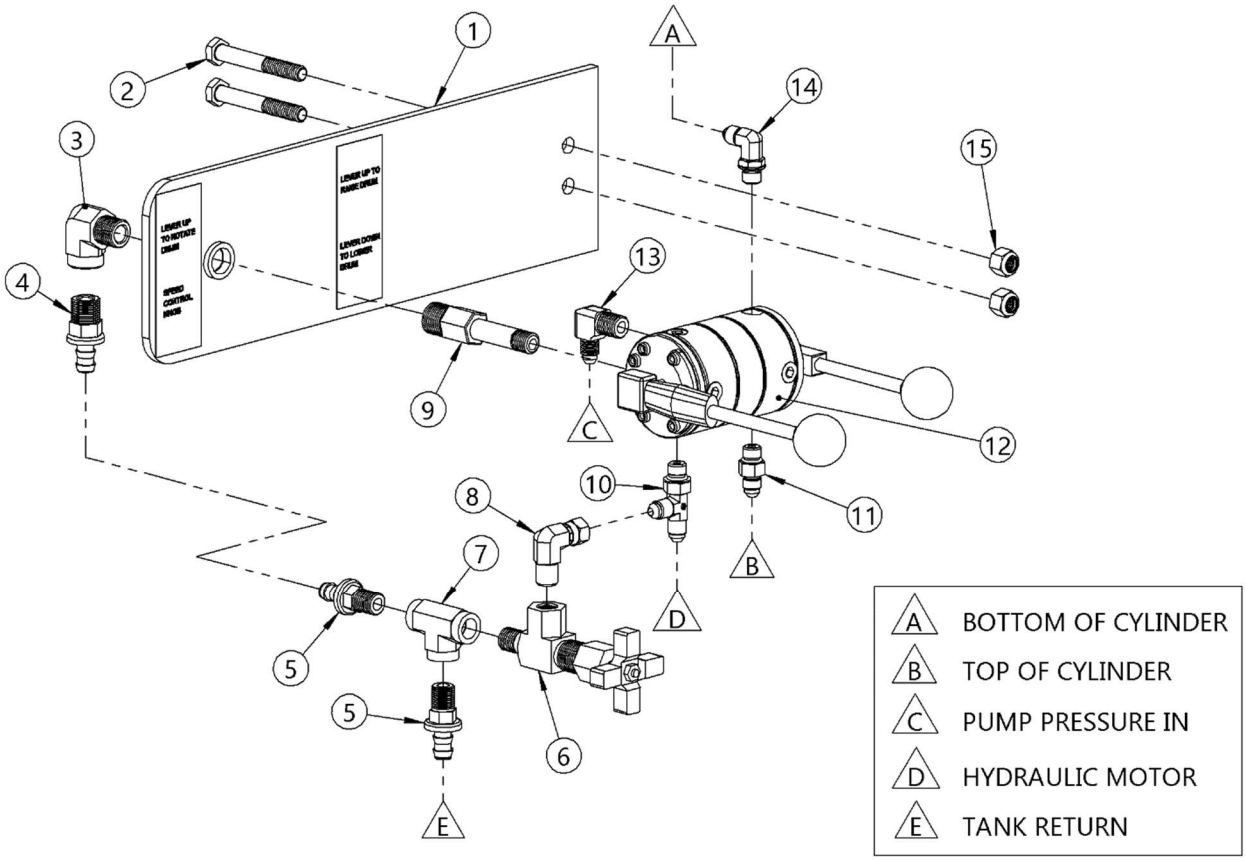
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	4572-P	CYLINDER, 2 X 10.5, 310	1
2	5330-P	SNAP RING, EXT, HD, .078, 3/4"	2
3	5329-P	PIN, GROOVE, 3/4 X 3.10	1
4	6690-P	BODY, VALVE, B10-3-A8T, 310	1
5	4576C-P	CART, PO CHECK, 310	1
6	3610-P	HYD FIT, MALE ELBOW, SAE 9/16	1
7	4860-P	FIT, ADAPTOR, SAE, 310	3
8	3612-P	HYD FIT, SAE 9/16 ADAPTOR	1
9	4593-P	HYD FIT, SAE STRAIGHT	1
10	4594-P	HYD FIT, SAE STRAIGHT SWIVEL	1
11	5585-P	PIN, GROOVE, 3/4 X 2.61	1

Safety Limit Valve Assembly



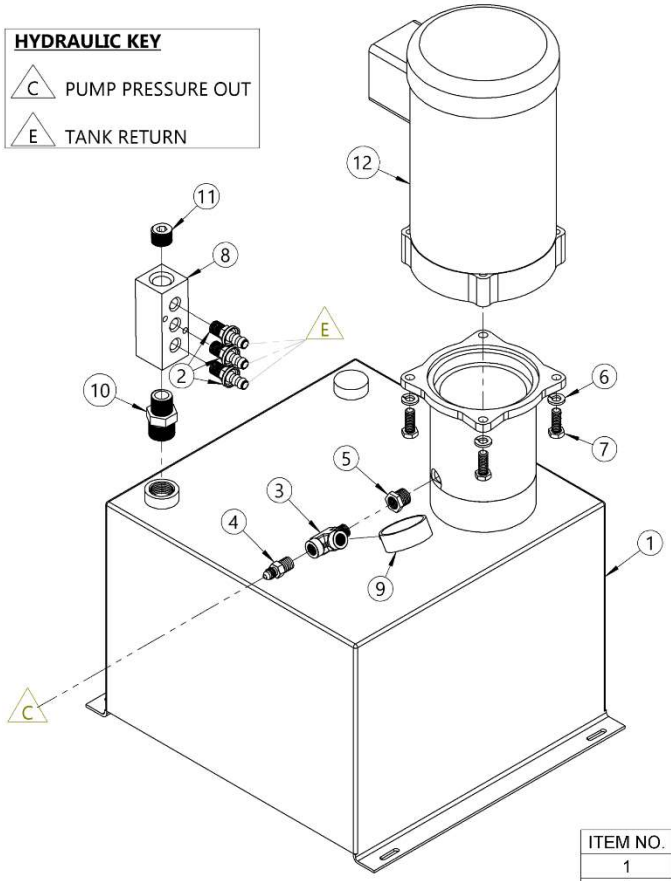
ITEM	QTY.	PART #	DESCRIPTION
1	1	4859-P	SAFETY LIMIT VALVE, 310
2	1	4922-P	LINK, SAFETY LIMIT VALVE 310
3	1	4250-P	NUT, LOCK, 1/4-28 NYLON
4	1	4249-P	COTTER PIN, 1/4" X 2-1/2"
5	3	3923-P	NUT, 1/4-20 WHIZ LOCK
6	1	1641-P	HHCS, 1/4-20 X 1 GR2
7	3	4860-P	FIT, ADAPTOR, SAE, 310
8	1	1108-P	HYD FIT, PIPE NIPPLE, 1/4"
9	1	4027-P	CHECK VALVE, 310
10	1	3757-P	HYD FIT, SAE ELBOW, 456 CYL
11	1	1107-P	HYD FIT, 1/4 X 3/8 PUSH LOK
12	2	4923-P	HHCS, 1/4-20 X 3-1/2 GR2
13	1	2118-P	HYD FIT, STREET EL, 1/4
14	1	3610-P	HYD FIT, MALE ELBOW, SAE
15	1	345-P	HYD FIT, MALE FLARE, 456, 82

Control Station



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	5766W-P	WELD, VALVE PLATE, 310, 456	1
2	1315-P	HHCS, 3/8-16 X 2-3/4 GR2	2
3	3301-P	HYD FIT, STREET EL, 3/8 310	1
4	2519-P	HYD FIT, PUSH LOK 3/8 X 3/8	1
5	1107-P	HYD FIT, PUSH LOK 1/4 X 3/8	2
6	4772-P	VALVE, METERING, 310, 456	1
7	6911-P	HYD FIT, TEE, 1/4 NPT F	1
8	6909-P	HYD FIT, EL, FLARE TO 1/4 NPT	1
9	M01319-P	ADAPTER, PUMP VALVE, 3-3/8	1
10	6910-P	HYD FIT, TEE, 2X FLARE, SAE 4	1
11	6649-P	HYD FIT, ST, SAE 4, FLARE	1
12	M07381-SAE-P	VALVE, 3-4 WAY, 456, 310, SAE	1
13	765-P	HYD FIT, MALE ELBOW, FLARE 400	1
14	6648-P	HYD FIT, EL, SAE 4, FLARE	1
15	3981-P	NUT, 3/8-16 NYLON LOCK	2

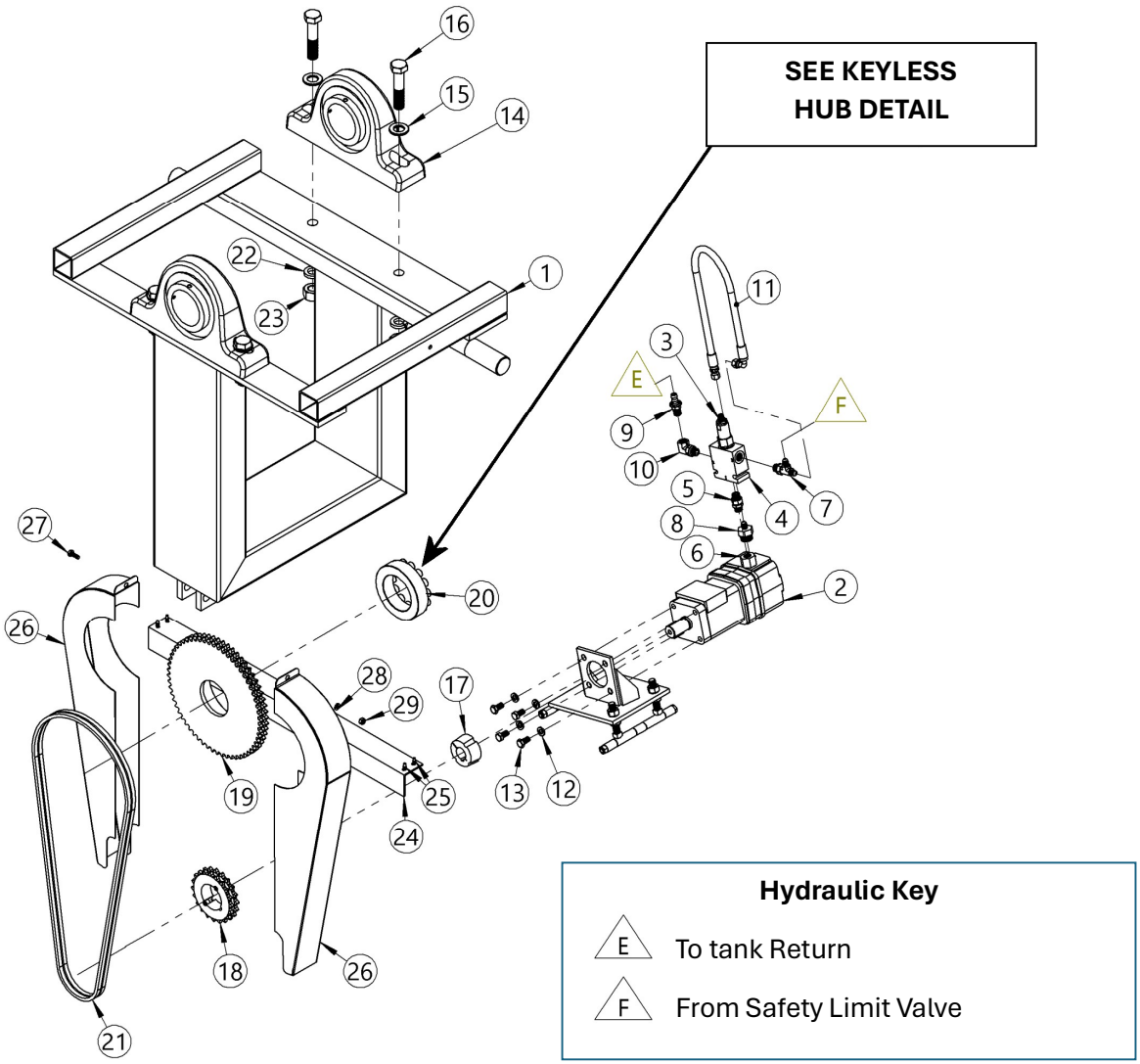
Hydraulic Power Pack Assembly



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	M404-310-P	HYD POWER PACK, 310	1
2	1107-P	HYD FIT, PUSH LOK 1/4 X 3/8	3
3	1105-P	HYD FIT, RUN TEE, 456, 310	1
4	345-P	HYD FIT, MALE FLARE, 456, 82	1
5	3299-P	HYD FIT, PIPE REDUCER 3/8-1/4	1
6	1474-P	WASHER, 3/8 SPLIT LOCK	4
7	1572-P	HHCS, 3/8-16 X 1 GR2 ZINC	4
8	5740-P	MANIFOLD, RETURN, 310	1
9	5744-P	PRESSURE GUAGE, 310	1
10	5741-P	HYD FIT, PIPE NIPPLE, 3/4-1/2	1
11	5745-P	HYD FIT, PLUG, 1/2" NPT	1

ITEM 12 - MOTOR		
Tumbler Model	**Motor Part #**	**Description**
310-1	3186-1-P	MOTOR, 2HP, 1PH, 3450 RPM
310-1-50	3186-1-50-P	MOTOR, 2HP, 1PH, 2850 RPM 50HZ
310-3	3186-3-P	MOTOR, 2HP, 3PH, 3450 RPM
310-3-50	3186-3-50-P	MOTOR, 2HP, 3PH 2850 RPM 50HZ
310-3-575	3186-575-P	MOTOR, 2HP, 3PH, 3450 RPM 575V
310-E1	3186-E1-P	MOTOR, 2HP, 1PH, 3450 RPM EXP
310-E1-50	3186-E1-50-P	MOTOR, 2HP, 1PH, 2850 50HZ EXP
310-E3	3186-E3-P	MOTOR, 2HP, 3PH, 3450 RPM EXP
310-E3-50	3186-E3-50-P	MOTOR, 2HP, 3PH, 2850 50HZ EXP
310-A	290-A-2P	MOTOR, 2HP, AIR, 56C

Tilt Assembly



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	5981-P	TILT WELD, 310TILT WELD, 310	1
2	3114-P	MOTOR, HYDRAULIC HYD, 310	1
3	4600-P	CART, COUNTER BALANCE, 310	1
4	4576B-P	BODY, VALVE, 310	1
5	4599-P	HYD FIT, NIPPLE	1
6	4598-P	HYD FIT, REDUCER	1
7	4597-P	HYD FIT, SAE TEE	1
8	3154-P	HYD FIT, MALE ADAPTOR SAE, 310	1
9	1107-P	HYD FIT, PUSH LOK 1/4 X 3/8	1
10	3757-P	HYD FIT, SAE ELBOW, 456 CYL	1
11	4627-P	HYD HOSE ASM, 20" ELBOW, 310	1
12	1474-P	WASHER, 3/8 SPLIT LOCK	4
13	1657-P	HHCS, 3/8-16 X 3/4 GR2	4
14*	2654-P	BEARING, 2-15/16" PILLOW BLOCK	2
15	55-P	WASHER, 3/4 SAE FL 1-1/2 OD	4

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
16	3318-P	HHCS, 3/4-10 X 3-1/2 GR5	4
17 *	3128-P	BUSHING, 1" TAPER LOCK, 310	1
18 *	3127-P	SPROCKET, #40D, 20T, TAPER 310	1
19 *	3117-P	SPROCKET #40D 60T, 309, 310	1
20 *	3124-P	HUB, 2-15/16" KEYLESS, 309 310	1
21 *	3132-P	CHAIN, ROLLER, #40D 115 PITCH	1
22	3319-P	WASHER, 3/4 SPLIT LOCK	4
23	2452-P	NUT, 3/4-10 FIN HEX	4
24	5463-P	BRACKET, ANGLE 310 GUARD	1
25	193-P	SCREW, TEK, 12-14 X 3/4 3 PT	8
26	5382-P	CHAIN COVER PIECE, 309, 310	2
27	1714-P	HHCS, 1/4-20 X 3/4 GR2	1
28	1882-P	WASHER, 1/4 SPLIT LOCK	1
29	1297-P	NUT, 1/4-20 REV HEX LOCK	1

* Recommended spare parts

Keyless Hub

B400 INSTALLATION AND REMOVAL INSTRUCTIONC FOR B-LOC® KEYLESS BUSHING SERIES B400

B-LOC® Keyless Bushings provide a high capacity, zero-backlash shaft/hub or coupling by means of a mechanical interference fit. Please follow the INSTALLATION AND REMOVAL INSTRUCTIONS carefully to ensure proper performance of this **B-LOC®** unit.

WARNING - When installing **B-LOC®** products, always adhere to the following safety standards:

1. Be sure that the system is de-energized using proper lockout/tagout procedures.
2. Wear proper personal protective equipment.

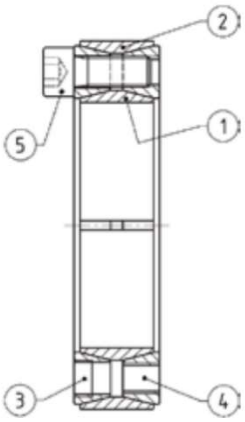


Figure 1


Cadmium plated screws

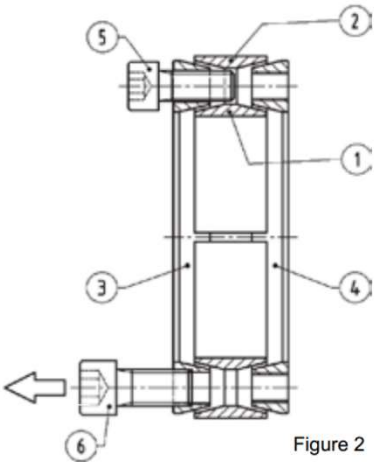


Figure 2

INSTALLATION (Refer to Figure 1)

B-LOC® Keyless Bushings are supplied lightly oiled and ready for installation. The frictional torque capacity of these devices is based on coefficient off friction od 0.12 for lightly oiled screw, taper, shaft and bore contact areas.

Therefore, it is important NOT to use Molybdenum Disulfide (e.g. Molykote, Never-Seeze or similar lubricants) in any Keyless Bushing installation.

1. Make sure that locking screw, taper, shaft and bore contact areas are clean and lightly oiled with a light machine oil.
2. Insert Keyless Bushing into hub counterbore prior to shaft installation.
3. After confirming correct hub position, hand-tighten three (3) or four (4) equally spaced locking screws until initial contact with shaft and hub bore is established.
4. Use torque wrench and set it approximately 5% higher than specified tightening torque (Ma). Tighten locking screws in either a clockwise or counter-clockwise sequence (it is not necessary to tighten in a diametrically opposite pattern), using only ¼ (i.e. 90°) turns for several passes until ¼ turns can no longer be achieved.
5. Continue to apply overtorque for 1 to 2 more passes. This is required to compensate for a system-related relaxation of locking screws since tightening of a given screw will always relax adjacent screws. Without overtorquing, an infinite number of passes would be needed to reach specified tightening torque.
6. Reset torque wrench to specified torque (Ma) and check all locking screws. No screw should turn at this point, otherwise repeat Steps 5 and 6.
   NOTE:
   1. It is not necessary to re-check tightening torque after equipment has been in operation.
   2. In applications subject to extreme corrosion, the slits in all collars can be sealed with a suitable caulking compound or equivalent.

INSTALLATION OF B-LOC® KEYLESS BUSHING OVER SHAFT KEYWAYS

The Keyless Bushing should be positioned so that slits in Keyless Bushing collars that contact the shaft are located approximately opposite the keyway. In addition, a locking screw should be centered directly over the keyway.

When tightening locking screws, it is important to follow the installation procedure outlined above, which specifies equal ¼ turns of each locking screw. Failure to follow these instructions could result in excessive tightening of the screw over the keyway, possibly causing permanent deformation of the Keyless Bushing collars.

REMOVAL (Refer to Figure 2)

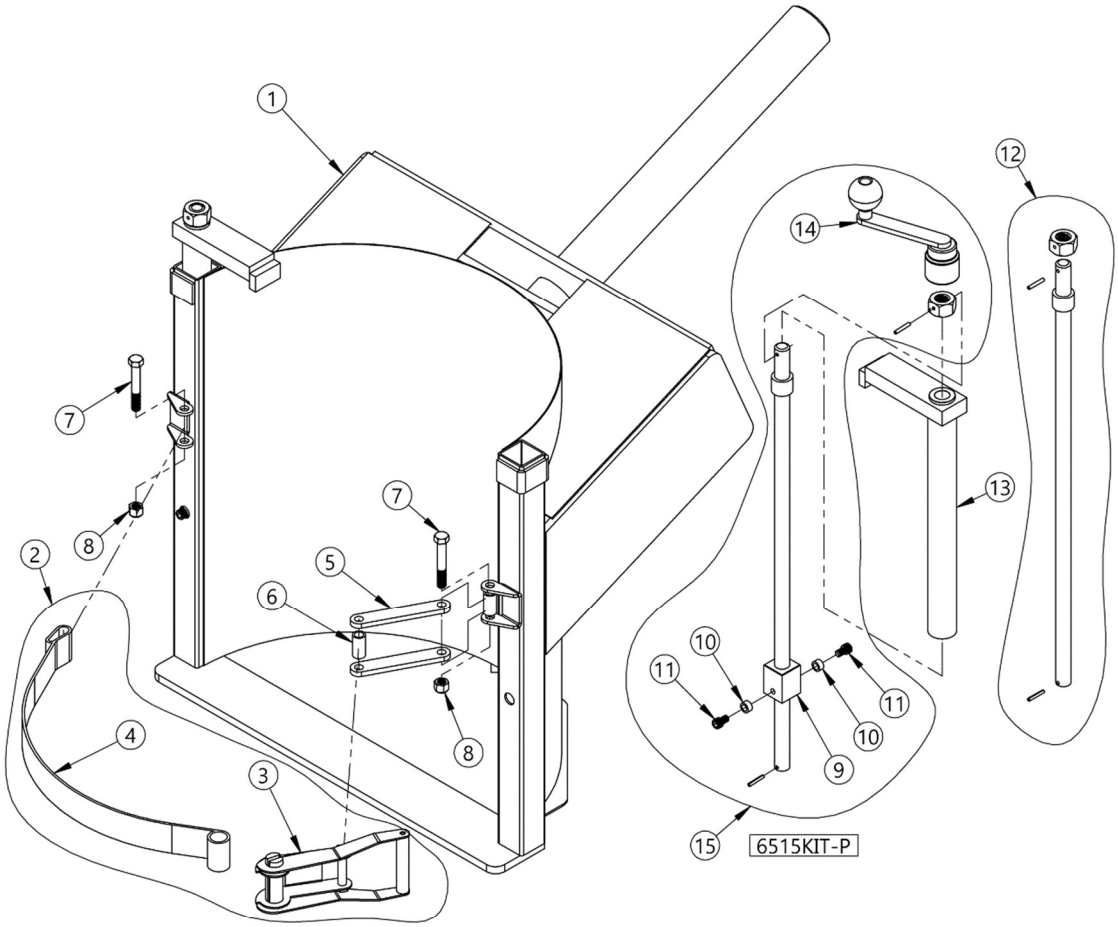
Prior to initiating the following removal procedure, check to ensure that no torque or thrust loads are acting on the Keyless Bushing, shaft or any mounted components.

1. Loosen locking screws in several stages by **using approximate ¼ turns**, following either clockwise or counterclockwise sequence.
   NOTE: B-LOC® Series B400 Keyless Bushings feature self-releasing tapers, meaning collars should release during Step 1. However, if for some reason the thrust collars jam, a light tap on three (3) equally spaced heads of loosened locking screws will positively release the connection
2. Hub and Keyless Bushing are normally removed together. Removal of Keyless Bushing only from deep counterbores is accomplished by inserting pull-off screws (not provided) into threads located under plated locking screws. These threads are NOT to be used for high pulling forces, as thrust collar is only partially threaded.

LOCKING SCREW SIZES AND SPECIFIED TIGHTENING TORQUE Ma
B400 KEYKLESS BUSHINGS

Metric Series	Inch Series	Tightening Torque Ma (ft Lb.)	Screw Size	Hex Key Size (mm)	Pull-off Thread dB
20 x 47 to 40 x 65	¾ to 1-1/2	11	M6	5	M8
42 x 75 to 65 x 95	1-5/8 to 2-9/16	26	M8	6	M10
70 x 110 to 95 x 135	2-5/8 to 3-3/4	51	M10	8	M12
100 x 145 to 160 x 210	3-7/8 to 6	91	M12	10	M14
170 x 225 to 200 x 260	6-7/16 to 8	138	M14	12	M16
220 x 285 to 260 x 325		214	M16	14	M20
280 x 355 to 300 x 375		293	M18	14	M22
320 x 405 to 340 x 425		420	M20	17	M24
360 x 455 to 420 x 515		565	M22	17	M27
440 x 545 to 1000 x 1110		725	M24	19	M30

Drum Holder (Saddle) Assembly



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	5802-P	SADDLE WELD, 309, 310, 311	1
2	4449-P	STRAP ASM W/ RATCHET	1
3	5498-P	RATCHET ONLY, 4449-P	1
4 *	5497-P	WEB STRAP ONLY, 4449-P	1
5	5790-P	LINK, CONNECTOR, RATCHET	2
6	5792-P	SPACER, CONNECTOR, RATCHET	2
7	6272-P	HHCS, 1/2-13 X 3-1/4"	2
8	6266-P	NUT, 1/2-13 NYLON LOCK	3
9	6517-P	CLAMP NUT BLOCK, ACME 310	1
10	3271-P	CLAMP NUT BLOCK SPACER, 310	2
11	22-P	SHCS, 3/8-24 X 5/8	2
12	6515-P	CLAMP SCREW WELD, ACME, 310	1
13	4553-P	CLAMP PIPE W/ BEARING WELD 310	1
14	6525-P	HAND CRANK, SOCKET, ACME, 310	1
15*	6515KIT-P	KIT, SCREW ASM REPLACE, ACME	1

* Recommended spare parts