

# ES2000R Operating Manual



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## Maintenance & Operation Manual for DSS2000R Portable Dredge Slurry Separation and Dewatering System

### INTRODUCTION

The TRIFLO DSS2000R Portable Dredge Slurry Separation and Dewatering System has been designed specifically to accept feed directly from the dredge at a maximum rate of 2000 GPM. In three (3) self contained stages, this system removes the solids from the dredged slurry that are larger in size than approximately 25 microns (um).

The TRIFLO DSS2000R SYSTEM consists of the following Triflo equipment;

1. Two (2) of 148 Elliptical Shale Shakers – 148E Shaker
2. Two (2) of Mud Cleaners with 2 each 10" cones mounted over a 146 Elliptical Shaker - Mud Cleaner 2-10/146E Shaker
3. Two (2) of Mud Cleaners with 16 each 4" cones mounted over a 146 Elliptical Shaker – Mud Cleaner 16-4/146E Shaker
4. Two (2) Agitators with 7.5 hp motor mounted inside the tank
5. Three (3) Centrifugal Pumps 250 Series 6x8x14 w\ 1 1/2 impellers, 50 hz 100hp
6. Trailer has 12 volt Hydraulic Lift System installed on pump porch
7. Central Control Panel with motor starters and stop/start buttons for all electric motors located on top of system
8. Fold down catwalk the full length of the tank, 2' wide x 45' long
9. Removable and fixed handrails with toe plate for catwalk and stairs
10. Serrated grating covering all open areas of tank top and catwalks
11. One (1) removable man way with tank access in each compartment on side of tank
12. One (1) fold down mud slide for each shaker, total of six (6)
13. One (1) or two (2) dump gates in each compartment
14. Complete plumbing system
15. Trailer is complete with air brakes, highway marks and U.S. DOT lighting

In addition, the solids that are removed are dewatered to a stackable state, which can readily be moved with a front end loader and/or dump truck. The effluent or discharged fluid is pumped off by a centrifugal pump.

The process is continuous and operates completely mechanically without any chemical enhancement.



## SAFETY



\*\*\*\*Before Setting Up or Starting Unit make sure all Safety and Environmental Rules and Regulations are in Compliance and all personnel have the required Personal Protection Equipment.



\*\*\*\*Before entering any tanks all Confined Spaces Procedures, Training, PPE and Equipment is in place and in compliance.



\*\*\*\*The DSS2000R Portable Dredge Slurry Separation and Dewatering System is manufactured in an Explosion Proof and a Non Explosion Proof version.

### NEVER USE THE NON-XP VERSION IN A CLASSIFIED AREA



\*\*\*\*High voltage is present, follow De-Energize and Lock Out/Tag Out procedures before maintaining or working on any equipment.



\*\*\*\*Only trained Personnel should operate or repair the equipment.



\*\*\*\*The successful and safe operation of the equipment on this system depends on proper Handling, Installation, Operation and Maintenance.



\*\*\*\*Power down and Lock Out/Tag Out starter before performing any Maintenance or Screen changes or any work on Rotating Machinery.



\*\*\*\*Safety Shoes, Safety Glasses, Ear Protection and Head Protection are needed.



\*\*\*\*If welding is done – **DO NOT** Ground welder through vibrating screen.



\*\*\*\*No person should stand, hold or lean against the vibrating frames.



\*\*\*\*Never lay tools or spare parts on the screens while operating.

## SET UP PROCEDURES



**\*\*\*\*MAKE SURE THAT LEVELING RAMS ARE ALL THE WAY UP AND THAT THE TANK IS ON LEVEL GROUND AND SECURED IN OPERATING POSITION.**

1. Shore and level tank.
2. Mark where underground utilities are located.
3. Connect ground lug to customers source or stake ground rod in accordance to applicable local electrical codes and/or NEC.
4. Connection Main Line Electrical:
  - 4.1. Should only be accomplished by trained electricians within compliance applicable local electrical codes and/or NEC.
  - 4.2. Connect only to an opened circuit disconnected panel (fused or breaker) with over amperage protection.
  - 4.3. Follow all Lock Out/Tag Out connection of power in a hazardous location and De-energized procedures.
5. Setting Up Tank:
  - 5.1. Assemble walk-ways, hand rails and slides. Match numbers to insure proper installation.
  - 5.2. Remove shipping tie downs from shakers. Save tie downs for using when moving the tank to another location.
  - 5.3. Raise telescoping lights and lock in place.
  - 5.4. Open and tighten dump gates.
  - 5.6. Connect a hose to the Inlet of Scalping Shaker from the Pit Pump.

## OPERATING PROCEDURES

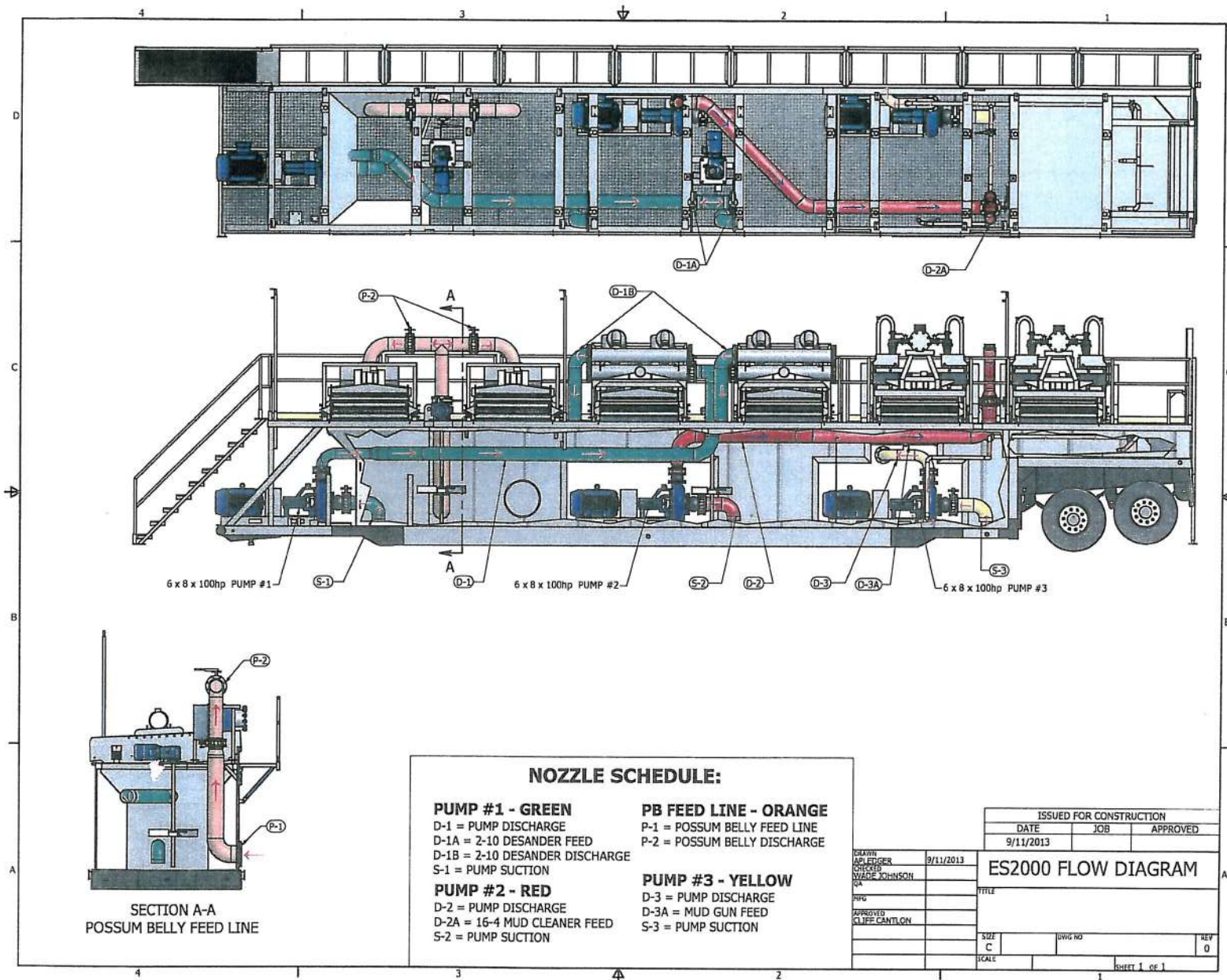
6. Main Breaker/On.
7. Lights/On/Electrical Panel.
8. Open Suction Valves (S-1,S-2,S-3,P-1)
9. Open Discharge Valves (D1B, D2A, D-3, P-2)
10. Make sure Charge hose is connected (both ends) one to D-3 and the other back to Reserve or active mud tank.
11. Open Mud Gun Line Valve (D-3A).
12. Open 16-4 valves half way.
13. Scalping Shakers/On/Electrical Panel.
14. Mud Cleaners 2-10/146 Shaker/ON/Electrical Panel.
15. Mud Cleaners 16-4/146 Shakers/ON/Electrical Panel.
16. Inlet valves 7/8 closed (P-2).
17. Pump supplying slurry (customers pump or pit pump)/ON.





18. Control Flow on the Primary Shakers 148 Scalping by adjusting inlet valves (P-2).
19. When level in Primary Shakers 148 Scalping Compartment one is 75% full engage MC 2-10/146 Pump/ON/ Electrical Panel.
20. When level in MC 2-10/146 Compartment is 75% full engage MC 16-4/146 Pump/ON/Electrical Panel.
21. When level in MC 16-4/146 Compartment is 75% full engage Charge pump/ON/Electrical Panel. This discharges clean mud to the hold tank or reservoir tank.
22. You will have a control valve for each of the two (2) possum bellies. Their function is to control inflow to each of the scalper shakers, regulating equalized flow to each shaker.
23. Once these are set, they should not have to be readjusted unless there is a major change of the feed stream,
24. The electrical controls are unified into one panel for each 2000 GPM system to enable operator control from one location.
25. Adequate walkways allow the operator to visually check the operation of all equipment and watch tank levels.
26. The weir dividers in the tank are purposely set at different levels to allow a small portion of the slurry to over flow the weirs in a "clean to dirty" direction.
27. The point of entry for the slurry from the dredge to the Triflo 2000 is the Receiver tank (possum belly).
28. The possum belly is used to "kill" velocity of the flow and spread the slurry evenly across the scalper screen.
29. Solids removed by the scalper screens are deposited on the discharge slide, while the fluid portion goes through the screen and drops into the tank section below.
30. The fluid is then picked up by a centrifugal pump, to be discharged through the 10" hydrocyclone.
31. Passing the slurry through these hydrocyclones will remove the sand in the slurry which is above 75 um.
32. The overflow or effluent from these hydrocyclones is channeled into the second tank section.
33. The underflow from the hydrocyclones is deposited onto a drying shaker for dewatering.
34. Again, the dewatered solids off the screens are deposited on the discharge slide, while the fluid portion drops into the tank section below.
35. This fluid is again picked up by a centrifugal pump and discharged through the 4" hydrocyclones.
36. Passing the slurry through these hydrocyclones will remove sand and silt above 25 um.
37. This underflow is deposited on a drying shaker for dewatering and then to the discharge slide.
38. The overflow or effluent drops into the third tank section to be picked up by a centrifugal pump for discharge of the operator's choice.





## 148 Elliptical PTP Shale Shaker



### GENERAL INFORMATION

The TRI-FLO 148 ELLIPTICAL PTP SHALE SHAKER (148E) is a compact and reliable solids removal method. Most shakers are similar in design and application. TRI-FLO asserts that their high-speed shale shaker is that necessary first line of defense against large drilled solids reentering an active mud system. The TRI-FLO 148E PTP SHALE SHAKER easily removes 74 micron, or larger size, particles for proper mud weight maintenance and efficient solids control. Balanced mud rheology to longer pump life, less daily fluid maintenance expense, and better penetration rates

The intensity of vibrations may be varied to suite conditions by changing the position of the adjustable counterweights. Position of 100% gives the maximum, and each successive notch or setting reduces the motion. Position of 0% gives the minimum intensity of vibrations. IT IS IMPORTANT THAT BOTH COUNTERWEIGHTS HAVE THE SAME SETTING. This is easily checked by a scale located on both inner counterweights.

The TRI-FLO deck construction employs two sets of screens set at different slopes. The first two screens are flat to allow maximum efficiency while the 3<sup>rd</sup> and 4<sup>th</sup> screens are at a 5 degree down slope. This allows the maximum amount of mud to be left in the tank.

The lower skid base contains the possum belly with the mud inlet at the bottom and the mud flume at the top. Replacement screens are available from coarse 10-mesh variety to a 200 mesh fine screen and they are easily changed in the field.



## SAFETY



.... Before Setting Up or Starting Unit make sure all Safety and Environmental Rules and Regulations are in Compliance and all personnel have the required Personal Protection Equipment



....The Triflo 148E PTP Shale Shaker is manufactured in an Explosion Proof and a Non Explosion Proof Version.

### NEVER USE THE NON-XP VERSION IN A CLASSIFIED AREA



....No person should stand, hold or lean against the vibrating frames. Vibrations transmitted to the human body can be harmful.



....If welding is done, **DO NOT** ground welder thru the vibrating screen.



....Only trained personnel should operate or repair this shaker.



....**REFER TO THE ELECTRICAL CONNECTION SECTION OF THE VIBRATORY MOTOR MANUAL.**



\*\*\*\* Power down and Lock Out/Tag Out Starter before Performing any Maintenance or Screen Changes



\*\*\*\*Safety Shoes, Safety Glasses, Ear Protection and Head Protection are needed.



## POWER REQUIREMENTS

39. The TRIFLO 148E PTP SHALE SHAKERS are normally wired at the factory for 460 V.A.C. 60 HZ, 3 Phase or 380 V.A.C., 50 HZ, 3 Phase.
40. If 230 V.A.C. 60 HZ, 3 Phase is needed it is necessary to:
  - 40.1 Rewire the motor.
  - 40.2 Replace or adjust overloads.
41. Turn the starter switch on and check the motor rotation.
  - 41.1 The top of the counter weights should travel in the same direction as the flow of the mud. This is from the "possum belly fume" of the shaker to the "solids discharge end".

## SCREENS

42. The screens used on the 148E PTP Shakers are Pretension Panels (PTP) and are held in place by polyurethane wedges. Strike with mallet on "Flag" end toward the angled retainer to loosen and the opposite end to tighten.
43. The 148E SHALE SHAKER has four (4) PTP Screens per Shaker deck. The screens location dictates the numerical sequence.
44. The direction of flow where cuttings or slurry first enters onto deck is 1st screen, end is 2<sup>nd</sup> and the screen on lower deck is 3<sup>rd</sup> and the screen on the end where the cuttings or slurry leave the shaker is the 4<sup>th</sup> screen. In order to change the 1st, screen number 2 needs to be removed completely and in order to change the 3<sup>rd</sup> screen number 4 needs to be removed completely.
45. Removal of 148E PTP Screen Panels:
  - 45.1 Remove the lock wedge as described in opening paragraph.
  - 45.2 Remove panels toward end of discharge.
46. When the panels are removed, clean and inspect rubber seals on shaker deck.
47. Installation of 148E PTP Screen Panels:
  - 47.1 Clean and inspect rubber seal on shaker deck as well as bottom of panel.
  - 47.2 Feed the panels from discharge end of shaker basket, toward the #1 or #3 positions, then panels 2&4. Push back and center panel in basket, make sure that panels 1 & 2 and 3 & 4 have cleared over holding hooks and panels are tight to the back.
  - 47.3 Place locking wedge blocks under retainers and strike firmly on the end, toward retainer and then alternate side to side to insure proper seal and even pressure.



## SCREEN SELECTION

48. Screen to the flow or cut point, if screens are discharging wet, correct by the following:
- 48.1 Too much flow. Adjust the liquid or slurry by lowering the flow.
  - 48.2 Slurry Solid Content is high, dilute bring solids to liquid ratio to a manageable level.
  - 48.3 Check for screen blinding (solids stuck in the screen opening or fibers wrapping and/or matting) Try using a smaller opening if blinding is apparent by going up to the next mesh size.
  - 48.3 Last choice, screen to lower mesh, this will let more solids through that section and may interfere with the downstream equipment.
49. Suggested screen selection for the shaker is Mesh 10-60.

## CHANGING THE SPRING COILS ON VIBRATING DECK

50. The Spring Coils on the vibrating deck should be checked every 6 months. When the spring shrinks or collapses to less than four (4") inches they should be replaced.
51. A new spring measures four and a half (4 ½") inches. Lifting the shaker box, removing the old springs, and installing the new ones do this.

## ADJUSTMENTS

52. Refer to the "Adjustment of Centrifugal Force Output" Section of the Vibratory Motor Manual.
53. The intensity of vibrations may be varied to suit conditions by changing the position of the adjustable counterweights. Position 100% gives the maximum, and each successive notch or setting reduces the motion. Position 0% gives the minimum intensity of vibrations.
- 53.1 **IT IS IMPORTANT THAT BOTH COUNTERWEIGHTS HAVE THE SAME SETTING.** This is easily checked by a scale located on both inner counterweights.

## MAINTENANCE



.... **WARNING:** IF WELDING IS DONE DO NOT GROUND WELDER THRU VIBRATING SCREEN.

### INSPECTION

54. A regular schedule of complete dismantling, and inspection intervals assures maximum screen life and minimum downtime.
55. The customer should keep a complete record of all such preventive maintenance plus a record of any repairs.
56. Since the TRI-FLO 148E SHALE SHAKER is a vibratory machine, it is important to correct all minor troubles before serious damage develops.
  - 56.1. Replace faulty support springs and any missing bolts at once.
  - 56.2. Cracks forming in the structure (usually at or near the joints) and unusual noises and motion are signs of developing failure.
  - 56.3. Consult TRIFLO at once in the event of such failures.

### ELECTRIC MOTOR

57. Check the mounting bolts.
58. Inspect the power cable for wear between the switch and the motor.

### SHORT SCREEN LIFE

59. Careless handling and installation.
60. Failure to clean all support surfaces prior to screen installation.
61. Improper installation of wedgelocks.
62. Cuttings build up under the edge of the screen.





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## **SAFETY**

- 63. NO PERSON SHOULD STAND, HOLD OR LEAN AGAINST THE VIBRATING FRAMES.**
  - 63.1. VIBRATIONS TRANSMITTED TO THE HUMAN BODY CAN BE HARMFUL.**
  - 63.2. THESE SCREENS ARE NOT THERAPEUTIC DEVICES.**
- 64. BECAUSE OF THE MOTION OF THE VIBRATING SCREEN IT IS IMPOSSIBLE TO SERVICE THE SHAKER WHILE IN MOTION.**
- 65. NEVER LAY TOOLS OR SPARE PARTS ON THE SCREENS.**
- 66. ONLY TRAINED PERSONNEL SHOULD OPERATE OR REPAIR THIS SHAKER.**



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### LOW VOLTAGE WIRING

4	5	6
o	o	o
o7	o8	09
o1	o2	03

Motor leads 4-5-6 together tape  
Motor leads 7-1 power lead 1 - tape  
Motor leads 8-2 power lead 2 - tape  
Motor leads 9-3 power lead 3 - tape

Note: The starter amperage must match the motor full load amperage.

### HIGH VOLTAGE WIRING

4	5	6
o	o	o
o7	o8	o9
o1	o2	o3

Motor lead 4-7 tape  
Motor lead 5-8 tape  
Motor lead 6-9 tape  
Motor lead 1 - to power lead 1 - tape  
Motor lead 2 - to power lead 2 - tape  
Motor lead 3 - to power lead 3 - tape

Note: The starter amperage must match the motor full load amperage.

(If motor rotates in wrong direction reverse any two of the power leads).

**NOTE:** IF THE MOTOR JUNCTION BOX IS REWIRED OR CHANGED IT MUST BE PACKED WITH FOAM RUBBER TO PREVENT THE WIRES FROM RUBBING TOGETHER WHEN THE SHAKER IS VIBRATING.



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### RECOMMENDED SPARE PARTS FOR ONE (1) YEAR

<u>PART #</u>	<u>DESCRIPTION</u>	<u>QTY</u>
01-01-179	VIBRATORY MOTOR XP 60Hz, 460v, 1750 RPM (IF YOUR UNIT IS EXPLOSION PROOF)	2
12-00-446	VIBRATORY MOTOR NON-XP 60Hz, 460V, 1750 RPM (IF YOUR UNIT IS NON EXPLOSION PROOF)	2
03-00-011	DECK SPRINGS HD	8
12-00-489	SCREEN WEDGE LOCKS	16
	PTP SCREENS	

### SERVICE & OPERATING MANUAL



## MUD CLEANER 2-10"/146E PTP SHAKER



### INTRODUCTION

The TRIFLO Mud Cleaner with two (2) - 10" Cones (Desander) mounted over a TRIFLO 146 Elliptical PreTension Panel (PTP) Shale Shaker (146E Shaker), is called TRIFLO Mud Cleaner 2-10/146E PTP Shaker (MC 2-10/146E PTP Shaker).

The TRIFLO Mud Cleaner 2-10/146E PTP Shaker is designed to remove the sand and silt sized particles before they have a chance to break down even smaller. The MC 2-10/146E operates efficiently on weighted mud as well as unweighted mud systems.

The TRIFLO MC 2-10/146E PTP Shaker is designed to save barite and remove low gravity solids larger than barite from weighted mud system. The Desander Hydrocyclones will separate the low solid liquid slurry from the barite and larger than medium silt range particles. The barite and larger silt size particles will be directed on the screen surface to save barite and drilling fluid while the large silt size particles will go off the end of the screen.

On the unweighted mud systems the TRIFLO MC 2-10/146E PTP Shaker will reduce the costs by reduced jetting, less chemical replacement and less replacement of water and/or oil. With the use of 400 mesh screens it is possible to remove solids to approximately 25-micron silt size particle.



\*\*\*\* Before Setting Up or Starting Unit make sure all Safety and Environmental Rules and Regulations are in Compliance and all personnel have the required Personal Protection Equipment.



\*\*\*\* The Mud Cleaner 2-10/146E PTP Shaker is manufactured in an Explosion Proof and a Non Explosion Proof Version.

**NEVER USE THE NON-XP VERSION IN A CLASSIFIED AREA**



\*\*\*\* High voltage is present, follow De-energize and Lock Out/Tag Out procedures before maintaining or working on any equipment.



\*\*\*\*If welding is done – **DO NOT** Ground welder through vibrating screen



\*\*\*\*Make sure that no personnel or material is close to moving parts (vibrating decks)

## OPERATION

1. The feed slurry of solids and liquid is fed through the inlet at a high velocity obtained by steady pressure of twenty-five **(25-32) psi**. The high velocity transmitted to the feed section creates a spinning velocity and resulting centrifugal forces. The vortex finder causes the stream to spiral downward towards the underflow solids discharge. Centrifugal force and inertia causes solids to settle outward toward the hydro cyclone wall, in a downward spiraling stream.
2. The solids separate according to size and weight of the particles. In the density range of solid particles in drilling fluids, size is of far more influence than the variations in density so that basically the biggest particles settle first and fastest.
3. The cone section narrows, inner layers of the downward spinning liquid turn back toward the overflow because of the increasing centrifugal forces near the center.
4. In TRIFLO's hydro cyclone, as the last of the liquid moves to the center and back upward toward the overflow, the downward spiraling solids continue out the apex, not being able to turn back because of their greater inertia and high downward velocity. Therefore, the actual solids removal at the underflow is by inertia, not by settling. The underflow rate and density varies with the volume and size of solids being separated to the underflow.



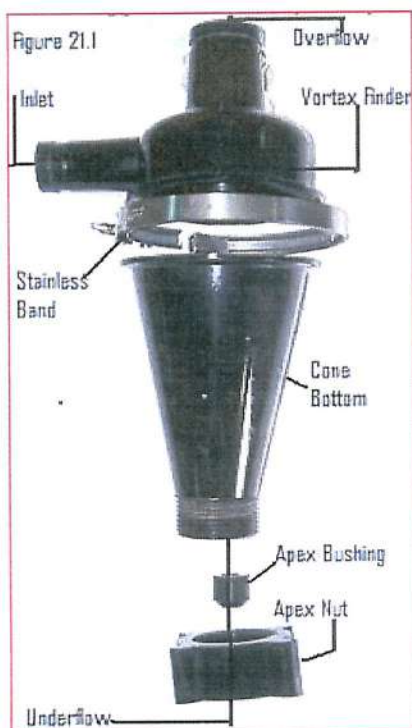
5. The apex nut and apex bushing are designed for easy removal when plugging becomes a problem and are adjustable to permit the required amount of spray discharge desired. When a smaller opening is necessary tighten the apex nut to the desired setting. The tighter the adjustment the less air permitted to enter the bottom of the hydro cyclone. At times when plugging is a problem, the apex nut and the

Apex bushing can be removed. This may be necessary when drilling a surface hole or when large amounts of sand are present.



\*\*\*\* Over tightening of the apex nut and apex bushing will cause the hydro cyclone to become plugged. When the hydro cyclone becomes plugged severe erosion will occur in the feed section of the hydro cyclone and may damage the interior of the hydro cyclone. The damage will first be noticed in the zone of maximum wear and may make the hydro cyclone virtually useless.

6. The TRIFLO hydro cyclone consists of a feed section, cone section, apex nut, apex bushing and a clamp.







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## LOCATION

7. The TRIFLO Mud Cleaner 2-10/146E should be mounted level on the mud tank next to the Shale Shaker.

## SHALE SLIDE

8. If it is not desirable to permit the cuttings or solids to drop off the end of the screen, it will be necessary to construct a shale slide from the end of the shaker to the shale pit.
9. This slide should be as steep as possible.
10. Water spray may be added to wash the cuttings into the shale pit.

## POWER REQUIREMENTS

11. Connect the power cable from the motor starter switch to the rig power supply. Connect the green insulated wire to ground.
12. The TRIFLO 146E Shaker is normally wired at the factory for 460 V.A.C. 60 hz and 3 phase or 380 V.A.C. 50 hz and 3 phase depending on the application. Please specify when ordering.
13. If lower voltage, 3 phase is needed, it is necessary to:
  - 13.1. Rewire the motor for low voltage per schematic in manual
  - 13.2. Replace or adjust overloads.
  - 13.3. The motor junction box must be packed with foam rubber to prevent the wires from rubbing together when the shaker is vibrating. This is necessary after the rewiring is completed.
14. Turn the starter switch on and check the motor rotation. The top of the counterweight should travel in the same direction as the flow of the mud. This is from the front of the shaker to the back.
15. If the rotation is incorrect, change any two of the red, black or white wires at the motor junction box at the rig power supply. The green wire should always be ground and would not affect the rotation of the motor.



\*\*\*\*\*REFER TO THE ELECTRICAL CONNECTION OF THE VIBRATORY MOTOR MANUAL.

## SCREENS



\*\*\*\*Power down and Lock Out/Tag Out Starter before performing any maintenance or screen changes.



\*\*\*\*Safety Shoes, safety glasses, ear protection and head protection are needed.

16. The screens used on the 146E Shaker are Pretension Panels (PTP) and are held in place by polyurethane wedges. Strike with mallet on "Flag" end toward the angled retainer to loosen and the opposite end to tighten.
17. The 146E Scalping Shaker has three PTP Screens per Shaker deck. The screens location dictates the numerical sequence. The direction of flow where cuttings or slurry first enters onto deck is 1st screen, middle is 2nd and the screen at the end is 3rd. In order to change the 1st, screen numbers 2 and 3 need to be removed completely.
18. Removal of 146E PTP Screen Panels:
  - 18.1. Remove the lock wedge as described in opening paragraph.
  - 18.2. Remove panels toward end of discharge.
  - 18.3. When the panels are removed, clean and inspect rubber seals on shaker deck.
19. Installation of 146E PTP Screen Panels:
  - 19.1. Clean and inspect rubber seal on shaker deck as well as bottom of panel.
  - 19.2. Feed the panels from discharge end of shaker basket, toward the #1 position, then panels 2&3. Push back and center panel in basket, make sure that panels 1 & 3 have cleared over holding hooks and panels are tight to the back.
  - 19.3. Place locking wedge blocks under retainers and strike firmly on the end, toward retainer and alternate side to side to insure proper seal and even pressure.

## SCREEN SELECTION

20. Screen to the flow or cut point, if screens are discharging wet, correct by the following:
  - 20.1. Too much flow. Adjust the liquid or slurry by lowering the flow.
  - 20.2. Slurry Solid Content is high, dilute bring solids to liquid ratio to a manageable level.
  - 20.3. Check for screen blinding (solids stuck in the screen opening or fibers wrapping and/or matting) Try using a smaller opening if blinding is apparent by going up to the next mesh size.
  - 20.4. Last choice, screen to lower mesh, this will let more solids through that section and may interfere with the downstream equipment.





## MAINTENANCE

21. The TRIFLO Mud Cleaner 2-10/146E PTP is a high performance piece of mud equipment and requires a regular maintenance program.
22. Hydro cyclone wear and performance is highly dependent of the feed pressure and the conditions of the hydro cyclones. The pressure should never exceed 32 psi, as more than 32 psi will cause excessive wear on the hydro cyclones. Recommended pressure is between 25 and 32 psi, however this will vary depending on the concentration of solids.
23. Damaged or worn, hydro cyclones will not separate the fine drill solids from the drilling fluid and need to be checked periodically for wear.

## CHANGING THE SPRING COILS ON VIBRATING DECK

24. The Spring Coils on the vibrating deck should be checked every 6 months.
25. When the spring shrinks or collapses to less than 4 inches they should be replaced. A new spring measures 4 ½ inches.
26. Lifting the shaker box, removing the old springs and installing the new ones do this.

## ADJUSTMENTS

27. Refer to the "Adjustment of Centrifugal Force Output" section of the Vibratory Motor Manual.
28. The intensity of vibrations may be varied to suit conditions by changing the position of the adjustable counterweights.
29. Position 100% gives the maximum and each successive notch or setting reduces the motion.
30. Position 0% gives the minimum intensity of vibrations.
31. **IT IS IMPORTANT THAT BOTH COUNTERWEIGHTS HAVE THE SAME SETTING.**
32. This is easily checked by a scale located on both inner counterweights.

## TORQUE SPECIFICATIONS FOR VIBRATORY MOTORS

33. Vibratory motor mounting bolts are to be torque to 288ft/lbs. (this is done at the TRIFLO facility upon initial installation).
34. Failure to do so could result in serious motor damage or complete motor failure.
35. Please refer to Vibratory Motor Manual for further concerns.



## SAFETY



\*\*\*\***WARNING!!!** IF WELDING IS DONE DO NOT GROUND WELDER THRU VIBRATING SCREEN



\*\*\*\*NO PERSON SHOULD STAND, HOLD OR LEAN AGAINST THE VIBRATING FRAMES.



\*\*\*\*VIBRATIONS TRANSMITTED TO THE HUMAN BODY CAN BE HARMFUL. THESE SCREENS ARE NOT THERAPEUTIC DEVICES.



\*\*\*\*NEVER LAY TOOLS OR SPARE PARTS ON THE SCREENS WHILE OPERATING



\*\*\*\*BECAUSE OF THE MOTION OF THE VIBRATING SCREEN, DO NOT TRY TO SERVICE THE SHAKER WHILE IN MOTION



\*\*\*\*ONLY TRAINED PERSONNEL SHOULD OPERATE OR REPAIR THIS MUD CLEANER 2-10/146E PTP SHAKER



## TROUBLE SHOOTING

36. A regular schedule of complete dismantling and inspection intervals assures maximum screen life and minimum downtime.
37. The customer should keep a complete record of all such preventive maintenance plus a record of any repairs.
38. Since the TRIFLO Mud Cleaner 2-10/146E PTP Shaker is a vibratory machine, it is important to correct all minor troubles before serious damage develops.
39. Replace faulty support springs and any missing bolts at once.
40. Cracks forming in the structure (usually at or near the joints) and unusual noises and motion are signs of developing failure.
41. Consult TRIFLO at once in the event of such failures.
42. Check the mounting bolts on motors.
43. Inspect the power cable for wear between the switch and the motor.
44. To prevent short screen life:
  - 44.1. Careless handling and installation
  - 44.2. Failure to clean all support surfaces prior to screen installation.
  - 44.3. Improper installation of wedge locks.
  - 44.4. Cuttings build up under the edge of the screen.

PROBLEM: Pressure at the manifold too low:

CAUSE: Is the pump impeller large enough to deliver at least 25 psi?  
Is the pump speed correct?  
Is the supply line from the pump to the manifold six (6") in diameter?  
Is the pump supplying any other piece of equipment?  
Is the supply line to the manifold plugged?  
Is the centrifugal pump suction plugged?

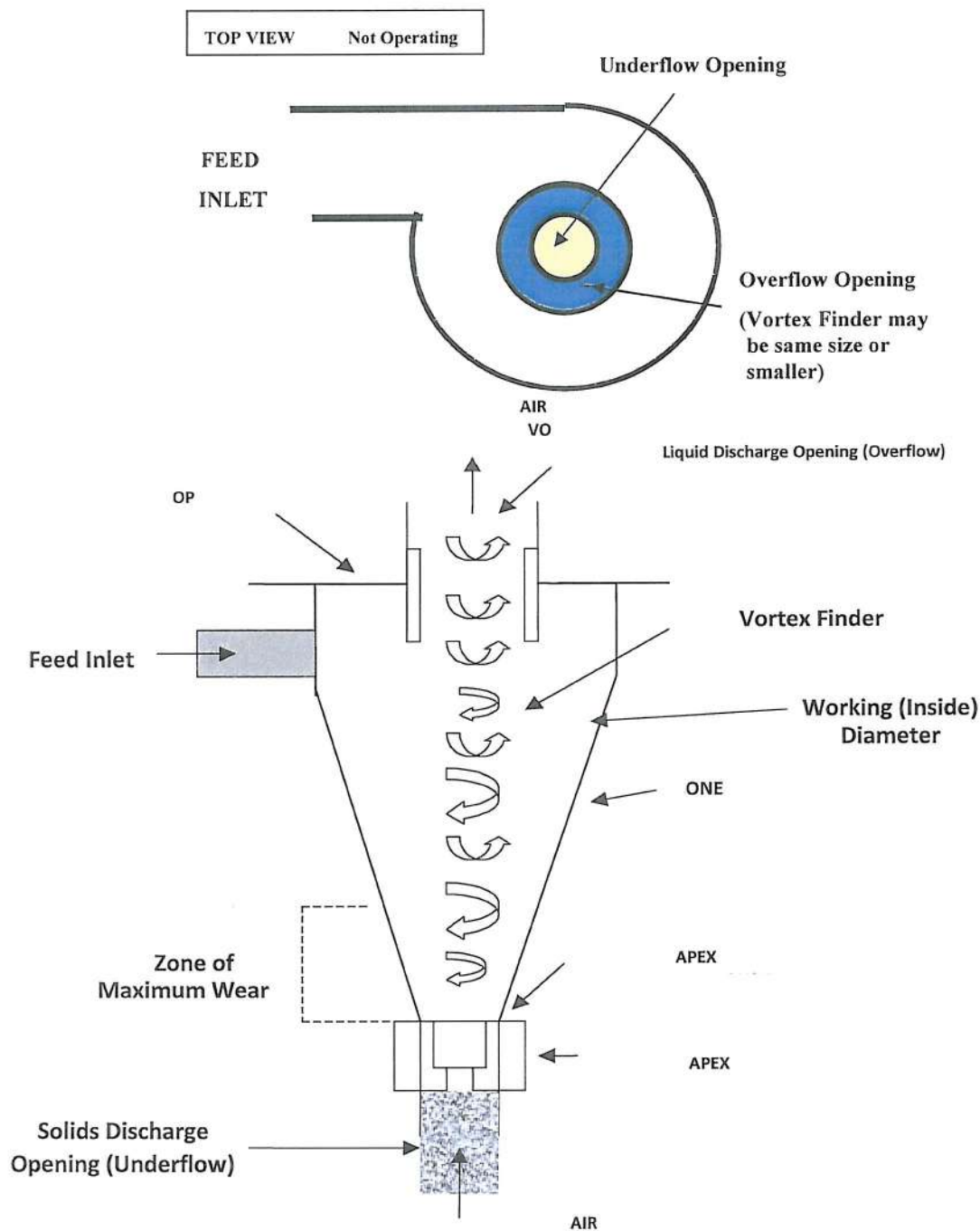
PROBLEM: No underflow or too little underflow:

CAUSE: Is the feed pressure at least 25 psi?  
Is the apex bushing plugged?  
Is the apex bushing closed too tightly?  
Are there fine-drilled solids in the mud?  
Is the valve to the hydro cyclone open?  
Is the pump running?

PROBLEM: Too much underflow:

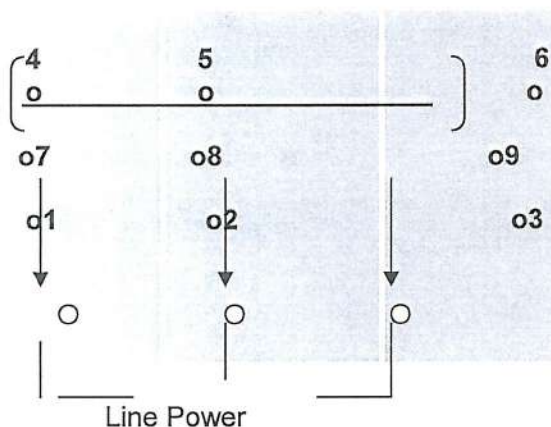
CAUSE: Is the hydro cyclone feed section or cone section  
damaged?  
Is the apex bushing in the hydro cyclone?  
Is the pressure too high?

## DRAWING – SPRAY DISCHARGE OF HYDRO CYCLONE





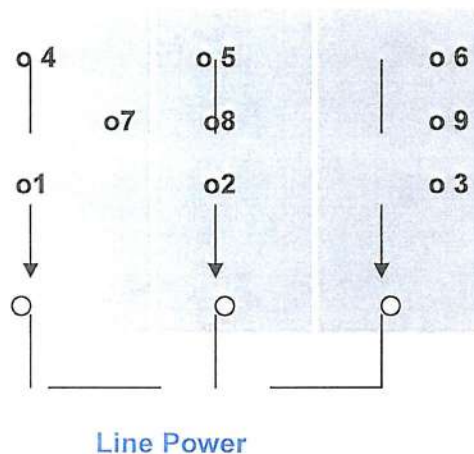
## LOW VOLTAGE WIRING



Motor leads 4-5-6 together tape  
Motor leads 7-1 power lead 1 - tape  
Motor leads 8-2 power lead 2 - tape  
Motor leads 9-3 power lead 3 - tape

Note: The low voltage heater is a H33, parte No. 01-00-043 If it is necessary to change from high voltage (460 V.A.C.) to low voltage (230 V.A.C.), the heater must be changed.

## HIGH VOLTAGE WIRING



Motor lead 4-7 tape  
Motor lead 5-8 tape  
Motor lead 6-9 tape  
Motor lead 1 - to power lead 1 - tape  
Motor lead 2 - to power lead 2 - tape  
Motor lead 3 - to power lead 3 - tape

Note: High Voltage heater is a H26. TRI-FLO Part No. 01-00-041. If it is necessary to change from low voltage (230 V.A.C.) to High voltage (460 V.A.C.), the heater must be changed.

**NOTE:** (If the motor rotates in wrong direction reverse any two of the power leads.)



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**NOTE: IF THE MOTOR JUNCTION BOX IS REWIRED OR CHANGED IT MUST BE PACKED WITH FOAM RUBBER TO PREVENT THE WIRES FROM RUBBING TOGETHER WHEN THE SHAKER IS VIBRATING.**

### RECOMMENDED SPARE PARTS

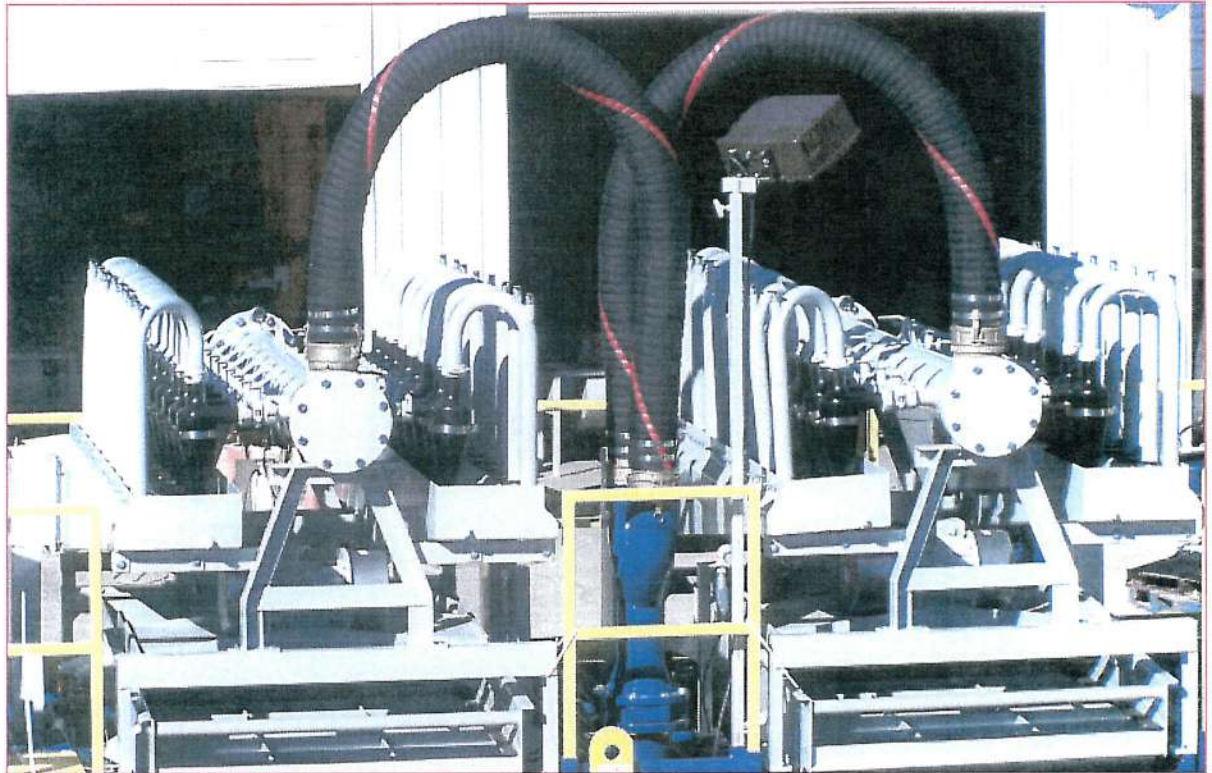
45. Always order spare parts from TRIFLO INTERNATIONAL, INC.
46. This is particularly true of bearings, which may not be available from the local bearing sources because of the special internal clearance requirements.
47. It is advisable to stock the following spare parts so that breakdowns can be repaired promptly and costly delays eliminated.

### SPARE PARTS FOR ONE (1) YEAR

NAME OF PARTS	QUANTITY	TRIFLO PART NO.
Hydro Cyclone Complete 10"	4	03-00-382
Victaulic Coupling 5"	8	00-00-045
Gauge	2	02-00-020
Apex Bushing	4	03-00-388
Apex Nut	4	03-00-390
Vibratory Motor XP	2	01-01-179
If your unit is explosion proof		
Vibratory Motor Non XP	2	12-00-446
If your unit is non explosion proof		
Deck Springs HD	8	03-00-011
Screen Wedge Locks	16	12-00-489



## MUD CLEANER 16-4"/146E PTP SHAKER



### INTRODUCTION

The TRIFLO Mud Cleaner 16 Cones with four (4") inch Cones (Sand/Silt Separator) mounted over a TRIFLO 146 Elliptical PreTension Panel (PTP) Shale Shaker (146E Shaker), is called a TRIFLO Mud Cleaner 16-4/146E PTP Shaker (MC 16-4/146E PTP Shaker).

The TRIFLO Mud Cleaner 16-4/146E PTP Shaker is designed to remove the sand and silt sized particles before they have a chance to break down even smaller. The MC 16-4/146E operates efficiently on weighted mud as well as unweighted mud systems.

The TRIFLO MC 16-4/146E PTP Shaker is designed to save barite and remove low gravity solids larger than barite from weighted mud system. The Sand/Silt Separator





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Hydro-cyclones will separate the low solid liquid slurry from the barite and larger than medium silt range particles. The barite and larger silt size particles will be directed on the screen surface to save barite and drilling fluid while the large silt size particles will go off the end of the screen.

On the unweighted mud systems the TRIFLO MC 16-4/146E PTP Shaker will reduce the costs by reduced jetting, less chemical replacement and less replacement of water and/or oil. With the use of 400 mesh screens it is possible to remove solids to approximately 25-micron silt size particle.

The TRIFLO MC 16-4/146E PTP Shaker has several design characteristics that justify its ability to remove sand and silt sized solids from the drilling fluid. The feed manifold is designed to insure balanced feed pressure into the hydro cyclones. System balance is achieved by opening or closing individual control valves on each hydro cyclone, by lowering or raising the siphon tubes on each overflow tube, and/or increasing or decreasing the apex valve size. Any of these adjustments can alter the GPM rate and handle most volume requirements. These adjustments can make particle interference, mud viscosity, and rejection volume less critical and enable the system to work more efficiently. The TRI-FLO MC 16-4/146E PTP Shaker can remove solids that are often found to be the cause of drill collar sticking and wear on mud pump expendables.



\*\*\*\* Before Setting Up or Starting Unit make sure all Safety and Environmental Rules and Regulations are in Compliance and all personnel have the required Personal Protection Equipment.



\*\*\*\* The Mud Cleaner 16-4"/146E PTP Shaker is manufactured in an Explosion Proof and a Non Explosion Proof Version.  
**NEVER USE THE NON-XP VERSION IN A CLASSIFIED AREA**



\*\*\*\* High voltage is present, follow De-energize and Lock Out/Tag Out procedures before maintaining or working on any equipment.



\*\*\*\* If welding is done – **DO NOT** Ground welder through vibrating screen



\*\*\*\*Make sure that no personnel or material is close to moving parts (vibrating decks)

## OPERATION

1. The feed slurry of solids and liquid is fed through the inlet at a high velocity obtained by steady pressure of twenty-five **(25-32) psi**. The high velocity transmitted to the feed section creates a spinning velocity and resulting centrifugal forces. The vortex finder causes the stream to spiral downward towards the underflow solids discharge. Centrifugal force and inertia causes solids to settle outward toward the hydro cyclone wall, in a downward spiraling stream.
2. The solids separate according to size and weight of the particles. In the density range of solid particles in drilling fluids, size is of far more influence than the variations in density so that basically the biggest particles settle first and fastest.
3. The cone section narrows, inner layers of the downward spinning liquid turn back toward the overflow because of the increasing centrifugal forces near the center.
4. In TRIFLO's hydro cyclone, as the last of the liquid moves to the center and back upward toward the overflow, the downward spiraling solids continue out the apex, not being able to turn back because of their greater inertia and high downward velocity. Therefore, the actual solids removal at the underflow is by inertia, not by settling. The underflow rate and density varies with the volume and size of solids being separated to the underflow.
5. The underflow from the fluids, even under extreme conditions, will be approximately 40 GPM and ordinarily under 30 GPM. This makes it possible to use fine mesh screen (150-200 mesh) to clean all of the mud returning from the bore hole. 200 mesh screens have openings of 74 microns and the 150 mesh screens have openings of 104 microns. Theoretically, particles smaller than these opening should remain with the mud and larger particles and would be carried off the end of the shaker.
6. The TRIFLO Mud Cleaner 16-4/146E is operated at **25-32 psi** of pressure. A six (6) inch butterfly valve should be placed in the discharge line between the centrifugal pump and the manifold inlet. This valve would be used for adjusting the manifold pressure to **25-32 psi**.
7. Each hydro cyclone has a two (2) inch butterfly valve located before the feed inlet. This valve permits the operator to turn off each hydro cyclone individually for system balance and removal of the hydro cyclone, without shutting down the entire system.
8. TRIFLO does not recommend this valve to be used as a flow adjustment and should be either fully open or fully closed.
9. The siphon tubes, located on the top of the overflow tubes are an adjustment of the underflow. When the siphon tube is completely down, the air entering the apex bushing



is increased and less drilling fluid is permitted to spray out the apex of the hydro cyclone.

10. When a more wet underflow with more fine solids is desired, the siphon tube should be raised. This adjustment will reduce the amount of air permitted through the apex and cause a wetter underflow to travel to the shaker screen. The distance the siphon tube should be raised will vary with the drilling conditions and no hard fast rule will apply.
11. The apex nut and apex bushing are designed for easy removal when plugging becomes a problem and are adjustable to permit the required amount of spray discharge desired. When a smaller opening is necessary tighten the apex nut to the desired setting. The tighter the adjustment the less air permitted to enter the bottom of the hydro cyclone. At times when plugging is a problem, the apex nut and the apex bushing can be removed. This may be necessary when drilling a surface hole or when large amounts of sand are present.



\*\*\*\* Over tightening of the apex nut and apex bushing will cause the hydro cyclone to become plugged. When the hydro cyclone becomes plugged severe erosion will occur in the feed section of the hydro cyclone and may damage the interior of the hydro cyclone. The damage will first be noticed in the zone of maximum wear and may make the hydro cyclone virtually useless.

12. The TRIFLO hydro cyclone consists of a feed section, cone section, apex nut, apex bushing and a clamp.





## INSTALLATION

13. The TRIFLO MC 16-4/146E PTP Shaker should be mounted at the end of the mud tank at least 8' wide by 9' long. The TRIFLO MC 16-4/146E PTP Shaker should be mounted with the inlet towards the flow line and the skid secured to the mud tank.
14. It is important it is mounted level. This will aid in an efficient operation.
15. After mounting, remove the four (4) shipping bolts. These bolts are located at each spring coil on the vibrating deck. Save these for future use in moving to another location.

## MUD TROUGH

16. Place the mud trough in place at the mud inlet on the skid base and place a blanking plate in the unused outlet.

## FLOW LINE

17. Connect a flow line between the bell nipple and the mud inlet of the TRIFLO MC 16-4/146E PTP Shaker.

18. It is not recommended to run the flow line into the top of the possum belly, as it will reduce the volume of the mud the screens can handle.

## SHALE SLIDE

19. If it is not desirable to permit the cuttings or solids to drop off the end of the screen, it will be necessary to construct a shale slide from the end of the shaker to the shale pit.  
20. This slide should be as steep as possible.  
21. Water spray may be added to wash the cuttings into the shale pit.

## POWER REQUIREMENTS

22. Connect the power cable from the motor starter switch to the rig power supply. Connect the green insulated wire to ground.  
23. The TRIFLO 146E Shaker is normally wired at the factory for 460 V.A.C. 60 hz and 3 phase or 380 V.A.C. 50 hz and 3 phase depending on the application. Please specify when ordering.  
24. If lower voltage, 3 phase is needed, it is necessary to:  
    24.1. Rewire the motor for low voltage per schematic in manual  
    24.2. Replace or adjust overloads. The motor junction box must be packed with foam rubber to prevent the wires from rubbing together when the shaker is vibrating. This is necessary after the rewiring is completed.  
25. Turn the starter switch on and check the motor rotation. The top of the counterweight should travel in the same direction as the flow of the mud. This is from the front of the shaker to the back.  
26. If the rotation is incorrect, change any two of the red, black or white wires at the motor junction box at the rig power supply. The green wire should always be ground and would not affect the rotation of the motor.



**\*\*\*\*REFER TO THE ELECTRICAL CONNECTION OF THE VIBRATORY MOTOR MANUAL.**

## SCREENS



**\*\*\*\*Power down and Lock Out/Tag Out Starter before performing any maintenance or screen changes.**



\*\*\*\*\*Safety Shoes, safety glasses, ear protection and head protection are needed.

27. The screens used on the 146E Shaker are Pretension Panels (PTP) and are held in place by polyurethane wedges. Strike with mallet on "Flag" end toward the angled retainer to loosen and the opposite end to tighten.
28. The 146E Scalping Shaker has three PTP Screens per Shaker deck. The screens location dictates the numerical sequence. The direction of flow where cuttings or slurry first enters onto deck is 1st screen, middle is 2nd and the screen at the end is 3rd. In order to change the 1st, screen numbers 2 and 3 need to be removed completely.
29. Removal of 146E PTP Screen Panels:
  - 29.1. Remove the lock wedge as described in opening paragraph.
  - 29.2. Remove panels toward end of discharge.
  - 29.3. When the panels are removed, clean and inspect rubber seals on shaker deck.
30. Installation of 146E PTP Screen Panels:
  - 30.1. Clean and inspect rubber seal on shaker deck as well as bottom of panel.
  - 30.2. Feed the panels from discharge end of shaker basket, toward the #1 position, then panels 2&3. Push back and center panel in basket, make sure that panels 1 & 3 have cleared over holding hooks and panels are tight to the back.
  - 30.3. Place locking wedge blocks under retainers and strike firmly on the end, toward retainer and alternate side to side to insure proper seal and even pressure.

## SCREEN SELECTION

31. Screen to the flow or cut point, if screens are discharging wet, correct by the following:
  - 31.1. Too much flow. Adjust the liquid or slurry by lowering the flow.
  - 31.2. Slurry Solid Content is high, dilute bring solids to liquid ratio to a manageable level.
  - 31.3. Check for screen blinding (solids stuck in the screen opening or fibers wrapping and/or matting) Try using a smaller opening if blinding is apparent by going up to the next mesh size.
  - 31.4. Last choice, screen to lower mesh, this will let more solids through that section and may interfere with the downstream equipment.





## MAINTENANCE

32. The TRIFLO Mud Cleaner 16-4/146E PTP is a high performance piece of mud equipment and requires a regular maintenance program.
33. Hydro cyclone wear and performance is highly dependent of the feed pressure and the conditions of the hydro cyclones. The pressure should never exceed 32 psi, as more than 32 psi will cause excessive wear on the hydro cyclones. Recommended pressure is between 25 and 32 psi, however this will vary depending on the concentration of solids.
34. Damaged or worn, hydro cyclones will not separate the fine drill solids from the drilling fluid and need to be checked periodically for wear.

## CHANGING THE SPRING COILS ON VIBRATING DECK

35. The Spring Coils on the vibrating deck should be checked every 6 months.
36. When the spring shrinks or collapses to less than 4 inches they should be replaced. A new spring measures 4 ½ inches.
37. Lifting the shaker box, removing the old springs and installing the new ones do this.

## ADJUSTMENTS

38. Refer to the "Adjustment of Centrifugal Force Output" section of the Vibratory Motor Manual.
39. The intensity of vibrations may be varied to suit conditions by changing the position of the adjustable counterweights.
40. Position 100% gives the maximum and each successive notch or setting reduces the motion.
41. Position 0% gives the minimum intensity of vibrations.
42. **IT IS IMPORTANT THAT BOTH COUNTERWEIGHTS HAVE THE SAME SETTING.**
43. This is easily checked by a scale located on both inner counterweights.

## TORQUE SPECIFICATIONS FOR VIBRATORY MOTORS

44. Vibratory motor mounting bolts are to be torque to 288ft/lbs. (this is done at the TRIFLO facility upon initial installation).
45. Failure to do so could result in serious motor damage or complete motor failure.
46. Please refer to Vibratory Motor Manual for further concerns.

## SAFETY



**\*\*\*\*WARNING!!! IF WELDING IS DONE DO NOT GROUND WELDER THRU VIBRATING SCREEN**



**\*\*\*\*NO PERSON SHOULD STAND, HOLD OR LEAN AGAINST THE VIBRATING FRAMES.**



**\*\*\*\*VIBRATIONS TRANSMITTED TO THE HUMAN BODY CAN BE HARMFUL. THESE SCREENS ARE NOT THERAPEUTIC DEVICES.**



**\*\*\*\*NEVER LAY TOOLS OR SPARE PARTS ON THE SCREENS WHILE OPERATING**



**\*\*\*\*BECAUSE OF THE MOTION OF THE VIBRATING SCREEN, DO NOT TRY TO SERVICE THE SHAKER WHILE IN MOTION**



**\*\*\*\*ONLY TRAINED PERSONNEL SHOULD OPERATE OR REPAIR THIS MUD CLEANER 16-4/146E PTP SHAKER**

## TROUBLE SHOOTING

47. A regular schedule of complete dismantling and inspection intervals assures maximum screen life and minimum downtime.
48. The customer should keep a complete record of all such preventive maintenance plus a record of any repairs.
49. Since the TRIFLO Mud Cleaner 16-4/146E PTP Shaker is a vibratory machine, it is important to correct all minor troubles before serious damage develops.
50. Replace faulty support springs and any missing bolts at once.
51. Cracks forming in the structure (usually at or near the joints) and unusual noises and motion are signs of developing failure.
52. Consult TRIFLO at once in the event of such failures.
53. Check the mounting bolts on motors.
54. Inspect the power cable for wear between the switch and the motor.
55. To prevent short screen life:
  - 55.1. Careless handling and installation



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55.2.Failure to clean all support surfaces prior to screen installation.

55.3.Improper installation of wedge locks.

55.4.Cuttings build up under the edge of the screen.

PROBLEM: Pressure at the manifold too low:

CAUSE: Is the pump impeller large enough to deliver at least 25 psi?  
Is the pump speed correct?  
Is the supply line from the pump to the manifold six (6") in diameter?  
Is the pump supplying any other piece of equipment?  
Is the supply line to the manifold plugged?  
Is the centrifugal pump suction plugged?

PROBLEM: No underflow or too little underflow:

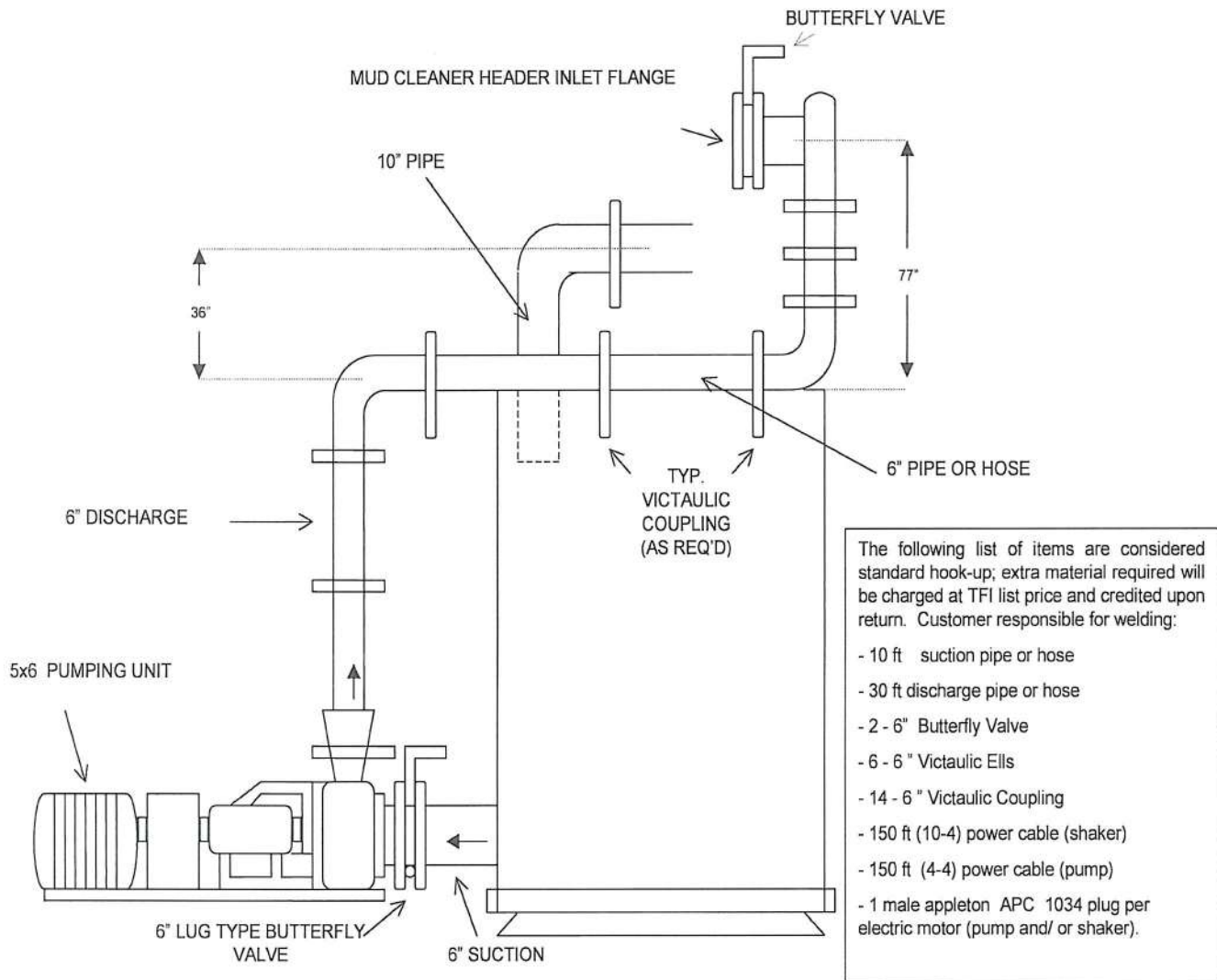
CAUSE: Is the feed pressure at least 25 psi?  
Is the apex bushing plugged?  
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Are there fine-drilled solids in the mud?  
Is the valve to the hydro cyclone open?  
Is the pump running?

PROBLEM: Too much underflow:

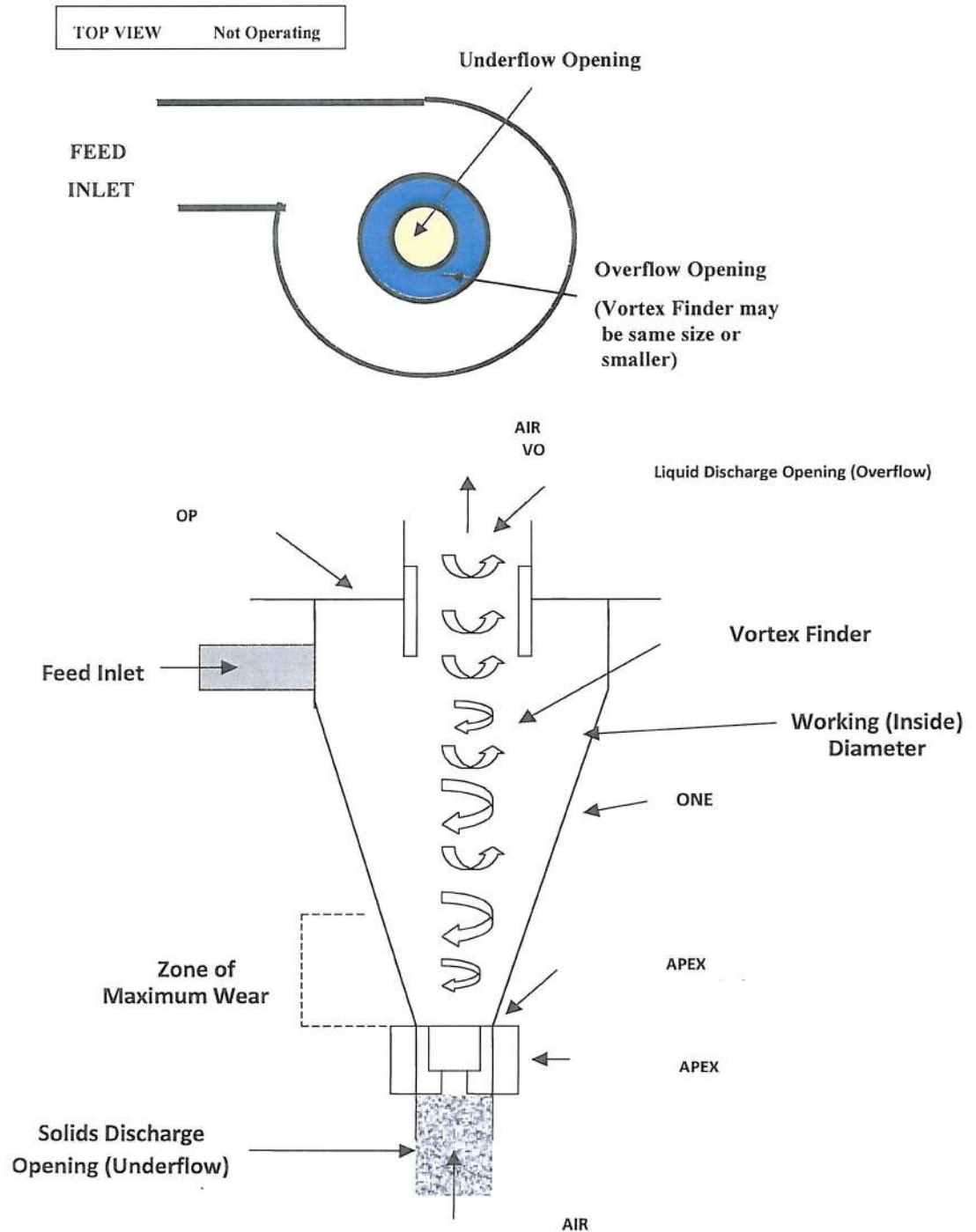
CAUSE: Is the hydro cyclone feed section or cone section  
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Is the apex bushing in the hydro cyclone?  
Is the pressure too high?



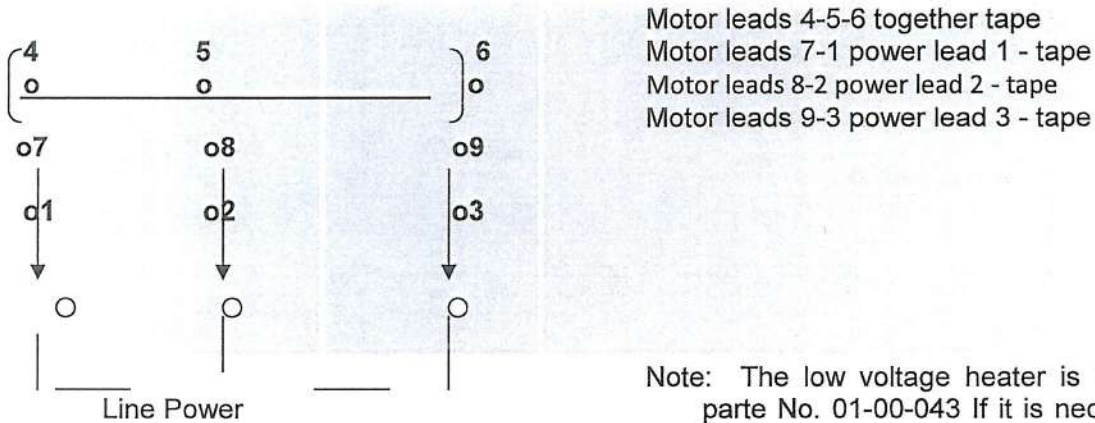
## DRAWING – GENERAL HOOKUP FOR MC 16-4/146E PTP SHAKER



## DRAWING – SPRAY DISCHARGE OF HYDRO CYCLONE



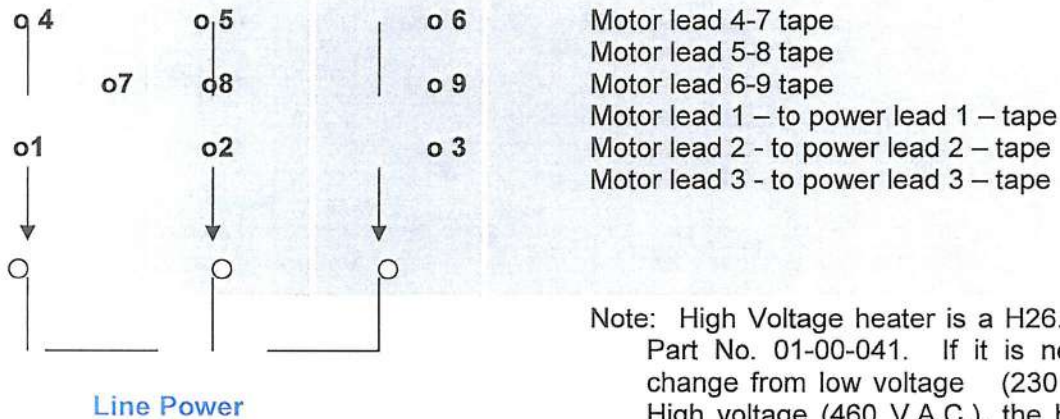
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Motor leads 4-5-6 together tape  
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Note: The low voltage heater is a H33, parte No. 01-00-043 If it is necessary to change from high voltage (460 V.A.C.) to low voltage (230 V.A.C.), the heater must be changed.

## HIGH VOLTAGE WIRING



Motor lead 4-7 tape  
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Note: High Voltage heater is a H26. TRI-FLO Part No. 01-00-041. If it is necessary to change from low voltage (230 V.A.C.) to High voltage (460 V.A.C.), the heater must be changed.

NOTE: (If the motor rotates in wrong direction reverse any two of the power leads.)

NOTE: IF THE MOTOR JUNCTION BOX IS REWIRED OR CHANGED, IT MUST BE PACKED WITH FOAM RUBBER TO PREVENT THE WIRES FROM RUBBING TOGETHER WHEN THE SHAKER IS VIBRATING.





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## SPARE PARTS FOR ONE (1) YEAR

NAME OF PARTS	QUANTITY	TRIFLO PART NO.
Hydro Cyclone Complete 4"	32	03-00-044
Victaulic Coupling 2"	96	00-00-047
Victaulic Gasket 2"	96	00-01-008
Siphon Rod Seals	32	01-00-011
Pressure Gauge	2	02-00-020
Apex Bushing	32	03-00-048
Apex Nut	32	03-00-047
Vibratory Motor XP	2	01-01-179
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## FOR INFORMATION

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OR TOLL FREE: 1-888-255-2440 EMAIL: [info@triflo.com](mailto:info@triflo.com)

Web Site: [www.triflo.com](http://www.triflo.com)

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## NOTES



# **ELECTRIC VIBRATOR MOTORS**

**FOOT MOUNTED – STANDARD AND EXPLOSIONPROOF**

## **INSTALLATION OPERATION AND MAINTENANCE MANUAL**

**DF-VIMARC CORPORATION**

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This Installation, Operation and Maintenance Manual is for all operators of VIMARC vibrator motors. These instructions are sent to accompany each vibrator sold by DF-Vimarc Corporation and should be available throughout the lifetime of the VIMARC vibrator motor.

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## 1. General Safety Rules and Precautions

VIMARC vibrator motors are used to energize industrial vibrating equipment, such as vibrating screens, feeders and chutes, shakeouts, compacting tables, deburring and finishing drums, resonant vibrating chutes, sorting machines, etc.

The successful and safe operation of all industrial machinery, including VIMARC vibrator motors, depends upon proper handling, installation, operation, and maintenance. Failure to follow certain fundamental installation and maintenance requirements may lead to personal injury, failure or loss of the machine, as well as damage to other property.

Only **qualified persons** should be involved in the installation, operation and maintenance procedure. All plant safety procedures must be observed.

A qualified person is one who is familiar with the construction, installation, maintenance and operation of industrial machinery, and any hazards involved. In addition, the person has the following qualifications:

- a. Is trained and authorized to energize, de-energize, clear, ground, and tag circuits and equipment in accordance with established safety practices;
- b. Is trained in the proper care and use of protective equipment such as rubber gloves, hard hat, safety glasses or face shields, flash clothing, etc., in accordance with established safety practices;
- c. Is trained in rendering first aid.

Any motor/generator should be installed and grounded per local and national codes.

It is not safe to put the vibrator motor into service without the weight covers. The terminal box cover must be fitted in the proper way to assure a complete seal.

To avoid serious injury and/or equipment damage, before any adjustments, servicing, wiring, parts replacement, or any other acts requiring physical contact with the electrical or mechanical working components of this equipment are performed, all equipment must be de-energized, disconnected and isolated to prevent accidental contact with live or rotating parts.

## 2. Design and Construction

VIMARC vibrator motors are specially designed non-synchronous, AC electric motors. The stator with its coils is mounted vibration-proof inside a sturdy cast iron housing. The shaft has the rotor shrunk on it and is supported by two heavy-duty cylindrical roller bearings (ball bearings are used for "A" and smaller models). These bearings are mounted, one at each end, in bearing housings with bearing covers. The bearings are pre-greased for continuous service for the normal B-10 life of the bearing on most models, which therefore, do not even have grease fittings, unless specifically desired by the customer. On some models, grease fittings are provided for periodic greasing. On both ends of the shaft, two centrifugal weights are fitted. Two weight covers are mounted on the stator housing for safety and protection.

The high starting torque of the VIMARC vibrator motor ensures a quick run-up to operating speed. The motors have been designed with ample dimensions from both electrical and mechanical points of view. Working temperatures remain at low level even after months of continuous duty. Under normal operating conditions, expected surface temperatures of the motor can range from 60 – 70° C (140 – 160° F).

The recommended minimum and maximum ambient temperatures are –25° C (-15° F) and 40° C (104° F), respectively, for normal operations. The VIMARC vibrator motor can be furnished with modifications for abnormal and extreme climate conditions.

These design features described above contribute to the long life, which characterizes the vibrator motors manufactured by VIMARC.

### 3. Transport and Storage

#### 3.1 Transport

VIMARC vibrator motors are provided with a min. of 2 "eyes" or crane hooks. When hoisting the motor a min. of 2 crane hooks must be used. Extra loads may not be attached to the motor since the crane hooks are designed to support the weight of the motor only. Motors may not be stacked; because the standard package used to ship motors cannot support such weight.

The adjustable centrifugal weights should be positioned at 0% (see section 6) for transporting motors.

**CAUTION!** Dropping or jarring any vibrator motor may cause damage to the bearings and should be avoided.

#### 3.2 Storage

VIMARC vibrator motors should be stored indoors in a room, which should answer the following demands:

- Clean and dry atmosphere.
- Vibration and shock free, in order to prevent damaging the bearings.
- Ambient temperature not to exceed 40° C (104° F).
- No high fluctuations of temperature in a short time that could cause condensation that could corrode the motor. When the fluctuations of temperature are greater than 20° C (36° F), storage in an acclimatised space is recommended.

#### 3.3 Transport and storage of complete machinery

If VIMARC vibrator motors are stored – whether by themselves or already placed on a machine - for an extended time, we recommend setting the adjustable weights to 0% (see section 6). When storing complete machinery, it is not necessary to remove the vibrator motors from the machinery; the motors can be stored as recommended above.

After an extended period of storage, over six months, it is recommended to have the insulation resistance of the windings measured by meggering, to ensure no moisture has developed within the motor during the storage period.



## 4. Installation

The vibrator motor must be mounted upon a flat, machined, rigid base. The motor should be secured on this base with bolts SAE grade 8 or Metric property class 8.8 DIN 931 or 933 with accompanying locknuts of compatible and comparable qualities and hardened steel washers. The nuts must be tightened using a torque wrench up to the following recommended torque values:

<u>Motor Type</u>	<u>Mounting Holes</u>	<u>Metric PC 8.8 Bolt &amp; Torque</u>	<u>SAE Gr. 8 Bolt &amp; Torque</u>
A, B	18 mm/ .709 in	M 16 : 200 NM or 148 ft-lb	5/8 : 145 ft-lb
C, D, E	21 mm/ .827 in	M 20 : 390 NM or 288 ft-lb	3/4 : 275 ft-lb
F, G, H	26 mm/1.024 in	M 24 : 670 NM or 494 ft-lb	7/8 : 455 ft-lb
K	32 mm/1.260 in	M 30 :1350 NM or 996 ft-lb	1 1/8 : 945 ft-lb

After approximately twenty minutes of operation the unit should be switched off and all mounting bolts checked and retightened with a torque wrench to the above-specified values. After two or three hours of operation this tightening procedure should be repeated. It is suggested that this checking and tightening procedure is repeated at 3 to 4 hour intervals for at least two days. Thereafter, the checking and tightening should be performed at intervals of 4 to 6 weeks, always following the aforementioned procedure.

**NOTE:** THE IMPORTANCE OF TIGHTENING THE BOLTS TO THE PROPER TORQUE AND CHECKING THE TORQUE PERIODICALLY CAN HARDLY BE STRESSED ENOUGH. ANY VIMARC MOTOR FAILURE IS PRACTICALLY ALWAYS DUE TO INADEQUATE TORQUE OR LOOSENING OF BOLTS.

### 4.1. Additional torque values of metric property class 8.8 bolts installed on the vibrator motor:

M 8 :	25 NM or 18 ft-lb
M 10 :	47 NM or 35 ft-lb
M 12 :	82 NM or 60 ft-lb
M 16 :	200 NM or 148 ft-lb

## 5. Electrical connection

Only qualified personnel may connect the motor. The motor must be connected according to local and national codes. A flexible electrical power cable, which is adequate to meet all national and local code regulations and requirements, should be used. An ample loop is indispensable because of the continuous motion and must be kept free from interference or rubbing.

The voltage and frequency of the power source must be in accordance with that stated on the motor rating plate. The connection terminal board inside the terminal box provides for alternative connection arrangements. Please consult motor rating plate for the motor's voltage and the immediately following sections 5.1 and 5.2 to determine the correct arrangement. The terminal box cover must be fitted in the proper way to assure a complete seal against dust or moisture.

In the case of two and four pole (high speed) motors, it is suggested that after making the connections to the terminal block, the terminal box be packed with vermiculite or some other insulating material so that the high vibrations do not cause the wires to rub and result in shorting.

A suitable and adequate disconnect switch and protective motor starter is required.

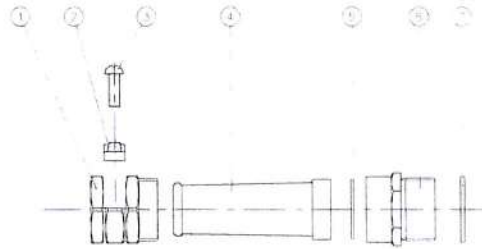
### Explosionproof Models

Connect the cable with a certified cable gland (not provided). The thread in the terminal box is 3/4 NPT. The wires inside the terminal box must also be kept free from interference or rubbing. Make sure that the cable gland seals the cable waterproof.

### Standard Models

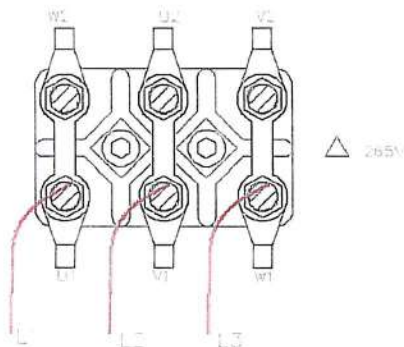
A cable inlet sleeve is provided to lead the cable into the terminal box. The cable should be run through the inlet sleeve to the terminal board inside the terminal box per instructions below.

- 1) Tighten the spacer (6) and screw it into the terminal box tapped hole. Check the rubber seal (7) for a proper seal.
- 2) Insert the cable through the clamping bracket (1), the inlet trumpet (4) and the ring (5) spacer (6) and seal (7) into the terminal box.
- 3) Tighten the clamping bracket (1) firmly. The rubber inlet trumpet will be compressed and seal off the cable entry.
- 4) Attach the clamping bracket (2) with the screw (3) and tighten the screw.
- 5) Connect the wires to the terminal board according to the motor's voltage rating. Please consult motor rating plate for correct arrangement. The motor must be grounded.
- 6) In the case of high speed motors (2-pole & 4-pole), it is recommended that after the wires are connected to the terminal block, the terminal box should be packed with vermiculite or some other appropriate insulation material so that the vibrations do not cause loose wire connections to break and short the motor.
- 7) Close the terminal box in the proper way to assure a complete seal against dust or moisture.

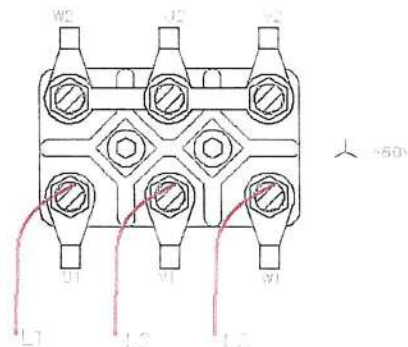


### 5.1 Single Voltage

The terminal board inside the terminal box provides for two connection arrangements. Motors are delivered with terminals properly connected for the specified voltage on the motor rating plate. However, alternating between "delta connection" and "star connection", by rearranging the terminal jumpers, a different line voltage can be applied to the motor. Example for connection 265/460 Volt motor:



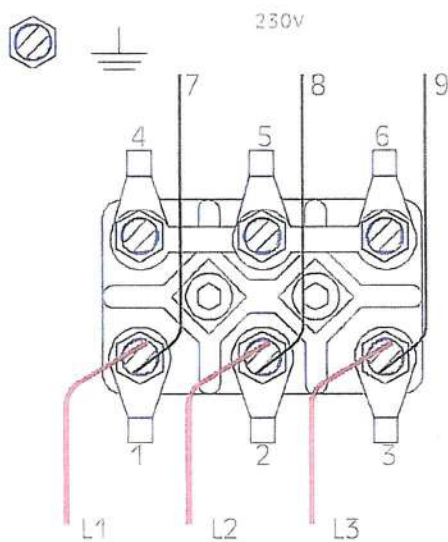
"Delta" connection



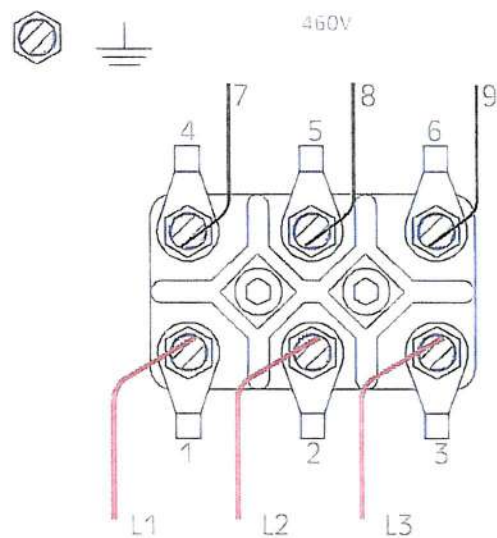
"Star" connection

## 5.2 Dual Voltage Connection

Dual voltage VIMARC vibrator motors are delivered with a terminal box containing nine leads, and they are connected for the lower voltage (230 V). For the higher voltage (460 V), rearrange the leads as shown in the figure below. Notice that terminal jumpers are omitted in that arrangement!



Lower voltage



Higher voltage

## 5.3 Grounding

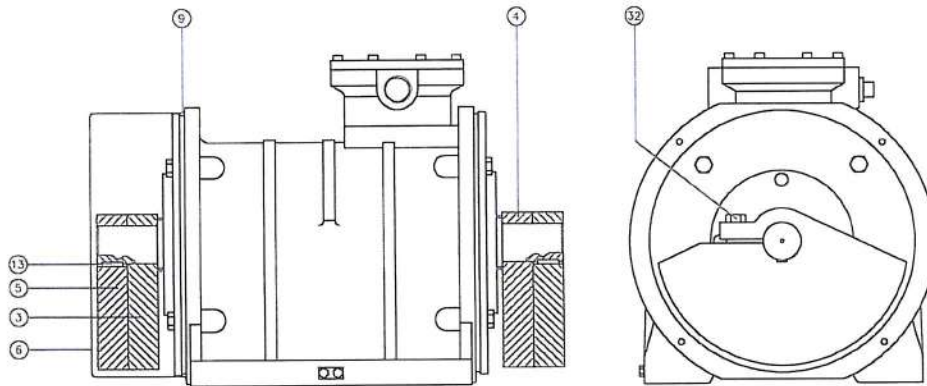
The motor must always be grounded in two places:

- 1) In the terminal box, the power cable to the ground safety bolt.
- 2) On the mounting foot, the grounding plate to the machinery.

**Important!** The diameter of these ground leads must be according to national and local codes.



## 6. Adjustment of Centrifugal Force Output



VIMARC vibrator motors leave the factory with the adjustable centrifugal weights positioned at 0% to minimize the possibility of damaging the bearings while in transport. The procedure to adjust the centrifugal force output is the same for explosionproof (as pictured above) and standard models. The centrifugal weights of the VIMARC vibrator motor can be reset to any percentage in order to obtain the working moment and centrifugal force to produce the required amplitude or stroke of the machine by the following procedure:

- 1) Detach and remove both weight covers (6).
- 2) Loosen both clamping bolts (32) to release the inner centrifugal weights and rotate each inner weight (3 and 4) equally, relative to outer weights, in the same direction (**see warning**). Outer weights (5) are keyed on the shaft and thus fixed. These outer weights are provided with a marking line and the inner weights have a scale. If a marking line is not visible, utilize the edge of the outer weight. The scale on the inner weights represents a percentage value of the total maximum centrifugal force available.
- 3) Retighten the clamping bolts (32). Retighten the clamping bolts to the proper torque values as shown in section 4.
- 4) Refit and secure both weight covers (6). Make sure that the o-ring seal (9) of the weight covers are in a "like new" condition.

**WARNING!** EXCEPT FOR SPECIAL APPLICATIONS, IT IS ESSENTIAL THAT THE WEIGHTS AT BOTH ENDS OF THE MOTOR SHAFT ARE SET AT PRECISELY THE SAME PERCENTAGE VALUE. ANY UNEQUAL SETTING OF THESE WEIGHTS WILL GENERATE TREMENDOUS TRANSVERSE FORCES, WHICH MAY RESULT IN INJURY OR DESTRUCTION OF YOUR VIBRATING EQUIPMENT.

## 7. Relubrication

Of the standard (non-hazardous locations) VIMARC motors, only two pole models, series C up to and including F, and also all G, H, and K motors are delivered with grease fittings. Any model not fitted by the manufacturer with grease fittings does not require regreasing for the B-10 life of its bearing. However, grease fittings may be ordered even for such models and then the procedure for regreasing should be followed.

**Note:** None of the explosion proof (hazardous locations) motors are fitted with grease fittings, except for the "G" series.

Relubricate using a lithium hydroxystearate grease, such as Shell Alvania R3 or equal, after the first 500 operating hours, and every 1000 operating hours thereafter in the following quantities:

<u>Model</u>	<u>Grams per Grease Fitting</u>
A and B	3
C and D	5 – 10
E and F	10 – 15
G	15 – 20
K	20 – 30
H	20 – 30 (IF equipped with NJ 2319 bearings)*
H	30 – 40 (IF equipped with NJ 2322 bearings)*
	* see motor rating plate

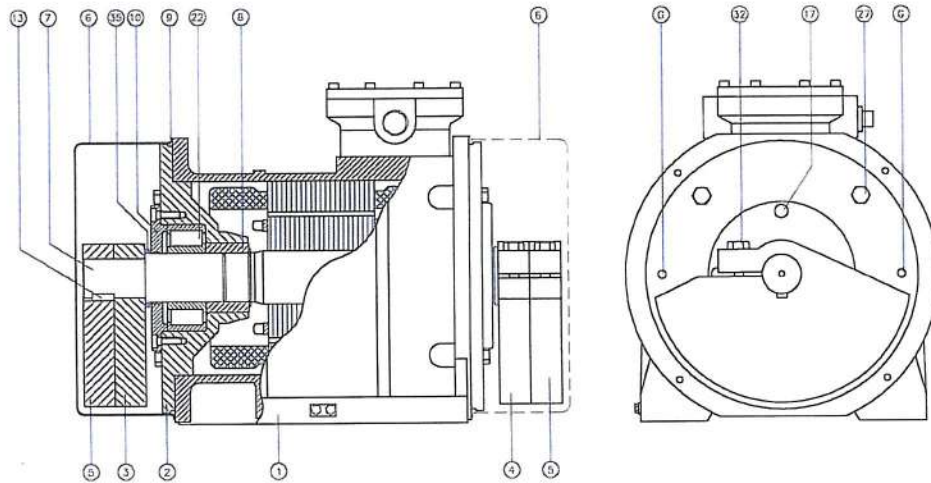
Lubrication above the recommended quantities can be harmful to the bearing life of the motor.

## 8. Replacement of bearings

The bearing type is specified on the rating plate of your VIMARC motor. It is usually a cylindrical roller bearing. The inner and the outer race of the bearing have raised collars, providing a lateral bearing surface for the rollers to take up the axial load on the bearing. As long as your VIMARC motor is properly installed and maintained as specified in this Manual, the bearing life will not be affected by normal thrust loads during operation.

**Warning!** VIMARC **Explosionproof** models conform to code FM 3615, that makes high demands upon the tolerances of the fittings between bearing housing and stator housing, and between the bearing housing and the spacers, which are shrunk on the shaft. When changing bearings on the explosion proof models, the above-mentioned fittings must be checked to ensure they are still in accordance with the code to maintain the explosion proof certification.

**Note:** The following procedure for replacement of bearings is the same for explosionproof and standard models.



### 8.1. Removing the Cylindrical Roller Bearings

- 1) Detach and remove both weight covers (6) and O-ring seal (9) from either side of the motor.
- 2) Either mark or record the angular setting of the inner centrifugal weights (3 and 4).
- 3) Loosen the clamping bolts (32) of the outer centrifugal weights (5) and pull off the weights and remove the keys (13).
- 4) Loosen the clamping bolts (32) of the inner weights (3 and 4) and pull off the weights.
- 5) Remove the V-rings (35).
- 6) Loosen and remove the screws (17) and remove bearing covers (10).
- 7) Loosen and remove the bolts (27).
- 8) Insert two bolts (27) into the threaded holes (G) and continue turning them in order to push the end plates (2) out of the motor housing (1).
- 9) Draw the end plates (2) outward carrying the outer races of the roller bearings (22).
- 10) Using an extractor tool, draw from the shaft the inner race of the roller bearing (22) and the spacers (8). Pay attention to protect the shoulder from being damaged. In case of motor type A & B, only the inner race.
- 11) Push the outer race of the roller bearing by means of the inner race out of the end plates (2).
- 12) On models K and H, remove the three screws located on the bearing housing and insert three bolts (27) into these holes and push the bearing out of the bearing housing.
- 13) Thoroughly degrease and clean and check all parts.



## 8.2. Installing the Cylindrical Roller Bearings

When ordering replacement bearings, make sure to order the same make, type and model number as the ones you are replacing. They are identified on the rating plate of your VIMARC motor. Pay particular attention to the C-4 fit. Use only the lubricant grease that is specified on the rating plate.

- 1) Heat both the inner races of new bearings and the spacers (8) to approx. 100° C (212° F). Next push them over the shaft until against the shoulder and let them cool off.
- 2) Grease-pack both roller bearings (22) with recommended grease lubricant (Shell-Alvania R 3 or equivalent) and press them into their bearing houses (2).
- 3) Pack the recesses 2/3 full of grease.
- 4) Assemble the bearing covers (10) and attach with appropriate screws (17).
- 5) Use Loctite 549 for the cylindrical gap between bearing housing and stator housing. Assemble the bearing housings; use Loctite 242 for the bolts.

**Important! Make sure that the lubrication channel (if any) is placed in the right position.**

- 6) Assemble the V-rings (35) on the shaft with the V facing the end of the shaft.
- 7) Push the inner centrifugal weights (3 and 4) on the shaft until against the shoulders.
- 8) Put the keys (13) into their recesses and push the outer weights (5) back on the shaft in the original position as marked and recorded, and tighten the clamping bolts (32).
- 9) Locate the inner centrifugal weights (3 and 4) in the exact angular position as marked or recorded and tighten the clamping bolts (32).

**Caution:** Except for special applications, it is essential that the inner weights at both ends be set exactly at the same value. Failure to have identical values at both ends will create dangerous transverse forces, which may cause injury and destroy your equipment.

- 10) After being completely assembled, the rotor shaft must have axial play of 0.4 to 1 mm, or .0158 to .0394 inches.
- 11) Refit the weight covers (6) and secure them with the appropriate screws. Make sure that the O-rings (9) are still serviceable and are properly re-positioned before the weight covers are secured.

**Note:** Additional torque values are found in section 4 for tightening the bearing covers, bearing housings, weights and the weight covers.

**Note:** During the first operating hours the motor will run warmer than usual. The excess lubricating grease will be pushed out. Thereafter the motor should run at normal operating temperature.

## 9. Repairs and Spare Parts

### Repairs

Thousands of VIMARC vibrator motors have been shipped to all parts of the world and are giving trouble-free, long life, in all manner of applications, in all sorts of climatic and other conditions.

Eventually, a bearing will wear out, as all moving parts do. That is normal, and this manual lists what needs to be done to replace bearings. In case of burnout of a motor, requiring rewinding, or any other abnormal repairs, which are beyond the scope of this manual, contact DF-Vimarc Corporation for referral to a qualified motor repair facility.

### Spare Parts

Spare parts for VIMARC vibrator motors can be ordered through DF-Vimarc Corporation. When ordering spare parts please provide the information as stated below, all of which can be found on the motor rating plate next to the terminal box. Please refer to the item number associated with the diagram on the next pages.

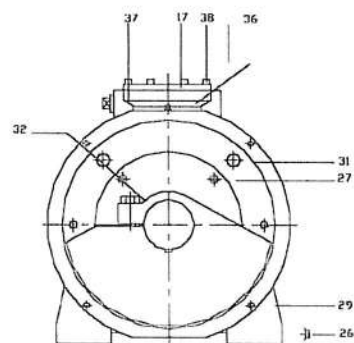
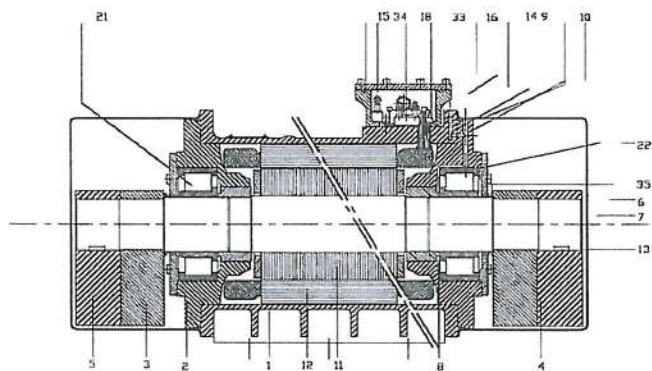
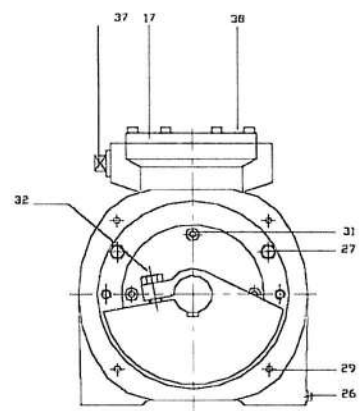
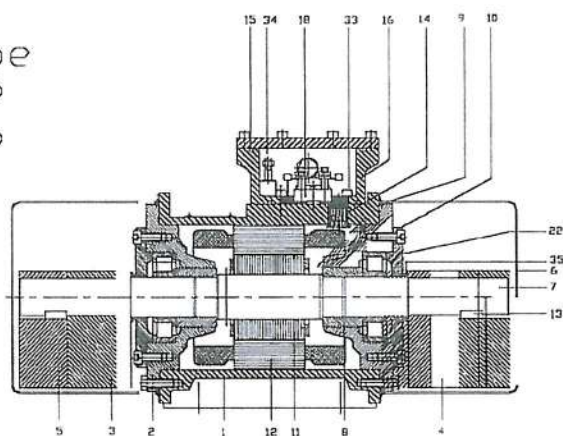
- Serial number of the vibrator motor
- Motor type
- Voltage and frequency
- Position number of the spare parts
- Quantity

Lists of spare parts are available on demand. (Numbers 20, 24, 25 & 28 are intentionally omitted)

<u>Item No.</u>	<u>Description</u>	<u>Pieces Required</u>
1	Stator Housing	1
2	Bearing Housing	2
3	Centrifugal Weight Inner Left	1
4	Centrifugal Weight Inner Right	1
5	Centrifugal Weight Outer	2
6	Weight Cover	2
7	Motor Shaft	1
8	Distance Ring	2
9	Seal (Weight Cover O-Ring)	2
10	Bearing Cover	2
11	Rotor	1
12	Stator	1
13	Weight Key	2
14	Transit Sleeve	1
15	Sealing Cord (Terminal Box O-Ring)	1
16	Terminal Box Housing	1
17	Terminal Box Cover	1
18	Terminal Board	1
19	Cable Gland	1
21	Ball Bearing (only on A Motors)	2
22	Roller Bearing	2
23	Gasket	1
26	Ground Safety Plate	1
27	Hexagon Screw	8
29	Hexagon Screw	8
30	Hexagon Screw	2
31	Hexagon Socket Head Screw	8
32	Hexagon Screw	4
33	Hexagon Socket Head Screw	4
34	Ground Safety Bolt	1
35	V-Ring	2
36	Grease Nipple	2
37	Plug	1
38	Hexagon Socket Head Screw	8

## 9.1 Explosionproof Motor Diagrams

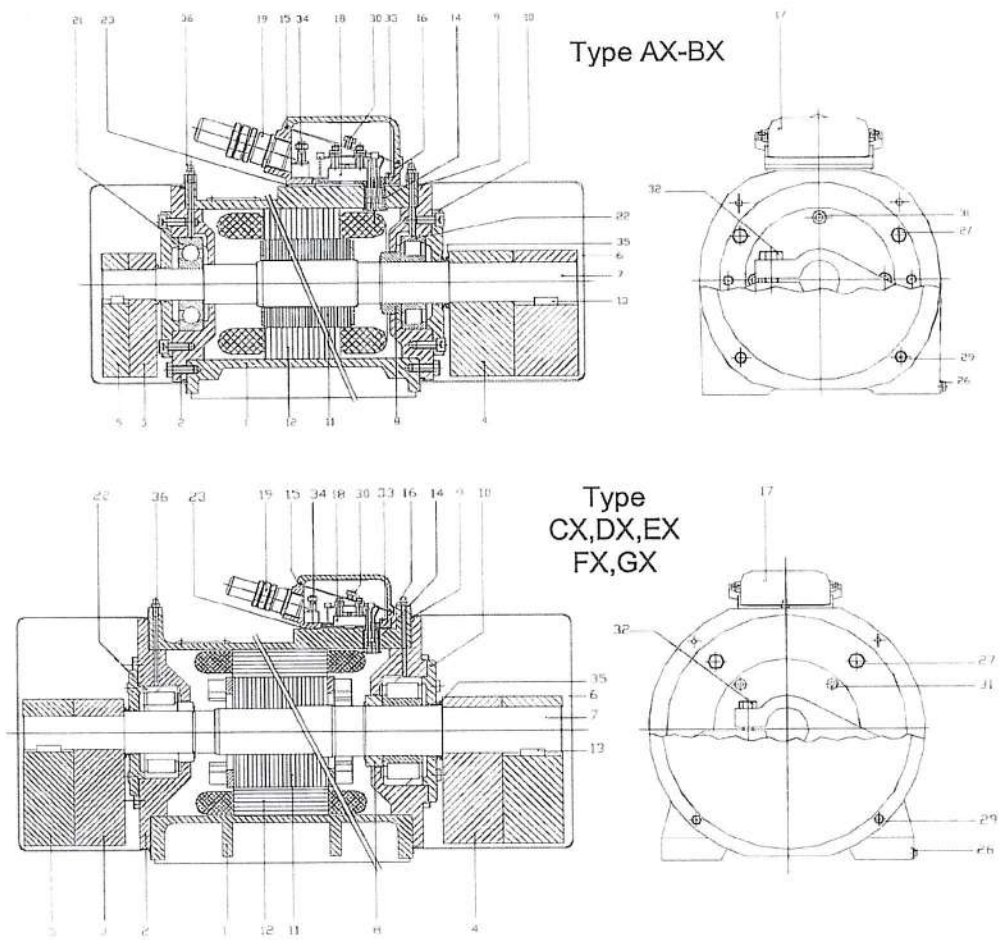
Type  
AXP  
BXP



Type    CXP    EXP    GXP  
         DXP    FXP



## 9.2 Standard Motor Diagrams



## 10. Explosionproof Certification

Your VIMARC explosion proof vibrator motor is virtually the same in application and maintenance as the standard VIMARC vibrator motor of equivalent size. Consequently the foregoing instructions are equally applicable, except as specially noted. The following additional instructions are particular for explosion proof motors and for your added protection. None of the explosionproof motors are fitted with grease fittings except for the "G" series.

VIMARC explosion proof vibrator motors are certified as follows by: FACTORY MUTUAL (FM) and CANADIAN STANDARDS ASSOCIATION (CSA)

- Series AXP, BXP, CXP, DXP, EXP, FXP and GXP:  
with a thermistor control, at Temperature Code T4 (135° C or 275° F) for:  
FM Class I and Class II, Division 1, Groups C, D, E, F and G  
CSA Class I, Groups C and D, Class II, Groups E, F and G
- Series EXP, FXP and GXP:  
with or without a thermistor control, at Temperature Code T3B (165° C or 329° F) for:  
FM Class I and Class II, Division 1, Groups C, D, E, F and G  
CSA Class I, Groups C and D, Class II, Groups E, F and G
- Series AXP, BXP, CXP and DXP:  
without a thermistor control, at Temperature Code T3 (200° C or 392° F) for:  
FM Class I and Class II, Division 1, Groups C, D, E, F and G  
CSA Class I, Groups C and D, Class II, Groups E and F

Each VIMARC explosion proof vibrator motor comes with thermistors embedded in its windings, which account for the two free wires you will see coming out of the motor housing into the terminal box. If thermistor controls are needed for the application, they can be furnished by DF-Vimarc Corporation or by the customer. These thermistor controls must be certified. Technical details will gladly be provided on request.

A good quality, approved, all-metal fitting must be provided to seal the threaded opening from the terminal box, which accommodates the power supply cable. Such fittings are readily available from your electrical supplier. Take care that the cable is approved for the application, is flexible, adequate in length, and hangs totally free of all surfaces so that it will not be damaged or chafed by motion of the motor while it is running.

After all motor connections are completed and before securing the terminal box cover, it is recommended to stuff the void within the terminal box with a type of insulating material. This will insure all connections and thermistor leads are free from chafing which could cause a short circuit.

In instances where a single starter controls two motors, the wiring is exactly the same. Make sure that the thermistors are wired in series with the thermistor control, if one is used. This offers the added protection of a system where, if one motor becomes overheated, both motors will be stopped.

### IMPORTANT!

Starters, controls and connecting materials used with Explosionproof Motors must conform to National Electrical Code (NEC) and to applicable State, municipal or local codes. For use in Canada, they must conform to the Canadian Electrical Code (CEC) and have been approved by CSA.

## 11. Warranty

DF-Vimarc Corporation for VIMARC warrants and agrees with respect to VIMARC motors manufactured by it:

- 1) that each VIMARC vibrator motor is specifically and exclusively designed as a vibrator motor for vibratory purposes.
- 2) that each VIMARC vibrator motor is free from defects in material and workmanship under applicable use and service.
- 3) that their obligation under this warranty shall be limited to authorizing or causing necessary repairs or corrections or, at their option, supplying replacement parts free of charge, with respect to defects in workmanship and/or materials claimed to have arisen within one year of service.

Any claims for breach of this warranty, in order to be recognized, must be presented to DF-Vimarc Corporation's Washington office in writing within thirty days of failure. The following information to be supplied with every claim: serial and model number of motor, date of receipt, description of application, and description of any obvious reason for failure.

DF-Vimarc Corporation disclaims any warranty if:

- The motor has been connected to the wrong voltage or frequency.
- Unnecessary damage of the motor is caused by incorrect or no electrical safety at all.
- Changes have been made which affect the working of the vibrator motor.
- The motor is damaged during transportation.
- The motor is not installed and maintained in strict accordance with this Manual.

No motor may be returned for any reason except on written authorization from DF-Vimarc Corporation, which authorization will include complete shipping instruction

The foregoing is in lieu of all other warranties, express or implied and, specifically, no responsibility of downtime or other consequential damages is or will be accepted.

On any occasion when you may have questions about parts, service, or any other pertinent factors about VIMARC vibrator motors, please do not hesitate to call, for prompt attention and advice.

Imported and Distributed in North America exclusively by

**DF-VIMARC CORPORATION**

P.O. Box 9993  
WASHINGTON, D.C. 20016

**TOLL FREE: 1-866-TO-VIMARC**  
**WWW.DF-VIMARC.COM**





## EC-DECLARATION OF CONFORMITY

within the meaning of EU Machines Directives (2006/42/EC Article 6 Paragraph (2) ; Annex II 1.B)  
for installable machines, amended by Directive 2006/42/EC with special reference to Annex I.

Herewith declares the manufacturer

**Company/Name/Address:** Vimarc Inc.  
10757 Cutten Rd. #5  
Houston, TX, 77066  
USA

of the incomplete machine

**Product/Type:** Vimarc vibrator motor  
Type: AX(Z) – KX(Z) ...-...

that this has been developed, built and manufactured in conformity with the following directive:

Machine Directive (2006/42/EG)

and meet the following basic requirements of the directive:

Annex I, Articles 1.1.2, 1.1.5, 1.3.2, 1.3.3, 1.3.7, 1.5.1, 1.7.3

The following harmonised standards have been applied:

DIN EN ISO 12100 Part 1 and 2. Safety of Machines, Equipment and Installations  
IEC 60204-1. Electrical Equipment for Industrial Machines

For this product the special technical documents were prepared in accordance with annex VII Part B.  
Complete technical documentation exists. Upon justifiable request, these documents from individual national location can be send by post, email or fax.  
Operating-/installation instructions are available.  
The safety instructions provided in the operating-/installation instructions must be observed.

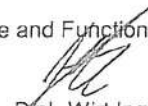
Authorised representative to assemble and transmission of the technical documents:  
Dipl.-Kffr. (FH) Anke Uebelmann, Friedrich Schwingtechnik GmbH, Am Höfgen 24, D-42781 Haan

It is forbidden to start up this machine/this machine part until it has been established that the machine in which the vibrator motor is to be installed complies with the regulations of the directive (2006/42/EG).

City / Date of Issue

Haan, 29.04.2011

Signature and Function of the Signer

  
Dipl.-Ing., Dipl.-Wirt.Ing. Martin Gerth  
Managing Director



## Certificate

<b>Client</b>		<b>Reference client</b>	TRI 27989
<b>Manufacturer</b>	Vimarc Inc.	<b>Reference manufacturer</b>	901216
<b>Motor type</b>	DX 301-4	<b>Serialnumber</b>	1309176
<b>Phases of motor</b>	3	<b>Type of current</b>	AC
<b>Enclosure type</b>	IP 65	<b>Mode of operation</b>	S1
<b>Power</b>	2,70 / 2,00 HP-kW	<b>Power factor</b>	0.85
<b>Stator voltage</b>	V	<b>Efficiency</b>	83 %
<b>Rated current</b>	A	<b>Frequency</b>	50 Hz
<b>Starting current</b>	0.00 A	<b>Rated torque</b>	9.70 ft·lb
<b>Full load speed</b>	1460 RPM	<b>Starting torque</b>	16.40 ft·lb
<b>Rotor type</b>	Short circuit rotor		
<b>Insulation class</b>	F		
<b>Special insulation</b>	Tropicalised		
<b>Max. Temperature rising</b>	108 °F		
<b>Max. ambient temperature</b>	104 °F		
<b>Windings-case test voltage</b>	kV		
<b>Weight</b>	284 lb		
<b>Remarks</b>			

**Examinator** S. Torres

Vimarc Inc  
10757 Cutten Rd. #5  
Houston, TX 77066

Phone : (281) 440-0028  
Fax : (281) 537-2371  
E-Mail : vimarcinc@att.net

07/10/2013

Vimarc Inc. • 10757 Cutten Rd. #5 • Houston, TX 77066 • Phone: (281) 440-0028 • Fax: (281) 537-2371



## Certificate

<b>Client</b>		<b>Reference client</b>	TRI 27716
<b>Manufacturer</b>	Vimarc Inc.	<b>Reference manufacturer</b>	901154
<b>Motor type</b>	DX 301-4	<b>Serialnumber</b>	1308195
<b>Phases of motor</b>	3	<b>Type of current</b>	AC
<b>Enclosure type</b>	IP 65	<b>Mode of operation</b>	S1
<b>Power</b>	2,70 / 2,00 HP-kw	<b>Power factor</b>	0.85
<b>Stator voltage</b>	V	<b>Efficiency</b>	83 %
<b>Rated current</b>	A	<b>Frequency</b>	50 Hz
<b>Starting current</b>	0.00 A	<b>Rated torque</b>	9.70 ft·lb
<b>Full load speed</b>	1460 RPM	<b>Starting torque</b>	16.40 ft·lb
<b>Rotor type</b>	Short circuit rotor		
<b>Insulation class</b>	F		
<b>Special insulation</b>	Tropicalised		
<b>Max. Temperature rising</b>	108 °F		
<b>Max. ambient temperature</b>	104 °F		
<b>Windings-case test voltage</b>	kV		
<b>Weight</b>	284 lb		
<b>Remarks</b>			

**Examinator**

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07/10/2013

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## Certificate

<b>Client</b>		<b>Reference client</b>	TRI 27716
<b>Manufacturer</b>	Vimarc Inc.	<b>Reference manufacturer</b>	901154
<b>Motor type</b>	DX 301-4	<b>Serialnumber</b>	1308194
<b>Phases of motor</b>	3	<b>Type of current</b>	AC
<b>Enclosure type</b>	IP 65	<b>Mode of operation</b>	S1
<b>Power</b>	2,70 / 2,00 HP-kW	<b>Power factor</b>	0.85
<b>Stator voltage</b>	V	<b>Efficiency</b>	83 %
<b>Rated current</b>	A	<b>Frequency</b>	50 Hz
<b>Starting current</b>	0.00 A	<b>Rated torque</b>	9.70 ft·lb
<b>Full load speed</b>	1460 RPM	<b>Starting torque</b>	16.40 ft·lb
<b>Rotor type</b>	Short circuit rotor		
<b>Insulation class</b>	F		
<b>Special insulation</b>	Tropicalised		
<b>Max. Temperature rising</b>	108 °F		
<b>Max. ambient temperature</b>	104 °F		
<b>Windings-case test voltage</b>	kV		
<b>Weight</b>	284 lb		
<b>Remarks</b>			

**Examinator**

S. Torres

Vimarc Inc  
10757 Cutten Rd #5  
Houston, TX 77066

Phone : (281) 440-0028  
Fax : (281) 537-2371  
E-Mail : vimarcinc@aol.net

07/10/2013

Vimarc Inc. • 10757 Cutten Rd. #5 • Houston, TX 77066 • Phone: (281) 440-0028 • Fax: (281) 537-2371



## Certificate

<b>Client</b>		<b>Reference client</b>	TRI 27716
<b>Manufacturer</b>	Vimarc Inc.	<b>Reference manufacturer</b>	901154
<b>Motor type</b>	DX 301-4	<b>Serialnumber</b>	1308193
<b>Phases of motor</b>	3	<b>Type of current</b>	AC
<b>Enclosure type</b>	IP 65	<b>Mode of operation</b>	S1
<b>Power</b>	2,70 / 2,00 HP-kW	<b>Power factor</b>	0.85
<b>Stator voltage</b>	V	<b>Efficiency</b>	83 %
<b>Rated current</b>	A	<b>Frequency</b>	50 Hz
<b>Starting current</b>	0.00 A	<b>Rated torque</b>	9.70 ft·lb
<b>Full load speed</b>	1460 RPM	<b>Starting torque</b>	16.40 ft·lb
<b>Rotor type</b>	Short circuit rotor		
<b>Insulation class</b>	F		
<b>Special insulation</b>	Tropicalised		
<b>Max. Temperature rising</b>	108 °F		
<b>Max. ambient temperature</b>	104 °F		
<b>Windings-case test voltage</b>	kV		
<b>Weight</b>	284 lb		
<b>Remarks</b>			

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## Certificate

<b>Client</b>		<b>Reference client</b>	TRI 27716
<b>Manufacturer</b>	Vimarc Inc.	<b>Reference manufacturer</b>	901154
<b>Motor type</b>	DX 301-4	<b>Serialnumber</b>	1308192
<b>Phases of motor</b>	3	<b>Type of current</b>	AC
<b>Enclosure type</b>	IP 65	<b>Mode of operation</b>	S1
<b>Power</b>	2,70 / 2,00 HP-kW	<b>Power factor</b>	0.85
<b>Stator voltage</b>	V	<b>Efficiency</b>	83 %
<b>Rated current</b>	A	<b>Frequency</b>	50 Hz
<b>Starting current</b>	0.00 A	<b>Rated torque</b>	9.70 ft·lb
<b>Full load speed</b>	1460 RPM	<b>Starting torque</b>	16.40 ft·lb
<b>Rotor type</b>	Short circuit rotor		
<b>Insulation class</b>	F		
<b>Special insulation</b>	Tropicalised		
<b>Max. Temperature rising</b>	108 °F		
<b>Max. ambient temperature</b>	104 °F		
<b>Windings-case test voltage</b>	kV		
<b>Weight</b>	284 lb		
<b>Remarks</b>			

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## Certificate

<b>Client</b>		<b>Reference client</b>	TRI 27716
<b>Manufacturer</b>	Vimarc Inc.	<b>Reference manufacturer</b>	901154
<b>Motor type</b>	DX 301-4	<b>Serialnumber</b>	1308191
<b>Phases of motor</b>	3	<b>Type of current</b>	AC
<b>Enclosure type</b>	IP 65	<b>Mode of operation</b>	S1
<b>Power</b>	2,70 / 2,00 HP-kW	<b>Power factor</b>	0.85
<b>Stator voltage</b>	V	<b>Efficiency</b>	83 %
<b>Rated current</b>	A	<b>Frequency</b>	50 Hz
<b>Starting current</b>	0.00 A	<b>Rated torque</b>	9.70 ft·lb
<b>Full load speed</b>	1460 RPM	<b>Starting torque</b>	16.40 ft·lb
<b>Rotor type</b>	Short circuit rotor		
<b>Insulation class</b>	F		
<b>Special insulation</b>	Tropicalised		
<b>Max. Temperature rising</b>	108 °F		
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## Certificate

<b>Client</b>		<b>Reference client</b>	TRI 27716
<b>Manufacturer</b>	Vimarc Inc.	<b>Reference manufacturer</b>	901154
<b>Motor type</b>	DX 301-4	<b>Serialnumber</b>	1308190
<b>Phases of motor</b>	3	<b>Type of current</b>	AC
<b>Enclosure type</b>	IP 65	<b>Mode of operation</b>	S1
<b>Power</b>	2,70 / 2,00 HP-kW	<b>Power factor</b>	0.85
<b>Stator voltage</b>	V	<b>Efficiency</b>	83 %
<b>Rated current</b>	A	<b>Frequency</b>	50 Hz
<b>Starting current</b>	0.00 A	<b>Rated torque</b>	9.70 ft·lb
<b>Full load speed</b>	1460 RPM	<b>Starting torque</b>	16.40 ft·lb
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<b>Insulation class</b>	F		
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<b>Max. Temperature rising</b>	108 °F		
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07/10/2013

Vimarc Inc. • 10757 Cutten Rd. #5 • Houston, TX 77066 • Phone: (281) 440-0028 • Fax: (281) 537-2371



No.:

Date: 19-JUL-2013

Customer :

## TECHNICAL PROPOSAL

## Three-phase induction motor - Squirrel cage rotor

Product line : W22 NEMA Premium - Ball Bearings

Catalog Number : -

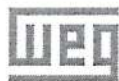
List Price : \$-

Notes:

Performed by:

Checked:





No.:

Date: 19-JUL-2013

**DATA SHEET****Three-phase induction motor - Squirrel cage rotor**

Customer :  
Product line : W22 NEMA Premium - Ball Bearings

Frame : 404/5T  
Output : 100 HP  
Frequency : 50 Hz  
Poles : 4  
Full load speed : 1470  
Slip : 2.00 %  
Voltage : 400 V  
Rated current : 129 A  
Locked rotor current : 839 A  
Locked rotor current (I<sub>L</sub>/I<sub>n</sub>) : 6.5  
No-load current : 40.1 A  
Full load torque : 352 lb.ft  
Locked rotor torque : 210 %  
Breakdown torque : 230 %  
Design : B  
Insulation class : F  
Temperature rise : 105 K  
Locked rotor time : 9 s (hot)  
Service factor : 1.00  
Duty cycle : S1  
Ambient temperature : -20°C - +40°C  
Altitude : 1000  
Degree of Protection : IP55  
Approximate weight : 1140 lb  
Moment of inertia : 29.894 sq.ft.lb  
Noise level : 64 dB(A)

	D.E.	N.D.E.	Load	Power factor	Efficiency (%)
Bearings	6316 C3	6314 C3	100%	0.88	94.1
Regreasing interval	10000 h	12000 h	75%	0.85	94.5
Grease amount	34 g	27 g	50%	0.79	94.5

Notes:

Performed by

Checked

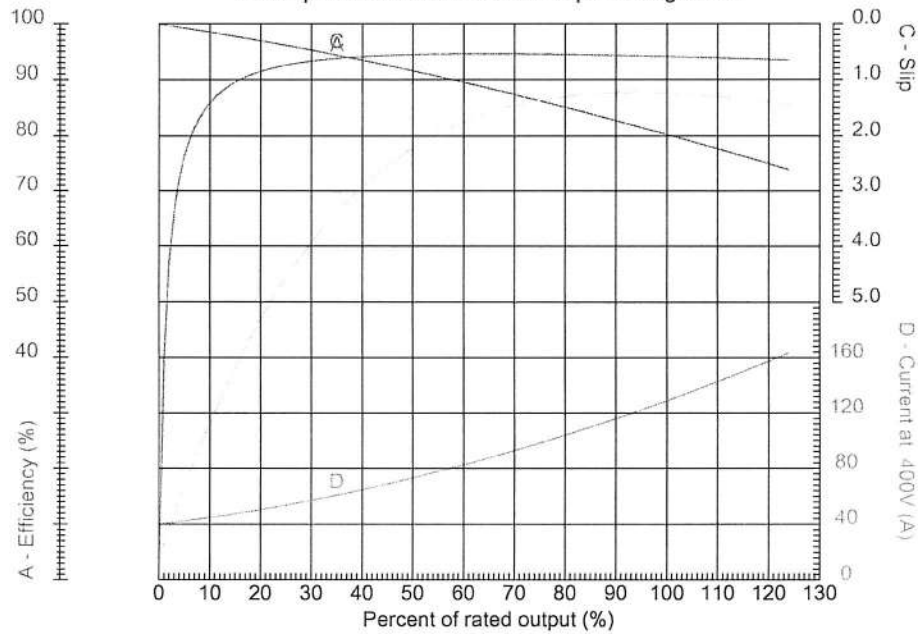


No.:

Date: 19-JUL-2013

## PERFORMANCE CURVES RELATED TO RATED OUTPUT

Three-phase induction motor - Squirrel cage rotor



Customer :  
Product line : W22 NEMA Premium - Ball Bearings

Frame	: 404/5T	Locked rotor current (I <sub>L</sub> /I <sub>n</sub> )	: 6.5
Output	: 100 HP	Duty cycle	: S1
Frequency	: 50 Hz	Service factor	: 1.00
Full load speed	: 1470	Design	: B
Voltage	: 400 V	Locked rotor torque	: 210 %
Rated current	: 129 A	Breakdown torque	: 230 %
Insulation class	: F		

Notes:

Performed by

Checked

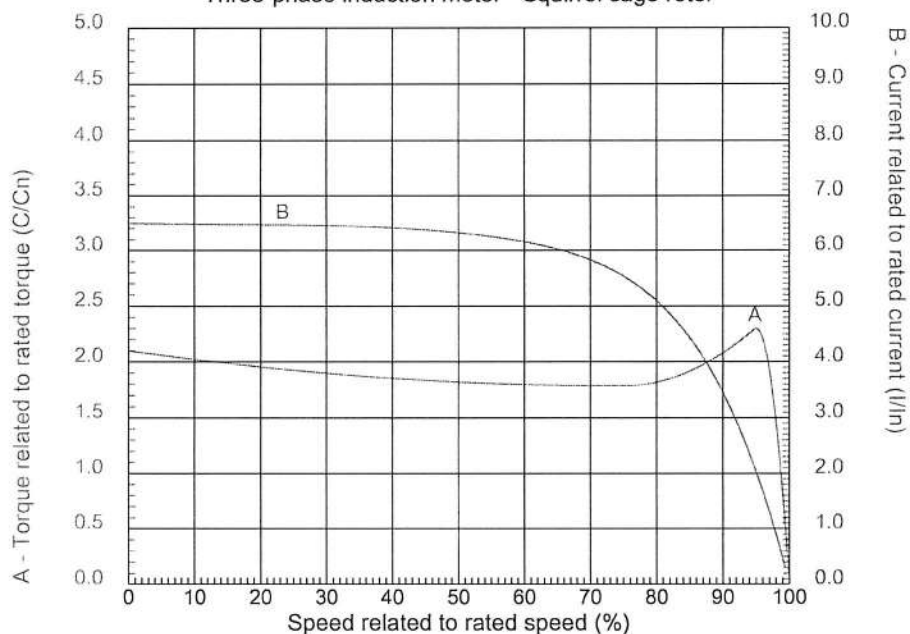


No.:

Date: 19-JUL-2013

## CHARACTERISTIC CURVES RELATED TO SPEED

Three-phase induction motor - Squirrel cage rotor



Customer :  
Product line : W22 NEMA Premium - Ball Bearings

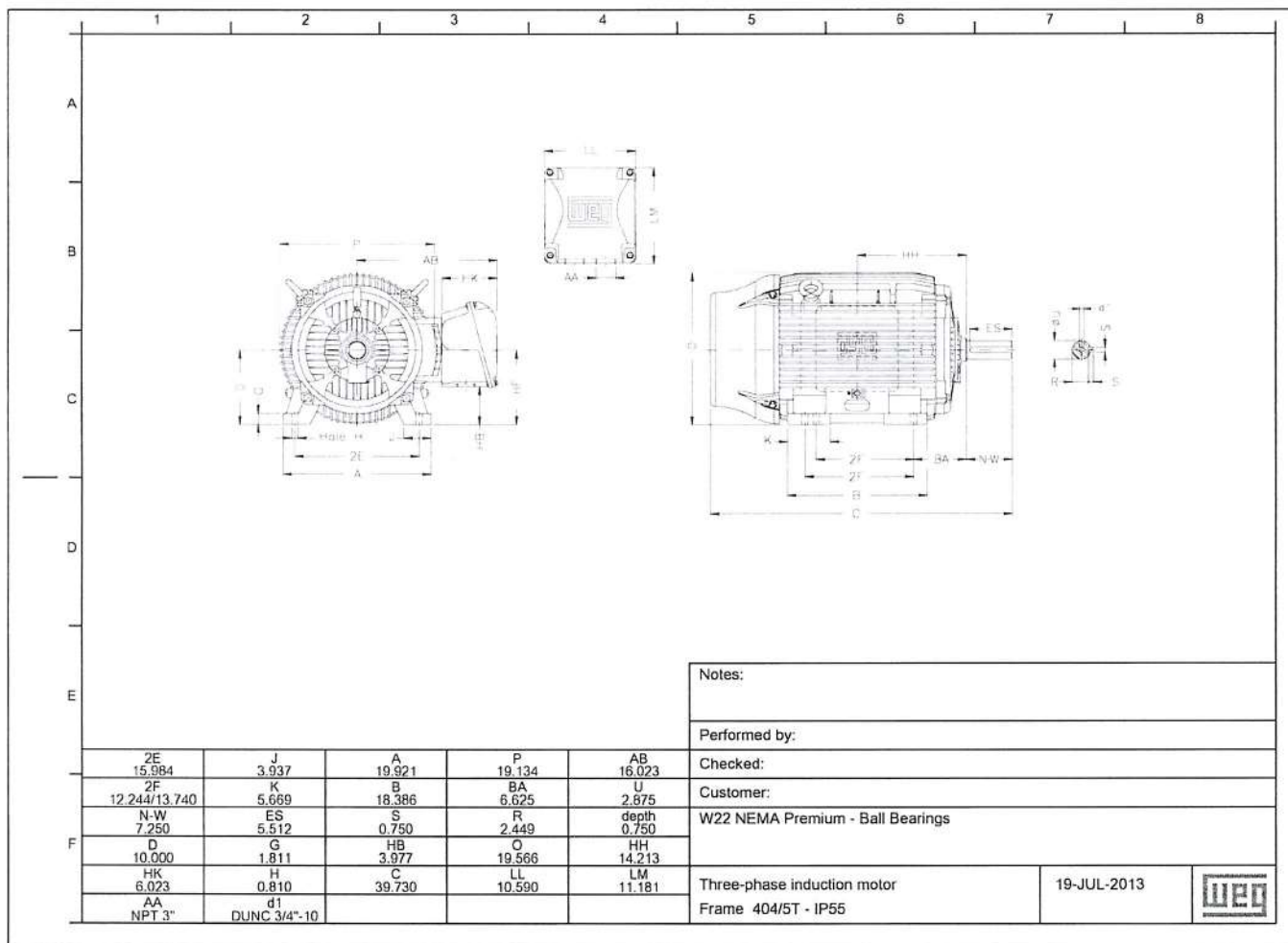
Frame	: 404/5T	Locked rotor current (I <sub>L</sub> /I <sub>n</sub> )	: 6.5
Output	: 100 HP	Duty cycle	: S1
Frequency	: 50 Hz	Service factor	: 1.00
Full load speed	: 1470	Design	: B
Voltage	: 400 V	Locked rotor torque	: 210 %
Rated current	: 129 A	Breakdown torque	: 230 %
Insulation class	: F		

Notes:

Performed by

Checked





# CERTIFICATE OF ORIGIN



To whom it may concern,

We hereby certify that WEG EQUIPAMENTOS ELÉTRICOS S.A. is a Brazilian manufacturer of LV and HV induction motors, generators, drives and controls, power and distribution transformers, industrial and electrical insulating varnishes.

All products exported into the United States of America are manufactured in the Brazilian plants located at Avenida Prefeito Waldemar Grubba, 3000, city of Jaraguá do Sul, State of Santa Catarina, Brazil and in the Mexican Plants located at Carretera Jorobas - Tula Km 3.5, Manzana 5, Lote 1, Fraccionamiento Parque Industrial Huehuetoca, Municipio de Huehuetoca, Cd. de México, Edo. de Mexico.

The undersigned hereby declares that this statement is correct, that all goods are produced in Brazil and Mexico and the same goods are commercialized all over the world including USA by WEG Electric Corp. - USA.

Mauro Tusset  
Marketing Supervisor  
WEG EQUIPAMENTOS ELÉTRICOS S.A. - WID

# EC Declaration of Conformity



**WEG Equipamentos Elétricos S/A**  
Av. Prefeito Waldemar Grubba, 3000  
89256-900 - Jaraguá do Sul - SC - Brazil.

and its authorised representative established in the European Community,  
**WEGeuro - Indústria Elétrica SA**  
Rua Eng Frederico Ulrich, Apartado 6074  
4476-908 - Maia - Porto - Portugal

hereby declare that the products:

WEG induction motors and components for using in these motors:

Three-phase

IEC frames 63 to 355

NEMA frames 42, 48, 56 and 143 to 587

Single-phase

IEC frames 63 to 132

NEMA frames 42, 48, 56 and 143 to 215

when installed, maintained and used in applications for which they were designed, and in compliance with the relevant installation standards and manufacturer's instructions, comply with the requirements of the following European Directives and applicable standards:

## Directives:

**Low Voltage Directive 2006/95/EC**


**EMC Directive 2004/108/EC** (induction motors are considered inherently benign in terms of electromagnetic compatibility)

## Standards:

EN 60034-1:2010	EN 60034-5:2007	EN 60034-6:1994	EN 60034-7:2001	EN 60034-8:2007
EN 60034-9:2007	EN 60034-11:2004	EN 60034-12:2007	EN 60034-14:2007	EN 60204-1:2010

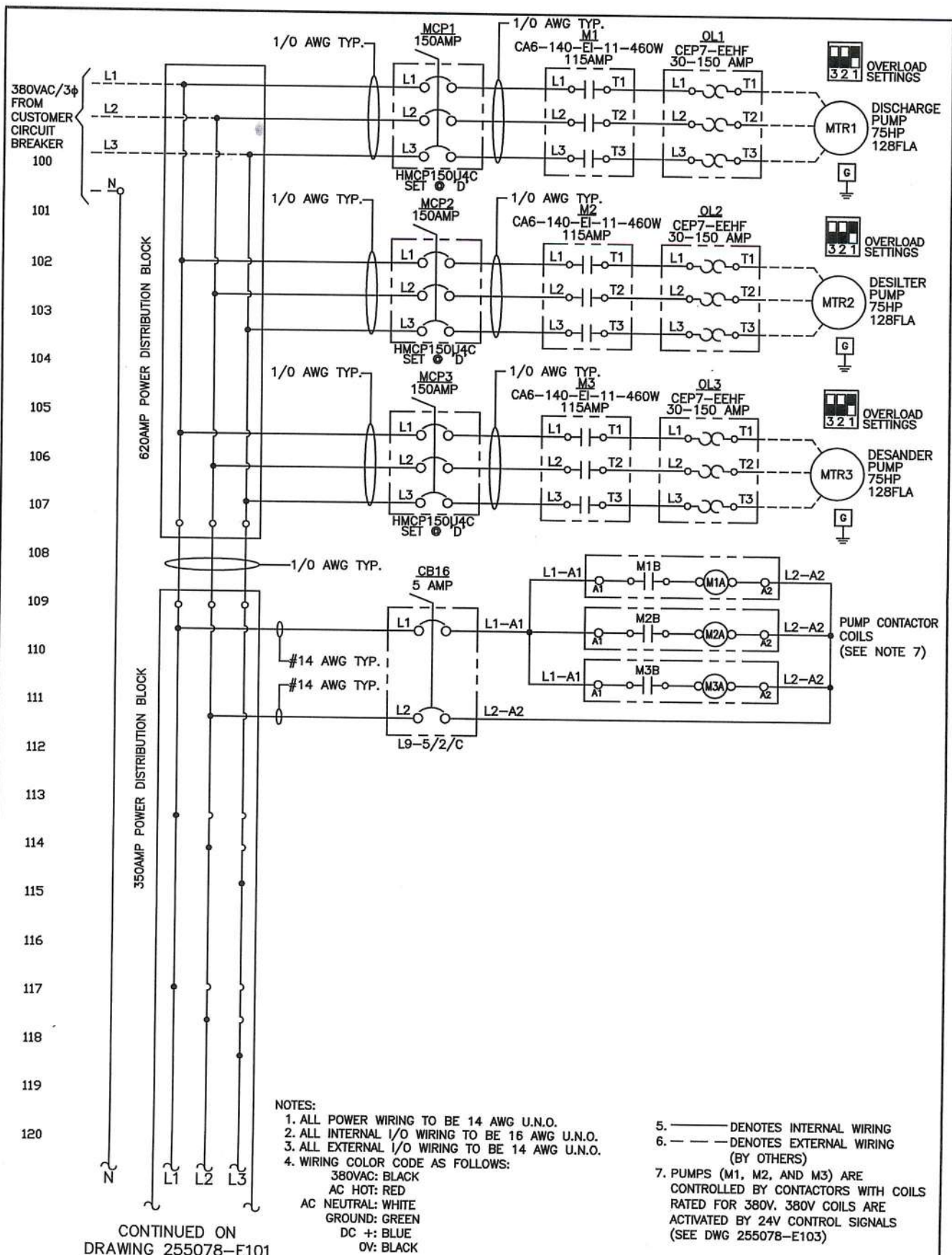
From 29/12/2009 on low voltage electric motors are no longer considered under the scope of the current Machinery Directive 2006/42/EC.

CE marking in: 1996

  
Milton Oscar Castella  
Engineering Director

Jaraguá do Sul, December 3<sup>th</sup>, 2010





REVISION DATA			APPROVALS		DATE
01	05/29/14	AS BUILT AND TESTED	DRAWN	W. STABELL	04/07/14
02	05/14/14	REMOVED AUGERS			
03	04/07/14	FOR CONSTRUCTION	CHECKED		
04					
05			APPROVED		
06					

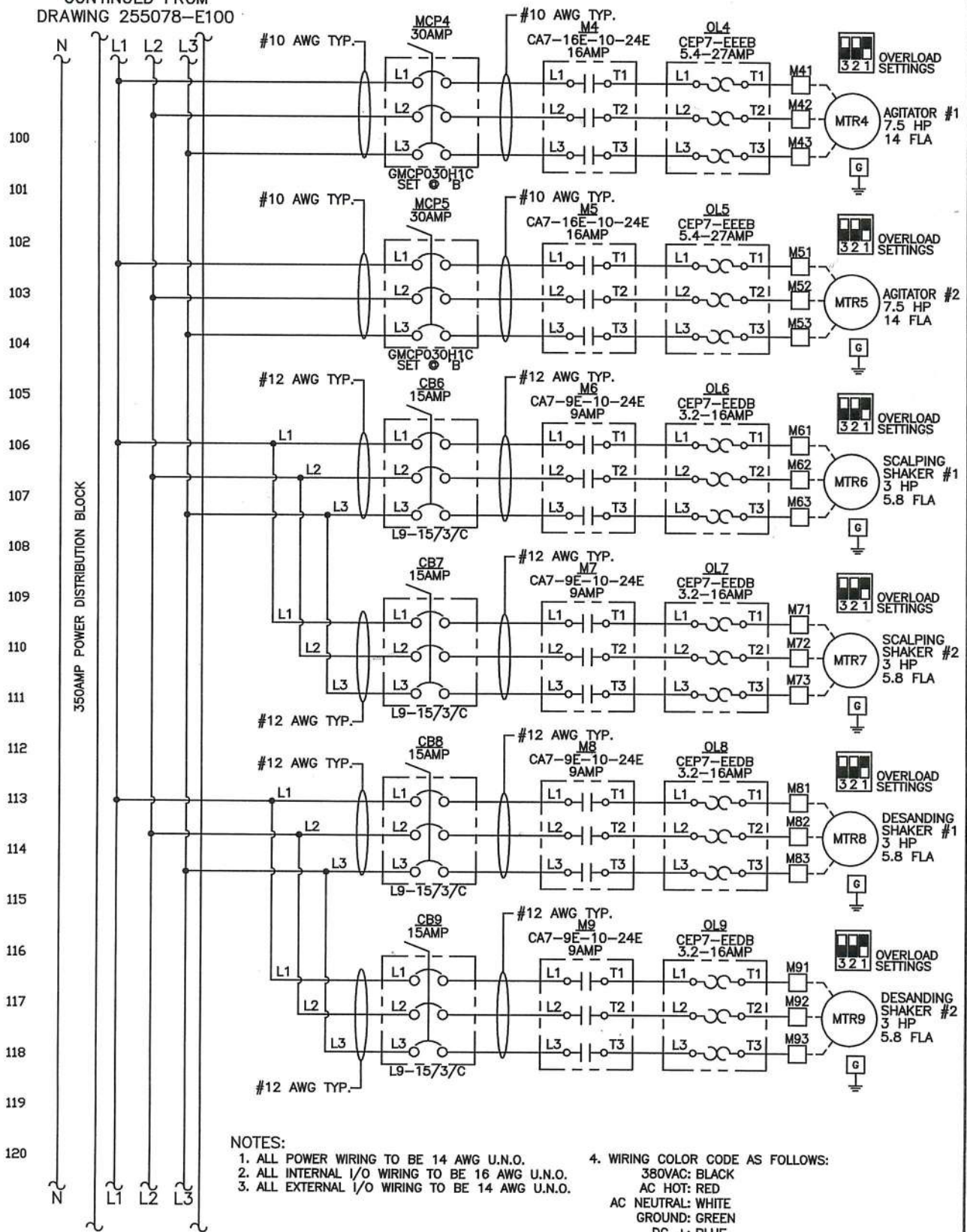
**CORDYNE**

9820 DRYSDALE LANE, HOUSTON, TEXAS PH 713.460.5151

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CUSTOMER/PROJECT		TRI-FLO INTERNATIONAL, INC.	
		WILLIS, TEXAS 77318	
DRAWING TITLE		380VAC/34/50HZ	
		NEMA 4, MULTI, FVNR STARTER PANEL	
		PART #TRI-FLO-ES2000-380V-AGR	
JOB NO.	255078	DRAWING NO.	255078-E100
REV.			01

CONTINUED FROM  
DRAWING 255078-E100



NOTES:

1. ALL POWER WIRING TO BE 14 AWG U.N.O.
2. ALL INTERNAL I/O WIRING TO BE 16 AWG U.N.O.
3. ALL EXTERNAL I/O WIRING TO BE 14 AWG U.N.O.

4. WIRING COLOR CODE AS FOLLOWS:

380VAC: BLACK  
AC HOT: RED  
AC NEUTRAL: WHITE  
GROUND: GREEN  
DC +: BLUE  
OV: BLACK

5. ——— DENOTES INTERNAL WIRING
6. - - - DENOTES EXTERNAL WIRING (BY OTHERS)

CONTINUED ON  
DRAWING 255078-E102

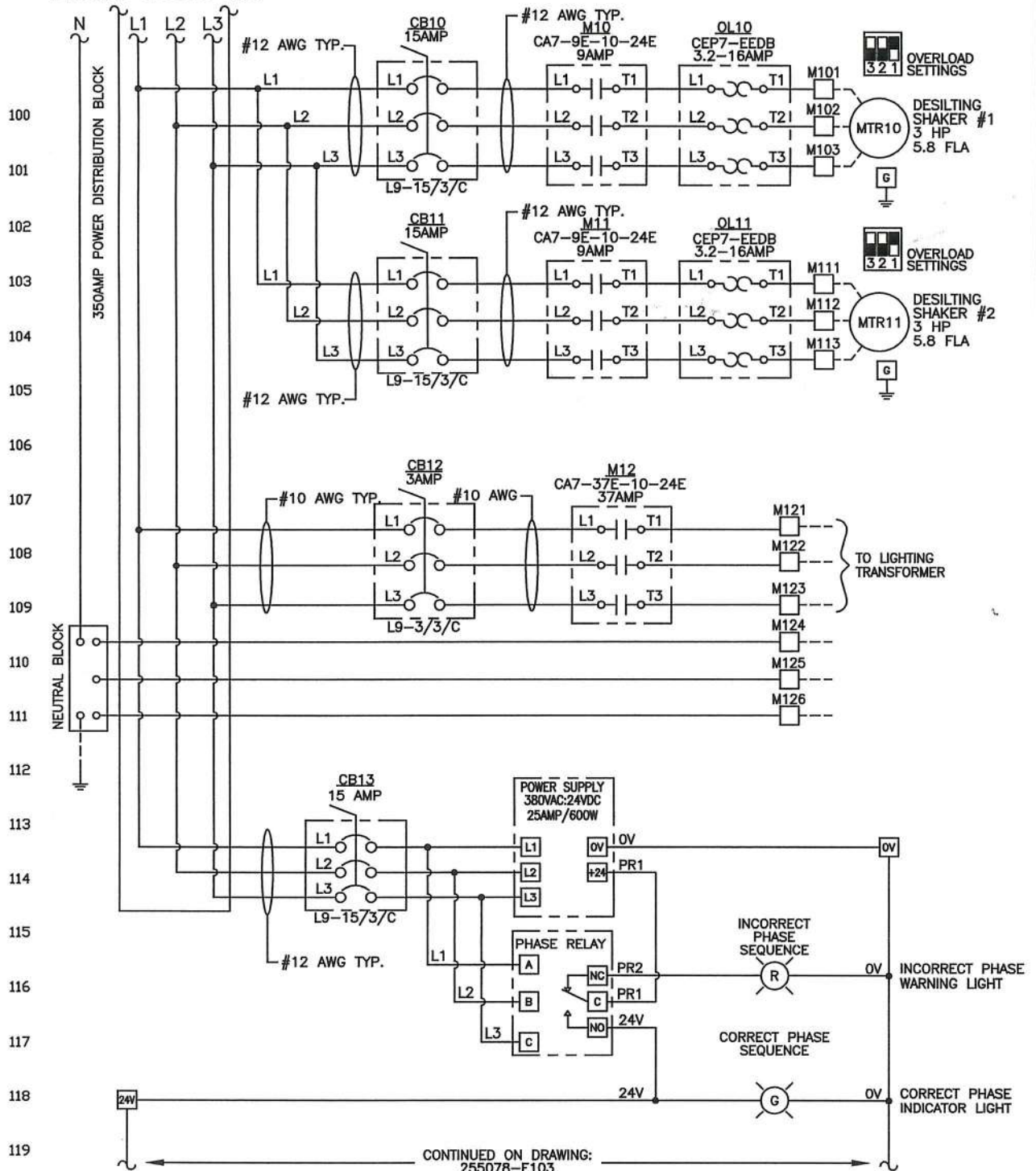
			APPROVALS		DATE		<div><b>CORDYNE</b></div> <p>9820 DRYSDALE LANE, HOUSTON, TEXAS PH 713.460.5151 THIS DRAWING/INFORMATION IS THE PROPERTY OF CORDYNE, INC. AND IS LOANED UPON CONDITION THAT IT IS NOT TO BE REPRODUCED OR COPIED IN WHOLE OR IN PART AND IS TO BE RETURNED UPON REQUEST.</p>		CUSTOMER/PROJECT		TRI-FLO INTERNATIONAL, INC. WILLIS, TEXAS 77318		SHEET SIZE: A
			DRAWN	W. STABELL	04/07/14	DRAWING TITLE			380VAC/34/50HZ NEMA 4, MULTI, FVNR STARTER PANEL PART #TRI-FLO-ES2000-380V-AGR				
01	05/29/14	AS BUILT AND TESTED	CHECKED			JOB NO.	255078	DRAWING NO.	255078-E101	REV.	01		
B	05/14/14	REMOVED AUGERS											
A	04/07/14	FOR CONSTRUCTION	APPROVED										
REV	DATE	DESCRIPTION											
REVISION DATA													

**CORDYNE**

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CONTINUED FROM  
DRAWING 255078-E101



NOTES:

1. ALL POWER WIRING TO BE 14 AWG U.N.O.
2. ALL INTERNAL I/O WIRING TO BE 16 AWG U.N.O.
3. ALL EXTERNAL I/O WIRING TO BE 14 AWG U.N.O.
4. 24V SIGNAL TRIGGERS 380V SIGNAL (SEE DWG 255078-E103)

5. WIRING COLOR CODE AS FOLLOWS:
- 380VAC: BLACK
  - DC+: BLUE
  - DC OV: BLACK
  - GROUND: GREEN

6. ——— DENOTES INTERNAL WIRING  
7. — — — DENOTES EXTERNAL WIRING (BY OTHERS)

REVISION DATA			APPROVALS		DATE
01	05/29/14	AS BUILT AND TESTED	DRAWN	W. STABELL	04/07/14
B	05/14/14	REMOVED AUGERS	CHECKED		
A	04/07/14	FOR CONSTRUCTION	APPROVED		
REV	DATE	DESCRIPTION			

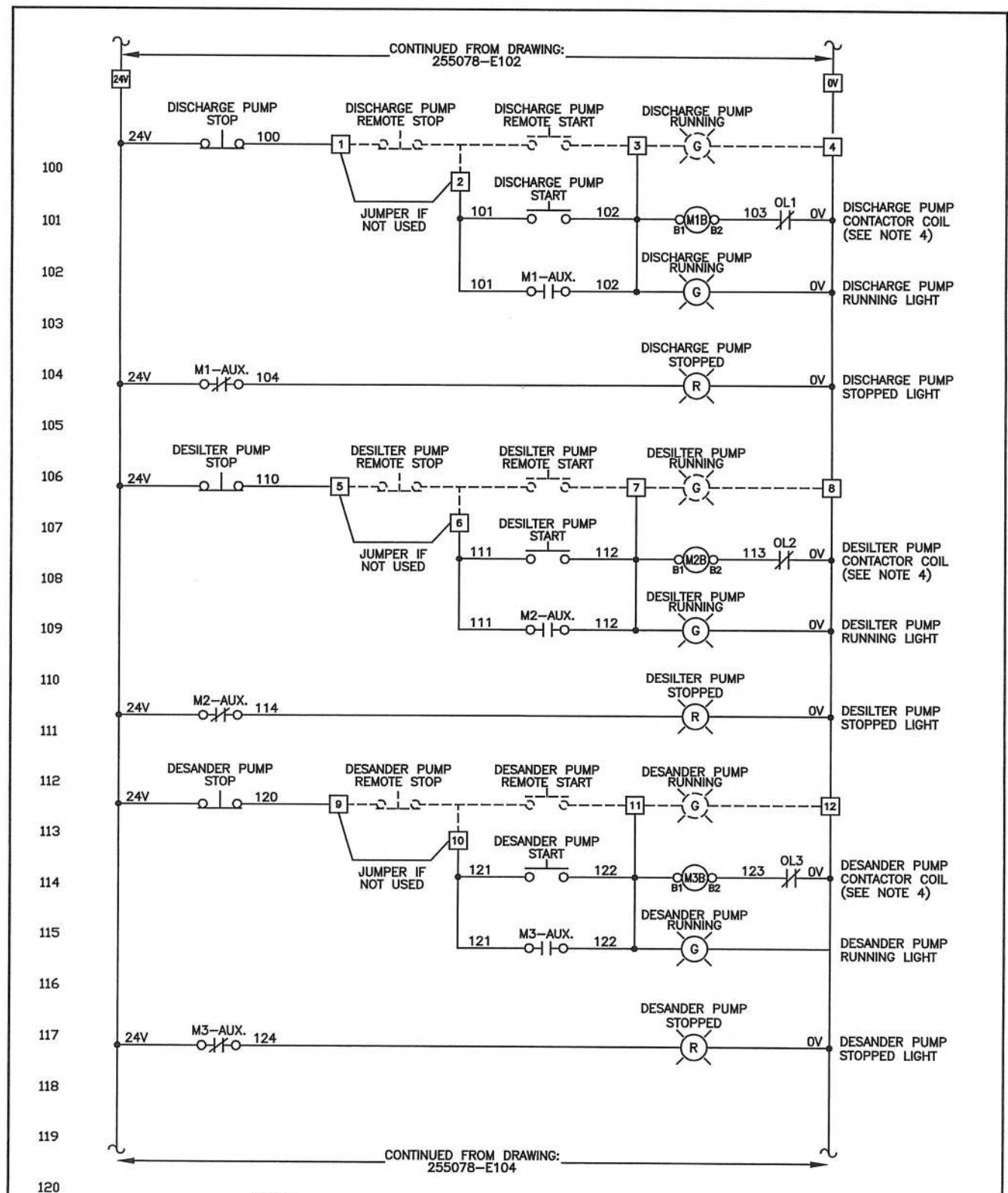
**CORDYNE**

9820 DRYSDALE LANE, HOUSTON, TEXAS 77134-6051  
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CUSTOMER/PROJECT		TRI-FLO INTERNATIONAL, INC. WILLIS, TEXAS 77318	
DRAWING TITLE		380VAC/34/50HZ NEMA 4, MULTI, FVNR STARTER PANEL PART #TRI-FLO-ES2000-380V-AGR	
JOB NO.	255078	DRAWING NO.	255078-E102
REV.			B

SHEET SIZE: A





# NOTES:

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2. ALL INTERNAL I/O WIRING TO BE 16 AWG U.N.O.
3. ALL EXTERNAL I/O WIRING TO BE 14 AWG U.N.O.
4. 24V SIGNAL TRIGGERS 380V SIGNAL (SEE DWG 255078-E103)

# 5. WIRING COLOR CODE AS FOLLOWS:

- 380VAC: BLACK
- DC+: BLUE
- DC 0V: BLACK
- GROUND: GREEN

# 6. ——— DENOTES INTERNAL WIRING

# 7. - - - DENOTES EXTERNAL WIRING (BY OTHERS)

REVISION DATA			APPROVALS		DATE
01	05/28/14	AS BUILT AND TESTED	DRAWN	W. STABELL	04/07/14
B	05/14/14	REMOVED AUGERS	CHECKED		
A	04/07/14	FOR CONSTRUCTION	APPROVED		
REV	DATE	DESCRIPTION			

## CORDYNE

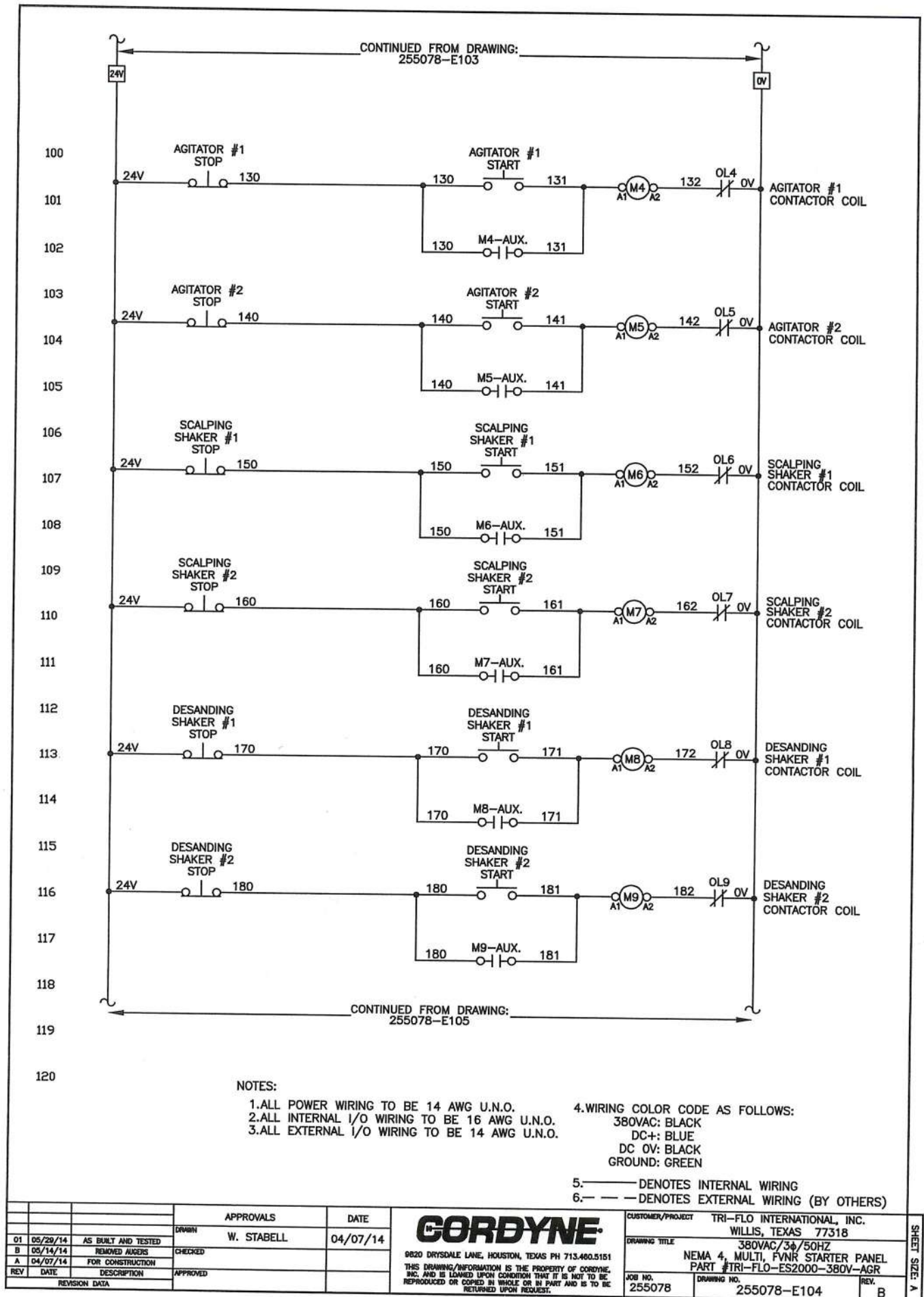
9820 DRYSDALE LANE, HOUSTON, TEXAS PH 713.480.5151  
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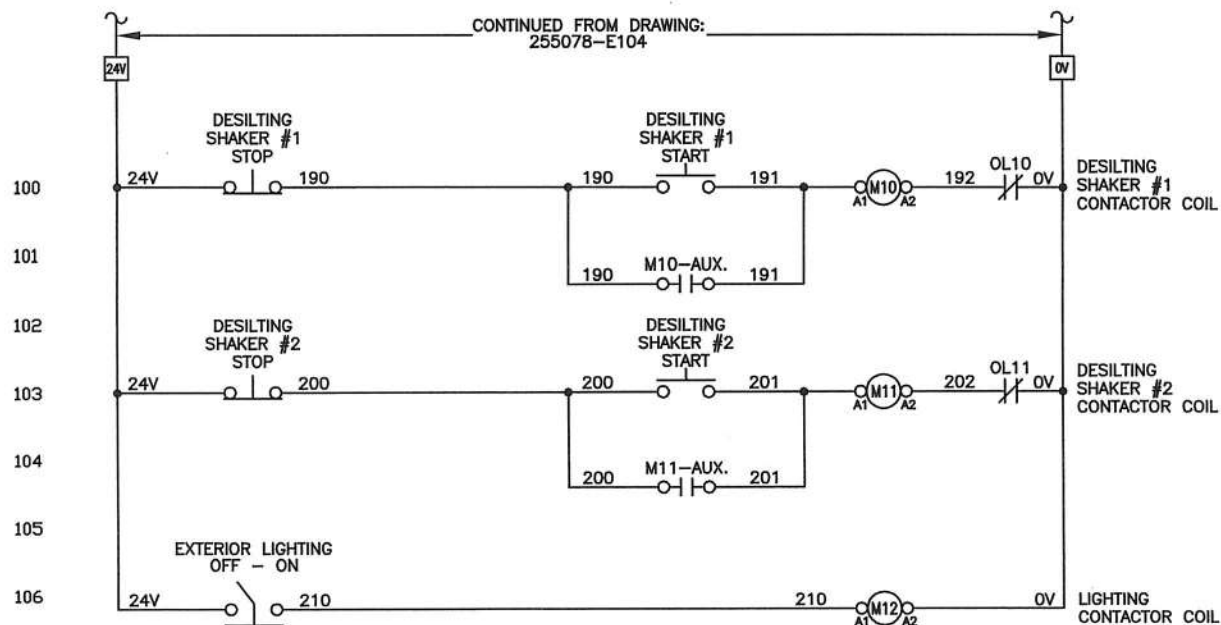
CUSTOMER/PROJECT TRI-FLO INTERNATIONAL, INC.  
WILLIS, TEXAS 77318

DRAWING TITLE NEMA 4, MULTI, FVNR STARTER PANEL  
PART #TRI-FLO-ES2000-380V-AGR

JOB NO. 255078 DRAWING NO. 255078-E103 REV. B

SHEET SIZE: A





# NOTES:

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				APPROVALS	DATE
01	05/29/14	AS BUILT AND TESTED	DRAWN	W. STABELL	04/07/14
B	05/14/14	REMOVED AUGERS	CHECKED		
A	04/07/14	FOR CONSTRUCTION			
REV	DATE	DESCRIPTION	APPROVED		
REVISION DATA					

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CUSTOMER/PROJECT		TRI-FLO INTERNATIONAL, INC. WILLIS, TEXAS 77318	
DRAWING TITLE		380VAC/3 $\phi$ /50HZ NEMA 4, MULTI, FVNR STARTER PANEL PART #TRI-FLO-ES2000-380V-AGR	
JOB NO.	DRAWING NO.	REV.	
255078	255078-E105	01	

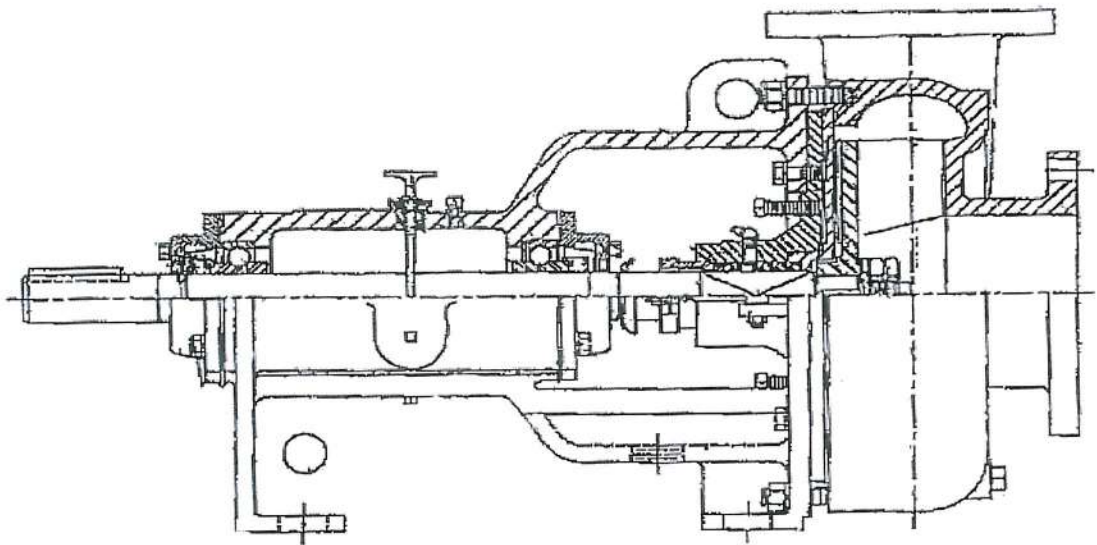
SHEET SIZE: A





## **Service & Operating Manual**

### **CENTRIFUGAL PUMP 2500 SERIES**





100 FM 830  
WILLIS, TX 77318  
(281) 856-8551  
PHONE  
(281) 856-5668 FAX

## INDEX

### **INSTALLATION AND STARTUP OF PUMP PACKAGES**

- INSTALLATION
- PUMP MODEL NUMBER
- COUPLING ALIGNMENT
- CHECK ROTATING
- PRIMING

#### **PIPING (GENERAL)**

- PIPING (SUCTION)
- PIPING (DISCHARGE)

#### **LUBRICATION**

- PUMP LUBRICATION
- GREASE LUBRICATION

#### **BEARING FAILURES**

- ABNORMAL TEMPERATURE RISE

#### **INSTALLATION OF REPLACEABLE PARTS**

- MAINTENANCE INSTRUCTION
- ADJUSTMENT OF IMPELLER CLEARANCE WITH CASING OFF

#### **LONG TERM PUMP AND MOTOR STORAGE**

#### **PUMP 2500 SERIES PARTS**



100 FM 850  
WILLIS, TX 75478  
(936) 556-8557  
PHONE  
(936) 556-5668 FAX

## **INSTALLATION AND STARTUP OF PUMP PACKAGES**

### **GENERAL INSTRUCTION**

1. Operate the pump only in the performance range for which it was designed.
  - 1.1. When operating in drilling mud, prevent packing drippage from clogging the drip pan.
  - 1.2. Only adjust while running and turn each packing nut  $\frac{1}{4}$  turn to lengthen the life of the mechanical seal.
  - 1.3. Do Not over tighten.

### **INSTALLATION**

2. The pump should be located near the liquid source so that the suction line may be short and direct.
3. The pump should be located below the level of the liquid to eliminate the necessity of priming

### **PUMP MODEL NUMBER**

4. There are numbers on the pump nameplate that will tell TRIFLO every part that was supplied in the pump. A record of these numbers should be made;
  - 4.1. Pump Serial Number
  - 4.2. Series
  - 4.3. Size
  - 4.4. Rotation
  - 4.5. Impeller Size
5. On Triflo built skidded pump packages we put a nameplate on the base with an Asset number and with this number we can tell you everything about the pump packages, including anything special on the motor, coupling type and size, impeller size, etc.

### **COUPLING ALIGNMENT**

6. Good service life of the pump and driver depends upon good alignment through the flexible coupling.
7. If the electric motor was mounted at TRIFLO, the pump and motor were in alignment when shipped.



8. The alignment between the driver and pump should be inspected after installation to ensure that transportation or other handling has not caused misalignment of the unit.
9. Poor alignment may cause failure of the coupling, pump, or motor bearings, or of either shaft.



**....FINAL ALIGNMENT MUST NOT BE ATTEMPTED UNTIL THE BASE IS IN POSITION AND THE MOUNTING AND FLANGE BOLTS HAVE BEEN TIGHTENED. MANY USERS SET THE BASE AND WELD THE PIPING FROM THE PUMP TO THE TANK. THE HEATING AND COOLING PULLS THE PUMP OUT OF ALIGNMENT.**

## **CHECK ROTATION**

10. Most pumps purchased are rotated clockwise when viewed from coupling end. The correct rotation can be found by an arrow on the pump casing.

## **PRIMING**

11. Be sure the pump has fluid in its casing before running.
  - 11.1. If the pump is operated without fluid, the mechanical seal can be destroyed in one minute.
12. Start pump with discharge valve cracked open.
13. After discharge pressure stabilizes, gradually open discharge valve to required position.
14. If flow is lost, close discharge valve and wait a few seconds for discharge pressure to build.
15. Do not run the pump with suction valve partly closed ANYTIME and with discharge valves closed only for short periods of time.

## **PIPING**

### **PIPING (SUCTION)**



**....THE CAPACITY OF A CENTRIFUGAL PUMP SHOULD NEVER BE ADJUSTED BY THROTTLING THE SUCTION**

16. Properly sizing and design of suction piping is extremely important to eliminate vibration and cavitations in the pump.
17. Vibration can cause packing problems, or undo bearing loads.

18. The suction should be equal to or larger than the pump suction.
19. A positive shut-off valve of any type, to cause minimum turbulence, should be installed in the suction line to permit the closing of the line and removal of the pump for inspection and maintenance.
20. The suction line should have a straight section into the pump of a length equivalent to at least two times the diameter of the suction line.
21. For temporary hookup, where flexible hose is used, a non-collapsing hose is essential since the suction line will result in below atmospheric pressure.
  - 21.1. A collapsing suction line will result in below design or complete loss of flow.

## PIPING (DISCHARGE)

22. A piping shutoff valve should be located in the discharge piping to permit inspection and maintenance of the pump.
23. All piping should be independently supported and accurately aligned.
24. The **pump must not** support the weight of the pipe or compensate for misalignment.
25. If operating conditions are not known with sufficient accuracy, it will be necessary to provide a throttle valve in the discharge piping to ensure that the pump operates at the design point.

## LUBRICATION

### PUMP LUBRICATION

26. All of TRIFLO's standard pumps are grease lubricated.

### GREASE LUBRICATION

27. TRIFLO pumps which are grease lubricated are pre-greased at the factory. There is no need to add grease before start-up.
28. TRIFLO recommends that depending on the time the pump is run, that a shot of grease is needed.
  - 29.1. If the pump is run continuously 24 hours a day, 7 days a week, then 5 shots of grease is needed monthly.
  - 29.2. If the pump is run less, then less shots of grease monthly.
29. Premium bearing grease like Exxon Unirex N2, Chevron Polyurea EP2, Texaco Marfak Multi-Purpose 2, Shell MP, and American Oil Company's Rycon Premium 2 EP is recommended.



## BEARING FAILURES



....EXCEPT FOR CAVITATION PROBLEMS, BEARING FAILURE IS THE GREATEST CAUSE OF INCREASED PUMP OPERATING COST.



....IF YOU CONTINUE TO RUN A PUMP WHEN BEARING FAILURES OCCUR, THERE IS AN EXCELLENT CHANCE THE WHOLE PUMP WILL BE DESTROYED. Therefore, it is very important to change the bearings when failure STARTS, if you wait for complete failure, other fluid end parts will be damaged.

## **ABNORMAL TEMPERATURE RISE**

- 30. The first indication of lubricant and bearing failure is a rapid rise from normal operating temperature.
- 31. You should check, with external thermometer, the frame (pedestal) once a week and know about how hot the bearings normally run.
- 32. A sudden high increase in temperature normally means the bearings are beginning to fail and need changing.
- 33.1. Anything above 160°F to 180°F is a sign of possible bearing failure.

## INSTALLATION OF REPLACEABLE PARTS

### **MAINTENANCE**

- 33. The pump is so constructed that those parts subject to wear may be readily replaced in the field.
- 34. To replace the casing, wear plate, impeller, bearing, and seals, the following procedures should be followed:
  - 35.1. Stop pump and drain all lines leading to the pump.
  - 35.2. Loosen the bolts at the suction and discharge flanges of the pump and move pipe clear of pump casing and remove pump from system.





- 35.3. Separate the coupling, and loosen the coupling half mounted on the pump shaft.
- 35.4. Remove the casing stud nuts, and take off the casing.
- 35.5. Loosen the packing gland nuts, and swing the packing gland bolts clear of the packing gland. Remove the packing gland halves.
- 35.6. The bearings may now be removed from the pedestal for inspection, by tapping lightly with a wooden or brass rod.

**To Re-Assemble the Pump, the Above Procedure is reversed.**

- 35. New gaskets should be used throughout. Gaskets should be 1/16" thick and made of a material suitable to the pump operating conditions.

**TO ADJUST IMPELLER CLEARANCE WITH CASING OFF**

- 36. Push rear bearing against shoulder with rear bearing cap.
- 37. Push impeller back against a .020 inch shim between the rear impeller pump out vanes and the front of the wear plate.
- 38. Push the rear bearing in again to be sure it is against shoulder.

**TO ADJUST THE CLEARANCE WITH THE CASING ON THE PUMP**

- 39. Put on the casing with the casing gasket and tighten the casing stud nuts uniformly.
- 40. Push the shaft forward until the impeller hits the casing, mark the shaft, then pull it back until the impeller hits the wear plate and mark the shaft again.
- 41. The shaft should be set halfway between these two marks, so that the clearance between the impeller and the wear plate are the same.
- 42. Make sure the rear bearing is seated against the pedestal shoulder.

**Note:**

- 43. The front bearing should not seat against the outboard bearing cartridge. The bearing should be free to float along the shaft to compensate for expansion and contraction caused by temperature changes.

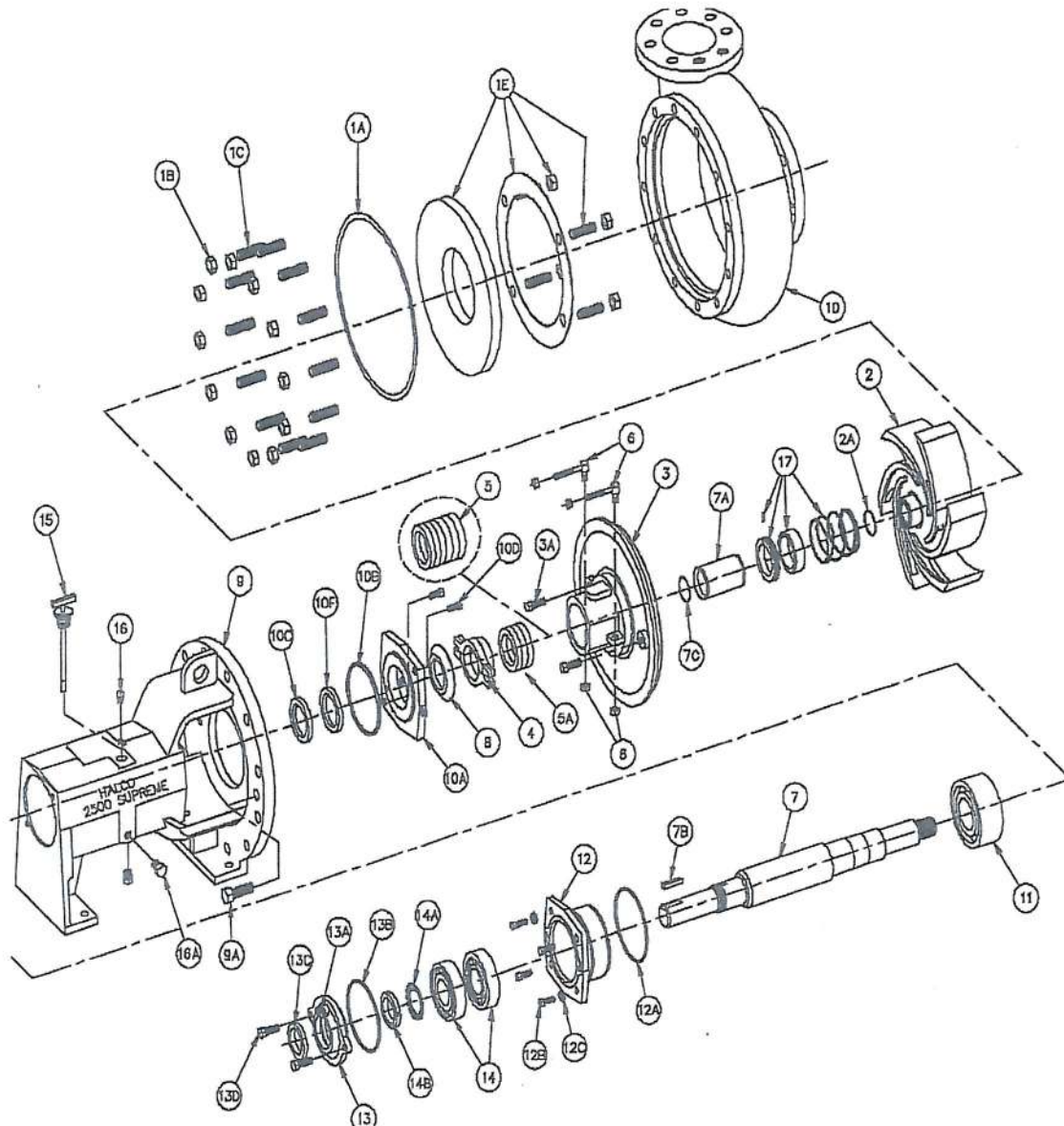


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## **LONG TERM PUMP AND MOTOR STORAGE**

44. Pump packages should be stored indoors in a clean, dry, and protected environment.
45. The storage area is to be free from any vibration and from extremes in temperature.
46. Motor and pump shafts are to be rotated manually every 2 months. A record of the rotation should be made. Continuous weight on a bearing ball can fall flat. Without agitation of grease oil separates leaving soap without lubricating properties. Top ball may rust. Any of these will reduce bearing life.
47. Grease in the motor is to be purged at the time of removal from storage, making sure that an ample supply of grease is in each grease cavity.
48. If the pumps have been in storage for a long time; regrease.
49. If the pumps are to be stored outside, the pump suction and discharge openings should be sealed to prevent any water from entering the pump housing, causing rust of the fluid end during storage.

## 2500 SERIES PUMP





## 2500 PUMP

Item	Qty	Part Number	Part Name	Material
1	1	Depending on Size	Casing + Item 1A - 1E	Hard Iron
1A*	1	02-01-076	Gasket, Casing	Fiber
1B	12	No Part #	Nut, Casing Stud	Stainless, 3/4-10Hex Head
1C	8	No Part #	Stud, Casing	Steel, 3/4-10x3-1/4" Long
1C	4	No Part #	Stud, Casing	Steel, 3/4-10x3" Long
1D	1	Depending on Size	Casing Less Wear Pad Kit	Hard Iron
1E	1	Depending on Size	Wear Pad	Hard Iron
2	1	Depending on Size	Impeller	Hard Iron
2*	1	02-01-081	Seal, Impeller	Viton
3	1	02-01-062	Stuffing Box Cover, Seal	Hard Iron
3	1	No Part #	Stuffing Box Cover, Packed	Hard Iron
3A	2	No Part #	Bolt, Stuffing Box	Steel 1/2-13x1-1/4"
4	1	02-01-084	Gland Set	300 Stainless Steel
5	1	02-01-085	Packing 5 Rings & Lant. Ring	Graphite Asbestos
5A	1	02-01-067	Packing 3 Rings & Lant. Ring	Graphite Asbestos
6	2	02-01-086	Bolt, Gland Assembly	300 Stainless Steel
7	1	02-01-087	Shaft	4140
7A	1	02-01-068	Sleeve, Shaft	416 SS, Ceramic
7B	1	02-01-088	Key, Coupling End	416 Stainless Steel
7C*	1	02-01-089	Seal, Shaft Sleeve	Buna-N
8	1	02-01-090	Deflector	Rubber
9	1	No Part #	Frame	Cast Iron
9A	2	No Part #	Jack Bolts	Stainless Steel
10A	1	02-01-093	Cover, Inboard Bearing	Cast Iron
10B*	1	02-01-132	Gasket, Inboard Bearing Cover	Asbestos
10C*	1	02-01-094	Oil Seal, Inboard Bearing Cover	Buna-N
10D*	2	02-01-095	Bolt-Inboard, Bearing Cover	Steel 1-2-13x1-1/2"



10F*	1	02-01-096	Exclusion Seal, Inbd.Bearing.	Buna-N
11	1	02-01-069	Bearing, Inboard	Fafnir 5313WBR MRC5313
12	1	02-01-097	Housing, Outboard Bearing	Cast Iron
12A*	1	02-01-098	Seal, Bearing Housing	Buna-N
12B	4	02-01-099	Bolts, Bearing Housing	stele 1/2-13x1-1/2"
12C	2	No Part #	Nuts, Bearing Housing	300 SS 1/2-13 Jam Nut
13	1	02-01-101	Cover, Outboard Bearing	Ductile Iron
13B*	1	02-01-103	Seal, Outboard Bearing. Cover	Buna-N
13C*	1	02-01-104	Oil Seal, Outboard Bearing Cover	Buna-N
13D	2	02-01-105	Bolt, Outboard Bearing. Cover	300 SS 3/8-16x1"
14	2	02-01-070	Bearing, Outboard	Fafnir 7311 PW-BR-SU MR731
14A*	1	No Part #	Lock Washer, Bearing	SKF-W1" Steel
14B*	1	No Part #	Lock Nut, Bearing	SKF-N1 Steel
15	1	No Part #	Dipstick	Rubber and Steel
16	1	No Part #	Breather	Steel
16A	2	No Part #	Plug, Oil	Steel
17	1	02-01-071	Mechanical Seal	Tungsten Carbide

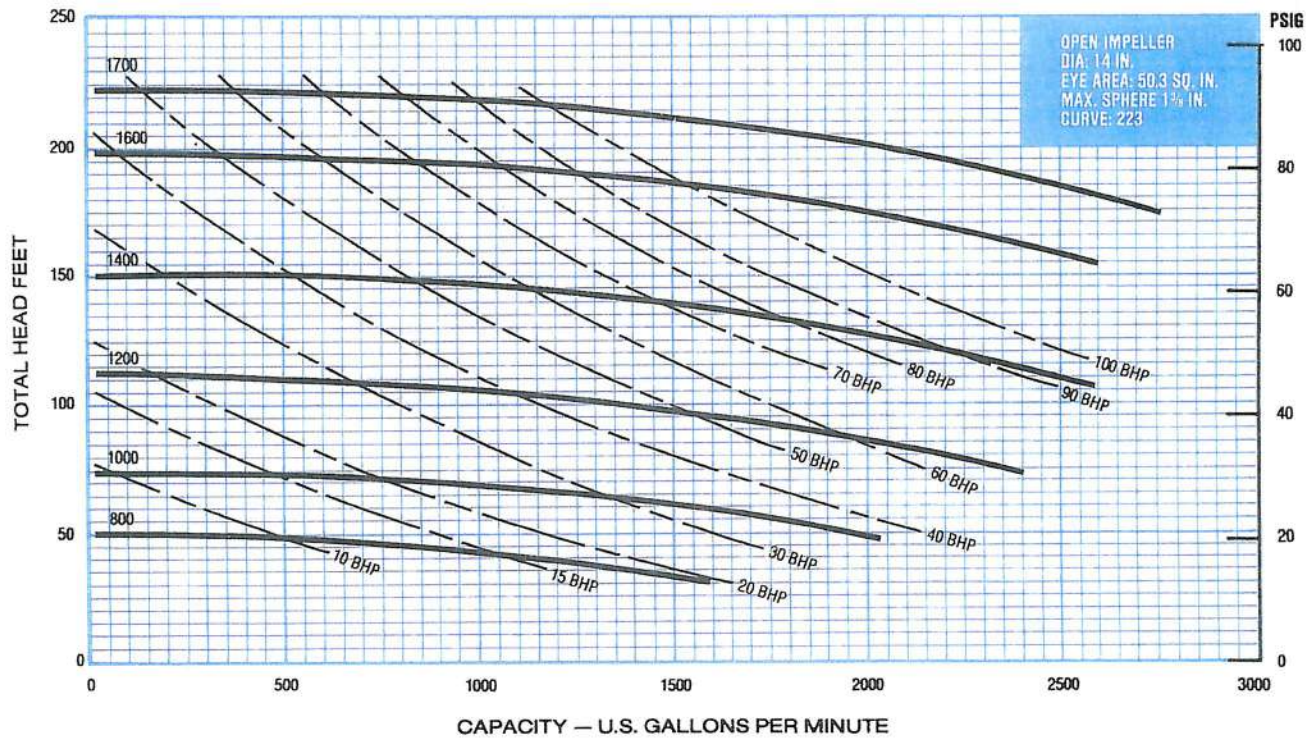


## NOTES



# Premium 250 Series Charts

6 x 8 x 14 800-1700 RPM



## CONVERSION DATA

FEET	PSI	FEET	PSI
10	4.33	23.1	10
20	8.66	46.2	20
25	10.80	57.8	25
30	13.00	69.3	30
40	17.30	80.9	35
50	21.60	92.4	40
75	32.48	104.0	45
100	43.20	115.5	50
150	64.80	138.6	60
200	86.40	173.2	75
250	108.00	231.0	100
300	130.00	288.7	125
350	151.60	346.5	150
400	172.80	404.2	175



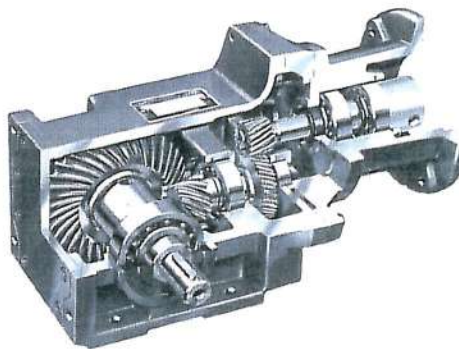
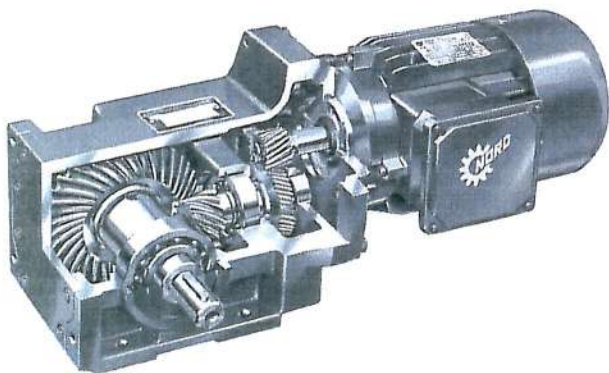
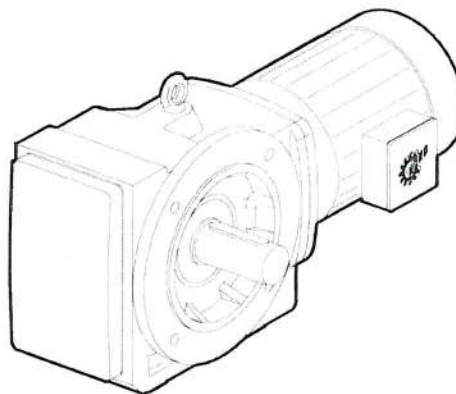
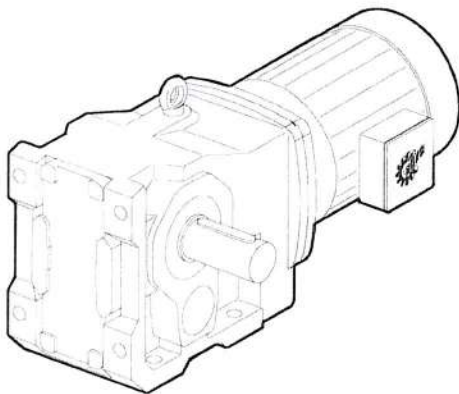
# Installation and Maintenance Instructions

Retain These Safety Instructions For Future Use

BIM 1040

USA

CDN



## INSPECTION OF UNIT

Thoroughly inspect the equipment for any shipping and handling damage before accepting shipment from the freight company. If any of the goods called for in the bill of lading or express receipt are damaged or the quantity is short, do not accept until the freight or express agent makes an appropriate notation on your freight bill or express receipt. If any concealed loss or damage is discovered later, notify your freight carrier or express agent at once and request him to make an inspection. We will be very happy to assist you in collecting claims for loss or damage during shipment; however, this willingness on our part does not remove the transportation company's responsibility in reimbursing you for collection of claims or replacement of material. Claims for loss or damage in shipment must not be deducted from the NORD Gear invoice, nor should payment of the NORD Gear invoice be withheld awaiting adjustment of such claims, as the carrier guarantees safe delivery.

If considerable damage has been incurred and the situation is urgent, contact the nearest NORD Gear Sales Office for assistance. Please keep a written record of all communications.

## RECORD NAMEPLATE DATA

Locate the gear reducer nameplate and record all nameplate data for future reference.

SK \_\_\_\_\_ S/N \_\_\_\_\_

RATIO \_\_\_\_\_ MAX TORQUE \_\_\_\_\_ RPM \_\_\_\_\_ MTG. POS \_\_\_\_\_

## STORAGE

### PROPER STORAGE UNTIL INSTALLED

Keep unit in a dry, temperature controlled area. If stored other than said, long-term storage methods must be applied to the unit including complete fill with lubricant. Protect machined surfaces and rotate shafts periodically. Prior to putting unit into service, drain lubricant and refill to proper level as determined by the mounting position.

### PROPER HANDLING OF THE UNIT

Exercise care to prevent damage to the unit when moving. Lift only at designed lifting points. Do not attach other machinery and lift by the unit lifting points. The lifting points are to be used to lift the unit only. Insure that adequate safety measures are taken to protect personnel during transportation. Protect the mounting surface from damage.



## INSTALLATION OF UNIT

To ensure long service and dependable performance, an enclosed gear drive must be rigidly supported and the shafts accurately aligned. The following describes the minimum precautions required to accomplish this end.

### FOUNDATION

The responsibility for the design and construction of the foundation lies with the user. The foundation must be adequate to withstand normal operating loads and possible overloads while maintaining alignment to attached system components under such loads.

### MOUNTING POSITION

Unless a unit is specifically ordered for inclined mounting, the foundation must be level and flat. The lubrication system may not operate properly if the unit is not mounted in the position for which it is designed. It may be desirable to elevate the foundation to facilitate oil drainage.

### CONCRETE FOUNDATION

If a concrete foundation is used, steel mounting pads and bolts of sufficient size to distribute the stress into the concrete should be grouted into the foundation.

### STEEL FOUNDATION

If a structural steel foundation is used (i.e. wide flange beams or channels), a base plate or sole plate of suitable thickness should be used and should extend under the entire unit.

### FOOT MOUNTED UNITS

Use shims under the feet of the unit to align the output shaft to the driven equipment. Make sure that all feet are supported so that the housing will not distort when it is bolted down. Improper shimming will reduce the life of the unit and may cause failure. Dowel pins may be installed to prevent misalignment and ensure proper realignment if removed for service.

### SHAFT MOUNTED UNITS

Shaft mounted drives should be mounted as close to the driven equipment bearing support as possible to minimize bearing loads due to overhung load. Design of the joint connection between the torque reaction arm and the foundation is the user's responsibility.

#### Hollow Shaft Diameter tolerance

Metric (mm)

$\leq \varnothing 18 = +0.018/-0.000$
$> \varnothing 18 \leq \varnothing 30 = +0.021/-0.000$
$> \varnothing 30 \leq \varnothing 50 = +0.025/-0.000$
$> \varnothing 50 \leq \varnothing 80 = +0.030/-0.000$
$> \varnothing 80 \leq \varnothing 120 = +0.035/-0.000$
$> \varnothing 120 \leq \varnothing 180 = +0.040/-0.000$

Inch

$\leq \varnothing 4.375 = +0.0010 / -0.0000$
$> \varnothing 4.375 = +0.0015 / -0.0000$

#### Customer shaft diameter tolerances with keyed hollow shafts

Metric (mm)

$\leq \varnothing 18 = +0.000/-0.011$
$> \varnothing 18 \leq \varnothing 30 = +0.000/-0.013$
$> \varnothing 30 \leq \varnothing 50 = +0.000/-0.016$
$> \varnothing 50 \leq \varnothing 80 = +0.000/-0.019$
$> \varnothing 80 \leq \varnothing 120 = +0.000/-0.022$
$> \varnothing 120 \leq \varnothing 180 = +0.000/-0.025$

Inch

$\leq \varnothing 1.500 = +0.000/-0.002$
$> \varnothing 1.500 \leq \varnothing 2.500 = +0.000/-0.003$
$> \varnothing 2.500 \leq \varnothing 7.000 = +0.000/-0.004$

Shaft finish to be 125 micro inches or smoother.

#### Customer shaft diameter tolerance with Shrink Disc fit h6

Metric (mm)

$\leq \varnothing 18 = +0.000/-0.011$
$> \varnothing 18 \leq \varnothing 30 = +0.000/-0.013$
$> \varnothing 30 \leq \varnothing 50 = +0.000/-0.016$

$> \varnothing 50 \leq \varnothing 80 = +0.000/-0.019$
$> \varnothing 80 \leq \varnothing 120 = +0.000/-0.022$
$> \varnothing 120 \leq \varnothing 180 = +0.000/-0.025$

Inch

$\leq \varnothing 0.750 = +0.0000/-0.0004$
$> \varnothing 0.750 \leq \varnothing 1.125 = +0.0000/-0.0005$
$> \varnothing 1.125 \leq \varnothing 2.000 = +0.0000/-0.0006$
$> \varnothing 2.000 \leq \varnothing 3.000 = +0.0000/-0.0007$
$> \varnothing 3.000 \leq \varnothing 4.750 = +0.0000/-0.0008$
$> \varnothing 4.750 \leq \varnothing 7.000 = +0.0000/-0.0010$

Shaft finish to be 125 micro inches or smoother.

#### Customer shaft diameter tolerance with Shrink Disc fit f6 (looser fit)

Metric (mm)

$\leq \varnothing 18 = -0.016/-0.024$
$> \varnothing 18 \leq \varnothing 30 = -0.020/-0.029$
$> \varnothing 30 \leq \varnothing 50 = -0.025/-0.036$
$> \varnothing 50 \leq \varnothing 80 = -0.030/-0.043$
$> \varnothing 80 \leq \varnothing 120 = -0.036/-0.051$
$> \varnothing 120 \leq \varnothing 180 = -0.043/-0.061$

Inch

$\leq \varnothing 0.750 = -0.0006/-0.0011$
$> \varnothing 0.750 \leq \varnothing 1.125 = -0.0008/-0.0013$
$> \varnothing 1.125 \leq \varnothing 2.000 = -0.0010/-0.0016$
$> \varnothing 2.000 \leq \varnothing 3.000 = -0.0012/-0.0019$
$> \varnothing 3.000 \leq \varnothing 4.750 = -0.0014/-0.0023$
$> \varnothing 4.750 \leq \varnothing 7.000 = -0.0017/-0.0027$

Shaft finish to be 125 micro inches or smoother

### FLANGE MOUNTED UNITS

If a structural steel foundation is used (i.e. wide flange beams or channels), a base plate or sole plate of suitable thickness should be used and should extend under the entire unit. If a bulk head plate is used it should be of proper strength to minimize buckling distortions.

#### Flange Pilot 'AK' or 'AK1' tolerance

Metric (mm)

$> \varnothing 50 \leq \varnothing 80 = +0.012/-0.007$
$> \varnothing 80 \leq \varnothing 120 = +0.013/-0.009$
$> \varnothing 120 \leq \varnothing 180 = +0.014/-0.011$
$> \varnothing 180 \leq \varnothing 230 = +0.016/-0.013$
$> \varnothing 230 \leq \varnothing 315 = +0.000/-0.032$
$> \varnothing 315 \leq \varnothing 400 = +0.000/-0.036$
$> \varnothing 400 \leq \varnothing 500 = +0.000/-0.040$

Inch

$> \varnothing 1.969 \leq \varnothing 3.150 = +0.005/-0.0003$
$> \varnothing 3.150 \leq \varnothing 4.724 = +0.005/-0.0004$
$> \varnothing 4.724 \leq \varnothing 7.087 = +0.006/-0.0004$
$> \varnothing 7.087 \leq \varnothing 9.055 = +0.006/-0.0005$
$> \varnothing 9.055 \leq \varnothing 12.402 = +0.000/-0.0013$
$> \varnothing 12.402 \leq \varnothing 15.748 = +0.000/-0.0014$
$> \varnothing 15.748 \leq \varnothing 19.685 = +0.000/-0.0016$

### BOLT STRENGTH

Bolt size, strength and quantity should be verified to insure proper torque reaction capacity whatever the mounting arrangement.

### LUBRICATE SHAFTS

Both the hollow shaft and the driven shaft should be liberally lubricated before assembly. The unit must slide freely onto the driven shaft. Do not hammer or force the unit into place. For shrink disc, follow instructions below.



### AXIAL RETENTION

Each drive shaft must be retained in place relative to the gear reducer. Or each gear reducer must be retained in place relative to the drive shaft. Either way NORD recommends the use of shaft shoulders, locking collars or FIXING ELEMENTS to axially retain the shaft or gear reducer in position.

### SET SCREWS

If set screws are used for axial retention, they should be tightened evenly. Flats may be filed on the driven shaft and a thread-locking adhesive used for more position retention.

### SNAP RING RETENTION

Placing external snap rings on drive shafts must be performed with caution. The groove, which the snap ring fits into, may weaken the drive shaft causing premature failure. NORD does not recommend this type of shaft retention.

### THRUST PLATE

In applications, which are subject to high vibratory loads, a thrust plate will provide greater resistance to axial movement. Follow the manufacturer's recommendations for assembly.

### SHRINK DISC

If a shrink disc is used to secure a reducer hollow shaft to the driven shaft, follow this assembly procedure. Start with the shrink disc mounted onto the extension of the hollow shaft disc locking bolts loosened.

1. Clean reducer bore and mating solid shaft to be free of any lubricants or dirt.
2. Slide reducer onto the solid shaft until it is about half way through.
3. Lubricate the remaining portion of the solid shaft with a #2 grease or similar lubricant. This part will be located under the bronze bushing. **Do not install grease under the shrink disc gripping area.** Finish installing the solid shaft into the reducer hollow bore.
4. Finger tighten all shrink disc bolts. Now, moving a circular pattern, tighten each shrink disc locking bolt 1/4 to 1/2 turn. **Do not use criss cross pattern.** Continue tightening in the same circular direction with 1/4 or 1/2 turn increments until all bolts reach the specified bolt tightening torque. Bolt tightening torque is shown on the shrink disc label for the particular unit.
5. Run unit for 24 hours, then retighten shrink disc locking bolts to the proper bolt torque as indicated above.

### TORQUE REACTION ARM

On the shaft mount 'Clincher', torque is reacted through the integral torque tab, which is part of the casting. Commonly, NORD's optional RUBBER BUFFER bushings are installed on each side of the integral torque tab to dampen torque shocks and allow for mis-alignment received from the machinery during operation.

Torque arm connection fabrications should always be mounted perpendicular to a line through the output shaft center and the point at attachment of the torque arm to the unit housing. In this position the minimum load on the attachment structure arm will be experienced. The attachment structure must be rigid and may not deflect under any load. Doing so will place extra loads on the output bearings of the reducer.

### PRIME MOVER MOUNTING

Align the prime mover to the reducer-input shaft using shims under the feet. Make sure that the feet are supported. Dowel the prime mover to its foundation.

### SHAFT CONNECTIONS

When connecting shafts to either the input or output of the reducer, consider the following instructions.

### FITS

Clearance or interference fits for coupling hubs should be in accordance with ANSI/AGMA 9002-A86 or as follows.

### Output and Input shaft Diameter tolerance

Metric (mm)

$\leq \varnothing 18 = +0.012/+0.001$
$> \varnothing 18 \leq \varnothing 30 = +0.015/+0.002$
$> \varnothing 30 \leq \varnothing 50 = +0.018/+0.002$
$> \varnothing 50 \leq \varnothing 80 = +0.030/+0.011$
$> \varnothing 80 \leq \varnothing 120 = +0.035/+0.013$
$> \varnothing 120 \leq \varnothing 180 = +0.040/+0.015$

Inch

$\leq \varnothing 1.750 = +0.0000/-0.0005$
$> \varnothing 1.750 = +0.0000/-0.0010$

### Output and Input shaft Drill and tap shaft end

Metric (mm)

$\leq \varnothing 16 = M5$
$> \varnothing 16 \leq \varnothing 21 = M6$
$> \varnothing 21 \leq \varnothing 24 = M8$
$> \varnothing 24 \leq \varnothing 30 = M10$
$> \varnothing 30 \leq \varnothing 38 = M12$
$> \varnothing 38 \leq \varnothing 50 = M16$
$> \varnothing 50 \leq \varnothing 85 = M20$
$> \varnothing 85 \leq \varnothing 130 = M24$

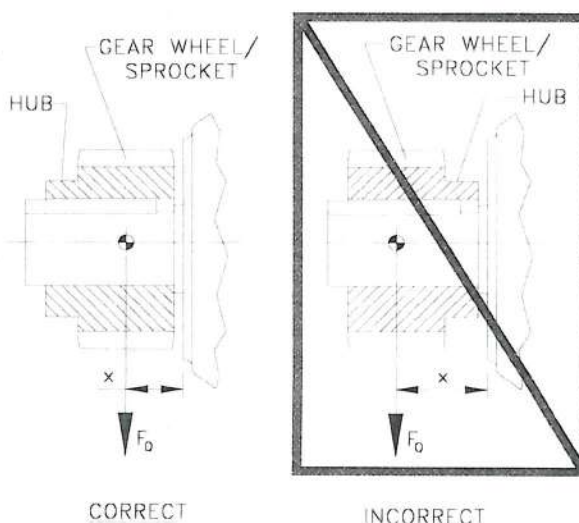
Inch

$\leq \varnothing 0.438 = \#10-24 \times 0.4 \text{ deep}$
$> \varnothing 0.438 \leq \varnothing 0.813 = 1/4-20 \times 0.6 \text{ deep}$
$> \varnothing 0.813 \leq \varnothing 0.938 = 5/16-18 \times 0.7 \text{ deep}$
$> \varnothing 0.938 \leq \varnothing 1.125 = 3/8-16 \times 0.9 \text{ deep}$
$> \varnothing 1.125 \leq \varnothing 1.375 = 1/2-13 \times 1.1 \text{ deep}$
$> \varnothing 1.375 \leq \varnothing 1.875 = 5/8-11 \times 1.4 \text{ deep}$
$> \varnothing 1.875 \leq \varnothing 3.250 = 3/4-10 \times 1.7 \text{ deep}$
$> \varnothing 3.250 = 1-8 \times 2.2 \text{ deep}$

Outboard pinion and sprocket fits should be as recommended by the pin sprockets with interference fits should be heated according to the manufacturer's recommendations, generally 250°F to 300°F, (120°C to 150°C) before assembling to the shaft.

### LOCATION

Coupling hubs should be mounted flush with the shaft ends, unless specifically ordered for overhung mounting. Pinions, sprockets and sheaves should be mounted as close as possible to the unit housing to minimize bearing loads and shaft deflections.



### COUPLING ALIGNMENT

Shaft couplings should be installed according to the coupling manufacturer's recommendations for gap, angular and parallel alignment. In many installations, it is necessary to allow for thermal and mechanical shaft movement when determining shaft alignment. The coupling manufacturer's recommendations should be followed.

### AXIAL DISPLACEMENT

The gap between shaft ends should be the same as the specified coupling gap unless overhung mounting of the coupling hub is specified. The coupling gap and shaft gap must be sufficient to accommodate any anticipated thermal or mechanical axial movement.

### ANGULAR ALIGNMENT

Insert a spacer or shim stock equal to the required coupling gap between the coupling hub faces and measure the clearance using feeler gauges. Repeat this at the same depth at 90-degree intervals to determine the amount of angular misalignment.

### PARALLEL ALIGNMENT

Mount a dial indicator to one coupling hub, and rotate this hub, sweeping the outside diameter of the other hub. The parallel misalignment is equal to one-half of the total indicator reading. Another method is to rest a straight edge squarely on the outside diameter of the hubs at 90-degree intervals and measure any gaps with feeler gauges. The maximum gap measurement is the parallel misalignment.

### CHECKING ALIGNMENT

After both angular and parallel alignments are within specified limits, tighten all foundation bolts securely and repeat the above procedure to check alignment. If any of the specified limits for alignment are exceeded, realign the coupling.

### SPROCKET OR SHEAVE ALIGNMENT

Align the sheaves or sprockets square and parallel by placing a straight edge across their faces. Alignment of bushed sheaves and sprockets should be checked after bushings have been tightened. Check horizontal shaft alignment by placing a level vertically against the face of the sheave or sprocket. Adjust belt or chain tension per the manufacturer's specified procedure.

### OUTBOARD PINION ALIGNMENT

Align the pinion by adjusting the gear tooth clearance according to the manufacturer's recommendations and checking for acceptable outboard pinion tooth contact. The foundation bolts may have to be loosened and the unit moved slightly to obtain this contact. When the unit is moved to correct tooth contact, the prime mover should be realigned.

### RECHECK ALIGNMENT

After a period of operation, recheck alignment and adjust as required.

1. Properly install unit on a rigid foundation
  - adequately supported
  - securely bolted into place
  - leveled so as not to distort the gear case
2. Properly install couplings suitable for the application and connected equipment.
3. Ensure accurate alignment with other equipment.
4. Furnish and install adequate machinery guards as needed to protect operating personnel and as required by the applicable standards of the Occupational Safety and Health Administration (OSHA), and by other applicable safety regulations;
5. Ensure that driving equipment is running in the correct direction before coupling to reducers with backstops (designed to operate only in a specific direction) or machinery designed to operate only in one direction.

### CHANGES IN PERFORMANCE SPECIFICATIONS

Owner has the responsibility to consult with NORD GEAR if such items such as applied loads, operating speeds or other operating conditions have changed.



### WARNING:

LOCK OUT POWER before any maintenance is performed. Make absolutely sure that no voltage is applied while work is being done on the gearbox.

### START-UP

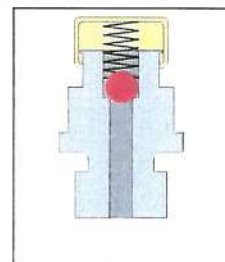
1. Ensure that switches, alarms, heaters, coolers and other safety and protection devices are installed and operational for their intended purpose.
2. Verify that the installed mounting position is the same as the nametag mounting position. If not, adjust the oil level accordingly and relocate the vent plug, fill plug and drain plug according to the mounting position. See following.

### AUTOVENT PLUG

The Autovent plug is brass in color and will be located at the highest point on the gearbox. It operates like a check-valve to allow the reducer to relieve internal pressure while preventing lubricant contamination during cooling. A spring presses a ball or plunger against a machined orifice until pressure exceeds 2 psi. Above 2 psi the air is allowed to escape depressurizing the gearcase. When internal pressure drops below 2 psi, the autovent re-seals closing the unit to the outside environment. After shutdown, the reducer cools along with the air inside the reducer. The unit will temporarily maintain a slight vacuum until normalization occurs. NORD Gear supplies an Autovent as a standard feature.



AUTOVENT  
PLUG

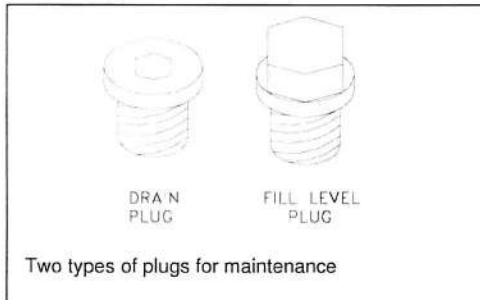


The Autovent releases built-up air pressure from inside the gearbox (Max. pressure 2 psi).



### FILL LEVEL & DRAIN PLUGS

The drain plugs are metric socket head cap screws. They will be located at the lowest part of the gearbox for ease of draining. The fill level plug is a hex head cap screw. It will be located between the Autovent and drain plug. Both types of plugs will have gaskets included to prevent oil from leaking.



### LUBRICANT

All NORD reducers are shipped from the factory properly filled with lubricant and all plugs are installed according to the mounting position given on the reducer nametag. Acceptable oil fill level is within  $\frac{1}{2}$  inch of the bottom of the fill plug threads.

### OPERATION AND MAINTENANCE CHECKLIST

1. Operate the equipment as it was intended to be operated
2. Do not overload.
3. Run at correct speed.
4. Maintain lubricant in good condition and at proper level.
5. Dispose of used lubricant in accordance with applicable laws and regulations.
6. Apply proper maintenance to attached equipment at prescribed intervals recommended by the manufacturer.
7. Perform periodic maintenance of the gear drive as recommended by NORD.

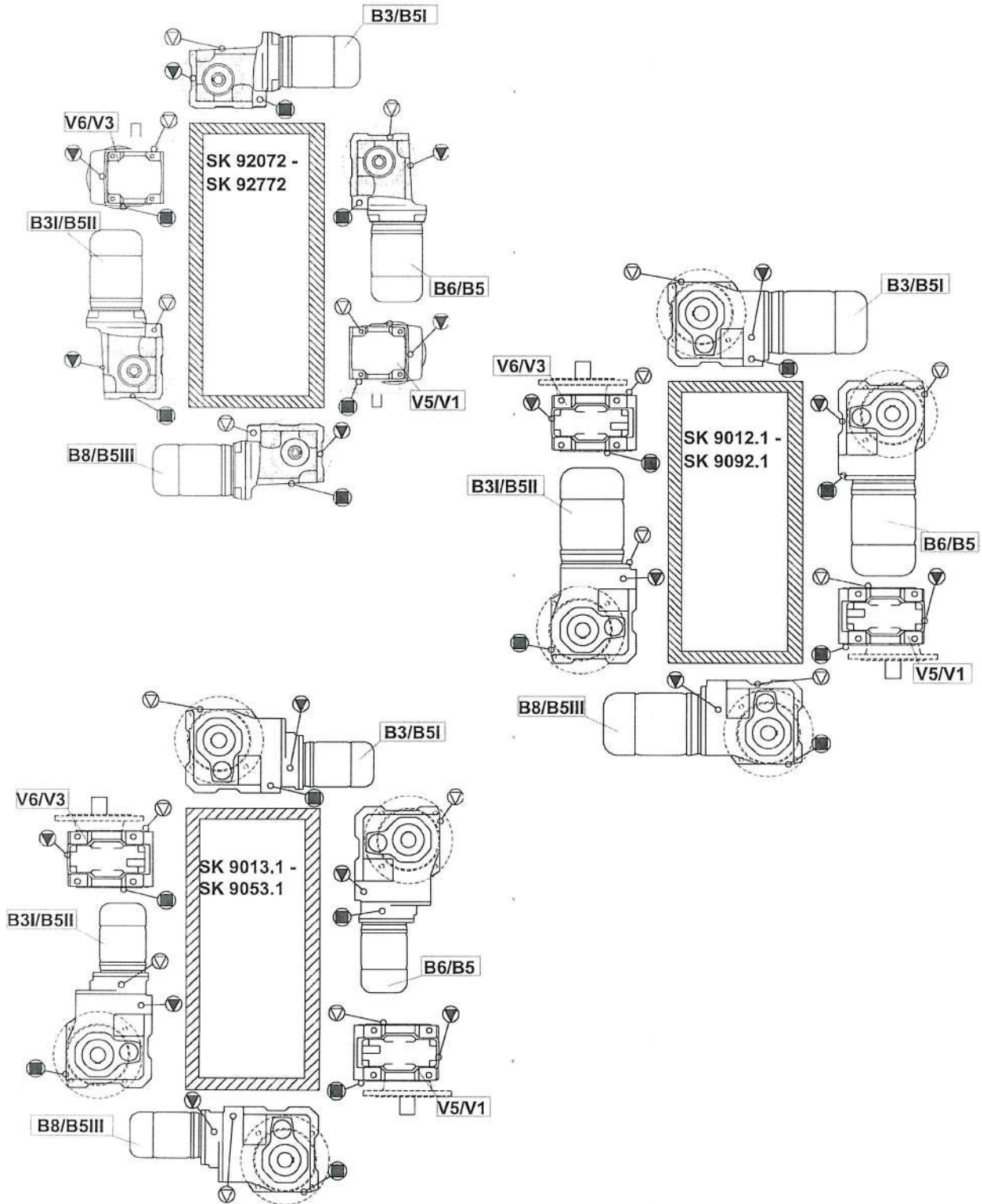
### NOTES

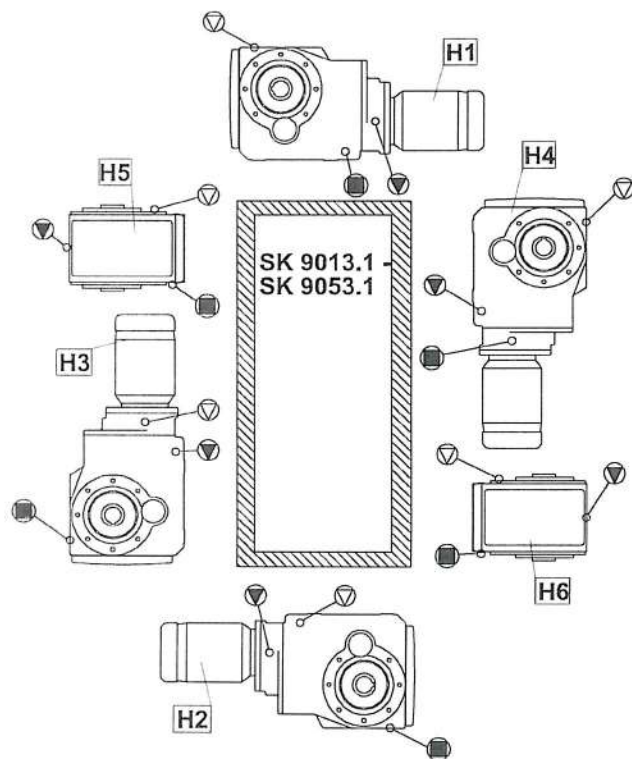
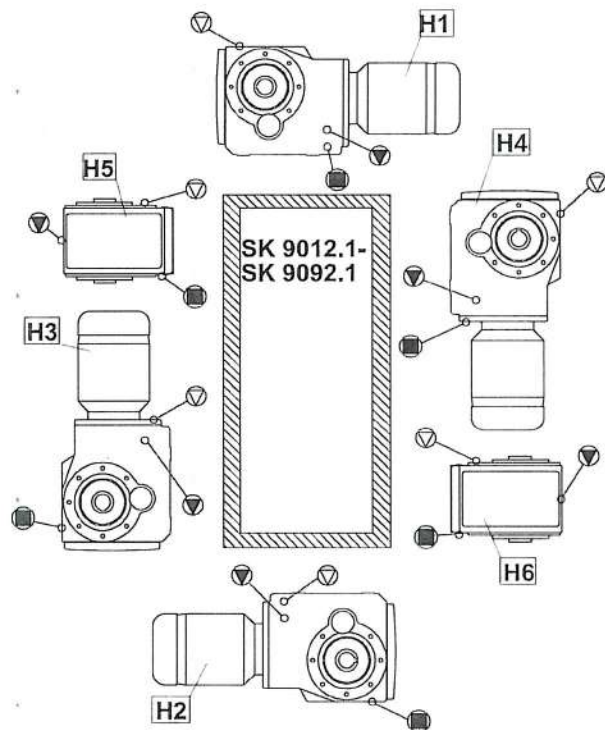
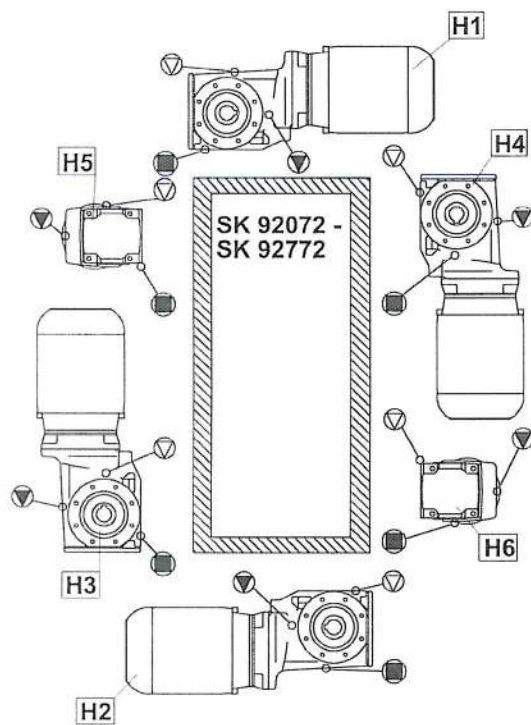


## MOUNTING POSITIONS

These charts detail the mounting positions for horizontal and vertical mounting. The Autovent, oil fill plug and drain plug are indicated on each mounting position picture. The factory set mounting position and plug locations match that shown on the gearbox nametag. For mounting orientations other than shown consult NORD Gear.

**The 92 Series Helical Bevel gearbox sizes SK92072, SK92172 & SK92372 have no vent or drain plugs. They are filled with synthetic oil so the units are "Lubed for Life".**





## MAINTENANCE

Mineral lubricant should be changed every 10,000 service hours or after two years. For synthetic oils, the lube should be changed every 20,000 service hours or after four years. In case of extreme operating (e.g. high humidity, aggressive environment or large temperature variations), shorter intervals between changes are recommended.

### OIL SPECIFICATIONS

NORD supplies all reducers filled with oil from the factory. Consult the sticker adjacent to the fill plug to determine the type of lubricant installed at the factory. Standard lubricant is ISO VG220 mineral-based oil. However, some units have special lubricants designed to operate in certain environments or to extend the service life of the lubricant. If in doubt about which lubricant is needed, contact NORD Gear.

**The 92 Series Helical Bevel gearbox sizes SK92072, SK92172 & SK92372 have no vent or drain plugs.  
They are filled with synthetic oil so the units are "Lubed for Life".**

### STANDARD OIL – ISO VG220

Ambient Temperature	Formulation
20 to 104°F (-5 to 40°C)	Mineral

### TYPICAL OILS

Viscosity ISO NLGI	Formulation	Service Temperature Range						
VG 460	Conventional Mineral	20°C to +50°C 68°F to +122°F	Mobilgear 634	Omala 460	7EP	Klüberoil GEM 1-460	Energol GR-XP 460	Tribol 1100/460
	Synthetic PAO	-30°C to +80°C -22°F to +176°F	Mobil SHC 634	Omala 460 HD	Isolube EP 460	Klübersynth EG 4-460	N/A	Tribol 1510/460
VG 320	Conventional Mineral	0°C to +30°C 32°F to +86°F	Mobilgear 632	Omala 320	6EP	Klüberoil GEM 1-320	Energol GR-XP 320	Tribol 1100/320
	Synthetic PAO	-35°C to +80°C -31°F to +176°F	Mobil SHC 632	Omala 320 HD	Isolube EP 460	Klübersynth EG 4-320	N/A	Tribol 1510/320
VG 220	Conventional Mineral	-5°C to +40°C +20°F to +104°F	Mobilgear 629	Omala 220	5EP	Klüberoil GEM 1-220	Energol GR-XP 220	Tribol 1100/220
	Synthetic PAO	-34°C to +80°C -30°F to +176°F	Mobil SHC 630	Omala 220 HD	Isolube EP 220	Klübersynth EG 4-220	N/A	Tribol 1510/220
VG 150 & VG 100	Conventional Mineral	-15°C to +25°C 5°F to +77°F	Mobilgear 629	Omala 100	4EP	Klüberoil GEM 1-150	Energol GR-XP 100	Tribol 1100/100
	Synthetic PAO	-37°C to +10°C -35°F to +50°F	Mobil SHC 629	Omala 150 HD	Isolube EP 150	Klübersynth EG 4-150	N/A	N/A
VG 68	Conventional Mineral	-15°C to +25°C 5°F to +77°F	Mobilgear 626	Omala 68	2EP	Klüberoil GEM 1-68	Energol GR-XP 68	Tribol 1100/68
	Synthetic PAO	-40°C to +10°C -40°F to +50°F	Mobil SHC 626	N/A	Isolube EP 68	N/A	N/A	N/A
VG 32	Synthetic PAO	-40°C to +10°C -40°F to +50°F	Mobil SHC 624	N/A	N/A	Klüber-Summit HySyn FG-32	N/A	N/A

PAO = Poly Alpha Olefin

### SPECIAL PURPOSE LUBRICANTS

Ambient Temperature	Formulation	Manufacturer	Oil Brand Name
20 to 104°F (-5 to 40°C)	Food Grade Oil - Synthetic	Chevron	FM ISO 220
20 to 104°F (-5 to 40°C)	Food Grade Oil - Synthetic	OilJAX	Magnaplate 85W140-FG
5 to 125°F (-20 to 50°C)	Fluid Grease	Mobil	Mobilux EP023
-30 to 140°F (-35 to 60°C)	Fluid Grease - Synthetic	Mobil	Mobilith SHC 007
-30 to 140°F (-35 to 60°C)	Fluid Grease - Synthetic	Shell	Albida LC

### STANDARD BEARING GREASE – NLGI 2EP Lithium

Ambient Temperature	Formulation
-20 to 140°F (-30 to 60°C)	Mineral

### OPTIONAL BEARING GREASES

Ambient Temperature	Formulation	Manufacturer	Grease Brand Name
-40 to 230°F (-40 to 110°C)	Synthetic	Shell	Aeroshell 6
-40 to 230°F (-40 to 110°C)	Food Grade - Synthetic	Lubriplate	SFL1



# LUBRICANT CAPACITY

Each reducer has the oil level and oil quantity adjusted according to the mounting position shown in the tables. When replacing the oil, consult the tables below to determine the proper amount of oil to be installed according to the reducer size and mounting position. Note that this is approximate and the final level will be adjusted when the reducer is installed. Acceptable oil fill level is within ½ inch of the bottom of the fill plug threads.

LUBRICATION CAPACITY – 90.1 SERIES HELICAL BEVEL GEARBOXES																	
Mounting position		Foot mounting															
		triple reduction									quadruple reduction						
		9012.1	9016.1	9022.1	9032.1	9042.1	9052.1	9072.1	9082.1	9086.1	9092.1	9013.1	9017.1	9023.1	9033.1	9043.1	9053.1
B 3	quarts	0.74	0.74	1.37	1.80	4.64	6.87	10.60	17.96	27.47	38.04	1.27	1.27	2.54	3.49	4.86	10.57
	liters	0.70	0.70	1.30	1.70	4.39	6.50	10.02	17.00	26.00	36.00	1.20	1.20	2.40	3.30	4.60	10.00
B 3 I	quarts	2.54	2.54	4.44	7.08	10.36	22.72	38.10	75.55	107.78	181.75	3.17	3.17	5.60	8.24	13.52	25.57
	liters	2.40	2.40	4.20	6.70	9.80	21.50	36.05	71.50	102.00	172.00	3.00	3.00	5.30	7.80	12.79	24.20
B 6	quarts	1.69	1.69	2.74	5.07	9.19	16.91	29.10	54.42	77.14	165.90	2.11	2.11	3.17	6.97	10.87	17.69
	liters	1.60	1.60	2.59	4.80	8.70	16.00	27.53	51.50	73.00	157.00	2.00	2.00	3.00	6.60	10.29	16.74
B 6 I	quarts	0.74	0.74	1.37	1.79	4.65	6.87	10.60	17.96	27.47	38.04	1.27	1.27	2.54	3.49	4.86	10.57
	liters	0.70	0.70	1.30	1.69	4.40	6.50	10.02	17.00	26.00	36.00	1.20	1.20	2.40	3.30	4.60	10.00
B 6 II	quarts	2.54	2.54	4.44	7.08	10.36	22.72	38.10	75.55	107.78	181.75	3.17	3.17	5.60	8.24	13.52	25.57
	liters	2.40	2.40	4.20	6.70	9.80	21.50	36.05	71.50	102.00	172.00	3.00	3.00	5.30	7.80	12.79	24.20
B 8	quarts	2.01	2.01	3.70	6.76	10.57	20.08	33.80	66.04	89.82	179.64	2.32	2.32	4.02	7.40	11.31	21.13
	liters	1.90	1.90	3.50	6.40	10.00	19.00	31.98	62.50	85.00	170.00	2.20	2.20	3.80	7.00	10.70	20.00
B 8 I	quarts	1.69	1.69	2.74	5.07	9.19	16.91	29.10	54.42	77.14	165.90	2.11	2.11	3.17	6.97	10.78	17.69
	liters	1.60	1.60	2.59	4.80	8.70	16.00	27.53	51.50	73.00	157.00	2.00	2.00	3.00	6.60	10.20	16.74
V 5	quarts	1.27	1.27	2.11	4.33	7.18	11.62	19.00	34.87	50.72	84.54	1.48	1.48	2.32	4.54	5.49	12.15
	liters	1.20	1.20	2.00	4.10	6.79	11.00	17.98	33.00	48.00	80.00	1.40	1.40	2.20	4.30	5.20	11.50
V 5 I	quarts	1.27	1.27	2.11	4.33	7.18	11.62	19.00	34.87	50.72	84.54	1.48	1.48	2.32	4.54	5.49	12.15
	liters	1.20	1.20	2.00	4.10	6.79	11.00	17.98	33.00	48.00	80.00	1.40	1.40	2.20	4.30	5.20	11.50
V 6	quarts	1.80	1.80	2.96	5.39	7.93	16.38	25.40	49.14	65.51	95.10	2.01	2.01	3.28	5.39	7.08	17.43
	liters	1.70	1.70	2.80	5.10	7.50	15.50	24.03	46.50	62.00	90.00	1.90	1.90	3.10	5.10	6.70	16.49
V 6 I	quarts	1.80	1.80	2.96	5.39	7.93	16.38	25.40	49.14	65.51	95.10	2.01	2.01	3.28	5.39	7.08	17.43
	liters	1.70	1.70	2.80	5.10	7.50	15.50	24.03	46.50	62.00	90.00	1.90	1.90	3.10	5.10	6.70	16.49
Mounting position		Flange mounting															
		triple reduction									quadruple reduction						
		9012.1	9016.1	9022.1	9032.1	9042.1	9052.1	9072.1	9082.1	9086.1	9092.1	9013.1	9017.1	9023.1	9033.1	9043.1	9053.1
B 5	quarts	2.01	2.01	2.75	5.49	10.25	17.44	29.10	57.06	82.42	137.37	2.43	2.43	3.17	6.02	10.78	19.02
	liters	1.91	1.91	2.61	5.22	9.74	16.57	27.53	54.21	78.30	130.50	2.31	2.31	3.01	5.72	10.24	18.07
B 5 I	quarts	0.74	0.74	1.37	2.01	3.80	7.93	12.70	22.19	38.04	42.27	1.27	1.27	2.54	2.85	6.02	13.21
	liters	0.70	0.70	1.30	1.91	3.61	7.53	12.02	21.08	36.14	40.16	1.21	1.21	2.41	2.71	5.72	12.55
B 5 II	quarts	2.54	2.54	4.44	7.71	12.15	24.83	40.70	84.54	124.69	184.92	3.17	3.17	5.60	8.98	15.53	28.00
	liters	2.41	2.41	4.22	7.32	11.54	23.59	38.51	80.31	118.46	175.67	3.01	3.01	5.32	8.53	14.75	26.60
B 5 III	quarts	2.01	2.01	3.70	6.76	12.05	21.13	34.90	69.74	96.16	162.73	2.32	2.32	4.02	7.29	12.04	22.19
	liters	1.91	1.91	3.52	6.42	11.45	20.07	33.02	66.25	91.35	154.59	2.20	2.20	3.82	6.93	11.44	21.08
V 1	quarts	1.27	1.27	2.11	3.49	6.87	12.15	20.10	40.15	56.00	86.65	1.47	1.47	2.32	3.80	6.97	13.74
	liters	1.21	1.21	2.00	3.32	6.53	11.54	19.02	38.14	53.20	82.32	1.40	1.40	2.20	3.61	6.62	13.05
V 3	quarts	1.80	1.80	2.96	5.39	8.66	19.02	27.50	54.95	80.31	96.16	2.01	2.01	3.28	5.92	10.41	17.96
	liters	1.71	1.71	2.81	5.12	8.23	18.07	26.02	52.20	76.29	91.35	1.91	1.91	3.12	5.62	9.89	17.06
Mounting position		Shaft mounting															
		triple reduction									quadruple reduction						
		9012.1	9016.1	9022.1	9032.1	9042.1	9052.1	9072.1	9082.1	9086.1	9092.1	9013.1	9017.1	9023.1	9033.1	9043.1	9053.1
H 1	quarts	0.74	0.74	1.37	2.08	3.80	7.93	12.70	22.19	38.04	42.27	1.27	1.27	2.54	2.85	6.02	13.21
	liters	0.70	0.70	1.30	1.98	3.61	7.53	12.02	21.08	36.14	40.16	1.21	1.21	2.41	2.71	5.72	12.55
H 2	quarts	2.01	2.01	3.70	6.76	12.05	21.13	34.90	69.74	96.16	162.73	2.32	2.32	4.02	7.29	12.05	22.19
	liters	1.91	1.91	3.52	6.42	11.45	20.07	33.02	66.25	91.35	154.59	2.20	2.20	3.82	6.93	11.45	21.08
H 3	quarts	2.54	2.54	4.44	7.71	12.15	24.83	40.70	84.54	124.69	184.92	3.17	3.17	5.60	8.98	15.53	28.00
	liters	2.41	2.41	4.22	7.32	11.54	23.59	38.51	80.31	118.46	175.67	3.01	3.01	5.32	8.53	14.75	26.60
H 4	quarts	2.01	2.01	2.74	5.49	10.25	17.43	29.10	57.06	82.42	137.37	2.43	2.43	3.17	6.02	10.77	19.02
	liters	1.91	1.91	2.60	5.22	9.74	16.56	27.53	54.21	78.30	130.50	2.31	2.31	3.01	5.72	10.23	18.07
H 5	quarts	1.27	1.27	2.11	3.49	6.87	12.15	20.10	40.15	56.01	86.65	1.48	1.48	2.32	3.80	6.97	13.74
	liters	1.21	1.21	2.00	3.32	6.53	11.54	19.02	38.14	53.21	82.32	1.41	1.41	2.20	3.61	6.62	13.05
H 6	quarts	1.80	1.80	2.96	5.39	8.66	19.02	27.50	54.95	80.31	96.16	2.01	2.01	3.28	5.92	10.14	17.96
	liters	1.71	1.71	2.81	5.12	8.23	18.07	26.02	52.20	76.29	91.35	1.91	1.91	3.12	5.62	9.63	17.06
Standard lubricant for the gearboxes is mineral oil. Synthetic oil is available at a surcharge.																	
Note: Filling quantities are approximate figures. Oil level must be checked according to oil level plug.																	
For mounting angles not shown, consult factory.																	

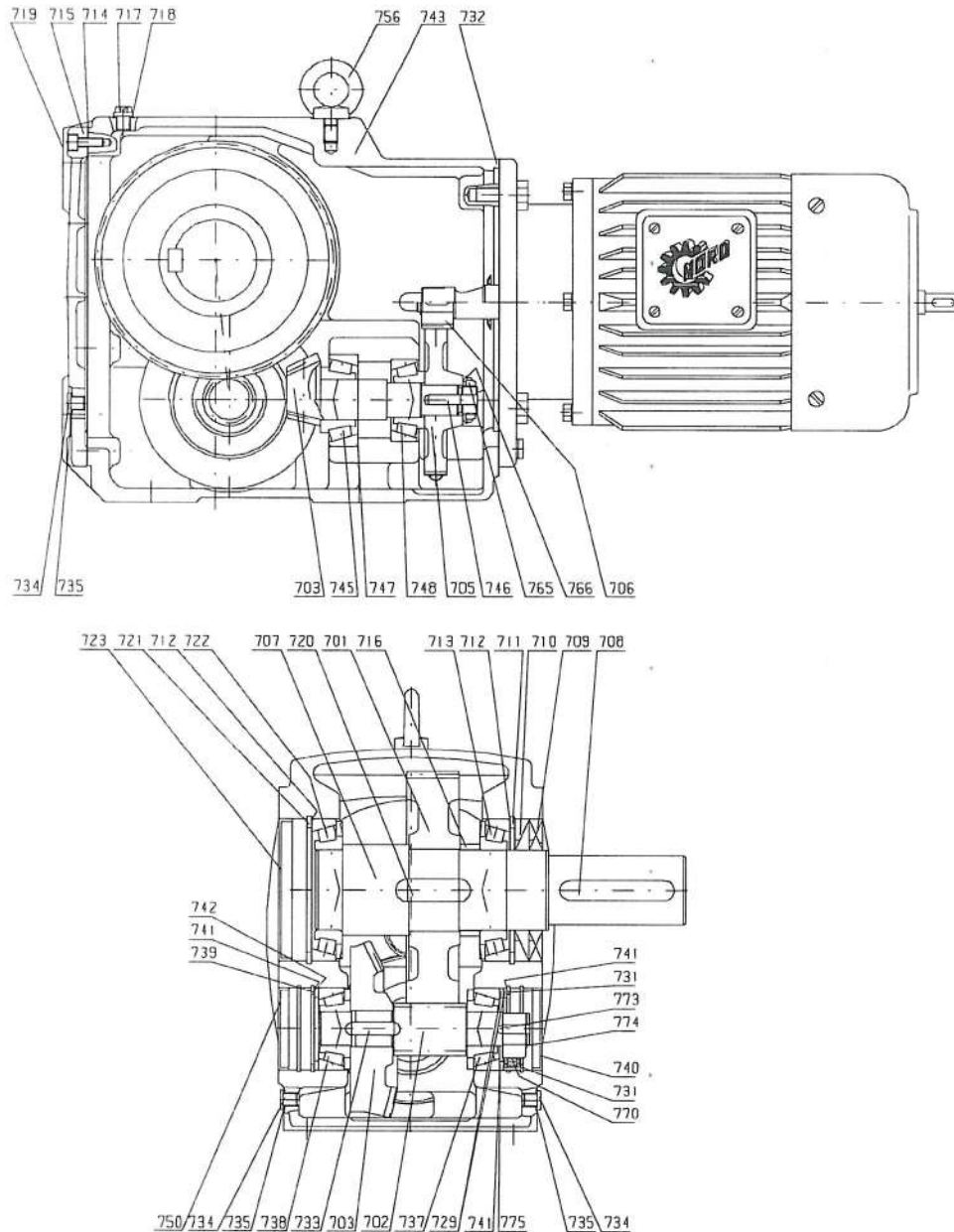
LUBRICATION CAPACITY – 92 SERIES HELICAL BEVEL GEARBOXES										
Mounting Position	Model Size									
	SK92072		SK92172		SK92372		SK92672		SK92772	
	[Quarts]	[Liters]	[Quarts]	[Liters]	[Quarts]	[Liters]	[Quarts]	[Liters]	[Quarts]	[Liters]
B3	0.42	0.40	0.63	0.60	0.95	0.90	1.90	1.80	2.43	2.30
B3I	0.85	0.80	1.06	1.00	1.69	1.60	3.59	3.40	5.60	5.30
B6	0.74	0.70	0.95	0.90	1.37	1.30	3.70	3.50	4.76	4.50
B6I	0.42	0.40	0.63	0.60	0.95	0.90	1.90	1.80	2.43	2.30
B6II	0.85	0.80	1.06	1.00	1.69	1.60	3.59	3.40	5.60	5.30
B8	0.63	0.60	1.16	1.10	1.53	1.45	3.38	3.20	4.86	4.60
B8I	0.74	0.70	0.95	0.90	1.37	1.30	3.70	3.50	4.76	4.50
V5	0.63	0.60	0.79	0.75	1.27	1.20	2.75	2.60	4.33	4.10
V5I	0.63	0.60	0.79	0.75	1.27	1.20	2.75	2.60	4.33	4.10
V6	0.63	0.60	0.79	0.75	1.27	1.20	2.75	2.60	4.33	4.10
V6I	0.63	0.60	0.79	0.75	1.27	1.20	2.75	2.60	4.33	4.10
B5	0.74	0.70	1.06	1.00	1.59	1.50	2.96	2.80	4.65	4.40
B5I	0.42	0.40	0.63	0.60	1.22	1.15	1.64	1.55	2.91	2.75
B5II	0.85	0.80	1.16	1.10	1.80	1.70	3.49	3.30	5.71	5.40
B5III	0.63	0.60	1.00	0.95	1.27	1.20	2.64	2.50	4.33	4.10
V1	0.63	0.60	0.79	0.75	1.22	1.15	2.54	2.40	3.70	3.50
V3	0.63	0.60	0.79	0.75	1.22	1.15	2.54	2.40	3.70	3.50
H1	0.42	0.40	0.63	0.60	1.22	1.15	1.64	1.55	3.17	3.00
H2	0.63	0.60	1.00	0.95	1.27	1.20	2.64	2.50	4.76	4.50
H3	0.85	0.80	1.16	1.10	1.80	1.70	3.49	3.30	5.81	5.50
H4	0.74	0.70	1.06	1.00	1.59	1.50	2.96	2.80	4.54	4.30
H5	0.63	0.60	0.79	0.75	1.22	1.15	2.54	2.40	3.80	3.60
H6	0.63	0.60	0.79	0.75	1.22	1.15	2.54	2.40	3.17	3.00

The 92 Series Helical Bevel gearbox sizes SK92072, SK92172 & SK92372 have no vent or drain plugs. They are filled with synthetic oil so the units are "Lubed for Life".



## PARTS LIST

SK9012 - SK9092  
Foot mounted



- 701 Output gear
- 702 Output pinion shaft
- 703 Bevel gearset
- 705 Input gear
- 706 Input pinion
- 707 Output shaft
- 708 Key
- 709 Shaft seal
- 710 Shaft seal
- 711 Circlip
- 712 Shim
- 713 Taper roller bearing
- 714 Gasket
- 715 Gear case cover
- 716 Spacer
- 717 Vent screw
- 718 Seal
- 719 Socket head screw
- 720 Key
- 721 Circlip
- 722 Taper roller bearing
- 723 Sealing plug
- 729 Supporting disc
- 731 Circlip
- 732 Gasket
- 733 Key
- 734 Drain plug
- 735 Seal
- 737 Taper roller bearing
- 738 Taper roller bearing
- 739 Circlip
- 740 Sealing plug
- 741 Shim
- 742 Supporting disc
- 743 Gear case
- 745 Taper roller bearing
- 746 Key
- 747 Shim
- 748 Taper roller bearing
- 750 Sealing plug
- 756 Flanged eye bolt
- 765 Slotted round nut
- 766 Tab washer
- 770 Backstop
- 773 Key
- 774 Circlip
- 775 Supporting disc

### RECOMMENDED SPARE PARTS

Bearings - all      Gaskets - all      Shims - all  
Seals - all      Seal Plugs - all

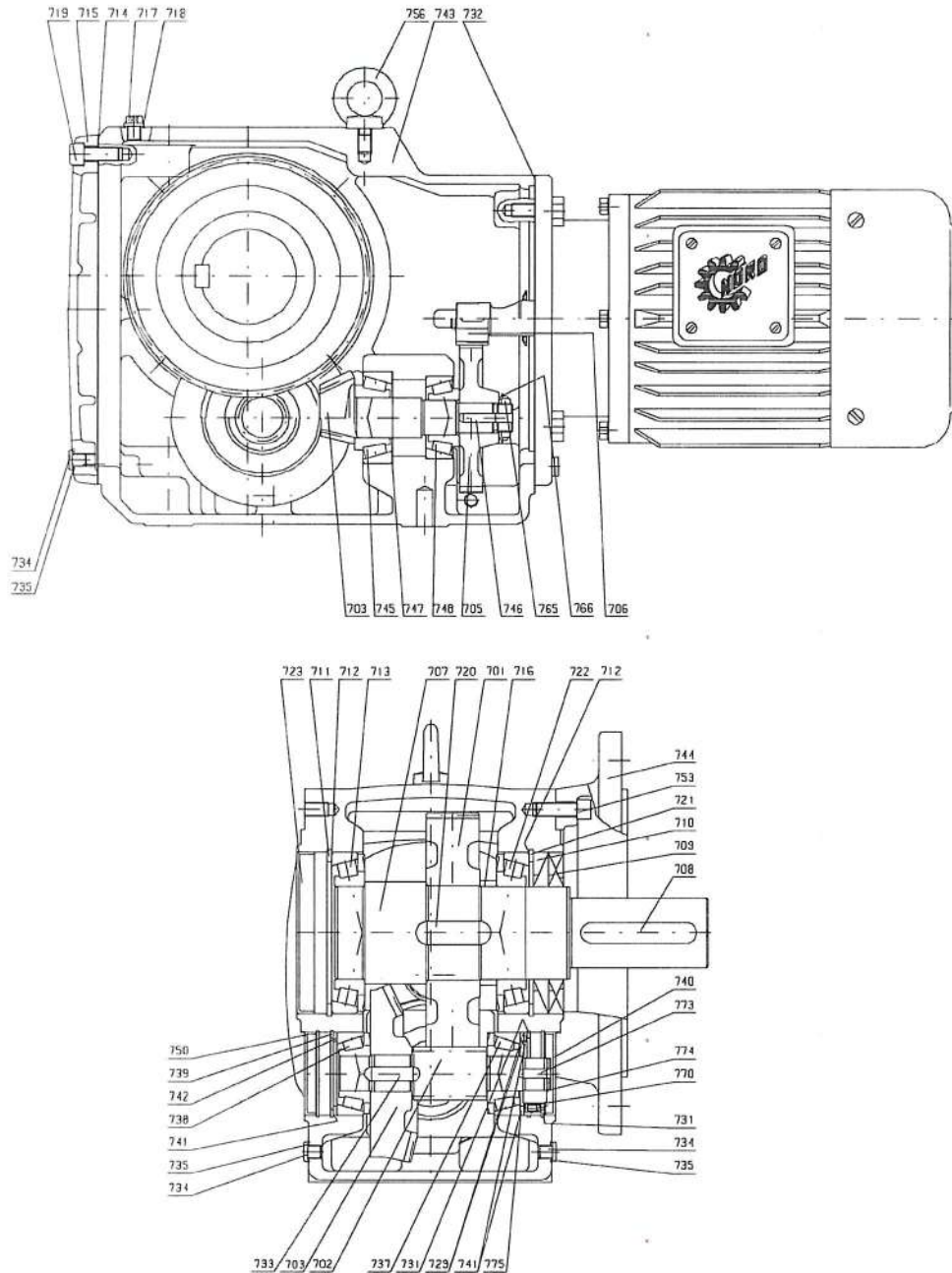
### IMPORTANT!

When ordering parts, it is necessary to have the **NORD SERIAL NUMBER** from the unit the parts are for. The serial number will dictate the correct parts for that particular unit. The gearbox nameplate will have the serial number on it.



## PARTS LIST

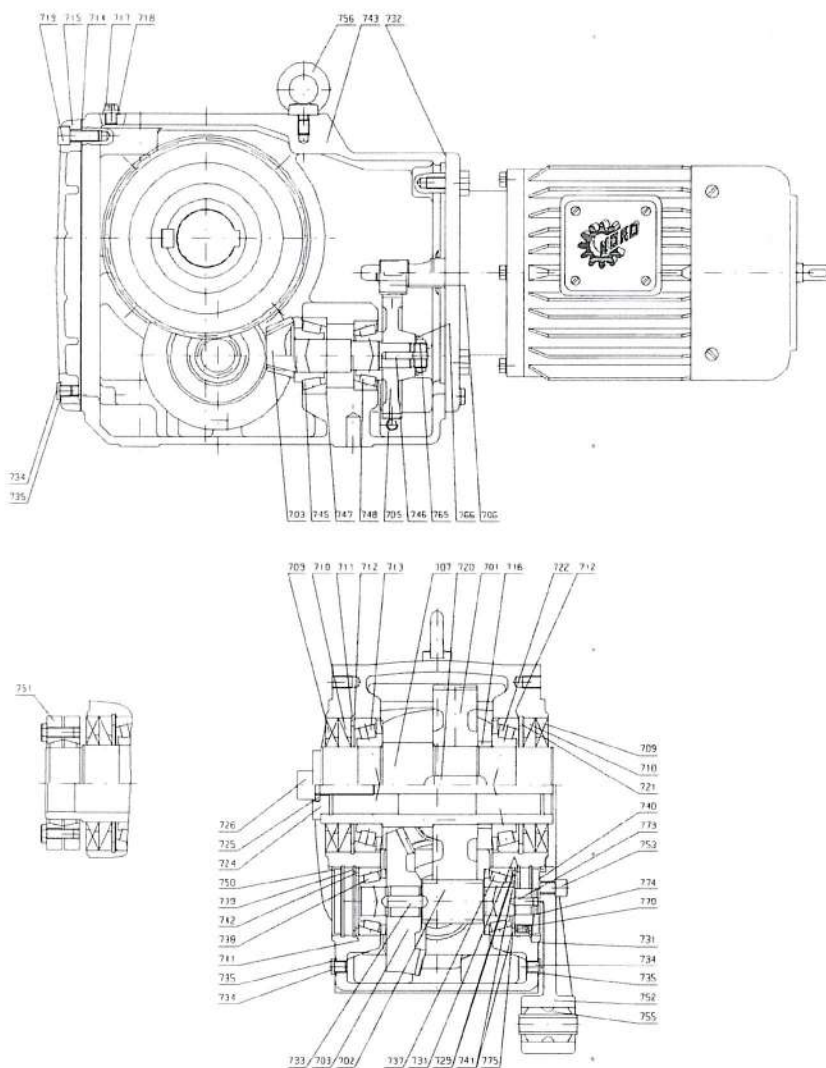
SK 9012 - SK 9092 VF  
Flange mounted



- 701 Output gear
- 702 Output pinion shaft
- 703 Bevel gearset
- 705 Input gear
- 706 Input pinion
- 707 Output shaft
- 708 Key
- 709 Shaft seal
- 710 Shaft seal
- 711 Orclip
- 712 Shim
- 713 Taper roller bearing
- 714 Gasket
- 715 Gear case cover
- 716 Spacer
- 717 Vent screw
- 718 Seal
- 719 Socket head screw
- 720 Key
- 721 Orclip
- 722 Taper roller bearing
- 723 Sealing plug
- 729 Supporting disc
- 731 Orclip
- 732 Gasket
- 733 Key
- 734 Drain plug
- 735 Seal
- 737 Taper roller bearing
- 738 Taper roller bearing
- 739 Orclip
- 740 Sealing plug
- 741 Shim
- 742 Supporting disc
- 743 Gear case
- 744 Flange
- 745 Taper roller bearing
- 746 Key
- 747 Shim
- 748 Taper roller bearing
- 750 Sealing plug
- 753 Socket head screw
- 756 Flanged eye bolt
- 765 Slotted round nut
- 766 Tab washer
- 770 Backstop
- 773 Key
- 774 Orclip
- 775 Supporting disc

## PARTS LIST

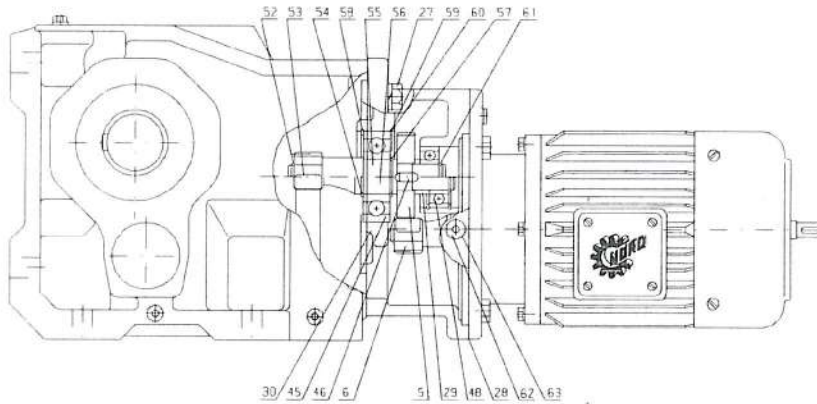
SK9012 - SK9092 AZ  
Shaft mounted



- 701 Output gear
- 702 Output pinion shaft
- 703 Bevel gearset
- 705 Driving gear
- 706 Driving pinion
- 707 Hollow shaft
- 709 Shaft seal
- 710 Shaft seal
- 711 Circlip
- 712 Shim
- 713 Taper roller bearing
- 714 Gasket
- 715 Gear case cover
- 716 Spacer
- 717 Vent screw
- 718 Seal
- 719 Socket head screw
- 720 Key
- 721 Circlip
- 722 Taper roller bearing
- 724 Washer
- 725 Spring washer
- 726 Socket head screw
- 729 Supporting disc
- 731 Circlip
- 732 Gasket
- 733 Key
- 734 Drain plug
- 737 Taper roller bearing
- 738 Taper roller bearing
- 739 Circlip
- 740 Sealing plug
- 741 Shim
- 742 Supporting disc
- 743 Gear case
- 745 Taper roller bearing
- 746 Key
- 747 Shim
- 748 Taper roller bearing
- 750 Sealing plug
- 751 Shrink disc connector
- 752 Torque arm
- 753 Socket head screw
- 755 Rubber buffer
- 756 Flanged eye bolt
- 765 Slotted round nut
- 766 Tab washer
- 770 Backstop

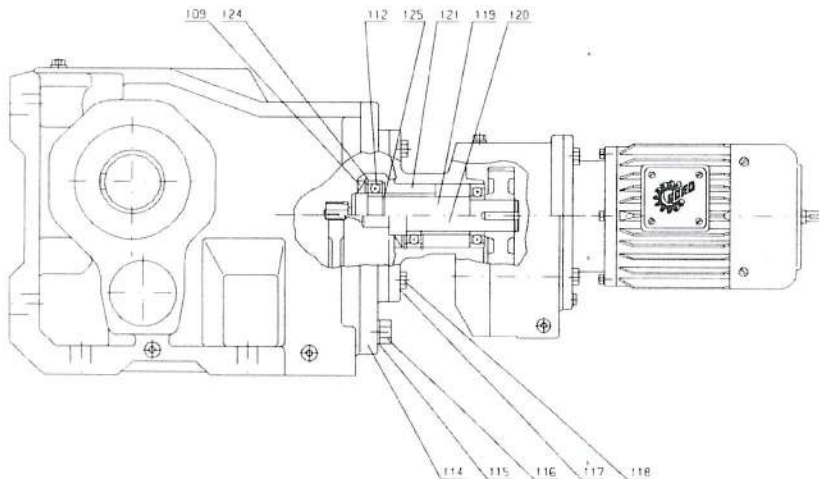
## PARTS LIST

SK 9013 - SK 9053  
Foot mounted  
Flange mounted VF  
Shaft mounted AZ



- 5 Input gear
- 6 Input pinion
- 27 Bolt
- 28 Gasket
- 29 Supporting disc
- 30 Third reduction gearcase
- 45 Ball bearing
- 46 Key
- 48 Ball bearing
- 52 Circlip
- 53 Key
- 54 Circlip
- 55 Intermediate shaft, plain
- 56 Intermediate shaft, gearcut
- 57 Circlip
- 58 Circlip
- 59 Shim
- 60 Circlip
- 61 Circlip
- 62 Plug
- 63 Seal
- 109 Shaft seal
- 112 Ball bearing
- 114 Intermediate flange
- 115 Spring washer
- 116 Bolt
- 117 Spring washer
- 118 Bolt
- 119 Intermediate shaft, plain
- 119 Intermediate shaft, gearcut
- 121 Bearing sleeve
- 124 Circlip
- 125 Circlip

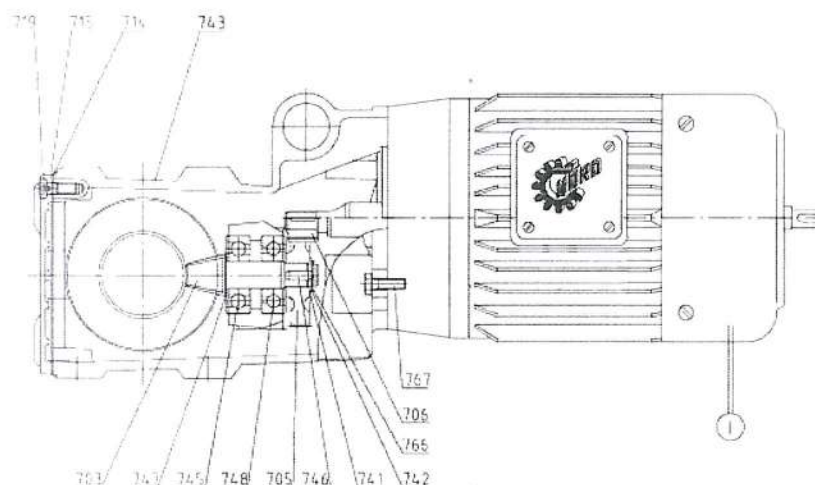
SK 9062/32 - SK 9092/52  
Foot mounted  
Flange mounted VF  
Shaft mounted AZ



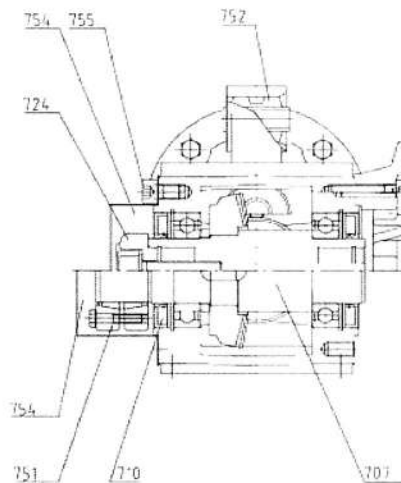
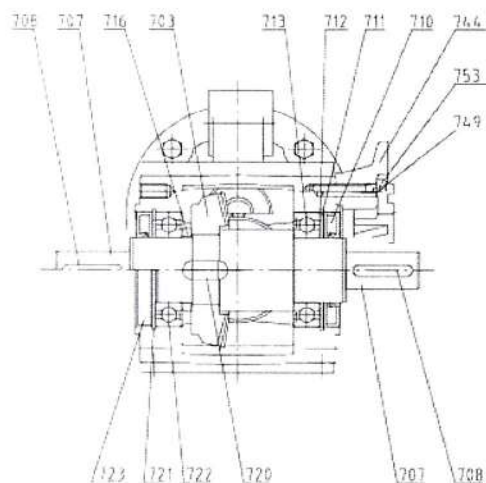


## PARTS LIST

SK92072



- 703 Bevel gearset
- 705 Input gear
- 706 Input pinion
- 707 Output shaft
- 708 Key
- 710 Shaft seal
- 711 Circlip
- 712 Shim
- 713 Taper roller bearing
- 714 Gasket
- 715 Gear case cover
- 716 Spacer
- 719 Socket head screw
- 720 Key
- 721 Circlip
- 722 Taper roller bearing
- 723 Sealing plug
- 724 Fixing element
- 741 Shim
- 742 Supporting disc
- 743 Gear case
- 744 Flange
- 745 Taper roller bearing
- 746 Key
- 747 Shim
- 748 Taper roller bearing
- 749 Grooved pin
- 751 Shrink disc connector
- 752 Rubber buffer
- 753 Socket head screw
- 754 Cover
- 755 Socket head screw
- 766 Circlip
- 767 Hexagon screw



### RECOMMENDED SPARE PARTS

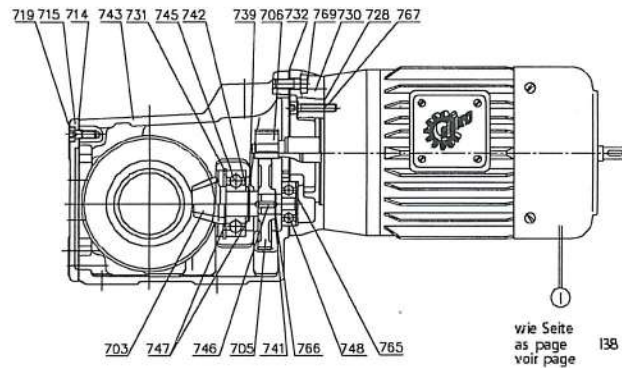
Bearings – all      Gaskets – all      Shims – all  
Seals – all      Seal Plugs – all

### IMPORTANT!

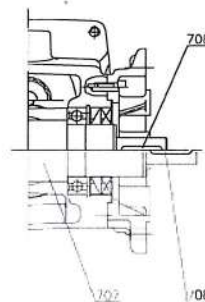
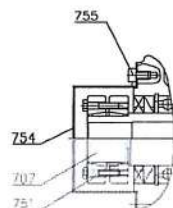
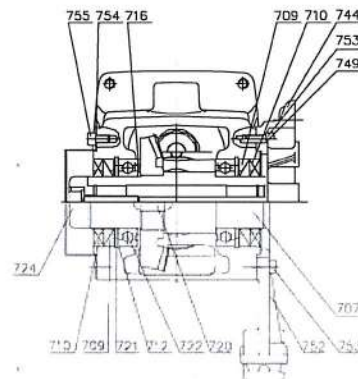
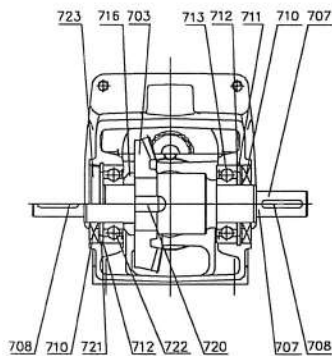
When ordering parts, it is necessary to have the **NORD SERIAL NUMBER** from the unit the parts are for. The serial number will dictate the correct parts for that particular unit. The gearbox nameplate will have the serial number on it.

## PARTS LIST

SK 92172 - SK 92772



- 703 Bevel gearset
- 705 Input gear
- 706 Input pinion
- 707 Output shaft
- 708 Key
- 709 Shaft seal
- 710 Shaft seal
- 711 Circlip
- 712 Shim
- 713 Taper roller bearing
- 714 Gasket
- 715 Gear case cover
- 716 Spacer
- 719 Socket head screw
- 720 Key
- 721 Circlip
- 722 Taper roller bearing
- 723 Sealing plug
- 724 Fixing element
- 728 Gasket
- 730 Gearbox cover
- 731 Circlip
- 732 Gasket
- 739 Circlip
- 741 Shim
- 742 Supporting disc
- 743 Gear case
- 744 Flange
- 745 Taper roller bearing
- 746 Key
- 747 Shim
- 748 Taper roller bearing
- 749 Grooved pin
- 751 Shrink disc connector
- 752 Torque arm
- 753 Socket head screw
- 754 Cover
- 755 Socket head screw
- 765 Bearing shim
- 766 Tab washer
- 767 Socket head screw
- 769 Hexagon screw
- 775 Supporting disc



### NORD Gear Corporation

National Customer Service Toll Free 888-314-6673

[www.nord.com](http://www.nord.com)

### NORD Gear Limited

Toll Free in Canada 800-668-4378

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Phone 951-279-2600  
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800 Nord Drive  
Waunakee, WI 53597  
Phone 608-849-7300  
Fax 800-373-6673

**SOUTH**  
100 Forsyth Hall Dr.  
Building 100B  
Charlotte, NC 28273  
Phone 704-529-1255  
Fax 888-259-6673

**CANADA**  
41 West Drive  
Brampton, Ontario L6T 4A1  
Phone 905-796-3606  
Fax 905-796-8130



**KEYLESS FRICTIONAL  
SHAFT/HUB  
LOCKING DEVICES**

**BL**

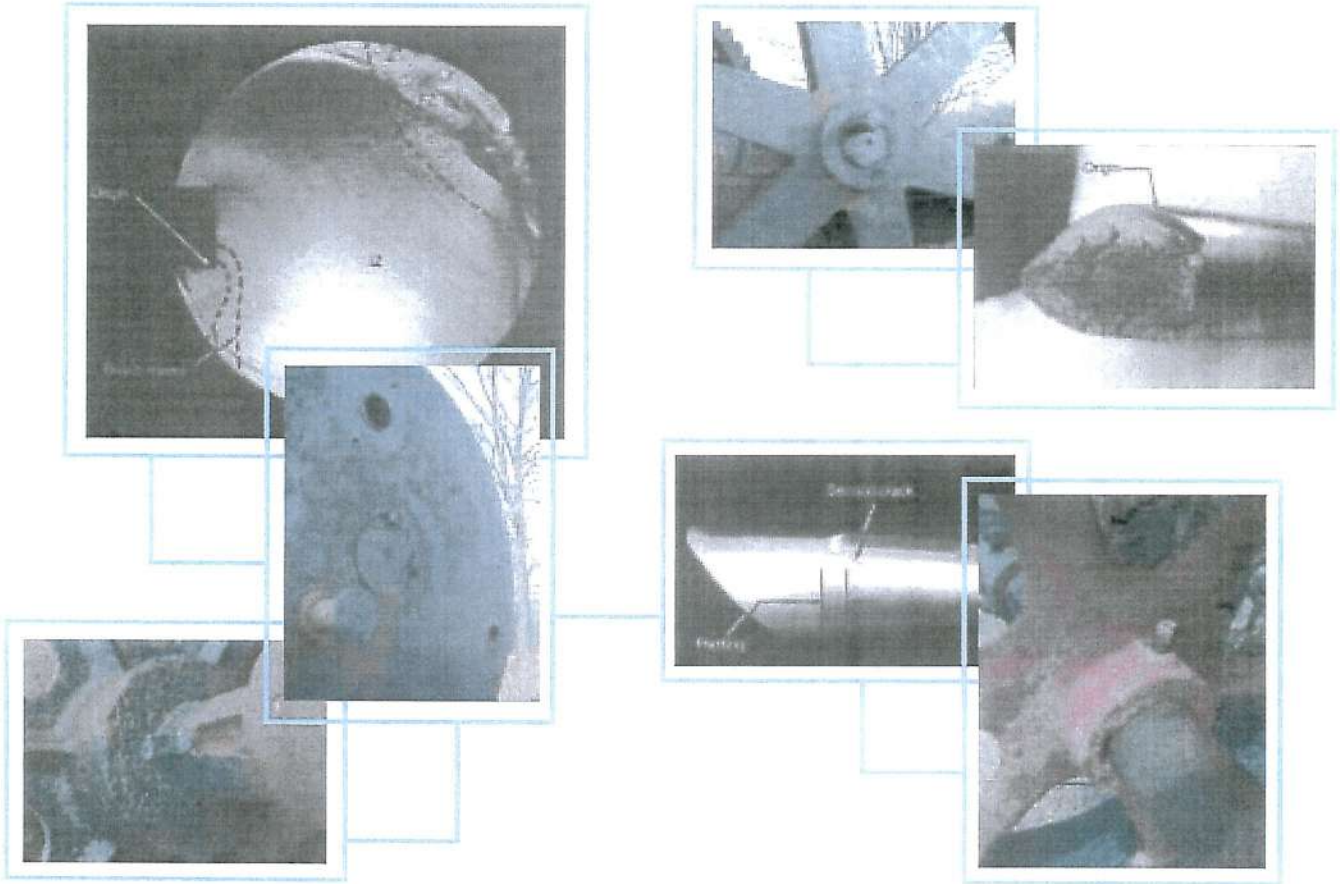


**THE KEY TO BETTER MACHINE DESIGN  
IS NO KEY AT ALL.**

CATALOG C02



## INTRODUCTION:



### THE PROBLEM:

In a typical keyed shaft/hub connection, the clearance between key and keyway required for fitting is a serious disadvantage when shock or reversing loads are to be transmitted. Any component held by a key is slipping on the shaft at start-up or load reversal by an amount equal to the amount of fit clearance. This results in impact loads when contact with the key stops the slippage. These impact loads, which are rarely accounted for in the design process, generate a continuous "pounding" between key and keyway. This pounding, combined with fretting corrosion caused by micromovements at the fit interface, frequently leads to shaft failures like the ones illustrated above. *[Shaft failure illustrations are reproduced with permission of Sachs, Salvetera & Associates, Solvay, NY.]*

### TRADITIONAL INTERFERENCE FITS:

The solution to these problems is elimination of the key by using a frictional bond between components and shafts. This type of connection, commonly known as an interference (shrink or press) fit, results in zero clearance – hence, no backlash – and utilizes the full contact area for uniform transmittal of torques and/or bending moments. Such a connection will never "pound out" – even for an infinite number of load cycles – as long as the frictional holding capacity of the connection is equal to or higher than the loads applied. In addition, the elimination of keyways eliminates keyed shaft notch factors, permitting smaller shaft and bearing sizes and reducing the overall cost and complexity of a design. Despite these advantages, mounting and removal problems associated with shrink or press fits have frequently disqualified this type of connection for many applications.

# THE B-LOC SOLUTION

B-LOC Keyless Frictional Shaft/Hub Locking Devices provide the ultimate solution by incorporating all the advantages of interference fits, while eliminating mounting and removal problems.

B-LOC Locking Assemblies and Shrink Discs rely on the proven wedge principle to create a keyless, mechanical interference fit by converting locking screw tension into radial contact pressures on shaft and hub. This connection, while in many ways similar to conventional shrink or press fits, has several distinct advantages:

1. *In the relaxed position, B-LOC keyless connectors provide a generous clearance for easy mounting and dismounting.*
2. *B-LOC keyless connectors generate higher contact pressures than those obtained by a shrink or press fit, thereby allowing for shorter hub lengths and eliminating the problem of fretting corrosion associated with wider connections.*
3. *B-LOC keyless connectors facilitate simple axial and angular timing of hub.*

## B-LOC CORPORATION: COMMITTED TO QUALITY PRODUCTS AND SUPERIOR CUSTOMER SERVICE

Since 1982, B-LOC has been committed to providing the highest quality keyless locking devices to customers worldwide. All B-LOC keyless shaft/hub connectors are manufactured in strict accordance with ISO 9002 requirements, and are available in a variety of styles and sizes – 1/4" up to 40" and larger, both inch and metric – to suit any application. B-LOC also has the capability to design and produce special units, even for small quantity production runs.

Our application engineers have over 20 years of experience and would be pleased to provide free design assistance for any kind of equipment.

Finally, our dedicated customer service staff is ready to provide you with prices, stock quantities and delivery information, and can process most orders to ship the same day.

COMPARISON CHART		B-LOC	Keyed Connection	Splined Connection	QD or Taper Lock	Shrink or Press Fit
B-LOC Frictional Shaft/Hub Locking Devices have several distinct advantages over all other commonly used methods.	Provides a keyless frictional connection	✓				✓
	Easily mounted & dismounted	✓	✓	✓	✓	
	Permits simple axial & angular timing	✓				
	Transmits reversing bending moments	✓				✓
	Provides a backlash free connection	✓				✓



## OUR PRODUCTS

B-LOC keyless frictional locking devices rely on the proven wedge principle to create a mechanical interference fit by converting locking screw tension into radial contact pressures on shaft and hub. We offer many different designs to suit any application.

### INTERNAL DEVICES


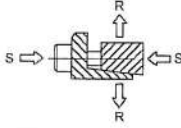

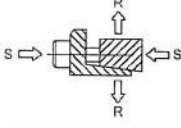

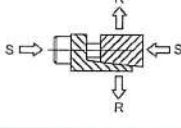

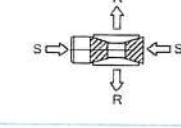

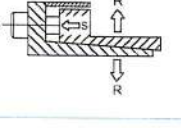

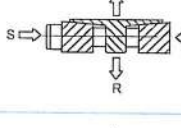

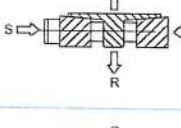

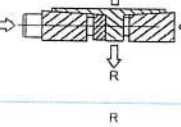

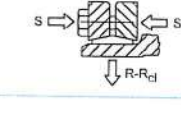

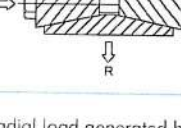
<p><b>SERIES B109</b> Series 2071 outside the US and Canada</p>	<ul style="list-style-type: none"> <li>• Designed for shafts as small as 1/4" (6 mm)</li> <li>• Shallow, single taper design with integrated push-off threads</li> <li>• Exceptional concentricity &amp; ability to transmit bending loads</li> <li>• Fixed axial hub position during assembly</li> </ul>
<p><b>SERIES B106</b> Series 1061 outside the US and Canada</p>	<ul style="list-style-type: none"> <li>• Shallow, single taper design with integrated push-off threads</li> <li>• Exceptional concentricity &amp; ability to transmit bending loads</li> <li>• Optional spacer sleeve optimizes connections involving narrow hub cross-sections</li> <li>• Fixed axial hub position during assembly</li> </ul>
<p><b>SERIES B103</b> Series 1062 outside the US and Canada</p>	<ul style="list-style-type: none"> <li>• Shallow, single taper design with integrated push-off threads</li> <li>• Exceptional concentricity &amp; ability to transmit bending loads</li> <li>• Axial hub position not fixed during installation</li> </ul>
<p><b>SERIES B400</b> Series 2005 outside the US and Canada</p>	<ul style="list-style-type: none"> <li>• Self-releasing, double taper design permits simple adjustment and removal</li> <li>• Not self-centering</li> <li>• Available pilot bushings provide pre-centering when required</li> <li>• Fixed axial hub position during assembly</li> </ul>
<p><b>SERIES B800</b> Series 5061 outside the US and Canada</p>	<ul style="list-style-type: none"> <li>• Shallow, single taper design</li> <li>• Exceptional concentricity</li> <li>• Thin, extra wide sleeves provide low contact pressures allowing for smaller diameter hubs</li> <li>• Integrated spacer sleeve eliminates axial hub movement during installation</li> </ul>
<p><b>SERIES B112</b> Series 4061 outside the US and Canada</p>	<ul style="list-style-type: none"> <li>• Heavy duty</li> <li>• Wide, double taper design for enhanced bending moment capacity</li> <li>• Exceptional concentricity</li> <li>• Fixed axial hub position during assembly</li> </ul>
<p><b>SERIES B115</b> Series 1008 outside the US and Canada</p>	<ul style="list-style-type: none"> <li>• Medium duty</li> <li>• Wide, double taper design for enhanced bending moment capacity</li> <li>• Exceptional concentricity</li> <li>• Fixed axial hub position during assembly</li> </ul>
<p><b>SERIES B113</b> Series 6061 outside the US and Canada</p>	<ul style="list-style-type: none"> <li>• Extra heavy duty</li> <li>• Wide, double taper design for enhanced bending moment capacity</li> <li>• Exceptional concentricity</li> <li>• Fixed axial hub position during assembly</li> </ul>
<p><b>SERIES 10, 20, 30 SHRINK DISCS</b> Series 2008, 2108 and 2208 outside the US and Canada</p>	<ul style="list-style-type: none"> <li>• External locking device</li> <li>• Provides extremely concentric and well-balanced mechanical interference fit</li> <li>• Offered in Standard, Light, and Heavy Duty series</li> <li>• Also available in Split and Half Shrink Disc designs</li> </ul>
<p><b>WK SHAFT COUPLINGS</b> Series 1204 outside the US and Canada</p>	<ul style="list-style-type: none"> <li>• Low cost rigid shaft coupling</li> <li>• Transmits high torque and bending moments using the same principles as the Shrink Disc</li> </ul>

### EXTERNAL DEVICES



# PRODUCT INDEX

PAGE

		$R = \frac{S}{\tan(\alpha + \gamma) + \mu}$	$M_t = R \mu \frac{d}{2}$	$p = \frac{R}{d\pi L}$	$p_H = \frac{R}{D\pi L}$	<b>13</b>
		$R = \frac{S}{\tan(\alpha + \gamma) + \mu}$	$M_t = R \mu \frac{d}{2}$	$p = \frac{R}{d\pi L}$	$p_H = \frac{R}{D\pi L}$	<b>14</b>
		$R = \frac{S}{\tan(\alpha + \gamma)}$	$M_t = R \mu \frac{d}{2}$	$p = \frac{R}{d\pi L}$	$p_H = \frac{R}{D\pi L}$	<b>14</b>
		$R = \frac{S}{\tan(\alpha + \gamma)}$	$M_t = R \mu \frac{d}{2}$	$p = \frac{R}{d\pi L}$	$p_H = \frac{R}{D\pi L}$	<b>16</b>
		$R = \frac{S}{\tan(\alpha + \gamma) + \mu}$	$M_t = R \mu \frac{d}{2}$	$p = \frac{R}{d\pi L}$	$p_H = \frac{R}{D\pi L}$	<b>18</b>
		$R = \frac{2 S}{\tan(\alpha + \gamma) + \mu}$	$M_t = R \mu \frac{d}{2}$	$p = \frac{R}{d\pi L}$	$p_H = \frac{R}{D\pi L}$	<b>20</b>
		$R = \frac{2 S}{\tan(\alpha + \gamma) + \mu}$	$M_t = R \mu \frac{d}{2}$	$p = \frac{R}{d\pi L}$	$p_H = \frac{R}{D\pi L}$	<b>22</b>
		$R = \frac{2 S}{\tan(\alpha + \gamma) + \mu}$	$M_t = R \mu \frac{d}{2}$	$p = \frac{R}{d\pi L}$	$p_H = \frac{R}{D\pi L}$	<b>23</b>
		$R = \frac{2 S}{\tan(\alpha + \gamma)}$	$M_t = (R - R_{cl}) \mu \frac{d}{2}$	$p = \frac{(R - R_{cl})}{d\pi L}$		<b>28</b>
		$R = \frac{2 S}{\tan(\alpha + \gamma)}$	$M_t = R \mu \frac{d}{2}$	$p = \frac{R}{d\pi L}$		<b>30</b>

$R$  = radial load generated by tightening locking screws  
 $R_{cl}$  = radial load required to bridge fit clearance  
 $S$  = locking screw clamp load  
 $M_t$  = rated torque capacity  
 $p$  = shaft contact pressure

$p_H$  = hub bore contact pressure  
 $\alpha$  = taper angle  
 $\gamma$  = friction angle  
 $\mu$  = coefficient of friction ( $= \tan \gamma$ )

$d$  = shaft diameter  
 $D$  = locking assembly OD  
 $L$  = locking device contact length

# APPLICATION EXAMPLES

*B-LOC Locking Assemblies and Shrink Discs are operating worldwide in thousands of applications, including:*

**AGITATOR SHAFTS**

**BRAKE DISCS**

**BUCKET WHEELS**

**BULL GEARS**

**CRUSHER ROTORS**

**CLUTCHES**

**COUPLINGS**

**CRANE WHEELS**

**CAMS**

**CONVEYOR PULLEYS**

**FLYWHEELS**

**FLANGES**

**SPUR GEARS**

**HYDRAULIC MOTORS**

**BEVEL GEARS**

**WORM GEARS**

**LEVERS**

**PUMP IMPELLERS**

**PINION GEARS**

**PINS**

**ROLLS**

**SHEAVES**

**SHIP PROPELLERS**

**SPEED REDUCERS**

**SPROCKETS**

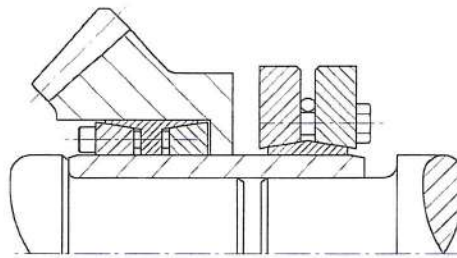
**TIMING PULLEYS**

**UNIVERSAL JOINTS**

**WINCH DRUMS**

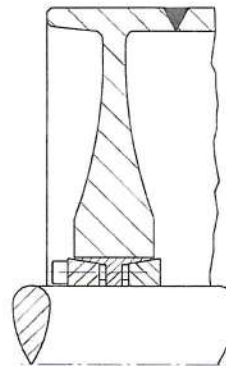
**AND MORE...**

AE1



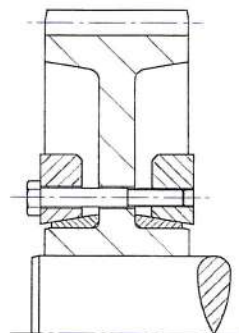
Miter gear connected with Series B112 installed over adaptor sleeve that also serves as shaft coupling.

AE2



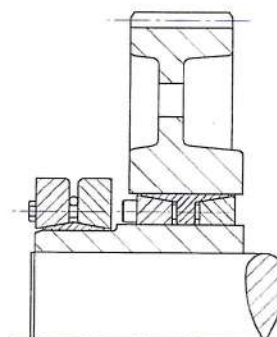
Engineered class belt conveyor pulley with advanced T-shaped end disc connected to shaft with Series B115.

AE3



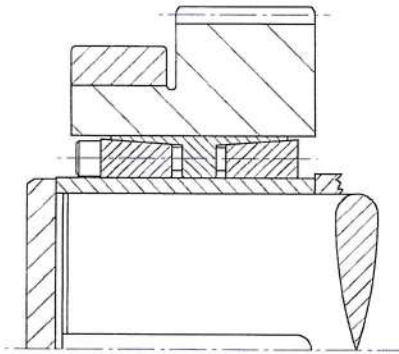
Typical Split Shrink Disc arrangement.

AE4



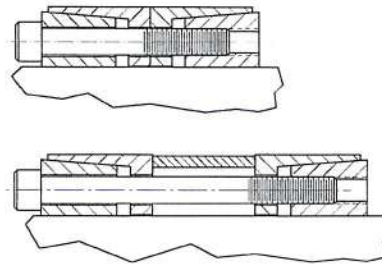
Narrow, high-torque press gear modified for repair using both Shrink Disc and Series B112 Locking Assembly (adaptor sleeve allows use of larger Locking Assembly, increasing torque capacity of connection).

AE5



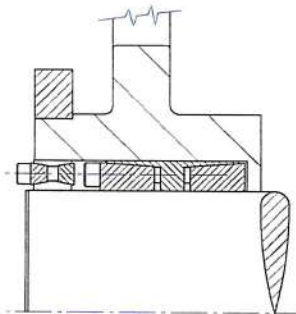
Pinion gear connection using Series B112 in application where retainer plate and adaptor sleeve permit axial adjustment of inner race of tapered roller bearing. Thin walled gear hub is reinforced with steel ring installed with light interference.

AE8



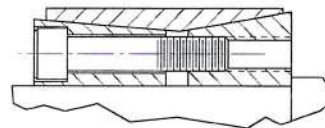
Series B114 design is similar to Series B112 but with fewer holes in front collar, higher torque capacity and/or wider contact length.

AE6



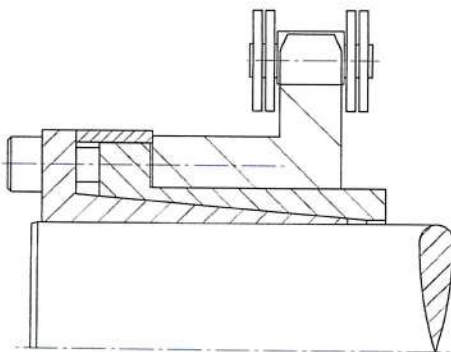
Series B400 and Series B112 used in series for gear with wide hub. Relatively thin hub cross section can be reinforced with steel collar.

AE9



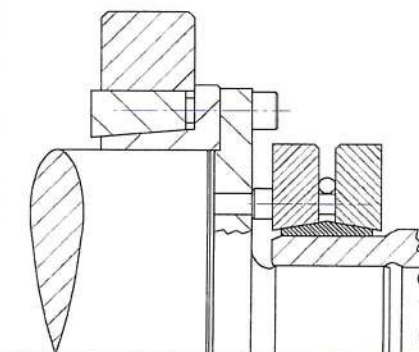
Series B014 design with asymmetric tapers offers heavy duty capacity at a reduced cost, but requires shaft shoulder for push-off during disassembly (can also be supplied with collars inverted).

AE7



B800 used to mount B-type roller chain sprocket with relatively small hub OD.

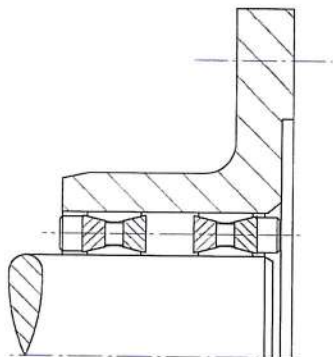
AE10



Series B106 with outer reinforcing collar used as mounting flange for hollow-shaft hydraulic drive with quill bore that is substantially smaller than driven shaft diameter. Shrink Disc used to mount mating adaptor flange to motor.

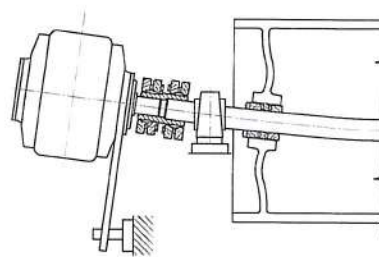


AE11



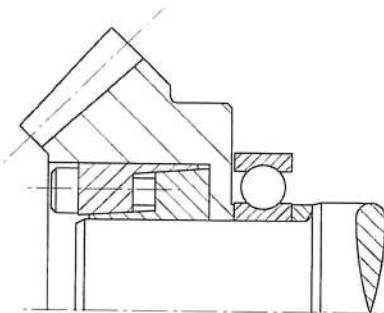
Selective screw tightening on opposing Series B400 units permits precise adjustment of flange pilot and axial and radial runout.

AE14



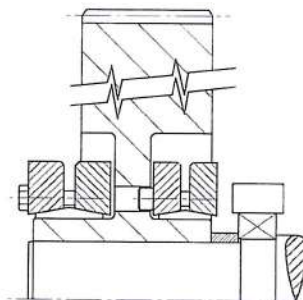
Mounting of drive directly onto driven shaft results in maintenance-free connection. See Page 31 for more information on B-LOC sleeve and flange-type rigid couplings.

AE12



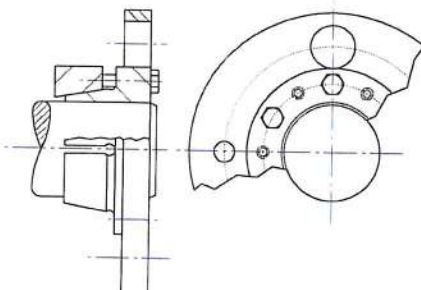
Series 6903 applies thrust against bearing inner race during assembly in lieu of typical arrangement using lock nut and threaded shaft.

AE15



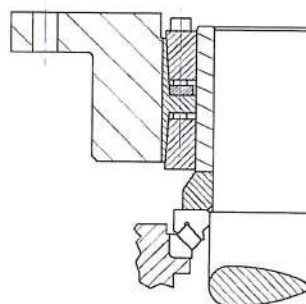
Socket head screws and web clearance holes permit tightening of inboard Shrink Disc.

AE13



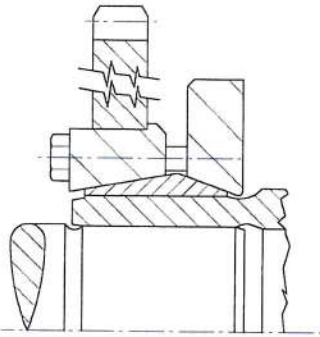
Low profile flange for disc-type flexible couplings (locking screws can be inserted from either end).

AE16



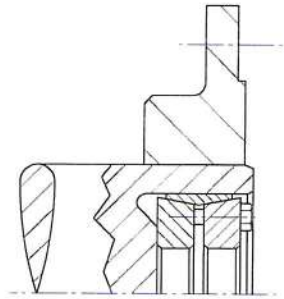
Slit adaptor sleeve between vertical shaft and Series B113 acts as shoulder to transmit substantial vertical load into spherical roller thrust bearing.

AE17



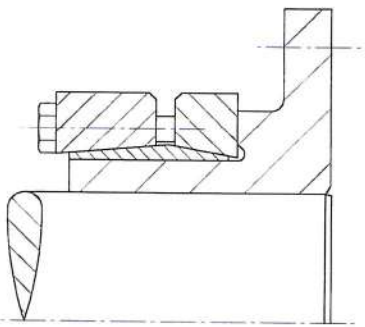
Shrink Disc with asymmetric tapers permits mounting of A-plate roller chain sprocket over modified outer ring where highest torque is generated.

AE20



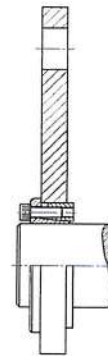
Inverted Shrink Disc connects coupling flange to counterbored shaft; shaft strength reduction surprisingly low.

AE18



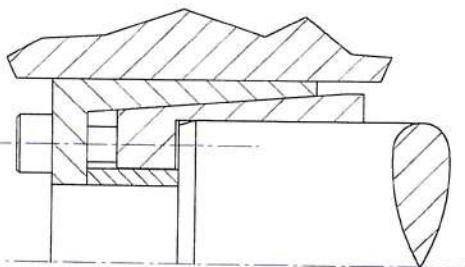
Modified Shrink Disc for mounting disc-type flexible coupling flange in application where low WR value is critical.

AE21



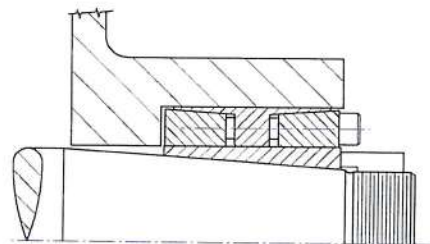
Series B106 used to connect lever arm. Locking Assembly connection permits quick and easy timing of several such lever arms mounted on same shaft.

AE19



Inverted B800 allows for extremely small hub bores.

AE22



Series B112 supplied with tapered-bore adaptor sleeve used to connect large fan wheel hub directly to tapered motor shaft.

# B-LOC INTERNAL DEVICES: LOCKING ASSEMBLIES

## DESIGN FEATURES

B-LOC Locking Assemblies are well suited to transmit torque, bending, thrust, and radial loads. Proper selection results in a zero backlash connection free of wear even under severe reversing loads.

Use the following criteria to aid in selecting the right unit for your application:

## TORQUE

$T$  = peak drive torque = nominal torque multiplied by a variable safety factor to account for stall or start-up conditions, mass accelerations, impact loads, etc.  
Nominal drive torque can be calculated as follows:

$$M_{\text{tnom}} = 5252 \times \text{HP} / \text{rpm}$$

Consult with us in cases where " $T$ " is uncertain.

$M_t$  = rated torque capacity of (1) B-LOC Locking Assembly with all screws tightened to specified torque  $M_A$  as listed in specifications. Tabular values are calculated without using a safety factor and should be considered as the point where a connection could slip if a higher torque is applied. Therefore, you should always select a unit where  $M_t \geq T$ .

Torque capacity and contact pressures are a linear function of locking screw tightening torque and may be varied if this is advantageous for certain applications by changing  $M_A$  within the following limits:

Series B400:	up to 20% higher or up to 20% lower
Series B103/B106/B109:	up to 20% lower
Series B800:	up to 20% lower
Series B112/B113:	up to 40% lower
Series B115:	up to 30% lower

In installations where two or more B-LOC Locking Assemblies are arranged in series with access to locking screws from one side only, total torque capacity is not a linear function of the number of units applied. In these situations, the factor  $f_{\text{mu}}$  should be used to compute total torque capacity, as follows:

$$M_{\text{t total}} = n \times M_t \times f_{\text{mu}}$$

Factors " $f_{\text{mu}}$ " for determining total torque capacity in multiple unit Locking Assembly installations			
Locking Assembly type	$n$ = number of units in series		
	2	3	4
B400 & B103	.80	.75	.70
B115	.80	.75	N/A
B112	.85	N/A	N/A
B113	.90	N/A	N/A

## THRUST

$F_{\text{ax}}$  = transmissible thrust, determined by using the following equation:

$$F_{\text{ax}} = \frac{24 \times M_t}{d}, \text{ where } d = \text{shaft diameter (in)}$$

## TORQUE AND THRUST COMBINED

Simultaneous transmission of torque and thrust requires calculating a resultant torque:

$$M_{\text{tres}} = \sqrt{T^2 + (F \times D / 2)^2}, \text{ where:}$$

$T$  = peak drive torque (ft-lbs)

$F$  = peak thrust load (lbs)

$D$  = shaft diameter (ft)

Select a unit where  $M_t \geq M_{\text{tres}}$ .

## BENDING MOMENTS

Bending moments are a crucial sizing factor in applications where a radial load from chain pull, the weight of components, etc., acts significantly outside the locking assembly centerline. Typical applications include rolls or conveyor pulleys where shaft deflection due to radial loads results in a bending moment between shaft and end disc. Generally, bending moments change from a positive to a negative value during each rotation and are designated as rotating or reversing bending moments.

B-LOC Locking Assemblies are well suited to transmit rotating/reversing bending moments. As a result of numerous successful heavy-duty applications in conveyor pulleys and pertinent investigations by independent institutions, the following bending moment capacities apply:

Series	Bending Moment Capacity
B400	= $0.22 \times M_t$
B103, B106, B109, B800	= $0.28 \times M_t$
B115	= $0.32 \times M_t$
B112 and B113	= $0.35 \times M_t$

Consult with us for applications where the bending moment capacity exceeds these recommended limits.

## TORQUE AND BENDING COMBINED

Simultaneous transmission of torque and bending requires calculating a resultant torque:

$$M_{\text{tb}} = \sqrt{T^2 + (2M_b)^2}, \text{ where:}$$

$T$  = peak drive torque (ft-lbs)

$M_b$  = bending moment (ft-lbs)

Select a unit where  $M_t \geq M_{\text{tb}}$  and  $M_b$  is within the limits shown above.



## CONCENTRICITY

B-LOC Locking Assemblies provide good to perfect concentricity in a variety of applications. The level of concentricity depends on taper angle and length, hub pre-centering, and mode of screw tightening. The following description of features should be helpful in selecting the most suitable device to meet specific concentricity requirements.

**SERIES B400:** The relatively narrow width of these double collar devices usually necessitates the need for a pre-centering hub section. Type of fit as well as the length of this pre-centering section greatly influences concentricity. The use of pilot bushings permits the reduction of hub length or even the elimination of pre-centering hub sections in the case of a roll configuration. These units provide concentricity sufficient for low to medium speed components.

**SERIES B103, B106, B109, B800:** These Locking Assemblies do not require a pre-centering hub section. The I.D., O.D. and taper of these units are machined in a single set-up ensuring perfect concentricity for the locking assembly itself. Total system concentricity will depend on installed components, but is typically excellent, even for high speed applications.

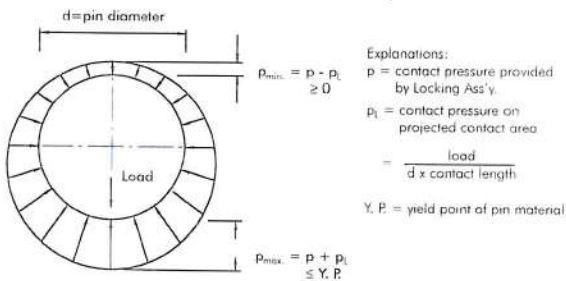
**SERIES B115, B112, B113:** The good pre-centering characteristics of these devices, combined with their wide double taper design, provides excellent concentricity for any type of application.

## RADIAL LOADS

Radial loads are generated by forces applied perpendicular to the centerline of the shaft, and are frequently associated with pin or axle connections. B-LOC Locking Assemblies are well suited to provide a tight, backlash-free fit for such connections (see illustration below).

$F_{rad}$  = radial load capacity =  $d \times L \times P$ , where:  
 $d$  = shaft diameter (in)  
 $L$  = contact length (in), see spec. tables  
 $P$  = shaft contact pressure (psi)

*Typical pressure distribution in backlash-free pin connections*



## TEMPERATURE INFLUENCE

Similar to conventional shrink or press fits, B-LOC Locking Assembly connections are not affected by temperature changes as long as they apply equally to hub and shaft. Since temperatures above 400 deg. F lower the strength of most commonly used materials, special considerations are necessary for connections working in temperatures higher than 400 deg. F.

## HOLLOW SHAFTS

Hollow shafts with bores exceeding 35% of outside diameter usually require a reduction of contact pressures in order to avoid permanent shaft contraction. Consult with us for the amount of reduction required or for corrective measures available for a trouble-free hollow shaft application.

## SECURING OF LOCKING SCREWS

Specified locking screw tightening torque  $M_A$  assures sufficient pre-load so that screws are self-locking, even in cases where B-LOC Locking Assemblies are subjected to extreme vibratory conditions.

## RELEASABILITY

B-LOC Locking Assemblies and Shrink Discs are designed for fast and easy removal. Our B400 Locking Assemblies, as well as all B-LOC Shrink Discs, feature self-releasing tapers. All other types use self-locking tapers for a more efficient clamp load conversion and higher bending moment capacities. For these units, a sufficient number of integrated push-off holes assure positive dismounting even after many years of service.

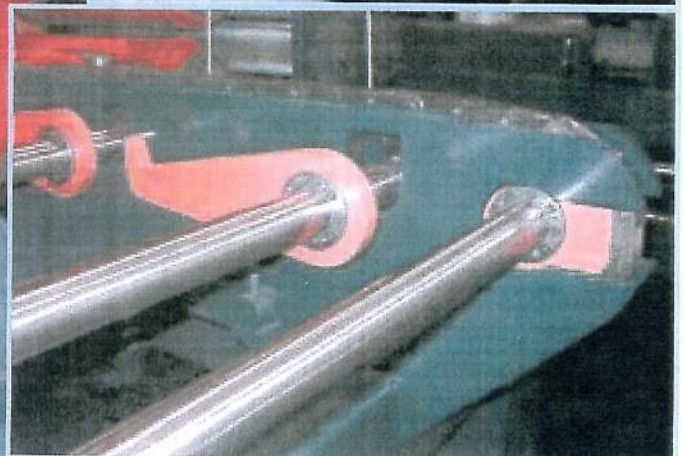
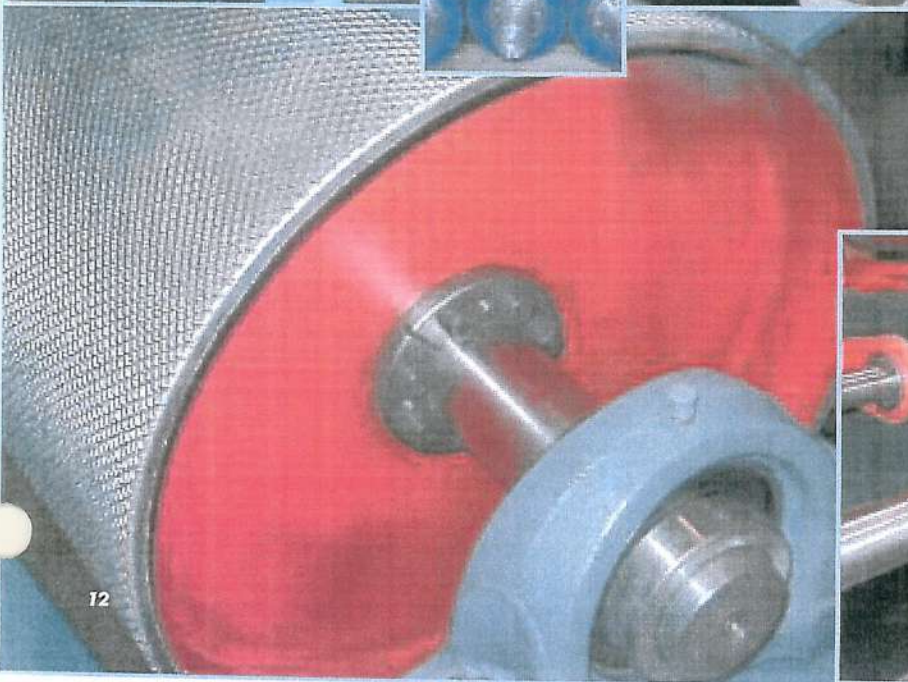
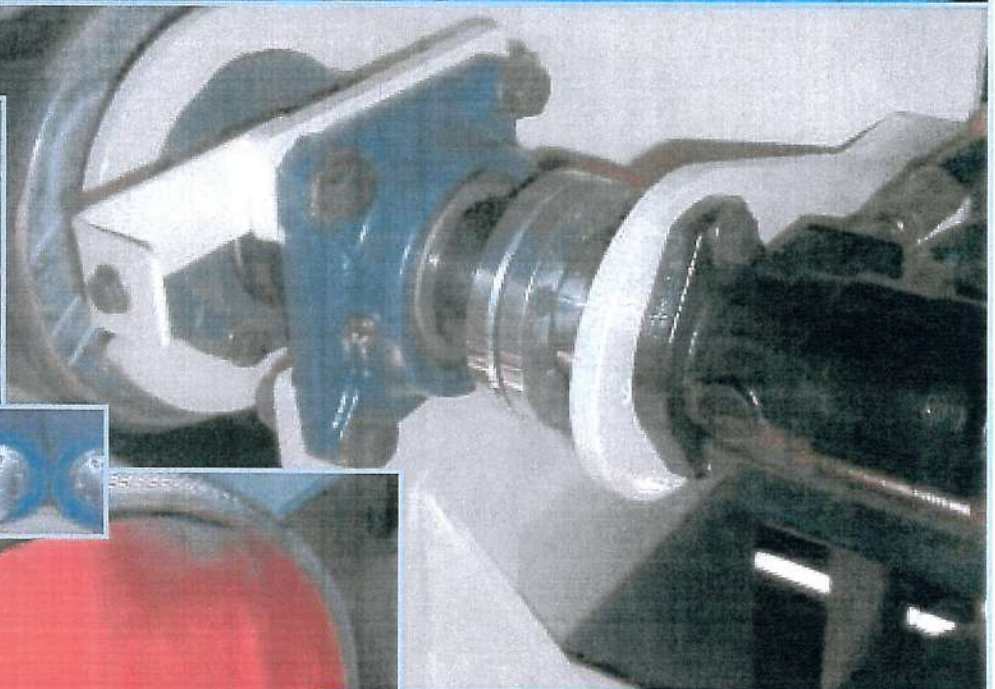
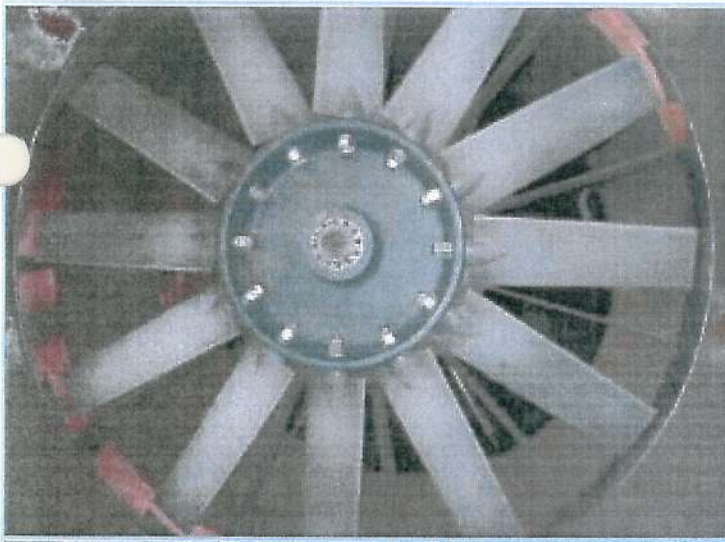
## MATERIAL

B-LOC Locking Assemblies are manufactured from heat treated high-carbon and alloy steels. Please contact us for applications requiring stainless steel. Corrosion resistance can be improved through the application of industry standard plating materials and/or the use of protective cover plates.

## LUBRICANTS

B-LOC Locking Assemblies are supplied lightly coated with ordinary machine oil.

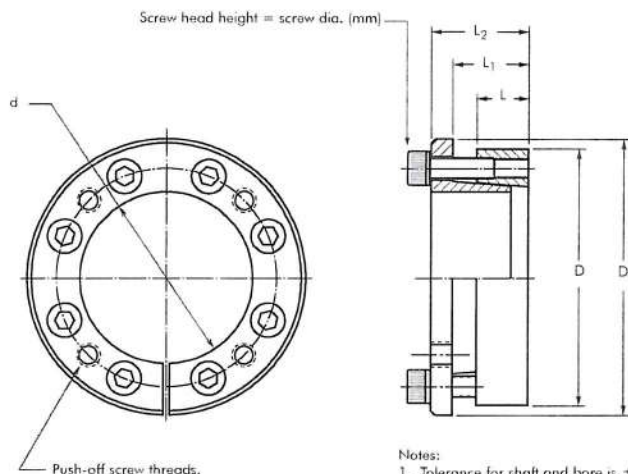








## B109 SERIES



### Ordering Information:

Specify series & shaft size

(e.g., Locking Assembly Series B109 1/4")

Larger sizes and sizes not shown are available on request.

### Notes:

1. Tolerance for shaft and bore is  $\pm .001$ " for all sizes.
2. Surface finish for shaft and bore is 63-125  $\mu$ N RMS.

### B109 METRIC SPECIFICATIONS

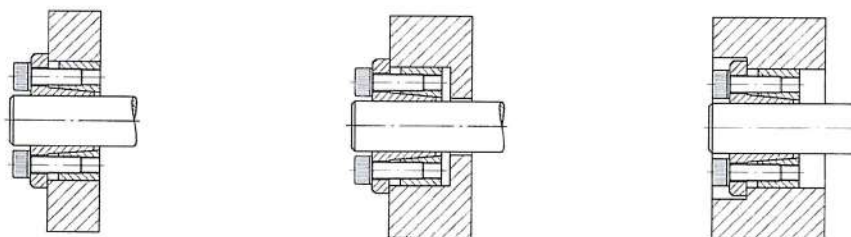
SIZE	d	D	D <sub>1</sub>	L	(Relaxed) L <sub>1</sub>	L <sub>2</sub>	M <sub>t</sub> (in.-lbs)	PH (psi)	D <sub>N</sub> *	Qty.	Locking Screws Size	M <sub>A</sub> (in.-lbs)	Weight (lbs)
6	0.2362	0.8125	0.9375	0.394	0.516	0.650	173	12,162	1.072	3	M4 x 12	38	0.1
8	0.3150	0.8750	1.0000	0.394	0.516	0.650	257	12,548	1.165	3	M4 x 12	42.5	0.1
10	0.3937	0.9375	1.0625	0.394	0.516	0.650	321	11,711	1.224	3	M4 x 12	42.5	0.1
11	0.4331	1.0625	1.1875	0.394	0.516	0.650	471	13,778	1.458	4	M4 x 12	42.5	0.1
12	0.4724	1.0625	1.1875	0.394	0.516	0.650	514	13,778	1.458	4	M4 x 12	42.5	0.1
14	0.5512	1.1875	1.3125	0.472	0.594	0.807	899	15,436	1.698	6	M4 x 14	42.5	0.1
15	0.5906	1.1875	1.3125	0.472	0.594	0.807	963	15,436	1.698	6	M4 x 14	42.5	0.2
16	0.6299	1.1875	1.3125	0.472	0.594	0.807	1,027	15,436	1.698	6	M4 x 14	42.5	0.2
19	0.7480	1.3125	1.4375	0.472	0.594	0.807	1,220	13,966	1.809	6	M4 x 14	42.5	0.2
20	0.7874	1.5625	1.7500	0.591	0.754	0.984	2,098	15,306	2.227	6	M5 x 18	87	0.4
22	0.8661	1.5625	1.7500	0.591	0.754	0.984	2,308	15,306	2.227	6	M5 x 18	87	0.4
24	0.9449	1.6875	1.8750	0.591	0.754	0.984	3,356	18,896	2.640	8	M5 x 18	87	0.4
25	0.9843	1.6875	1.8750	0.591	0.754	0.984	3,496	18,896	2.640	8	M5 x 18	87	0.4
28	1.1024	1.8750	2.0000	0.669	0.829	1.102	4,405	16,901	2.783	9	M5 x 18	87	0.6
30	1.1811	1.9375	2.0625	0.669	0.829	1.102	5,244	18,173	2.973	10	M5 x 18	87	0.6
32	1.2598	2.0000	2.1250	0.669	0.829	1.102	5,594	17,606	3.023	10	M5 x 18	87	0.6
35	1.3780	2.1250	2.2500	0.669	0.829	1.102	6,118	16,570	3.127	10	M5 x 18	87	0.6

### B109 INCH SPECIFICATIONS

SIZE	d	D	D <sub>1</sub>	L	(Relaxed) L <sub>1</sub>	L <sub>2</sub>	M <sub>t</sub> (in.-lbs)	PH (psi)	D <sub>N</sub> *	Qty.	Locking Screws Size	M <sub>A</sub> (in.-lbs)	Weight (lbs)
1/4	0.2500	0.8125	0.9375	0.394	0.516	0.650	183	12,162	1.072	3	M4 x 12	38	0.1
5/16	0.3125	0.8750	1.0000	0.394	0.516	0.650	255	12,548	1.165	3	M4 x 12	42.5	0.1
3/8	0.3750	0.9375	1.0625	0.394	0.516	0.650	306	11,711	1.224	3	M4 x 12	42.5	0.1
1/2	0.5000	1.0625	1.1875	0.394	0.516	0.650	544	13,778	1.458	4	M4 x 12	42.5	0.1
5/8	0.6250	1.1875	1.3125	0.472	0.594	0.807	1,019	15,436	1.698	6	M4 x 16	42.5	0.2
3/4	0.7500	1.3125	1.4375	0.472	0.594	0.807	1,223	13,966	1.809	6	M4 x 16	42.5	0.2
7/8	0.8750	1.5625	1.7500	0.591	0.754	0.984	2,331	15,306	2.227	6	M5 x 20	87	0.4
1	1.0000	1.6875	1.8750	0.591	0.754	0.984	3,552	18,896	2.640	8	M5 x 20	87	0.4
1 1/8	1.1250	1.8750	2.0000	0.669	0.829	1.102	4,496	16,901	2.783	9	M5 x 20	87	0.6
1 3/16	1.1875	1.9375	2.0625	0.669	0.829	1.102	5,273	18,173	2.973	10	M5 x 20	87	0.6
1 1/4	1.2500	2.0000	2.1250	0.669	0.829	1.102	5,550	17,606	3.023	10	M5 x 20	87	0.6
1 3/8	1.3750	2.1250	2.2500	0.669	0.829	1.102	6,105	16,570	3.127	10	M5 x 20	87	0.6

\*Required hub OD for 1045 h.r. steel hub assuming 45 ksi Yield Point and Stress Reduction Factor C=1 (see Page 24 for details)

### Possible design configurations



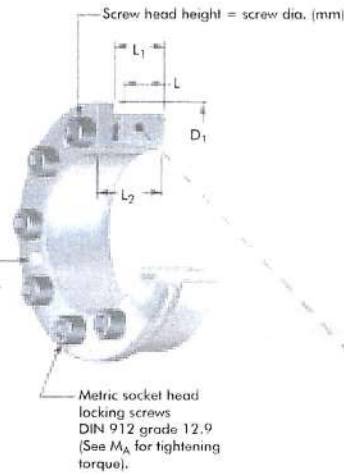


# B103 & B106 SERIES

## B106



Locking screws transfer to integrated push-off holes for disassembly.



Required hub OD depends on strength of hub material (see Specifications and Hub Sizing on Page 24)

Bore dia. machined to  $D - 0/-T$   
 $T = .002$ " for bores up to 4.724"  
 $.003$ " for bores up to 12.008"  
 $.004$ " for bores over 12.008"  
 $d$  = Shaft dia. machined to  $d + 0/-T$   
 Surface finish for shaft and hub bore to be 63-125  $\mu$ N RMS

Note: Series B106 also available with optional integrated spacer sleeve (ideal for very narrow drive elements) by specifying B106 SP when ordering. Spacers are 0.275" wide for sizes to and including 1 1/2" (40 mm) and 0.315" wide for all other sizes.

### Ordering Information:

Specify series & shaft size

(e.g., Locking Assembly Series B106 160mm)

Larger sizes and sizes not shown are available on request.

### B103/106 METRIC SPECIFICATIONS

Size	d	D	D <sub>1</sub> (B106 only)	(Relaxed)			M <sub>1</sub> (ft-lbs)	P <sub>H</sub> (psi)	D <sub>N</sub> *	Locking Screws				Weight (lbs)
				L	L <sub>1</sub>	L <sub>2</sub>				Qty.	Size	M <sub>A</sub> (ft-lb) B103	B106	
20 x 47	0.787	1.850	2.106	0.669	0.886	1.122	206	13,420	2.517	5	M6 x 20	10	12	0.6
22 x 47	0.866	1.850	2.106	0.669	0.886	1.122	226	13,420	2.517	5	M6 x 20	10	12	0.6
24 x 50	0.945	1.969	2.224	0.669	0.886	1.122	296	15,138	2.794	6	M6 x 20	10	12	0.7
25 x 50	0.984	1.969	2.224	0.669	0.886	1.122	308	15,138	2.794	6	M6 x 20	10	12	0.7
28 x 55	1.102	2.165	2.421	0.669	0.886	1.122	345	13,762	2.970	6	M6 x 20	10	12	0.8
30 x 55	1.181	2.165	2.421	0.669	0.886	1.122	370	13,762	2.970	6	M6 x 20	10	12	0.7
35 x 60	1.378	2.362	2.618	0.669	0.886	1.122	576	16,820	3.499	8	M6 x 20	10	12	0.8
40 x 65	1.575	2.559	2.815	0.669	0.886	1.122	658	15,526	3.667	8	M6 x 20	10	12	0.9
45 x 75	1.772	2.953	3.287	0.787	1.043	1.358	1,196	18,490	4.570	7	M8 x 25	25	30	1.5
50 x 80	1.969	3.150	3.484	0.787	1.043	1.358	1,329	17,335	4.728	7	M8 x 25	25	30	1.7
55 x 85	2.165	3.346	3.681	0.787	1.043	1.358	1,671	18,646	5.200	8	M8 x 25	25	30	1.8
60 x 90	2.362	3.543	3.898	0.787	1.043	1.358	1,823	17,610	5.357	8	M8 x 25	25	30	1.9
65 x 95	2.559	3.740	4.094	0.787	1.043	1.358	2,222	18,768	5.832	9	M8 x 25	25	30	2.1
70 x 110	2.756	4.331	4.685	0.945	1.201	1.594	3,377	19,064	6.806	8	M10 x 30	50	60	3.7
75 x 115	2.953	4.528	4.882	0.945	1.201	1.594	3,618	18,235	6.959	8	M10 x 30	50	60	3.8
80 x 120	3.150	4.724	5.079	0.945	1.201	1.594	3,859	17,475	7.118	8	M10 x 30	50	60	4.1
85 x 125	3.346	4.921	5.276	0.945	1.201	1.594	4,613	18,873	7.695	9	M10 x 30	50	60	4.3
90 x 130	3.543	5.118	5.472	0.945	1.201	1.594	4,885	18,147	7.849	9	M10 x 30	50	60	4.5
95 x 135	3.740	5.315	5.669	0.945	1.201	1.594	5,729	19,417	8.434	10	M10 x 30	50	60	4.7
100 x 145	3.937	5.709	6.063	1.024	1.299	1.772	7,024	19,437	9.063	8	M12 x 35	90	105	6.2
110 x 155	4.331	6.102	6.457	1.024	1.299	1.772	7,726	18,183	9.367	8	M12 x 35	90	105	6.6
120 x 165	4.724	6.496	6.850	1.024	1.299	1.772	9,482	19,216	10.252	9	M12 x 35	90	105	7.2
130 x 180	5.118	7.087	7.441	1.339	1.614	2.165	14,095	18,482	10.965	9	M14 x 40	135	166	10
140 x 190	5.512	7.480	7.835	1.339	1.614	2.165	15,179	17,509	11.280	9	M14 x 40	135	166	12
150 x 200	5.906	7.874	8.228	1.339	1.614	2.165	18,070	18,482	12.183	10	M14 x 40	135	166	12
160 x 210	6.299	8.268	8.622	1.339	1.614	2.165	21,202	19,362	13.100	11	M14 x 40	135	166	13
170 x 225	6.693	8.858	9.213	1.732	2.008	2.559	24,576	15,234	12.601	12	M14 x 40	135	166	18
180 x 235	7.087	9.252	9.606	1.732	2.008	2.559	26,021	14,585	12.950	12	M14 x 40	135	166	19
190 x 250	7.480	9.843	10.197	1.732	2.008	2.559	34,333	17,138	14.699	15	M14 x 40	135	166	22
200 x 260	7.874	10.236	10.591	1.732	2.008	2.559	36,140	16,479	15.029	15	M14 x 40	135	166	23
220 x 285	8.661	11.220	11.575	1.969	2.244	2.874	44,201	14,709	15.753	12	M16 x 45	219	257	31
240 x 305	9.449	12.008	12.362	1.969	2.244	2.874	60,273	17,180	17.952	15	M16 x 45	219	257	34
260 x 325	10.236	12.795	13.150	1.969	2.244	2.874	78,355	19,347	20.265	18	M16 x 45	219	257	36
280 x 355	11.024	13.976	14.331	2.362	2.638	3.346	90,252	15,787	20.161	16	M18 x 50	290	350	50
300 x 375	11.811	14.764	15.118	2.362	2.638	3.346	108,786	16,813	21.863	18	M18 x 50	290	350	80
320 x 405	12.598	15.945	16.299	2.913	3.228	4.016	150,537	16,375	23.348	18	M20 x 50	420	500	80
340 x 425	13.386	16.732	17.087	2.913	3.228	4.016	186,603	18,205	25.699	21	M20 x 50	420	500	85
360 x 455	14.173	17.913	18.268	3.386	3.701	4.567	210,810	15,612	25.726	18	M22 x 60	560	675	102
380 x 475	14.961	18.701	19.055	3.386	3.701	4.567	259,609	17,447	28.154	21	M22 x 60	560	675	121
400 x 495	15.748	19.488	19.843	3.386	3.701	4.567	273,272	16,742	28.807	21	M22 x 60	560	675	134

\*Required hub OD for 1045 h.r. steel hub assuming 45 ksi Yield Point and Stress Reduction Factor C=1 (see Page 24 for details)

# B103 & B106 SERIES

## B103



### Ordering Information:

Specify series & shaft size

(e.g., Locking Assembly Series B103 2 15/16")

Larger sizes and sizes not shown are available on request.

Note: Flange of Series B103 locking assemblies should be located inside of hub bore.

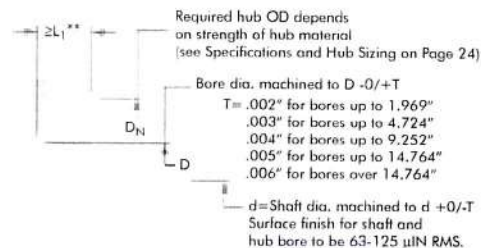
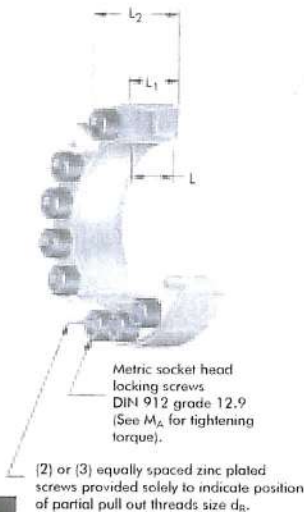
### B103/106 INCH SPECIFICATIONS

Size	d	D	D <sub>1</sub> (B106 only)	(Relaxed)			M <sub>1</sub> (ft-lbs)	P <sub>H</sub> (psi)	D <sub>N+</sub>	Locking Screws				Weight (lbs)
				L	L <sub>1</sub>	L <sub>2</sub>				Qty.	Size	M <sub>A</sub> (ft-lb) B103	B106	
3/4	0.750	1.850	2.106	0.669	0.886	1.122	196	13,420	2.517	5	M6 x 20	10	12	0.6
7/8	0.875	1.850	2.106	0.669	0.886	1.122	228	13,420	2.517	5	M6 x 20	10	12	0.6
1	1.000	1.969	2.224	0.669	0.886	1.122	313	15,138	2.794	6	M6 x 20	10	12	0.7
1 1/8	1.125	2.165	2.421	0.669	0.886	1.122	352	13,762	2.970	6	M6 x 20	10	12	0.8
1 3/16	1.188	2.165	2.421	0.669	0.886	1.122	372	13,762	2.970	6	M6 x 20	10	12	0.7
1 1/4	1.250	2.362	2.618	0.669	0.886	1.122	522	16,820	3.499	8	M6 x 20	10	12	0.9
1 3/8	1.375	2.362	2.618	0.669	0.886	1.122	574	16,820	3.499	8	M6 x 20	10	12	0.8
1 7/16	1.438	2.559	2.815	0.669	0.886	1.122	600	15,526	3.667	8	M6 x 20	10	12	1.0
1 1/2	1.500	2.559	2.815	0.669	0.886	1.122	627	15,526	3.667	8	M6 x 20	10	12	1.0
1 5/8	1.625	2.953	3.287	0.787	1.043	1.358	1,097	18,490	4.570	7	M8 x 25	25	30	1.7
1 11/16	1.688	2.953	3.287	0.787	1.043	1.358	1,140	18,490	4.570	7	M8 x 25	25	30	1.6
1 3/4	1.750	2.953	3.287	0.787	1.043	1.358	1,182	18,490	4.570	7	M8 x 25	25	30	1.6
1 7/8	1.875	3.150	3.484	0.787	1.043	1.358	1,266	17,335	4.728	7	M8 x 25	25	30	1.8
1 15/16	1.938	3.150	3.484	0.787	1.043	1.358	1,308	17,335	4.728	7	M8 x 25	25	30	1.7
2	2.000	3.150	3.484	0.787	1.043	1.358	1,351	17,335	4.728	7	M8 x 25	25	30	1.6
2 1/8	2.125	3.346	3.681	0.787	1.043	1.358	1,640	18,646	5.200	8	M8 x 25	25	30	1.9
2 3/16	2.188	3.346	3.681	0.787	1.043	1.358	1,688	18,646	5.200	8	M8 x 25	25	30	1.8
2 1/4	2.250	3.543	3.898	0.787	1.043	1.358	1,736	17,610	5.357	8	M8 x 25	25	30	2.1
2 3/8	2.375	3.543	3.898	0.787	1.043	1.358	1,833	17,610	5.357	8	M8 x 25	25	30	1.9
2 7/16	2.438	3.740	4.094	0.787	1.043	1.358	2,116	18,768	5.832	9	M8 x 25	25	30	2.2
2 1/2	2.500	3.740	4.094	0.787	1.043	1.358	2,171	18,768	5.832	9	M8 x 25	25	30	2.2
2 9/16	2.563	3.740	4.094	0.787	1.043	1.358	2,225	18,768	5.832	9	M8 x 25	25	30	2.1
2 11/16	2.688	4.331	4.685	0.945	1.201	1.594	3,293	19,064	6.806	8	M10 x 30	50	60	3.8
2 3/4	2.750	4.331	4.685	0.945	1.201	1.594	3,370	19,064	6.806	8	M10 x 30	50	60	3.7
2 7/8	2.875	4.528	4.882	0.945	1.201	1.594	3,523	18,235	6.959	8	M10 x 30	50	60	4.0
2 15/16	2.938	4.528	4.882	0.945	1.201	1.594	3,600	18,235	6.959	8	M10 x 30	50	60	3.9
3	3.000	4.724	5.079	0.945	1.201	1.594	3,676	17,475	7.118	8	M10 x 30	50	60	4.4
3 1/4	3.250	4.921	5.276	0.945	1.201	1.594	3,982	16,776	7.281	8	M10 x 30	50	60	4.5
3 3/8	3.375	4.921	5.276	0.945	1.201	1.594	4,653	18,873	7.695	9	M10 x 30	50	60	4.3
3 7/16	3.438	5.118	5.472	0.945	1.201	1.594	4,739	18,147	7.849	9	M10 x 30	50	60	4.8
3 1/2	3.500	5.118	5.472	0.945	1.201	1.594	4,825	18,147	7.849	9	M10 x 30	50	60	4.6
3 3/4	3.750	5.315	5.669	0.945	1.201	1.594	5,744	19,417	8.434	10	M10 x 30	50	60	4.7
3 15/16	3.938	5.709	6.063	1.024	1.299	1.772	7,025	19,437	9.063	8	M12 x 35	90	105	6.2
4	4.000	5.709	6.063	1.024	1.299	1.772	7,136	19,437	9.063	8	M12 x 35	90	105	6.0
4 7/16	4.438	6.102	6.457	1.024	1.299	1.772	7,917	18,183	9.367	8	M12 x 35	90	105	6.3
4 3/4	4.750	6.496	6.850	1.024	1.299	1.772	9,534	19,216	10.252	9	M12 x 35	90	105	7.1
4 15/16	4.938	7.087	7.441	1.339	1.614	2.165	13,597	18,482	10.965	9	M14 x 40	135	166	11
5	5.000	7.087	7.441	1.339	1.614	2.165	13,770	18,482	10.965	9	M14 x 40	135	166	11
5 7/16	5.438	7.480	7.835	1.339	1.614	2.165	14,974	17,509	11.280	9	M14 x 40	135	166	12
5 15/16	5.938	7.874	8.228	1.339	1.614	2.165	18,168	18,482	12.183	10	M14 x 40	135	166	12
6 7/16	6.438	8.858	9.213	1.732	2.008	2.559	23,638	15,234	12.601	12	M14 x 40	135	166	20
6 15/16	6.938	9.252	9.606	1.732	2.008	2.559	25,474	14,585	12.950	12	M14 x 40	135	166	20
7	7.000	9.252	9.606	1.732	2.008	2.559	25,703	14,585	12.950	12	M14 x 40	135	166	20
7 7/16	7.438	9.843	10.197	1.732	2.008	2.559	34,137	17,138	14.699	15	M14 x 40	135	166	22
7 15/16	7.938	10.236	10.591	1.732	2.008	2.559	36,432	16,479	15.029	15	M14 x 40	135	166	23
8	8.000	10.236	10.591	1.732	2.008	2.559	36,719	16,479	15.029	15	M14 x 40	135	166	21

\*Required hub OD for 1045 h.r. steel hub assuming 45 ksi Yield Point and Stress Reduction Factor C=1 (see Page 24 for details)



## B400 SERIES



### Ordering Information:

Specify series & shaft size

(e.g., Locking Assembly Series B400 2 1/2")

Larger sizes and sizes not shown are available on request.

\*\* Recommended pre-centering length in installations without pilot bushings. Provide a minimum .001" clearance (hub concentricity depends on fit clearance).

### B400 METRIC SPECIFICATIONS

Size	d	D	L	(Relaxed) L <sub>1</sub>	L <sub>2</sub>	M <sub>t</sub> (ft.-lbs)	P <sub>H</sub> (psi)	D <sub>N</sub> *	Qty.	Locking Screws Size	M <sub>A</sub> (ft.-lbs)	d <sub>B</sub>	Weight (lbs)
20 x 47	0.787	1.850	0.669	0.787	1.024	234	15,282	2.635	8	M6 x 18	11	M8	0.5
22 x 47	0.866	1.850	0.669	0.787	1.024	257	15,282	2.635	8	M6 x 18	11	M8	0.5
24 x 50	0.945	1.969	0.669	0.787	1.024	316	16,161	2.867	9	M6 x 18	11	M8	0.5
25 x 50	0.984	1.969	0.669	0.787	1.024	329	16,161	2.867	9	M6 x 18	11	M8	0.5
28 x 55	1.102	2.165	0.669	0.787	1.024	410	16,324	3.167	10	M6 x 18	11	M8	0.6
30 x 55	1.181	2.165	0.669	0.787	1.024	439	16,324	3.167	10	M6 x 18	11	M8	0.6
32 x 60	1.260	2.362	0.669	0.787	1.024	562	17,957	3.604	12	M6 x 18	11	M8	0.7
35 x 60	1.378	2.362	0.669	0.787	1.024	615	17,957	3.604	12	M6 x 18	11	M8	0.6
38 x 65	1.496	2.559	0.669	0.787	1.024	778	19,338	4.052	14	M6 x 18	11	M8	0.7
40 x 65	1.575	2.559	0.669	0.787	1.024	819	19,338	4.052	14	M6 x 18	11	M8	0.7
42 x 75	1.654	2.953	0.787	0.945	1.260	1,358	22,483	5.112	12	M8 x 22	26	M10	1.2
45 x 75	1.772	2.953	0.787	0.945	1.260	1,455	22,483	5.112	12	M8 x 22	26	M10	1.2
48 x 80	1.890	3.150	0.787	0.945	1.260	1,552	21,078	5.235	12	M8 x 22	26	M10	1.3
50 x 80	1.969	3.150	0.787	0.945	1.260	1,617	21,078	5.235	12	M8 x 22	26	M10	1.3
55 x 85	2.165	3.346	0.787	0.945	1.260	2,074	23,144	5.909	14	M8 x 22	26	M10	1.4
60 x 90	2.362	3.543	0.787	0.945	1.260	2,263	21,858	6.023	14	M8 x 22	26	M10	1.4
65 x 95	2.559	3.740	0.787	0.945	1.260	2,802	23,666	6.710	16	M8 x 22	26	M10	1.5
70 x 110	2.756	4.331	0.945	1.102	1.496	4,199	23,705	7.779	14	M10 x 25	51	M12	2.7
75 x 115	2.953	4.528	0.945	1.102	1.496	4,500	22,675	7.883	14	M10 x 25	51	M12	2.9
80 x 120	3.150	4.724	0.945	1.102	1.496	4,800	21,730	8.000	14	M10 x 25	51	M12	3.0
85 x 125	3.346	4.921	0.945	1.102	1.496	5,827	23,841	8.877	16	M10 x 25	51	M12	3.1
90 x 130	3.543	5.118	0.945	1.102	1.496	6,170	22,924	8.978	16	M10 x 25	51	M12	3.3
95 x 135	3.740	5.315	0.945	1.102	1.496	7,327	24,834	9.891	18	M10 x 25	51	M12	3.5
100 x 145	3.937	5.709	1.024	1.299	1.772	8,778	24,291	10.442	14	M12 x 30	91	M14	4.7
110 x 155	4.331	6.102	1.024	1.299	1.772	9,657	22,724	10.640	14	M12 x 30	91	M14	5.1
120 x 165	4.724	6.496	1.024	1.299	1.772	12,038	24,396	11.922	16	M12 x 30	91	M14	5.5
130 x 180	5.118	7.087	1.339	1.496	1.969	16,302	21,377	11.879	20	M12 x 35	91	M14	7.7
140 x 190	5.512	7.480	1.339	1.496	1.969	19,313	22,277	12.871	22	M12 x 35	91	M14	8.2
150 x 200	5.906	7.874	1.339	1.496	1.969	22,575	23,087	13.880	24	M12 x 35	91	M14	8.6
160 x 210	6.299	8.268	1.339	1.496	1.969	26,083	23,820	14.903	26	M12 x 35	91	M14	9.4
170 x 225	6.693	8.858	1.496	1.732	2.283	32,136	23,065	15.604	22	M14 x 40	138	M16	12
180 x 235	7.087	9.252	1.496	1.732	2.283	37,122	24,091	16.818	24	M14 x 40	138	M16	13
190 x 250	7.480	9.843	1.811	2.047	2.598	45,710	21,825	16.714	28	M14 x 45	138	M16	18
200 x 260	7.874	10.236	1.811	2.047	2.598	51,555	22,485	17.722	30	M14 x 45	138	M16	19
220 x 285	8.661	11.220	1.969	2.205	2.835	67,743	22,544	19.460	26	M16 x 50	214	M20	24
240 x 305	9.449	12.008	1.969	2.205	2.835	85,277	24,306	21.975	30	M16 x 50	214	M20	26
260 x 325	10.236	12.795	1.969	2.205	2.835	104,696	25,852	24.613	34	M16 x 50	214	M20	28
280 x 355	11.024	13.976	2.362	2.598	3.307	129,013	22,566	24.256	32	M18 x 60	293	M22	43
300 x 375	11.811	14.764	2.362	2.598	3.307	155,501	24,033	26.789	36	M18 x 60	293	M22	45
320 x 405	12.598	15.945	2.835	3.071	3.858	214,016	23,928	28.838	36	M20 x 70	420	M24	64
340 x 425	13.386	16.732	2.835	3.071	3.858	227,403	22,802	29.243	36	M20 x 70	420	M24	69
360 x 455	14.173	17.913	3.307	3.543	4.409	299,461	22,706	31.217	36	M22 x 80	565	M27	95
380 x 475	14.961	18.701	3.307	3.543	4.409	316,110	21,750	31.686	36	M22 x 80	565	M27	97
400 x 495	15.748	19.488	3.307	3.543	4.409	332,739	20,871	32.199	36	M22 x 80	565	M27	101
420 x 515	16.535	20.276	3.307	3.543	4.409	388,186	22,289	34.900	40	M22 x 80	565	M27	110
440 x 545	17.323	21.457	3.780	4.016	4.961	470,039	21,301	35.888	40	M24 x 90	725	M30	142
460 x 565	18.110	22.244	3.780	4.016	4.961	491,393	20,547	36.418	40	M24 x 90	725	M30	148
480 x 585	18.898	23.031	3.780	4.016	4.961	538,413	20,836	38.017	42	M24 x 90	725	M30	156
500 x 605	19.685	23.819	3.780	4.016	4.961	587,541	21,107	39.619	44	M24 x 90	725	M30	160

\*Required hub OD for 1045 h.r. steel hub assuming 45 ksi Yield Point and Stress Reduction Factor C=1 (see Page 24 for details)



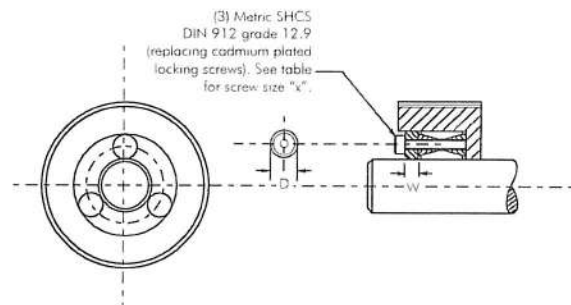
## B400 INCH SPECIFICATIONS

Size	d	D	(Relaxed)			M <sub>1</sub> (ft-lbs)	P <sub>H</sub> (psi)	D <sub>N</sub> *	Locking Screws				Weight (lbs)
			L	L <sub>1</sub>	L <sub>2</sub>				Qty.	Size	M <sub>A</sub> (ft-lbs)	d <sub>B</sub>	
3/4	0.750	1.850	0.669	0.787	1.024	223	15,282	2.635	8	M6 x 18	11	M8	0.5
7/8	0.875	1.850	0.669	0.787	1.024	260	15,282	2.635	8	M6 x 18	11	M8	0.5
1	1.000	1.969	0.669	0.787	1.024	334	16,161	2.867	9	M6 x 18	11	M8	0.5
1 1/8	1.125	2.165	0.669	0.787	1.024	418	16,324	3.167	10	M6 x 18	11	M8	0.6
1 3/16	1.188	2.159	0.669	0.787	1.024	441	16,372	3.161	10	M6 x 18	11	M8	0.6
1 1/4	1.250	2.362	0.669	0.787	1.024	557	17,958	3.604	12	M6 x 18	11	M8	0.7
1 3/8	1.375	2.365	0.669	0.787	1.024	613	17,935	3.606	12	M6 x 18	11	M8	0.6
1 7/16	1.438	2.559	0.669	0.787	1.024	748	19,338	4.052	14	M6 x 18	11	M8	0.8
1 1/2	1.500	2.559	0.669	0.787	1.024	780	19,338	4.052	14	M6 x 18	11	M8	0.7
1 5/8	1.625	2.953	0.787	0.945	1.260	1,334	22,483	5.112	12	M8 x 22	26	M10	1.3
1 11/16	1.688	2.953	0.787	0.945	1.260	1,386	22,483	5.112	12	M8 x 22	26	M10	1.2
1 3/4	1.750	2.953	0.787	0.945	1.260	1,437	22,483	5.112	12	M8 x 22	26	M10	1.2
1 7/8	1.875	3.150	0.787	0.945	1.260	1,540	21,078	5.235	12	M8 x 22	26	M10	1.3
1 15/16	1.938	3.150	0.787	0.945	1.260	1,591	21,078	5.235	12	M8 x 22	26	M10	1.3
2	2.000	3.346	0.787	0.945	1.260	1,916	23,144	5.909	14	M8 x 22	26	M10	1.5
2 1/8	2.125	3.346	0.787	0.945	1.260	2,036	23,144	5.909	14	M8 x 22	26	M10	1.4
2 3/16	2.188	3.543	0.787	0.945	1.260	2,095	21,858	6.023	14	M8 x 22	26	M10	1.6
2 1/4	2.250	3.543	0.787	0.945	1.260	2,155	21,858	6.023	14	M8 x 22	26	M10	1.5
2 3/8	2.375	3.531	0.787	0.945	1.260	2,275	21,934	6.015	14	M8 x 22	26	M10	1.4
2 7/16	2.438	3.740	0.787	0.945	1.260	2,669	23,666	6.710	16	M8 x 22	26	M10	1.6
2 1/2	2.500	3.740	0.787	0.945	1.260	2,737	23,666	6.710	16	M8 x 22	26	M10	1.6
2 9/16	2.563	3.737	0.787	0.945	1.260	2,805	23,686	6.708	16	M8 x 22	26	M10	1.5
2 5/8	2.625	4.331	0.945	1.102	1.496	4,000	23,705	7.779	14	M10 x 25	51	M12	2.8
2 11/16	2.688	4.331	0.945	1.102	1.496	4,095	23,705	7.779	14	M10 x 25	51	M12	2.8
2 3/4	2.750	4.337	0.945	1.102	1.496	4,190	23,671	7.782	14	M10 x 25	51	M12	2.7
2 7/8	2.875	4.528	0.945	1.102	1.496	4,381	22,675	7.883	14	M10 x 25	51	M12	2.9
2 15/16	2.938	4.528	0.945	1.102	1.496	4,476	22,675	7.883	14	M10 x 25	51	M12	2.8
3	3.000	4.724	0.945	1.102	1.496	4,571	21,730	8.000	14	M10 x 25	51	M12	3.2
3 1/8	3.125	4.724	0.945	1.102	1.496	4,762	21,730	8.000	14	M10 x 25	51	M12	3.0
3 1/4	3.250	4.921	0.945	1.102	1.496	5,660	23,841	8.877	16	M10 x 25	51	M12	3.3
3 3/8	3.375	4.921	0.945	1.102	1.496	5,877	23,841	8.877	16	M10 x 25	51	M12	3.1
3 7/16	3.438	5.118	0.945	1.102	1.496	5,986	22,924	8.978	16	M10 x 25	51	M12	3.4
3 1/2	3.500	5.118	0.945	1.102	1.496	6,095	22,924	8.978	16	M10 x 25	51	M12	3.4
3 3/4	3.750	5.305	0.945	1.102	1.496	7,346	24,880	9.887	18	M10 x 25	51	M12	3.5
3 7/8	3.875	5.709	1.024	1.299	1.772	8,640	24,291	10.442	14	M12 x 30	91	M14	4.8
3 15/16	3.938	5.709	1.024	1.299	1.772	8,779	24,291	10.442	14	M12 x 30	91	M14	4.7
4	4.000	5.843	1.024	1.299	1.772	8,919	23,733	10.504	14	M12 x 30	91	M14	5.0
4 3/16	4.188	6.102	1.024	1.299	1.772	9,337	22,724	10.640	14	M12 x 30	91	M14	6.0
4 7/16	4.438	6.496	1.024	1.299	1.772	11,308	24,396	11.922	16	M12 x 30	91	M14	6.0
4 1/2	4.500	6.496	1.024	1.299	1.772	11,467	24,396	11.922	16	M12 x 30	91	M14	5.9
4 15/16	4.938	7.087	1.339	1.496	1.969	15,727	21,377	11.879	20	M12 x 35	91	M14	8.2
5	5.000	7.087	1.339	1.496	1.969	15,926	21,377	11.879	20	M12 x 35	91	M14	8.0
5 7/16	5.438	7.480	1.339	1.496	1.969	19,052	22,277	12.871	22	M12 x 35	91	M14	8.5
5 1/2	5.500	7.492	1.339	1.496	1.969	19,271	22,242	12.878	22	M12 x 35	91	M14	8.2
6	6.000	8.268	1.339	1.496	1.969	24,845	23,820	14.903	26	M12 x 35	91	M14	10.2
6 7/16	6.438	8.858	1.496	1.732	2.283	30,910	23,065	15.604	22	M14 x 40	138	M16	13.6
6 1/2	6.500	8.858	1.496	1.732	2.283	31,210	23,065	15.604	22	M14 x 40	138	M16	13.2
6 15/16	6.938	9.252	1.496	1.732	2.283	36,339	24,091	16.818	24	M14 x 40	138	M16	13.7
7	7.000	9.252	1.496	1.732	2.283	36,666	24,091	16.818	24	M14 x 40	138	M16	13.5
7 1/2	7.500	9.823	1.811	2.047	2.598	45,833	21,869	16.701	28	M14 x 45	138	M16	17.9
7 7/8	7.875	10.236	1.811	2.047	2.598	51,562	22,485	17.722	30	M14 x 45	138	M16	18.8
8	8.000	10.504	1.811	2.047	2.598	52,380	21,912	17.882	30	M14 x 45	138	M16	18.5

\*Required hub OD for 1045 h.r. steel hub assuming 45 ksi Yield Point and Stress Reduction Factor C=1 (see Page 24 for details)

### PILOT BUSHINGS FOR METRIC LOCKING ASSEMBLIES

SET NUMBER	SUITABLE FOR B400 LOCKING ASSEMBLY SIZES	INCHES		MM
		D	W	X
PB 4565	45 x 75 to 65 x 95	0.589	0.313	M8 x 30
PB 7095	70 x 110 to 95 x 135	0.787	0.375	M10 x 35
PB 1012	100 x 145 to 120 x 165	0.886	0.375	M12 x 40
PB 1316	130 x 180 to 160 x 210	0.984	0.625	M12 x 50
PB 1718	170 x 225 to 180 x 235	1.082	0.625	M14 x 55
PB 1920	190 x 250 to 200 x 260	1.181	0.625	M14 x 60
PB 2224	220 x 285 to 240 x 305	1.279	0.625	M16 x 70
PB 2600	260 x 325	1.279	0.625	M16 x 70
PB 2830	280 x 355 to 300 x 375	1.476	0.750	M18 x 80
PB 3234	320 x 405 to 340 x 425	1.673	0.750	M20 x 90
PB 3642	360 x 455 to 420 x 515	1.870	0.750	M22 x 100
PB 4450	440 x 545 to 500 x 605	2.067	0.875	M24 x 110
PB 5200	520 x 630 to 1000 x 1110	2.165	1.125	M24 x 120



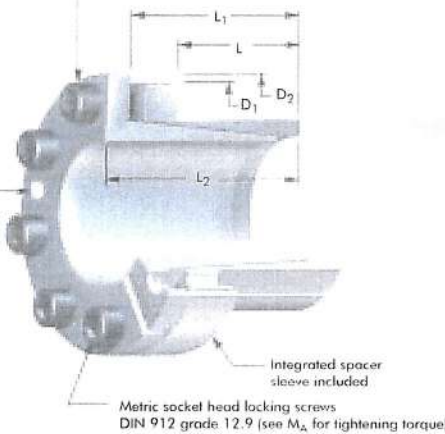
**B-LOC PILOT BUSHINGS:** for series B400 Locking Assemblies to provide pre-centering in applications with either straight through hub bores or narrow hubs. Pilot Bushings are supplied in sets consisting of three (3) bushings and three (3) longer screws. Pilot Bushings for inch size Locking Assemblies are identical to bushings used for related metric units except for outside diameter "D".

# B800 SERIES



Locking screws transfer to integrated push-off holes for disassembly.

Screw head height = screw dia. (mm)



Required hub OD depends on strength of hub material (see Specifications and Hub Sizing on Page 24)

Bore dia. machined to  $D - 0/-T$   
 $T = .002"$  for bores up to 2.559"  
 $.003"$  for bores over 2.559"

$d$  = Shaft dia. machined to  $d + 0/-T$   
 Surface finish for shaft and hub bore to be 63-125  $\mu$ IN RMS

## Ordering Information:

Specify series & shaft size

(e.g., Locking Assembly Series B800 1<sup>15</sup>/<sub>16</sub>" )

## B800 METRIC SPECIFICATIONS

SIZE	d	D	D <sub>1</sub>	D <sub>2</sub>	L	(Relaxed) L <sub>1</sub>	L <sub>2</sub>	M <sub>H</sub> (ft.-lbs)	P <sub>H</sub> (psi)	D <sub>N</sub> *	Qty.	Locking Screws Size	M <sub>A</sub> (ft.-lbs)	Weight (lbs)
6 x 14	0.236	0.551	0.906	0.984	0.394	0.748	0.866	16	19,935	0.887	3	M4 x 10	3.55	0.3
8 x 15	0.315	0.591	0.945	1.063	0.472	0.866	0.984	21	15,505	0.846	3	M4 x 10	3.55	0.3
9 x 16	0.354	0.630	1.024	1.142	0.551	0.945	1.063	32	16,612	0.928	4	M4 x 10	3.55	0.4
10 x 16	0.394	0.630	1.024	1.142	0.551	0.945	1.063	36	16,612	0.928	4	M4 x 10	3.55	0.4
11 x 18	0.433	0.709	1.102	1.260	0.551	0.945	1.083	39	14,766	0.996	4	M4 x 10	3.55	0.5
12 x 18	0.472	0.709	1.102	1.260	0.551	0.945	1.083	43	14,766	0.996	4	M4 x 10	3.55	0.5
14 x 23	0.551	0.906	1.299	1.496	0.551	0.945	1.083	50	11,556	1.178	4	M4 x 10	3.55	0.6
15 x 24	0.591	0.945	1.575	1.732	0.630	1.161	1.437	93	16,754	1.397	3	M6 x 16	12	0.6
16 x 24	0.630	0.945	1.575	1.732	0.630	1.161	1.437	99	16,754	1.397	3	M6 x 16	12	0.6
18 x 26	0.709	1.024	1.654	1.850	0.709	1.280	1.555	148	18,330	1.577	4	M6 x 16	12	0.6
19 x 27	0.748	1.063	1.693	1.929	0.709	1.280	1.555	156	17,651	1.609	4	M6 x 16	12	0.7
20 x 28	0.787	1.102	1.732	1.969	0.709	1.280	1.555	164	17,020	1.641	4	M6 x 16	12	0.7
22 x 32	0.866	1.260	1.890	2.126	0.984	1.575	1.850	181	10,723	1.606	4	M6 x 16	12	0.8
24 x 34	0.945	1.339	1.969	2.205	0.984	1.575	1.850	296	15,138	1.900	6	M6 x 16	12	0.9
25 x 34	0.984	1.339	1.969	2.205	0.984	1.575	1.850	308	15,138	1.900	6	M6 x 16	12	0.9
28 x 39	1.102	1.535	2.165	2.402	0.984	1.575	1.850	345	13,197	2.077	6	M6 x 16	12	1.0
30 x 41	1.181	1.614	2.244	2.441	0.984	1.575	1.850	370	12,554	2.150	6	M6 x 16	12	1.1
32 x 43	1.260	1.693	2.323	2.559	0.984	1.575	1.850	526	15,960	2.453	8	M6 x 16	12	1.2
35 x 47	1.378	1.850	2.441	2.677	1.260	1.850	2.126	576	11,407	2.398	8	M6 x 18	12	1.4
38 x 50	1.496	1.969	2.598	2.835	1.260	1.850	2.126	625	10,723	2.510	8	M6 x 18	12	1.5
40 x 53	1.575	2.087	2.717	2.953	1.260	1.850	2.126	658	10,116	2.623	8	M6 x 18	12	1.6
42 x 55	1.654	2.165	2.795	3.071	1.260	1.850	2.126	691	9,748	2.698	8	M6 x 18	12	1.7
45 x 59	1.772	2.323	3.150	3.386	1.772	2.441	2.756	1,368	11,939	3.048	8	M8 x 22	30	2.7
48 x 62	1.890	2.441	3.189	3.425	1.772	2.441	2.756	1,458	11,361	3.160	8	M8 x 22	30	2.7
50 x 65	1.969	2.559	3.386	3.622	1.772	2.441	2.756	1,519	10,837	3.272	8	M8 x 22	30	3.1
55 x 71	2.165	2.795	3.622	3.858	2.165	2.874	3.189	1,880	9,132	3.434	9	M8 x 22	30	3.8
60 x 77	2.362	3.031	3.858	4.094	2.165	2.874	3.189	2,051	8,420	3.663	9	M8 x 22	30	4.2
65 x 84	2.559	3.307	4.134	4.370	2.165	2.874	3.189	2,222	7,719	3.933	9	M8 x 22	30	4.9
70 x 90	2.756	3.543	4.449	4.685	2.559	3.386	3.780	3,799	9,679	4.409	9	M10 x 25	60	6.7
75 x 95	2.953	3.740	4.685	4.961	2.559	3.386	3.780	4,071	9,169	4.599	9	M10 x 25	60	7.3
80 x 100	3.150	3.937	4.921	5.157	2.559	3.386	3.780	5,789	11,614	5.127	12	M10 x 25	60	7.6
85 x 106	3.346	4.173	5.157	5.394	2.559	3.386	3.780	6,151	10,957	5.350	12	M10 x 25	60	7.7
90 x 112	3.543	4.409	5.394	5.669	2.559	3.386	3.780	6,513	10,370	5.576	12	M10 x 25	60	8.7
95 x 120	3.740	4.724	5.591	5.866	2.559	3.386	3.780	8,020	11,292	6.105	14	M10 x 25	60	9.8
100 x 125	3.937	4.921	6.024	6.299	2.756	3.701	4.213	10,536	12,562	6.556	12	M12 x 30	105	12
110 x 140	4.331	5.512	6.614	6.850	2.756	3.701	4.213	11,590	11,216	7.110	12	M12 x 30	105	15
120 x 155	4.724	6.102	7.362	7.795	3.543	4.528	5.039	16,858	10,506	7.741	16	M12 x 30	105	21
130 x 165	5.118	6.496	7.756	8.189	3.543	4.528	5.039	18,262	9,869	8.118	16	M12 x 30	105	23

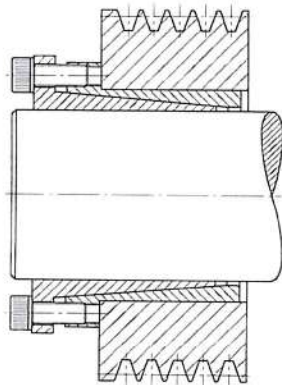
\*Required hub OD for 1045 h.r. steel hub assuming 45 ksi Yield Point and Stress Reduction Factor C=1 (see Page 24 for details)



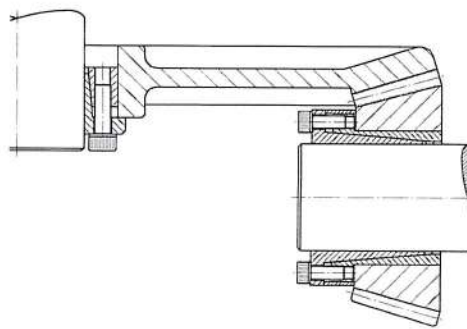
## B800 INCH SPECIFICATIONS

SIZE	d	D	D <sub>1</sub>	D <sub>2</sub>	(Relaxed)			M <sub>1</sub> (ft.-lbs)	P <sub>H</sub> (psi)	D <sub>N</sub> *	Locking Screws			Weight (lbs)
					L	L <sub>1</sub>	L <sub>2</sub>				Qty.	Size	M <sub>A</sub> (ft.-lbs)	
1/4	0.250	0.551	0.906	0.984	0.394	0.748	0.866	17	19,935	0.887	3	M4 x 10	3.55	0.2
5/16	0.313	0.591	0.945	1.063	0.472	0.866	0.984	21	15,505	0.846	3	M4 x 10	3.55	0.3
3/8	0.375	0.630	1.024	1.142	0.551	0.945	1.063	34	16,612	0.928	4	M4 x 10	3.55	0.4
7/16	0.438	0.709	1.102	1.260	0.551	0.945	1.083	40	14,766	0.996	4	M4 x 10	3.55	0.5
1/2	0.500	0.906	1.299	1.496	0.551	0.945	1.083	45	11,556	1.178	4	M4 x 10	3.55	0.5
5/8	0.625	0.945	1.575	1.732	0.630	1.161	1.437	98	16,754	1.397	3	M6 x 16	12	0.6
3/4	0.750	1.063	1.693	1.929	0.709	1.280	1.555	157	17,651	1.609	4	M6 x 16	12	0.7
7/8	0.875	1.260	1.890	2.126	0.984	1.575	1.850	183	10,723	1.606	4	M6 x 16	12	0.8
15/16	0.938	1.339	1.969	2.205	0.984	1.575	1.850	294	15,138	1.900	6	M6 x 16	12	0.9
1	1.000	1.339	1.969	2.205	0.984	1.575	1.850	313	15,138	1.900	6	M6 x 16	12	0.9
1 1/8	1.125	1.535	2.165	2.402	0.984	1.575	1.850	352	13,197	2.077	6	M6 x 16	12	1.0
1 3/16	1.188	1.614	2.244	2.441	0.984	1.575	1.850	372	12,554	2.150	6	M6 x 16	12	1.1
1 1/4	1.250	1.693	2.323	2.559	0.984	1.575	1.850	522	15,960	2.453	8	M6 x 16	12	1.2
1 3/8	1.375	1.850	2.441	2.677	1.260	1.850	2.126	574	11,407	2.398	8	M6 x 18	12	1.4
1 7/16	1.438	1.969	2.598	2.835	1.260	1.850	2.126	600	10,723	2.510	8	M6 x 18	12	1.5
1 1/2	1.500	1.969	2.598	2.835	1.260	1.850	2.126	627	10,723	2.510	8	M6 x 18	12	1.5
1 5/8	1.625	2.165	2.795	3.071	1.260	1.850	2.126	679	9,748	2.698	8	M6 x 18	12	1.7
1 11/16	1.688	2.323	3.150	3.386	1.772	2.441	2.756	1,302	11,939	3.048	8	M8 x 22	30	2.7
1 3/4	1.750	2.323	3.150	3.386	1.772	2.441	2.756	1,351	11,939	3.048	8	M8 x 22	30	2.7
1 7/8	1.875	2.441	3.189	3.425	1.772	2.441	2.756	1,447	11,361	3.160	8	M8 x 22	30	2.7
1 15/16	1.938	2.559	3.386	3.622	1.772	2.441	2.756	1,495	10,837	3.272	8	M8 x 22	30	3.1
2	2.000	2.795	3.622	3.858	2.165	2.874	3.189	1,736	9,132	3.434	9	M8 x 22	30	3.8
2 1/8	2.125	2.795	3.622	3.858	2.165	2.874	3.189	1,845	9,132	3.434	9	M8 x 22	30	3.8
2 3/16	2.188	3.031	3.858	4.094	2.165	2.874	3.189	1,899	8,420	3.663	9	M8 x 22	30	4.2
2 3/8	2.375	3.031	3.858	4.094	2.165	2.874	3.189	2,062	8,420	3.663	9	M8 x 22	30	4.2
2 7/16	2.438	3.307	4.134	4.370	2.165	2.874	3.189	2,116	7,719	3.933	9	M8 x 22	30	4.9
2 1/2	2.500	3.307	4.134	4.370	2.165	2.874	3.189	2,171	7,719	3.933	9	M8 x 22	30	4.9
2 5/8	2.625	3.543	4.449	4.685	2.559	3.386	3.780	3,619	9,679	4.409	9	M10 x 25	60	6.8
2 3/4	2.750	3.543	4.449	4.685	2.559	3.386	3.780	3,791	9,679	4.409	9	M10 x 25	60	6.7
2 7/8	2.875	3.740	4.685	4.961	2.559	3.386	3.780	3,963	9,169	4.599	9	M10 x 25	60	7.4
2 15/16	2.938	3.740	4.685	4.961	2.559	3.386	3.780	4,049	9,169	4.599	9	M10 x 25	60	7.3
3	3.000	3.740	4.685	4.961	2.559	3.386	3.780	4,136	9,169	4.599	9	M10 x 25	60	7.2
3 1/8	3.125	3.937	4.921	5.157	2.559	3.386	3.780	5,744	11,614	5.127	12	M10 x 25	60	7.6
3 1/4	3.250	4.173	5.157	5.394	2.559	3.386	3.780	5,974	10,957	5.350	12	M10 x 25	60	8.4
3 3/8	3.375	4.173	5.157	5.394	2.559	3.386	3.780	6,203	10,957	5.350	12	M10 x 25	60	7.8
3 7/16	3.438	4.409	5.394	5.669	2.559	3.386	3.780	6,318	10,370	5.576	12	M10 x 25	60	9.1
3 1/2	3.500	4.409	5.394	5.669	2.559	3.386	3.780	6,433	10,370	5.576	12	M10 x 25	60	8.8
3 5/8	3.625	4.409	5.394	5.669	2.559	3.386	3.780	6,663	10,370	5.576	12	M10 x 25	60	8.6
3 3/4	3.750	4.724	5.591	5.866	2.559	3.386	3.780	8,041	11,292	6.105	14	M10 x 25	60	9.7
3 7/8	3.875	4.921	6.024	6.299	2.756	3.701	4.213	10,370	12,562	6.556	12	M12 x 30	105	12
3 15/16	3.938	4.921	6.024	6.299	2.756	3.701	4.213	10,537	12,562	6.556	12	M12 x 30	105	12
4	4.000	4.921	6.024	6.299	2.756	3.701	4.213	10,705	12,562	6.556	12	M12 x 30	105	12
4 1/4	4.250	5.512	6.614	6.850	2.756	3.701	4.213	11,374	11,216	7.110	12	M12 x 30	105	15
4 3/8	4.375	5.512	6.614	6.850	2.756	3.701	4.213	11,708	11,216	7.110	12	M12 x 30	105	15
4 7/16	4.438	6.102	7.362	7.795	3.543	4.528	5.039	15,834	10,506	7.741	16	M12 x 30	105	21
4 1/2	4.500	6.102	7.362	7.795	3.543	4.528	5.039	16,057	10,506	7.741	16	M12 x 30	105	21
4 3/4	4.750	6.102	7.362	7.795	3.543	4.528	5.039	16,949	10,506	7.741	16	M12 x 30	105	21
4 15/16	4.938	6.496	7.756	8.189	3.543	4.528	5.039	17,618	9,869	8.118	16	M12 x 30	105	23

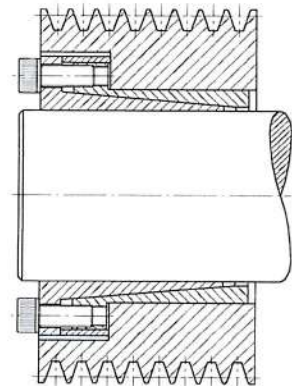
\*Required hub OD for 1045 h.r. steel hub assuming 45 ksi Yield Point and Stress Reduction Factor C = 1 (see Page 24 for details)



Possible design configurations



Note: In applications where spacer sleeve is removed, the drive element will move axially during installation and torque ratings and contact pressures increase 58%.

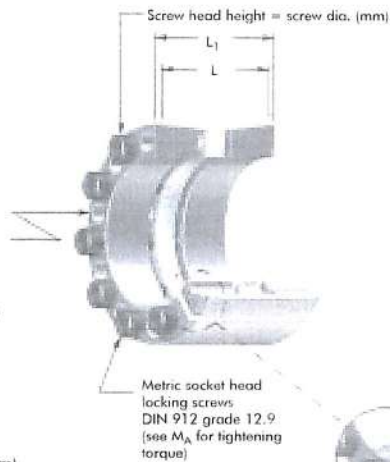




# B112 HEAVY DUTY SERIES



Locking screws transfer to integrated push-off holes for disassembly.



Metric socket head locking screws  
DIN 912 grade 12.9  
(see  $M_A$  for tightening torque)



Note: Unique staggered slit on series B112, B113, and B115 sizes 200mm and larger prevents permanent deformation of thrust collars that can result from improper disassembly.

Required hub OD depends on strength of hub material [see Specifications and Hub Sizing on Page 24]

Bore dia. machined to  $D - 0/-T$   
 $T = .002"$  for bores up to 4.724"  
 $.003"$  for bores up to 12.008"  
 $.004"$  for bores up to 25.000"  
 $.005"$  for bores over 25.000"

$d$  = Shaft dia. machined to  $d + 0/-T$   
 Surface finish for shaft and hub bore to be 63-125  $\mu$ IN RMS

## Ordering Information:

Specify series & shaft size

(e.g., Locking Assembly Series B112 170mm)

Larger sizes and sizes not shown are available on request.

## B112 METRIC SPECIFICATIONS

Size	d	D	(Relaxed)		$M_t$ (ft.-lbs)	$P_H$ (psi)	$D_{N^*}$	Locking Screws		$M_A$ (ft.-lbs)	Weight (lbs)
			L	$L_1$				Qty.	Size		
25 x 55	0.984	2.165	1.260	1.575	617	19,496	3.443	6	M6 x 35	12	1.0
30 x 55	1.181	2.165	1.260	1.575	740	19,496	3.443	6	M6 x 35	12	0.9
32 x 60	1.260	2.362	1.732	2.126	921	14,718	3.317	7	M6 x 45	12	1.4
35 x 60	1.378	2.362	1.732	2.126	1,007	14,718	3.317	7	M6 x 45	12	1.3
40 x 75	1.575	2.953	1.732	2.126	2,127	21,753	5.004	7	M8 x 50	30	2.3
45 x 75	1.772	2.953	1.732	2.126	2,393	21,753	5.004	7	M8 x 50	30	2.0
50 x 80	1.969	3.150	2.205	2.598	3,038	18,010	4.812	8	M8 x 55	30	2.7
55 x 85	2.165	3.346	2.205	2.598	3,760	19,069	5.260	9	M8 x 55	30	2.9
60 x 90	2.362	3.543	2.205	2.598	4,558	20,011	5.715	10	M8 x 55	30	3.1
65 x 95	2.559	3.740	2.205	2.598	4,937	18,958	5.861	10	M8 x 55	30	3.3
70 x 110	2.756	4.331	2.756	3.150	8,443	20,426	7.066	10	M10 x 60	60	6.2
80 x 120	3.150	4.724	2.756	3.150	10,613	20,596	7.746	11	M10 x 60	60	6.8
90 x 130	3.543	5.118	2.756	3.150	13,026	20,740	8.425	12	M10 x 60	60	7.6
100 x 145	3.937	5.709	3.543	4.016	19,316	19,853	9.168	11	M12 x 80	105	13
110 x 155	4.331	6.102	3.543	4.016	23,179	20,261	9.911	12	M12 x 80	105	13
120 x 165	4.724	6.496	3.543	4.016	29,501	22,205	11.154	14	M12 x 80	105	14
130 x 180	5.118	7.087	4.094	4.567	37,586	19,949	11.411	12	M14 x 90	166	20
140 x 190	5.512	7.480	4.094	4.567	47,224	22,048	12.785	14	M14 x 90	166	21
150 x 200	5.906	7.874	4.094	4.567	54,211	22,442	13.615	15	M14 x 90	166	22
160 x 210	6.299	8.268	4.094	4.567	61,680	22,798	14.448	16	M14 x 90	166	23
170 x 225	6.693	8.858	5.276	5.866	79,695	19,760	14.189	14	M16 x 110	257	36
180 x 235	7.087	9.252	5.276	5.866	90,410	20,271	15.031	15	M16 x 110	257	38
190 x 250	7.480	9.843	5.276	5.866	101,795	20,325	16.014	16	M16 x 110	257	43
200 x 260	7.874	10.236	5.276	5.866	107,153	19,543	16.299	16	M16 x 110	257	45
220 x 285	8.661	11.220	5.276	5.906	132,602	20,057	18.121	18	M16 x 110	257	54
240 x 305	9.449	12.008	5.276	5.906	160,729	20,824	19.814	20	M16 x 110	257	57
260 x 325	10.236	12.795	5.276	5.906	182,829	20,520	20.933	21	M16 x 110	257	63
280 x 355	11.024	13.976	6.496	6.969	263,439	20,946	23.142	18	M20 x 130	500	106
300 x 375	11.811	14.764	6.496	6.969	313,618	22,032	25.222	20	M20 x 130	500	112
320 x 405	12.598	15.945	6.496	6.969	351,252	21,420	26.761	21	M20 x 130	500	136
340 x 425	13.386	16.732	6.496	6.969	390,977	21,384	28.053	22	M20 x 130	500	145
360 x 455	14.173	17.913	7.480	7.992	491,890	20,611	29.381	21	M22 x 150	675	200
380 x 475	14.961	18.701	7.480	7.992	543,942	20,683	30.735	22	M22 x 150	675	209
400 x 495	15.748	19.488	7.480	7.992	624,622	21,652	32.927	24	M22 x 150	675	220
420 x 515	16.535	20.276	7.480	7.992	655,853	20,811	33.443	24	M22 x 150	675	229
440 x 535	17.323	21.063	7.480	7.992	687,084	20,033	33.994	24	M22 x 150	675	240
460 x 555	18.110	21.850	7.480	7.992	718,316	19,311	34.572	24	M22 x 150	675	249
480 x 575	18.898	22.638	7.480	7.992	874,471	21,746	38.353	28	M22 x 150	675	260
500 x 595	19.685	23.425	7.480	7.992	910,907	21,015	38.863	28	M22 x 150	675	268
520 x 615	20.472	24.213	7.480	7.992	1,015,011	21,784	41.066	30	M22 x 150	675	277
540 x 635	21.260	25.000	7.480	7.992	1,054,050	21,098	41.573	30	M22 x 150	675	288
560 x 655	22.047	25.787	7.480	7.992	1,165,962	21,817	43.779	32	M22 x 150	675	297
580 x 675	22.835	26.575	7.480	7.992	1,207,603	21,170	44.284	32	M22 x 150	675	308
600 x 695	23.622	27.362	7.480	7.992	1,288,283	21,204	45.639	33	M22 x 150	675	317

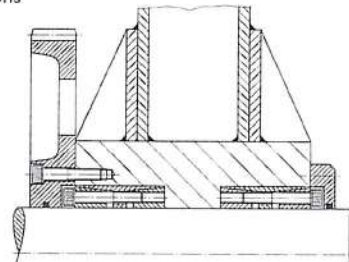
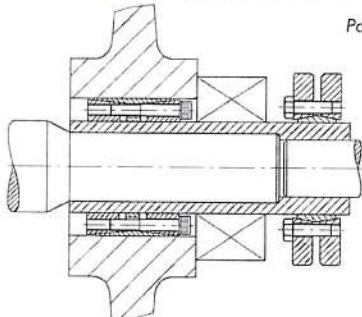
\*Required hub OD for 1045 h.r. steel hub assuming 45 ksi Yield Point and Stress Reduction Factor  $C=1$  (see Page 24 for details)

# B112 INCH SPECIFICATIONS

Size	d	D	(Relaxed)		M <sub>L</sub> (ft-lbs)	P <sub>H</sub> (psi)	D <sub>N</sub> *	Locking Screws		M <sub>A</sub> (ft-lbs)	Weight (lbs)
			L	L <sub>T</sub>				Qty.	Size		
1	1.000	2.165	1.260	1.575	627	19,496	3.443	6	M6 x 35	12	1.0
1 1/8	1.125	2.165	1.260	1.575	705	19,496	3.443	6	M6 x 35	12	1.0
1 3/16	1.188	2.165	1.260	1.575	744	19,496	3.443	6	M6 x 35	12	0.9
1 1/4	1.250	2.362	1.732	2.126	914	14,718	3.317	7	M6 x 45	12	1.5
1 3/8	1.375	2.362	1.732	2.126	1,005	14,718	3.317	7	M6 x 45	12	1.4
1 7/16	1.438	2.362	1.732	2.126	1,051	14,718	3.317	7	M6 x 45	12	1.3
1 1/2	1.500	2.953	1.732	2.126	2,026	21,753	5.004	7	M8 x 50	30	2.4
1 5/8	1.625	2.953	1.732	2.126	2,195	21,753	5.004	7	M8 x 50	30	2.3
1 3/4	1.750	2.953	1.732	2.126	2,364	21,753	5.004	7	M8 x 50	30	2.1
1 7/8	1.875	3.150	2.205	2.598	2,894	18,010	4.812	8	M8 x 55	30	2.9
1 15/16	1.938	3.150	2.205	2.598	2,991	18,010	4.812	8	M8 x 55	30	2.8
2	2.000	3.150	2.205	2.598	3,087	18,010	4.812	8	M8 x 55	30	2.6
2 1/8	2.125	3.346	2.205	2.598	3,690	19,069	5.260	9	M8 x 55	30	2.9
2 3/16	2.188	3.346	2.205	2.598	3,798	19,069	5.260	9	M8 x 55	30	2.8
2 1/4	2.250	3.543	2.205	2.598	4,341	20,011	5.715	10	M8 x 55	30	3.3
2 3/8	2.375	3.543	2.205	2.598	4,582	20,011	5.715	10	M8 x 55	30	3.1
2 7/16	2.438	3.740	2.205	2.598	4,703	18,958	5.861	10	M8 x 55	30	3.6
2 1/2	2.500	3.740	2.205	2.598	4,823	18,958	5.861	10	M8 x 55	30	3.4
2 9/16	2.563	3.740	2.205	2.598	4,944	18,958	5.861	10	M8 x 55	30	3.3
2 5/8	2.625	4.331	2.756	3.150	8,041	20,426	7.066	10	M10 x 60	60	6.6
2 11/16	2.688	4.331	2.756	3.150	8,233	20,426	7.066	10	M10 x 60	60	6.5
2 3/4	2.750	4.331	2.756	3.150	8,424	20,426	7.066	10	M10 x 60	60	6.2
2 7/8	2.875	4.331	2.756	3.150	8,807	20,426	7.066	10	M10 x 60	60	5.8
2 15/16	2.938	4.724	2.756	3.150	9,899	20,596	7.746	11	M10 x 60	60	7.7
3	3.000	4.724	2.756	3.150	10,109	20,596	7.746	11	M10 x 60	60	7.4
3 1/8	3.125	4.724	2.756	3.150	10,531	20,596	7.746	11	M10 x 60	60	6.9
3 1/4	3.250	4.724	2.756	3.150	10,952	20,596	7.746	11	M10 x 60	60	6.5
3 3/8	3.375	5.118	2.756	3.150	12,407	20,740	8.425	12	M10 x 60	60	8.2
3 7/16	3.438	5.118	2.756	3.150	12,637	20,740	8.425	12	M10 x 60	60	8.1
3 1/2	3.500	5.118	2.756	3.150	12,866	20,740	8.425	12	M10 x 60	60	7.8
3 5/8	3.625	5.118	2.756	3.150	13,326	20,740	8.425	12	M10 x 60	60	7.3
3 3/4	3.750	5.709	3.543	4.016	18,398	19,853	9.168	11	M12 x 80	105	13
3 7/8	3.875	5.709	3.543	4.016	19,012	19,853	9.168	11	M12 x 80	105	12
3 15/16	3.938	5.709	3.543	4.016	19,318	19,853	9.168	11	M12 x 80	105	13
4	4.000	5.709	3.543	4.016	19,625	19,853	9.168	11	M12 x 80	105	12
4 1/4	4.250	6.102	3.543	4.016	22,747	20,261	9.911	12	M12 x 80	105	14
4 3/8	4.375	6.102	3.543	4.016	23,416	20,261	9.911	12	M12 x 80	105	13
4 7/16	4.438	6.496	3.543	4.016	27,709	22,205	11.154	14	M12 x 80	105	16
4 1/2	4.500	6.496	3.543	4.016	28,099	22,205	11.154	14	M12 x 80	105	16
4 3/4	4.750	6.496	3.543	4.016	29,660	22,205	11.154	14	M12 x 80	105	14
4 15/16	4.938	7.087	4.094	4.567	36,260	19,949	11.411	12	M14 x 90	166	21
5	5.000	7.087	4.094	4.567	36,719	19,949	11.411	12	M14 x 90	166	21
5 1/4	5.250	7.480	4.094	4.567	44,980	22,048	12.785	14	M14 x 90	166	24
5 7/16	5.438	7.480	4.094	4.567	46,587	22,048	12.785	14	M14 x 90	166	22
5 1/2	5.500	7.480	4.094	4.567	47,122	22,048	12.785	14	M14 x 90	166	21
5 3/4	5.750	7.874	4.094	4.567	52,783	22,442	13.615	15	M14 x 90	166	24
5 15/16	5.938	7.874	4.094	4.567	54,504	22,442	13.615	15	M14 x 90	166	22
6	6.000	8.268	4.094	4.567	58,750	22,798	14.448	16	M14 x 90	166	26
6 7/16	6.438	8.858	5.276	5.866	76,654	19,760	14.189	14	M16 x 110	257	40
6 1/2	6.500	8.858	5.276	5.866	77,398	19,760	14.189	14	M16 x 110	257	39
6 15/16	6.938	9.252	5.276	5.866	88,508	20,271	15.031	15	M16 x 110	257	40
7	7.000	9.252	5.276	5.866	89,305	20,271	15.031	15	M16 x 110	257	38
7 1/4	7.250	9.843	5.276	5.866	98,661	20,325	16.014	16	M16 x 110	257	47
7 7/16	7.438	9.843	5.276	5.866	101,212	20,325	16.014	16	M16 x 110	257	44
7 1/2	7.500	9.843	5.276	5.866	102,063	20,325	16.014	16	M16 x 110	257	43
7 3/4	7.750	10.236	5.276	5.866	105,465	19,543	16.299	16	M16 x 110	257	48
7 15/16	7.938	10.236	5.276	5.866	108,017	19,543	16.299	16	M16 x 110	257	45
8	8.000	10.236	5.276	5.866	108,867	19,543	16.299	16	M16 x 110	257	44

\*Required hub OD for 1045 h.r. steel hub assuming 45 ksi Yield Point and Stress Reduction Factor C=1 (see Page 24 for details)

Possible design configurations

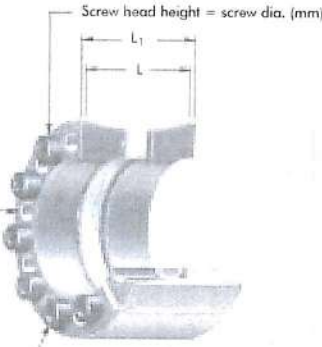




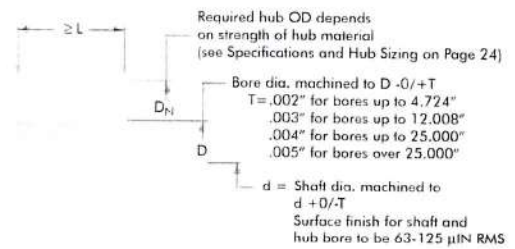
# B115 MEDIUM DUTY SERIES



Locking screws transfer to integrated push-off holes for disassembly.



Metric socket head locking screws DIN 912 grade 12.9 (see  $M_A$  for tightening torque)



**Ordering Information:**  
 Specify series & shaft size  
 (e.g., Locking Assembly Series B115 220mm)

## B115 METRIC SPECIFICATIONS

Size	d	D	(Relaxed)		$M_L$	$P_H$	$D_{N^*}$	Qty.	Locking Screws Size	$M_A$	Weight
			L	$L_1$	(ft.-lbs)	(psi)				(ft.-lbs)	(lbs)
70 x 110	2.756	4.331	1.969	2.441	5,199	17,609	6.547	8	M10 x 50	60	5.0
80 x 120	3.150	4.724	1.969	2.441	7,427	20,177	7.655	10	M10 x 50	60	5.4
90 x 130	3.543	5.118	1.969	2.441	9,191	20,487	8.365	11	M10 x 50	60	6.0
100 x 145	3.937	5.709	2.362	2.835	13,516	20,260	9.272	10	M12 x 60	105	8.8
110 x 155	4.331	6.102	2.362	2.835	14,868	18,952	9.562	10	M12 x 60	105	9.5
120 x 165	4.724	6.496	2.362	2.835	17,842	19,584	10.355	11	M12 x 60	105	10
130 x 180	5.118	7.087	2.559	3.228	24,600	20,310	11.526	14	M12 x 70	105	14
140 x 190	5.512	7.480	2.559	3.228	28,384	20,615	12.270	15	M12 x 70	105	15
150 x 200	5.906	7.874	2.559	3.228	30,412	19,584	12.552	15	M12 x 70	105	16
160 x 210	6.299	8.268	2.559	3.228	34,602	19,895	13.293	16	M12 x 70	105	16
170 x 225	6.693	8.858	3.071	3.661	47,291	20,153	14.344	15	M14 x 80	166	23
180 x 235	7.087	9.252	3.071	3.661	50,073	19,296	14.633	15	M14 x 80	166	24
190 x 250	7.480	9.843	3.465	4.134	56,378	16,292	14.382	16	M14 x 80	166	31
200 x 260	7.874	10.236	3.465	4.134	66,764	17,624	15.482	18	M14 x 80	166	32
220 x 285	8.661	11.220	3.780	4.370	85,055	17,258	16.809	15	M16 x 90	257	42
240 x 305	9.449	12.008	3.780	4.370	123,717	21,502	20.201	20	M16 x 90	257	45
260 x 325	10.236	12.795	3.780	4.370	140,728	21,188	21.333	21	M16 x 90	257	48
280 x 355	11.024	13.976	3.780	4.370	168,979	23,335	24.822	15	M20 x 90	500	61
300 x 375	11.811	14.764	3.780	4.370	181,049	22,091	25.265	15	M20 x 90	500	66
320 x 405	12.598	15.945	4.882	5.354	257,492	21,591	26.893	20	M20 x 110	500	106
340 x 425	13.386	16.732	4.882	5.354	273,586	20,575	27.416	20	M20 x 110	500	112
360 x 455	14.173	17.913	5.512	6.299	360,590	19,138	28.210	20	M22 x 130	675	152
380 x 475	14.961	18.701	5.512	6.299	380,623	18,332	28.819	20	M22 x 130	675	161
400 x 495	15.748	19.488	5.512	6.299	440,721	19,351	30.868	22	M22 x 130	675	167
420 x 515	16.535	20.276	5.512	6.299	504,826	20,290	32.958	24	M22 x 130	675	176
440 x 535	17.323	21.063	5.512	6.299	528,865	19,532	33.528	24	M22 x 130	675	179
460 x 555	18.110	21.850	5.512	6.299	552,904	18,828	34.123	24	M22 x 130	675	187
480 x 575	18.898	22.638	5.512	6.299	600,983	18,930	35.450	25	M22 x 130	675	194
500 x 595	19.685	23.425	5.512	6.299	626,024	18,294	36.063	25	M22 x 130	675	200
520 x 615	20.472	24.213	5.512	6.299	729,193	19,823	38.851	28	M22 x 130	675	209
540 x 635	21.260	25.000	5.512	6.299	757,239	19,198	39.435	28	M22 x 130	675	216
560 x 655	22.047	25.787	5.512	6.299	841,376	19,942	41.514	30	M22 x 130	675	222
580 x 675	22.835	26.575	5.512	6.299	871,425	19,351	42.093	30	M22 x 130	675	229
600 x 695	23.622	27.362	5.512	6.299	901,475	18,794	42.691	30	M22 x 130	675	238

## B115 INCH SPECIFICATIONS

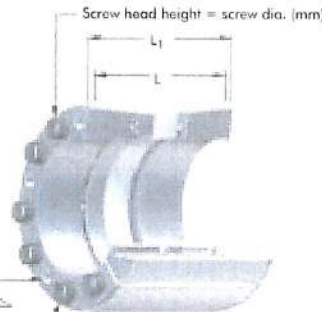
Size	d	D	(Relaxed)		$M_L$	$P_H$	$D_{N^*}$	Qty.	Size	$M_A$	Weight
			L	$L_1$	(ft.-lbs)	(psi)				(ft.-lbs)	(lbs)
2 3/4	2.750	4.331	1.969	2.441	5,188	17,609	6.547	8	M10 x 50	60	5.0
2 15/16	2.938	4.528	1.969	2.441	5,541	16,841	6.710	8	M10 x 50	60	5.4
3 7/16	3.438	5.118	1.969	2.441	8,916	20,487	8.365	11	M10 x 50	60	6.5
3 1/2	3.500	5.118	1.969	2.441	9,078	20,487	8.365	11	M10 x 50	60	6.2
3 15/16	3.938	5.709	2.362	2.835	13,518	20,260	9.272	10	M12 x 60	105	9.0
4 7/16	4.438	6.496	2.362	2.835	16,758	19,584	10.355	11	M12 x 60	105	12
4 1/2	4.500	6.496	2.362	2.835	16,994	19,584	10.355	11	M12 x 60	105	11
4 15/16	4.938	7.087	2.559	3.228	23,732	20,308	11.526	14	M12 x 70	105	15
5	5.000	7.087	2.559	3.228	24,032	20,308	11.526	14	M12 x 70	105	15
5 7/16	5.438	7.480	2.559	3.228	28,002	20,616	12.270	15	M12 x 70	105	15
5 15/16	5.938	7.874	2.559	3.228	30,576	19,584	12.552	15	M12 x 70	105	16
6	6.000	8.268	2.559	3.228	32,958	19,895	13.293	16	M12 x 70	105	19
6 7/16	6.438	8.858	3.071	3.661	45,486	20,153	14.344	15	M14 x 80	166	25
6 15/16	6.938	9.252	3.071	3.661	49,019	19,296	14.633	15	M14 x 80	166	25
7 15/16	7.938	10.236	3.465	4.134	67,302	17,624	15.482	18	M14 x 80	166	31
8	8.000	10.236	3.465	4.134	67,832	17,624	15.482	18	M14 x 80	166	32



## B113 EXTRA HEAVY DUTY SERIES



Locking screws transfer to integrated push-off holes for disassembly.



**Ordering Information:**  
Specify series & shaft size  
(e.g., Locking Assembly Series B113 360mm)

Metric socket head locking screws DIN 912 grade 12.9 (see  $M_A$  for tightening torque)

Required hub OD depends on strength of hub material (see Specifications and Hub Sizing on Page 24)

Bore dia. machined to  $D - 0/+T$   
 $T = .0025"$  for bores up to 11.220"  
 $.003"$  for bores up to 13.976"  
 $.0035"$  for bores up to 24.213"  
 $.004"$  for bores up to 26.575"  
 $.005"$  for bores over 26.575"

$d =$  Shaft dia. machined to  $d + 0/+T$   
 Surface finish for shaft and hub bore to be 63-125  $\mu$ in RMS

### B113 METRIC SPECIFICATIONS

Size	d	D	(Relaxed) L	L <sub>1</sub>	M <sub>t</sub> (ft.-lbs)	PH (psi)	D <sub>N</sub> *	Qty.	Size	M <sub>A</sub> (ft.-lbs)	Weight (lbs)
180 x 285	7.087	11.220	8.071	9.016	163,972	20,092	18.138	14	M22 x 180	675	136
200 x 305	7.874	12.008	8.071	9.016	208,207	21,455	20.174	16	M22 x 180	675	147
220 x 325	8.661	12.795	8.071	9.016	229,017	20,135	20.709	16	M22 x 180	675	160
240 x 355	9.449	13.976	8.189	9.370	288,534	20,785	23.036	16	M24 x 180	870	193
260 x 375	10.236	14.764	8.189	9.370	351,636	22,135	25.299	18	M24 x 180	870	206
280 x 405	11.024	15.945	8.189	9.370	420,785	22,773	27.843	20	M24 x 180	870	242
300 x 425	11.811	16.732	8.189	9.370	450,825	21,702	28.311	20	M24 x 180	870	257
320 x 455	12.598	17.913	9.843	11.024	569,197	20,393	29.201	18	M27 x 220	1,300	356
340 x 475	13.386	18.701	9.843	11.024	672,000	21,704	31.645	20	M27 x 220	1,300	374
360 x 495	14.173	19.488	9.843	11.024	782,660	22,910	34.170	22	M27 x 220	1,300	391
380 x 515	14.961	20.276	9.843	11.024	826,175	22,020	34.626	22	M27 x 220	1,300	411
400 x 535	15.748	21.063	9.843	11.024	869,634	21,197	35.126	22	M27 x 220	1,300	423
420 x 555	16.535	21.850	9.843	11.024	996,103	22,291	37.613	24	M27 x 220	1,300	446
440 x 575	17.323	22.638	9.843	11.024	1,043,573	21,515	38.098	24	M27 x 220	1,300	464
460 x 595	18.110	23.425	9.843	11.024	1,090,984	20,792	38.618	24	M27 x 220	1,300	484
480 x 615	18.898	24.213	9.843	11.024	1,328,197	23,468	43.177	28	M27 x 220	1,300	501
500 x 635	19.685	25.000	9.843	11.024	1,383,509	22,730	43.598	28	M27 x 220	1,300	513
520 x 655	20.472	25.787	9.843	11.024	1,438,822	22,036	44.058	28	M27 x 220	1,300	539
540 x 675	21.260	26.575	9.843	11.024	1,600,933	22,910	46.595	30	M27 x 220	1,300	554
560 x 695	22.047	27.362	9.843	11.024	1,660,196	22,251	47.045	30	M27 x 220	1,300	574

\*Required hub OD for 1045 h.r. steel hub assuming 45 ksi Yield Point and Stress Reduction Factor C=1 (see Page 24 for details)

## LOCKING ASSEMBLY CONNECTIONS WITH SHAFT-ADAPTOR SLEEVES:

In applications where an existing shaft diameter does not fit the bore of a standard B-LOC Locking Assembly, we recommend using an **adaptor sleeve** sized to facilitate the use of a standard sized Locking Assembly and the existing shaft. The maximum wall thickness of an adaptor sleeve should be approximately 10% of the shaft diameter. The minimum thickness will depend upon the machining process.

It is important to note that in order to maximize the torque capacity of a sleeved Locking Assembly connection, the shaft/sleeve bore interface should be free of any lubricant, resulting in a coefficient of friction  $\mu = 0.15$  and making the sleeve OD/Locking Assembly bore the point of lowest torque capacity (provided the sleeve OD is less than 1.25 times the shaft diameter). This facilitates full use of the larger Locking Assembly's higher torque capacity.

Notes:

1. Sleeve ID =  $d_s - 0/+ .001"$  where  $d_s$  = shaft dia.
2. Sleeve OD =  $d + 0/+ T$  for Locking Assembly to be used.
3. Install DRY at shaft/sleeve bore interface for coefficient of friction  $\mu = 0.15$ .
4. Torque capacity at sleeve OD =  $M_t$  for Locking Assembly to be used.
5. Torque capacity on shaft =  $M_t \times \frac{d_s}{d} \times 1.25$ .
6. Sleeve to be manufactured with one lengthwise slit (after machining) and from material equal to or better than shaft material.
7. Sleeve can be installed over existing keyway; position slit approximately opposite keyway.



# HUB SIZING

B-LOC™ Locking Assemblies transmit torque and other loads by means of mechanical interference generated by pressure exerted on both the shaft and hub, meaning that consideration must be given to the amount of hub material required to prevent permanent expansion (i.e., yielding). The following information is provided to assist you in determining the required hub OD for any Locking Assembly application.

Using the stress equations presented at right, the required hub OD "D<sub>N</sub>" is determined as follows:

$$D_N = D \sqrt{\frac{Y.P. + (p_H \times C)}{Y.P. - (p_H \times C)}}$$

where D = hub bore (inches) from specification tables, and . . .

p<sub>H</sub> = contact pressure (psi) applied to hub bore from specification tables

Y.P. = yield point (psi) of hub material (see below)

C = Stress Reduction Factor, considering the relationship of actual hub width "B" (as determined by customer) to Locking Assembly contact length "L" (per specification tables), determined as follows (assumes locking assembly collar in contact with hub bore is centered in hub):

For Series B103, B106, B109, B400 and B800

- C = 1.0 for B = L
- C = 0.8 for B = 1.5 x L
- C = 0.6 for B = 2.0 x L

For Series B112, B113 and B115

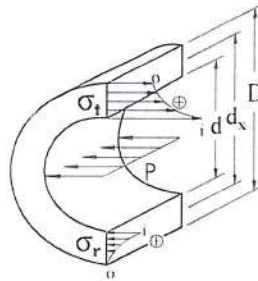
- C = 1.0 for B = L
- C = 0.8 for B = 1.25 x L
- C = 0.6 for B = 1.50 x L

This equation can also be expressed as D<sub>N</sub>=DK, where

K represents the expression  $\sqrt{\frac{Y.P. + (p_H \times C)}{Y.P. - (p_H \times C)}}$

The table at right provides these "K" factors for various combinations of Y.P., p<sub>H</sub>, and C. To use the table, determine the Yield Point (in psi) of your hub material, find the p<sub>H</sub> value for the Locking Assembly you've selected from the appropriate specification table (round up to the nearest 1,000 psi), and determine the value of C based on your component's length-thru-bore (LTB). Then, find the K factor from the table and multiply by the Locking Assembly OD to calculate the minimum required hub OD for your application.

## THICK WALLED CYLINDER SUBJECTED TO INTERNAL PRESSURE



### TANGENTIAL STRESSES "σ<sub>t</sub>"

$$\sigma_{tx} = P \frac{Q}{1-Q} \left[ 1 + \frac{D_o^2}{d_s^2} \right]$$

$$\sigma_{ti} = P \frac{1+Q}{1-Q}$$

$$\sigma_{to} = 2P \frac{Q}{1-Q}$$

### RADIAL STRESSES "σ<sub>r</sub>"

$$\sigma_{rx} = P \frac{Q}{1-Q} \left[ 1 - \frac{D_o^2}{d_s^2} \right]$$

$$\sigma_{ri} = -P$$

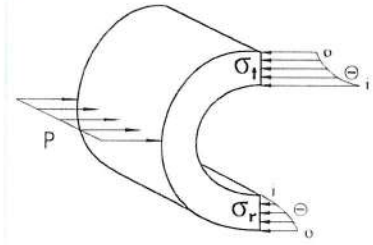
$$\sigma_{ro} = 0$$

### EXPANSION/CONTRACTION

$$\Delta d_i = Pd_i \frac{(v+1) + (v-1) \frac{Q}{1-Q}}{vE(1-Q)}$$

$$\Delta D_o = 2P \frac{D_o Q}{E(1-Q)}$$

## THICK WALLED CYLINDER SUBJECTED TO EXTERNAL PRESSURE



$$\sigma_{tx} = -\frac{P}{1-Q} \left[ 1 + \frac{d_i^2}{d_s^2} \right]$$

$$\sigma_{ti} = -\frac{2P}{1-Q}$$

$$\sigma_{to} = -P \frac{1+Q}{1-Q}$$

$$\sigma_{rx} = -\frac{P}{1-Q} \left[ 1 - \frac{d_i^2}{d_s^2} \right]$$

$$\sigma_{ri} = 0$$

$$\sigma_{ro} = -P$$

$$\Delta d_i = 2P \frac{d_i}{E(1-Q)}$$

$$\Delta D_o = PD_o \frac{(v-1) + (v+1) \frac{Q}{1-Q}}{vE(1-Q)}$$

### COMBINED HUB STRESSES IN SHRINK DISC APPLICATIONS "σ<sub>v</sub>"

$$\sigma_v = \sqrt{\sigma_t^2 + \sigma_r^2 - (\sigma_r \times \sigma_t) + \tau^2}$$

### KEY

r = inside of hub

a = outside of hub

v = poisson's ratio (.3003 for steel)

E = modulus of elasticity (30x10<sup>6</sup> for steel)

P = pressure (psi)

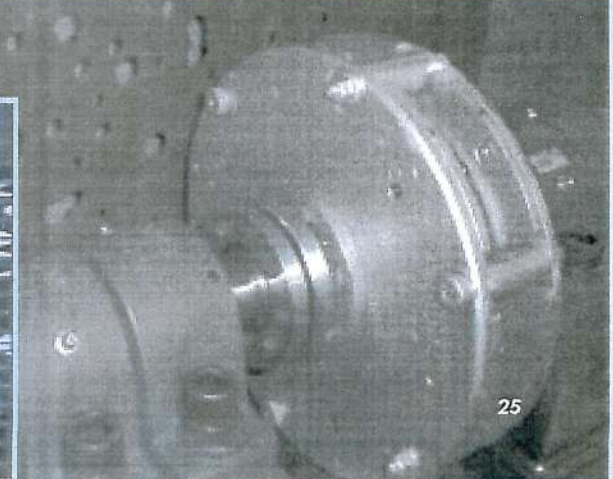
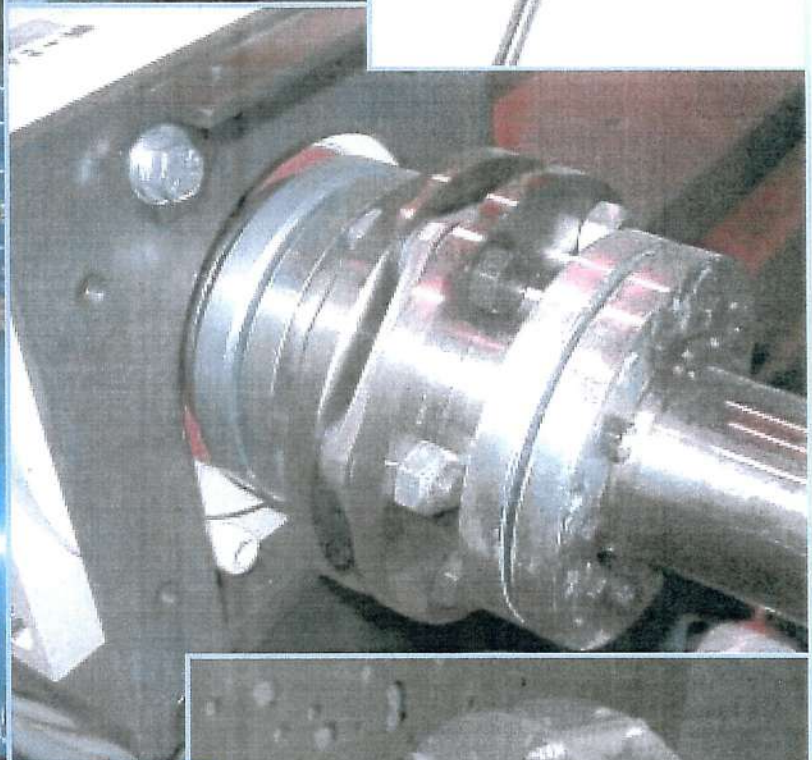
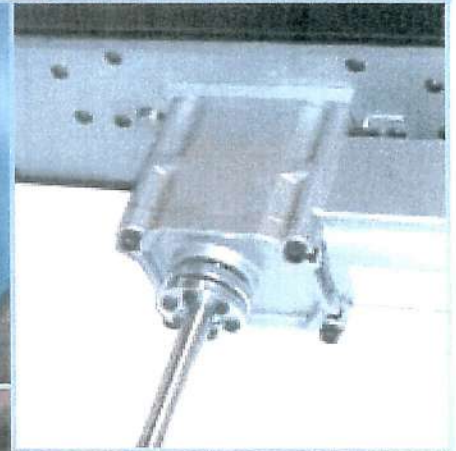
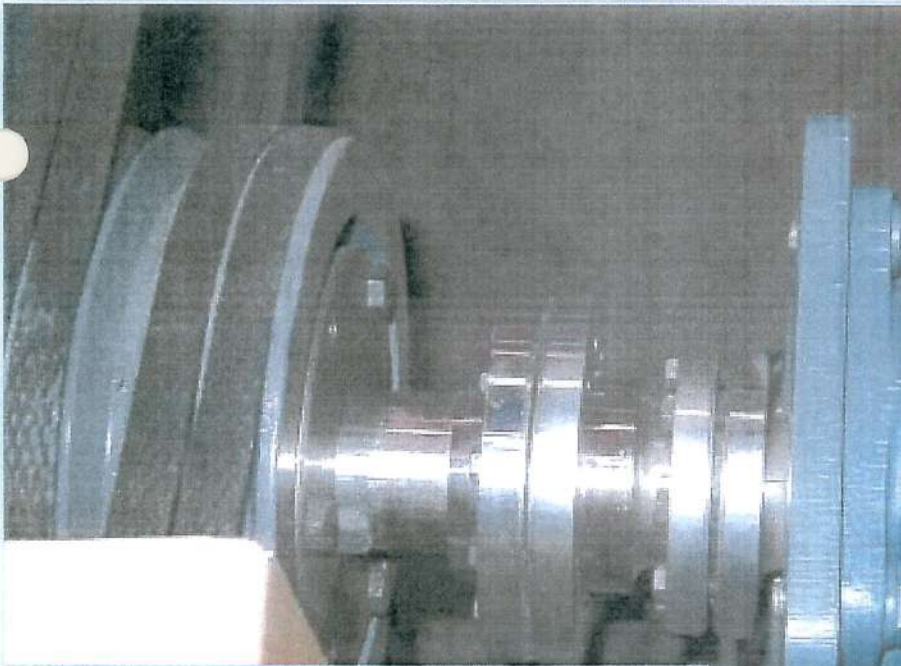
τ = torsional hub stress

$$Q = \left( \frac{d}{D} \right)^2$$

### "K" FACTORS FOR HUB MATERIAL WITH Y.P. EQUAL TO

	32,000 psi			45,000 psi			90,000 psi			
	C =	0.6	0.8	1.0	0.6	0.8	1.0	0.6	0.8	1.0
7,000	1.14	1.19	1.25	1.10	1.13	1.17	1.05	1.06	1.08	
8,000	1.16	1.22	1.29	1.11	1.15	1.20	1.05	1.07	1.09	
9,000	1.19	1.26	1.34	1.13	1.18	1.22	1.06	1.08	1.11	
10,000	1.21	1.29	1.38	1.14	1.20	1.25	1.07	1.09	1.12	
11,000	1.23	1.33	1.43	1.16	1.22	1.28	1.08	1.10	1.13	
12,000	1.26	1.36	1.48	1.18	1.24	1.31	1.08	1.11	1.14	
13,000	1.28	1.40	1.54	1.19	1.27	1.35	1.09	1.12	1.16	
14,000	1.31	1.44	1.60	1.21	1.29	1.38	1.10	1.13	1.17	
15,000	1.34	1.48	1.66	1.22	1.31	1.41	1.11	1.14	1.18	
16,000	1.36	1.53	1.73	1.24	1.34	1.45	1.11	1.15	1.20	
17,000	1.39	1.57	1.81	1.26	1.37	1.49	1.12	1.16	1.21	
18,000	1.42	1.62	1.89	1.28	1.39	1.53	1.13	1.18	1.22	
19,000	1.45	1.68	1.98	1.30	1.42	1.57	1.14	1.19	1.24	
20,000	1.48	1.73	2.08	1.31	1.45	1.61	1.14	1.20	1.25	
21,000	1.52	1.79	2.20	1.33	1.48	1.66	1.15	1.21	1.27	
22,000	1.55	1.86	2.32	1.35	1.51	1.71	1.16	1.22	1.28	
23,000	1.59	1.93	2.47	1.37	1.54	1.76	1.17	1.23	1.30	
24,000	1.62	2.00	2.65	1.39	1.58	1.81	1.18	1.24	1.31	
25,000	1.66	2.08	2.85	1.41	1.61	1.87	1.18	1.25	1.33	







# B-LOC EXTERNAL DEVICES: SHRINK DISCS & WK SERIES RIGID SHAFT COUPLINGS

## DESIGN FEATURES

External locking devices for keyless frictional shaft/hub connections on shafts from 5/8" to 40" diameter, B-LOC Shrink Discs . . .

- Provide a high capacity interference fit with all the positive features of conventional interference fits, but without their assembly and dismounting problems.
- Offer extremely concentric and well-balanced connections, ideal for high-speed applications.
- Permit simple axial and angular timing.
- Are available in standard, light, and heavy-duty series to suit any application.

## WORKING PRINCIPLE

The double tapered inner ring of a B-LOC Shrink Disc provides a high-ratio conversion of screw clamp loads into radial contact pressures when the outer collars are pulled together by tightening of the integrated high-strength locking screws. These radial contact pressures in turn accomplish the following:

1. Contract the inner ring and hub to bridge the clearance between shaft and hub bore.
2. Generate a defined shaft/hub contact pressure for a high capacity mechanical interference fit.

This frictional bond transmits torque, bending and/or thrust loads directly from the hub to the shaft; the Shrink Disc itself does not carry any torque or thrust load.

## TORQUE

$M_t$  = rated torque capacity of (1) B-LOC Shrink Disc with all screws tightened to specified torque  $M_A$  as listed in specifications, based on a coefficient of friction  $\mu = 0.15$  and specified tolerances and clearances. Torque capacities for Half Shrink Discs =  $M_t / 2$ .

- Torque capacities for connections using shaft diameters between the minimum and maximum sizes listed can be approximated through interpolation.
- Transmissible torque decreases if tolerances and/or clearances are larger than specified; or if hollow shafts with bores exceeding 35% of shaft diameter are used.

## THRUST

$F_{ax}$  = transmissible thrust, determined by using the following equation:

$$F_{ax} = \frac{24 \times M_t}{d}, \text{ where } d = \text{shaft diameter (in)}$$

## TORQUE AND THRUST COMBINED

Simultaneous transmission of torque and thrust requires calculating a resultant torque:

$$M_{tres} = \sqrt{T^2 + (F \times D / 2)^2}, \text{ where:}$$

$T$  = peak drive torque (ft-lbs)

$F$  = peak thrust load (lbs)

$D$  = shaft diameter (ft)

Select a unit where  $M_t \geq M_{tres}$ .

## BENDING MOMENTS

Shrink Discs will generally transmit a continuous bending moment equal to 25% of rated torque capacity  $M_t$ .

## RELEASEABILITY

Since the tapers of a B-LOC Shrink Disc are self-releasing and stresses from radial contractions of the hub are well within elastic limits, relaxing of the locking screws results in hub expansion back to its original dimensions, thereby restoring fit clearance for simple disassembly.

## MATERIAL

Shrink Disc inner rings are manufactured from high-carbon steel. Outer rings are made from forged and heat treated alloy steel.

## LUBRICANTS

Shrink Discs are supplied with Molybdenum Disulphide based lubricant applied to the tapers and to the locking screw threads and head contact areas.

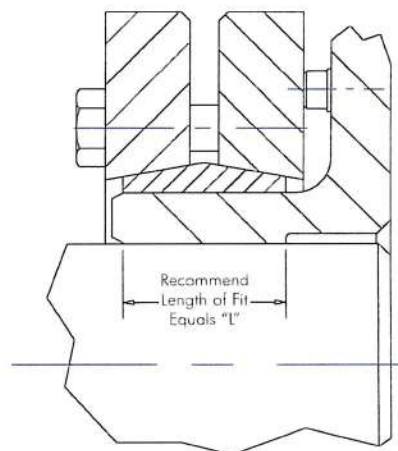
## SHAFT AND HUB MATERIAL

Listed specifications assume shaft and hub material with a yield point of at least 45,000 psi. Cast iron hubs are well suited for compressive stresses exerted by B-LOC Shrink Discs. However, a lower torsional hub strength generally requires the selection of a Shrink Disc at least one size larger than listed if full torque (i.e., that applicable to a steel hub) is to be transmitted.

## LENGTH OF FIT

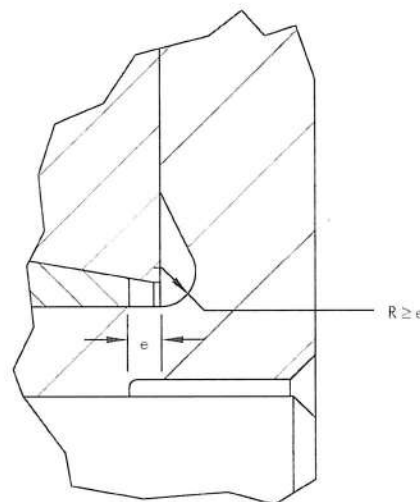
The most recent research on length of fit for a Shrink Disc connection\* indicates that the hub bore-to-shaft interface should be relieved using a non-toleranced clearance except for that portion directly under the Shrink Disc inner ring, for a fit length equal to "L" for a standard Shrink Disc (see illustration at right). This approach eliminates fretting corrosion between shaft and hub which can make the separation of components difficult.

\*(see Casper, Thomas:  
Reibkorrosionsverhalten von Spänelementverbindungen -  
Aachen: Mainz, 1999)



## LOCATING AGAINST HUB FACE

In applications subjected to reversing bending moments, we recommend the configuration at right which requires a hub undercut where  $R \geq e$  for smooth transition.

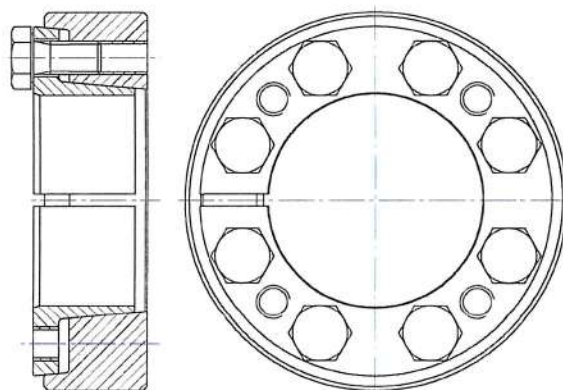


## REGARDING SINGLE TAPER SHRINK DISCS

We generally do not advocate this design due to the following limitations:

- Reduced effective contact length results in significantly higher dynamic fit pressures in applications with bending moments
- Shallow taper angle means units are not self-releasing; removal can be difficult

We offer Single Taper Shrink Discs only upon request.

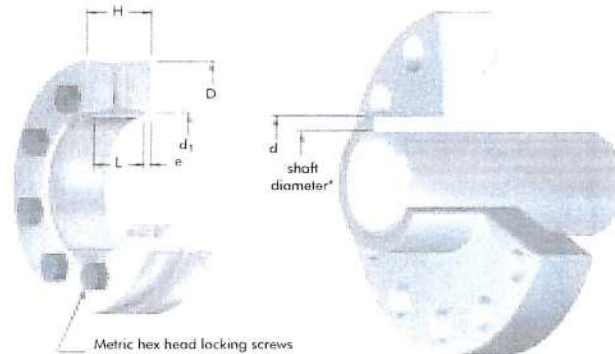






# SHRINK DISCS

STANDARD, LIGHT, AND HEAVY DUTY EXTERNAL LOCKING DEVICES



Metric hex head locking screws  
DIN 931 grade 10.9 (see  $M_A$   
for tightening torque)

\*See table at left for maximum  
diametrical clearance between shaft  
and hub bore. Surface finish for  
shaft and bore, as well as for hub  
OD, to be 63-125  $\mu$ IN RMS.

Standard Shrink Disc

Shaft Sizes		Maximum Diametrical Clearance Between Shaft and Hub Bore
Over	To and Including	
1 1/8	1 1/8	0.0010
1 1/8	1 15/16	0.0015
1 15/16	4 3/4	0.0020
4 3/4	7	0.0030
7	10	0.0040
10	14	0.0050
14		0.0060

## SD SERIES 10 SPECIFICATIONS

## STANDARD DUTY

Size	(Shrink Disc bore/hub OD)		Shaft Diameter Range		$M_t$ (ft-lbs) for min. shaft max. shaft		Locking Screws		Bolt Circle	(Relaxed)							Weight (lbs)	
	d	Hub OD tolerance	min	max			Qty.	Size	$M_A$ (ft-lbs)	Dia.	D	L	H	e	d <sub>1</sub>	a		R
24-10	0.945	+ 0 / - 0.002	0.625	0.774	139	279	6	M5 x 16	3.6	1.417	1.97	0.551	0.71	0.078	1.023	0.098	1/16	0.5
30-10	1.181	+ 0 / - 0.002	0.750	0.967	178	409	7	M5 x 18	3.6	1.732	2.36	0.629	0.79	0.078	1.259	0.098	1/16	0.7
36-10	1.417	+ 0 / - 0.002	0.875	1.161	321	678	5	M6 x 20	8.7	2.047	2.83	0.700	0.87	0.078	1.496	0.098	1/16	0.9
44-10	1.732	+ 0 / - 0.002	1.125	1.419	700	1,220	7	M6 x 20	8.7	2.402	3.15	0.787	0.94	0.078	1.850	0.098	1/16	1.4
50-10	1.969	+ 0 / - 0.002	1.375	1.613	990	1,600	8	M6 x 22	8.7	2.756	3.54	0.866	1.02	0.078	2.086	0.098	1/16	1.8
55-10	2.165	+ 0 / - 0.002	1.500	1.773	1,040	1,740	8	M6 x 25	8.7	2.953	3.94	0.905	1.14	0.118	2.283	0.098	3/32	2.4
62-10	2.441	+ 0 / - 0.002	1.750	1.999	1,750	2,420	10	M6 x 25	8.7	3.386	4.33	0.905	1.14	0.118	2.598	0.098	3/32	2.9
68-10	2.677	+ 0 / - 0.002	1.875	2.192	1,800	2,650	10	M6 x 25	8.7	3.386	4.53	0.905	1.14	0.118	2.834	0.098	3/32	3.0
75-10	2.953	+ 0 / - 0.002	2.125	2.419	2,810	4,090	7	M8 x 25	22	3.937	5.43	0.984	1.22	0.118	3.110	0.197	1/8	3.8
80-10	3.150	+ 0 / - 0.002	2.375	2.580	3,440	4,360	7	M8 x 25	22	3.937	5.71	0.984	1.22	0.118	3.307	0.197	1/8	4.2
90-10	3.543	+ 0 / - 0.004	2.500	2.902	4,780	7,180	10	M8 x 30	22	4.488	6.10	1.181	1.49	0.157	3.700	0.197	1/8	7.3
100-10	3.937	+ 0 / - 0.004	2.875	3.224	7,100	9,640	12	M8 x 35	22	4.882	6.69	1.338	1.69	0.177	4.094	0.197	1/8	10
110-10	4.331	+ 0 / - 0.004	3.125	3.547	8,880	12,430	9	M10 x 40	44	5.354	7.28	1.535	1.93	0.197	4.488	0.197	1/8	13
125-10	4.921	+ 0 / - 0.004	3.500	4.030	13,510	19,260	12	M10 x 40	44	6.299	8.46	1.653	2.04	0.197	5.275	0.197	1/8	18
140-10	5.512	+ 0 / - 0.004	4.000	4.514	19,550	26,310	10	M12 x 45	74	6.890	9.06	1.811	2.28	0.236	5.708	0.197	3/16	23
155-10	6.102	+ 0 / - 0.004	4.500	4.998	27,380	33,880	12	M12 x 50	74	7.559	10.36	1.968	2.44	0.236	6.496	0.197	3/16	31
165-10	6.496	+ 0 / - 0.004	4.875	5.320	37,530	46,890	8	M16 x 55	185	8.268	11.42	2.204	2.67	0.236	6.889	0.197	3/16	49
175-10	6.890	+ 0 / - 0.004	5.250	5.643	41,390	49,740	8	M16 x 55	185	8.661	11.81	2.204	2.67	0.236	7.283	0.197	3/16	50
185-10	7.283	+ 0 / - 0.004	5.625	5.965	56,500	65,630	10	M16 x 65	185	9.291	12.99	2.795	3.34	0.236	7.677	0.197	3/16	82
195-10	7.677	+ 0 / - 0.004	5.875	6.287	71,530	84,460	12	M16 x 65	185	9.685	13.78	2.795	3.34	0.236	8.110	0.197	3/16	91
200-10	7.874	+ 0 / - 0.004	6.250	6.449	80,250	86,650	12	M16 x 65	185	9.685	13.78	2.795	3.34	0.236	8.110	0.197	3/16	90
220-10	8.661	+ 0 / - 0.004	6.375	7.093	91,740	115,770	15	M16 x 75	185	10.630	14.57	3.464	4.06	0.315	8.897	0.295	1/4	119
240-10	9.449	+ 0 / - 0.004	7.000	7.739	130,080	161,120	12	M20 x 80	362	11.614	15.95	3.622	4.22	0.315	9.763	0.295	1/4	148
260-10	10.236	+ 0 / - 0.004	7.625	8.383	161,480	204,390	14	M20 x 90	362	12.638	16.93	4.055	4.69	0.315	10.511	0.295	1/4	181
280-10	11.024	+ 0 / - 0.005	8.375	9.029	209,640	252,360	16	M20 x 100	362	13.622	18.11	4.488	5.20	0.354	11.338	0.394	5/16	225
300-10	11.811	+ 0 / - 0.005	9.000	9.673	256,150	305,450	18	M20 x 100	362	14.331	19.10	4.803	5.52	0.354	12.125	0.394	5/16	260
320-10	12.598	+ 0 / - 0.005	9.625	10.318	309,170	358,200	20	M20 x 100	362	15.197	20.48	4.803	5.52	0.354	12.913	0.394	5/16	288
340-10	13.386	+ 0 / - 0.005	10.250	10.963	390,360	460,420	24	M20 x 110	362	16.063	22.44	5.276	6.14	0.394	13.700	0.394	5/16	409
350-10	13.780	+ 0 / - 0.005	10.875	11.286	430,780	472,150	24	M20 x 110	362	17.008	22.84	5.511	6.30	0.394	14.488	0.394	5/16	429
360-10	14.173	+ 0 / - 0.005	11.250	11.608	449,460	485,630	24	M20 x 110	362	17.008	23.23	5.511	6.30	0.394	14.488	0.394	5/16	449
380-10	14.961	+ 0 / - 0.005	11.500	12.253	534,650	622,650	20	M24 x 120	620	18.031	25.40	5.669	6.46	0.394	15.276	0.394	5/16	526
390-10	15.354	+ 0 / - 0.005	12.250	12.575	632,820	673,460	21	M24 x 120	620	18.425	25.99	5.669	6.46	0.394	15.629	0.492	3/8	572
420-10	16.535	+ 0 / - 0.006	12.500	13.542	685,090	829,050	24	M24 x 130	620	19.843	27.17	6.456	7.25	0.394	16.929	0.492	3/8	630
440-10	17.323	+ 0 / - 0.006	13.500	14.188	768,260	852,150	24	M24 x 130	620	20.748	29.53	6.771	7.56	0.394	17.716	0.492	3/8	835
460-10	18.110	+ 0 / - 0.006	14.125	14.832	936,240	1,053,240	28	M24 x 130	620	21.535	30.32	6.771	7.56	0.394	18.425	0.492	3/8	924
480-10	18.898	+ 0 / - 0.006	14.750	15.477	1,046,400	1,175,610	30	M24 x 150	620	22.441	31.50	7.401	8.39	0.492	19.291	0.591	1/2	1,110
500-10	19.685	+ 0 / - 0.006	15.375	16.122	1,167,170	1,307,490	24	M27 x 150	922	23.228	33.46	7.401	8.39	0.492	19.999	0.591	1/2	1,265

Notes:

1. Inner Rings of all Shrink Discs are supplied with (1) lengthwise slit
2. Shrink Discs are available for shafts up to 40" dia. and in a variety of special designs.
3. Max. shaft sizes listed for Series 10 and Series 30 Shrink Discs reflect equal section moduli of shaft and hub (max. shaft dia. =  $\frac{d}{1.221}$ )

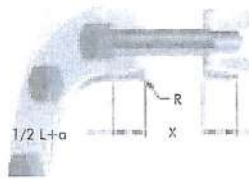
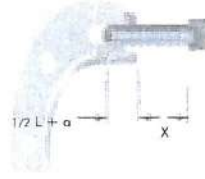
### Specifications for Web Clearance Holes (diameter in inches)

Screw Size	M5	M6	M8	M10	M12	M16	M20	M24	M27
Split Shrink Disc	0.281	0.328	0.406	0.500	0.594	0.750	0.906	1.063	1.188
Half Shrink Disc HT	0.219	0.266	0.359	0.438	0.531	0.719	0.875	1.031	1.156



**Ordering Information:**

Specify series & size when ordering (e.g., Shrink Disc 125-10).  
Add the suffix "Split" or "Half", along with the web thickness  
"X" if a Split Shrink Disc or Half Shrink Disc Type HT is  
required. (See table at bottom of facing page for web  
clearance hole data.)

**Split Shrink Disc****Half Shrink Disc  
Type HT****Half Shrink Disc  
Type HC****SD SERIES 20 SPECIFICATIONS****LIGHT DUTY**

Size	(Shrink Disc bore/hub OD) d	Hub OD tolerance	Shaft Diameter Range min max		M <sub>t</sub> (ft.-lbs) for min. shaft max. shaft		Locking Screws Qty. Size		M <sub>A</sub> (ft.-lbs)	Bolt Circle Dia.	(Relaxed)							Weight (lbs)
											D	L	H	e	d <sub>1</sub>	a	R	
125-20	4.921 + 0 / - 0.004		3.625	4.125	9,240	13,160	8	M10 x 40	44	6.220	7.48	1.535	2.05	0.236	5.118	0.197	1/8	13
140-20	5.512 + 0 / - 0.004		4.250	5.000	15,240	22,460	10	M10 x 40	44	6.889	8.67	1.535	2.05	0.236	5.669	0.197	1/8	18
155-20	6.102 + 0 / - 0.004		5.000	5.500	23,010	29,710	12	M10 x 40	44	7.559	9.65	1.535	2.05	0.236	6.259	0.197	1/8	22
165-20	6.496 + 0 / - 0.004		5.375	5.750	30,500	36,500	10	M12 x 50	74	8.267	10.24	1.811	2.44	0.314	6.653	0.197	3/16	31
175-20	6.890 + 0 / - 0.004		5.625	6.125	31,200	39,150	10	M12 x 50	74	8.661	10.83	1.811	2.44	0.314	7.047	0.197	3/16	35
185-20	7.283 + 0 / - 0.004		6.000	6.500	41,440	50,790	12	M12 x 50	74	8.858	11.62	1.811	2.44	0.314	7.440	0.197	3/16	44
195-20	7.677 + 0 / - 0.004		6.500	7.000	58,690	70,740	15	M12 x 60	74	9.330	12.40	2.204	2.84	0.314	7.834	0.197	3/16	60
220-20	8.661 + 0 / - 0.004		7.000	7.875	76,060	100,400	10	M16 x 70	185	10.433	13.59	2.598	3.31	0.354	8.818	0.197	3/16	77
240-20	9.449 + 0 / - 0.004		7.875	8.500	106,450	129,210	12	M16 x 70	185	11.417	14.57	2.598	3.31	0.354	9.606	0.295	1/4	97
260-20	10.236 + 0 / - 0.004		8.625	9.250	139,180	165,750	12	M16 x 70	185	12.204	15.55	2.834	3.63	0.354	10.433	0.295	1/4	106
280-20	11.024 + 0 / - 0.005		9.000	9.875	157,880	199,380	16	M16 x 75	185	13.110	16.74	3.307	4.10	0.393	11.220	0.295	1/4	132
300-20	11.811 + 0 / - 0.005		9.875	10.625	204,180	241,460	18	M16 x 75	185	14.094	18.11	3.307	4.10	0.393	12.007	0.295	1/4	165
320-20	12.598 + 0 / - 0.005		10.500	11.375	237,630	290,520	18	M16 x 75	185	14.881	19.49	3.307	4.18	0.433	12.795	0.295	1/4	185
340-20	13.386 + 0 / - 0.005		11.375	12.000	279,490	319,180	20	M16 x 75	185	15.826	21.07	3.307	4.18	0.433	13.582	0.295	1/4	220
360-20	14.173 + 0 / - 0.005		11.875	12.625	340,430	396,400	16	M20 x 90	362	16.653	21.85	3.937	4.81	0.433	14.370	0.394	5/16	275
380-20	14.961 + 0 / - 0.005		12.500	13.000	401,610	442,760	18	M20 x 100	362	17.401	23.03	4.409	5.35	0.472	15.236	0.394	5/16	301
390-20	15.354 + 0 / - 0.005		12.625	13.750	444,290	546,850	20	M20 x 100	362	17.795	23.43	4.409	5.36	0.472	15.629	0.394	5/16	344
420-20	16.535 + 0 / - 0.006		13.750	14.625	488,970	562,970	20	M20 x 100	362	19.094	24.81	4.724	5.67	0.472	16.810	0.394	5/16	407
460-20	18.110 + 0 / - 0.006		14.625	16.375	591,520	786,300	24	M20 x 110	362	20.747	26.97	5.196	6.22	0.511	18.425	0.492	3/8	517
500-20	19.685 + 0 / - 0.006		16.250	17.375	856,450	1,010,750	30	M20 x 120	362	22.519	29.53	5.984	7.01	0.511	19.999	0.492	3/8	704

See Additional Notes under SD SERIES 10 Table

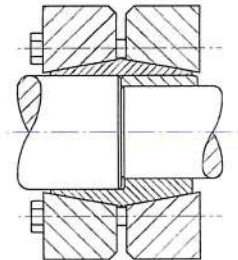
**SD SERIES 30 SPECIFICATIONS****HEAVY DUTY**

Size	(Shrink Disc bore/hub OD) d	Hub OD tolerance	Shaft Diameter Range min max		M <sub>t</sub> (ft.-lbs) for min. shaft max. shaft		Locking Screws Qty. Size		M <sub>A</sub> (ft.-lbs)	Bolt Circle Dia.	(Relaxed)							Weight (lbs)
											D	L	H	e	d <sub>1</sub>	a	R	
44-30	1.732 + 0 / - 0.002		1.125	1.419	950	1,670	5	M8 x 30	22	2.598	3.35	1.102	1.34	0.100	1.890	0.098	1/16	1.4
50-30	1.969 + 0 / - 0.002		1.375	1.613	1,780	2,770	7	M8 x 35	22	2.874	3.74	1.181	1.54	0.180	2.126	0.098	1/16	1.8
55-30	2.165 + 0 / - 0.002		1.500	1.773	1,910	3,040	7	M8 x 35	22	3.071	4.13	1.181	1.54	0.180	2.323	0.098	3/32	2.4
62-30	2.441 + 0 / - 0.002		1.750	1.999	2,370	3,270	7	M8 x 35	22	3.346	4.53	1.181	1.54	0.180	2.598	0.098	3/32	2.9
68-30	2.677 + 0 / - 0.002		1.875	2.192	2,880	4,190	8	M8 x 35	22	3.622	4.72	1.181	1.54	0.180	2.835	0.098	3/32	3.0
75-30	2.953 + 0 / - 0.002		2.125	2.419	4,480	6,450	7	M10 x 40	44	4.134	5.71	1.417	1.81	0.200	3.307	0.197	1/8	3.8
80-30	3.150 + 0 / - 0.002		2.375	2.580	5,460	6,870	7	M10 x 40	44	4.134	5.71	1.417	1.81	0.200	3.307	0.197	1/8	4.2
90-30	3.543 + 0 / - 0.004		2.500	2.902	5,860	8,870	8	M10 x 40	44	4.567	6.30	1.575	1.97	0.200	3.701	0.197	1/8	7.3
100-30	3.937 + 0 / - 0.004		2.875	3.224	9,230	12,520	10	M10 x 45	44	4.961	6.69	1.732	2.13	0.200	4.094	0.197	1/8	10
110-30	4.331 + 0 / - 0.004		3.125	3.547	14,140	19,590	14	M10 x 45	44	5.354	7.28	2.126	2.60	0.236	4.482	0.197	1/8	17
125-30	4.921 + 0 / - 0.004		3.500	4.030	19,990	28,240	12	M12 x 50	74	6.299	8.47	2.126	2.60	0.236	5.157	0.197	3/16	24
140-30	5.512 + 0 / - 0.004		4.000	4.514	23,150	31,330	12	M12 x 60	74	6.889	9.06	2.362	2.92	0.275	5.744	0.197	3/16	29
155-30	6.102 + 0 / - 0.004		4.500	4.998	33,980	42,060	15	M12 x 60	74	7.795	10.36	2.598	3.15	0.275	6.496	0.197	3/16	44
165-30	6.496 + 0 / - 0.004		4.875	5.320	46,700	58,440	10	M16 x 70	185	8.267	11.42	2.834	3.47	0.314	6.940	0.197	3/16	57
175-30	6.890 + 0 / - 0.004		5.250	5.643	51,520	61,990	10	M16 x 70	185	8.661	11.82	2.834	3.47	0.314	7.322	0.197	3/16	64
185-30	7.283 + 0 / - 0.004		5.625	5.965	86,390	99,860	15	M16 x 80	185	9.291	12.99	3.622	4.41	0.393	7.704	0.197	3/16	104
195-30	7.677 + 0 / - 0.004		5.875	6.287	89,010	105,230	15	M16 x 80	185	9.685	13.78	3.622	4.41	0.393	8.102	0.295	1/4	110
200-30	7.874 + 0 / - 0.004		6.250	6.449	99,940	107,960	15	M16 x 80	185	9.685	13.78	3.622	4.41	0.393	8.102	0.295	1/4	110
220-30	8.661 + 0 / - 0.004		6.375	7.093	122,800	154,880	20	M16 x 90	185	10.629	14.57	4.488	5.28	0.393	8.901	0.295	1/4	143
240-30	9.449 + 0 / - 0.004		7.000	7.739	161,810	200,550	15	M20 x 100	362	11.614	15.95	4.724	5.67	0.472	9.692	0.295	1/4	192
260-30	10.236 + 0 / - 0.005		7.625	8.383	206,810	262,130	18	M20 x 110	362	12.637	16.93	5.354	6.30	0.472	10.511	0.295	1/4	220
280-30	11.024 + 0 / - 0.005		8.375	9.029	260,760	314,360	20	M20 x 120	362	13.622	18.11	5.826	6.77	0.472	11.370	0.394	5/16	291
300-30	11.811 + 0 / - 0.005		9.000	9.673	280,480	335,900	20	M20 x 120	362	14.330	19.10	5.984	6.93	0.472	12.177	0.394	5/16	308
320-30	12.598 + 0 / - 0.005		9.625	10.318	367,360	425,990	24	M20 x 120	362	15.196	20.48	6.299	7.25	0.472	12.964	0.394	5/16	363
340-30	13.386 + 0 / - 0.005		10.250	10.963	462,660	547,470	20	M24 x 130	620	16.535	22.44	6.929	7.88	0.472	13.724	0.394	5/16	528
360-30	14.173 + 0 / - 0.005		11.000	11.608	505,300	578,440	20	M24 x 140	620	17.007	23.23	7.086	8.04	0.472	14.515	0.492	3/8	550
390-30	15.354 + 0 / - 0.005		11.625	12.575	628,570	761,590	24	M24 x 140	620	18.425	25.99	7.401	8.35	0.472	15.787	0.492	3/8	770
420-30	16.535 + 0 / - 0.006		12.500	13.542	852,340	1,032,960	30	M24 x 160	620	19.842	27.17	8.425	9.37	0.472	16.811	0.492	3/8	902
460-30	18.110 + 0 / - 0.006		13.625	14.832	1,142,170	1,401,060	28	M27 x 170	922	21.535	30.32	8.818	9.93	0.551	18.503	0.591	1/2	1,188
500-30	19.685 + 0 / - 0.006		14.875	16.122	1,440,340	1,745,790	32	M27 x 180	922	23.228	33.47	9.685	10.79	0.551	19.999	0.591	1/2	1,650

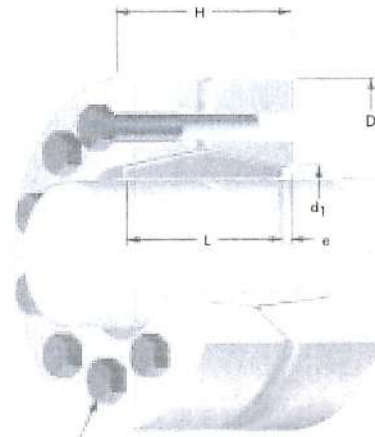
See Additional Notes under SD SERIES 10 Table



## WK SERIES RIGID SHAFT COUPLINGS



WK Coupling can be manufactured to accommodate different shaft diameters; this can also be accomplished using an adaptor sleeve.



$d$  = Shaft dia. machined to  $d + 0/-T$

$T = .003"$  for shafts up to 1"  
 $.006"$  for shafts over 1"

Metric hex head locking screws  
 DIN 931 grade 10.9 (see  $M_A$   
 for tightening torque)

Note: Shaft engagement equal for both  
 ends with gap not exceeding 5% of  
 shaft diameter.

### Ordering Information:

Specify series & size when ordering  
 (e.g. WK Series Coupling 50-12 / 2").

### WK SERIES COUPLING SPECIFICATIONS

Type	Size	d	D	(Relaxed)				Bolt Circle Dia.	M <sub>f</sub> (ft.-lbs)	Locking Screws			Weight (lbs)
				H	L	e	d <sub>1</sub>			Qty.	Size	M <sub>A</sub> (ft.-lbs)	
WK 15-12	5/8	0.625	2.047	1.339	1.181	0.079	0.827	1.378	134	3	M6 x 30	8.7	0.9
	11/16	0.6875							148				0.9
	3/4	0.750							161				0.9
WK 20-12	13/16	0.8125	2.362	1.575	1.339	0.118	1.024	1.614	290	5	M6 x 35	8.7	1.4
	7/8	0.875							313				1.3
	15/16	0.9375							335				1.3
WK 25-12	1	1.000	2.598	1.732	1.496	0.118	1.260	1.890	501	7	M6 x 35	8.7	1.8
	1 1/16	1.0625							532				1.8
	1 1/8	1.125							563				1.7
WK 30-12	1 3/16	1.1875	2.992	1.890	1.654	0.118	1.496	2.126	679	8	M6 x 40	8.7	2.7
	1 1/4	1.250							715				2.7
	1 3/8	1.375							787				2.6
WK 40-12	1 7/16	1.4375	3.780	2.205	1.969	0.118	1.850	2.638	1,324	7	M8 x 45	22	5.0
	1 1/2	1.500							1,382				5.0
	1 5/8	1.625							1,496				4.8
	1 11/16	1.6875							1,554				4.7
	1 3/4	1.750							1,612				4.7
WK 50-12	1 7/8	1.875	4.409	2.676	2.362	0.157	2.283	3.150	2,467	10	M8 x 50	22	7.9
	1 15/16	1.9375							2,549				7.8
	2	2.000							2,631				7.8
	2 1/8	2.125							2,796				7.7
WK 60-12	2 3/16	2.1875	4.724	3.071	2.756	0.157	2.598	3.504	3,454	12	M8 x 55	22	10.3
	2 1/4	2.250							3,552				10.0
	2 3/8	2.375							3,750				9.8
	2 7/16	2.4375							3,848				9.6
	2 1/2	2.500							3,947				9.3
WK 70-12	2 9/16	2.5625	5.826	3.464	3.150	0.157	3.110	4.173	6,430	12	M10 x 65	44	19.2
	2 5/8	2.625							6,587				18.6
	2 11/16	2.6875							6,744				18.2
	2 3/4	2.750							6,901				17.9
	2 7/8	2.875							7,214				17.3
WK 80-12	2 15/16	2.9375	6.693	4.095	3.701	0.197	3.701	4.961	8,965	10	M12 x 80	74	28.2
	3	3.000							9,156				28.0
	3 1/8	3.125							9,537				27.0
	3 1/4	3.250							9,919				26.2
	3 3/8	3.375							10,300				25.9
WK 90-12	3 7/16	3.4375	7.283	4.567	4.173	0.197	4.094	5.433	12,589	12	M12 x 85	74	36.3
	3 1/2	3.500							12,818				35.6
	3 5/8	3.625							13,275				34.9
	3 3/4	3.750							13,734				34.2
	3 7/8	3.875							14,191				33.5
WK 100-12	3 15/16	3.9375	7.756	4.960	4.488	0.236	4.488	5.866	18,023	15	M12 x 90	74	43.2
	4	4.000							18,311				42.6
	4 1/4	4.250							19,456				41.9



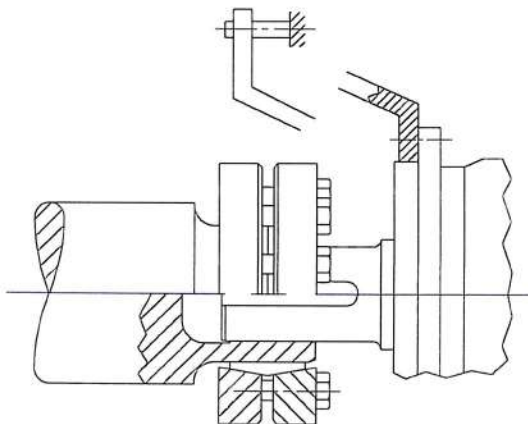
# B-LOC RIGID SHRINK DISC COUPLINGS

B-LOC Shrink Discs are perfect for creating custom rigid shaft couplings that transmit high torque and/or bending loads. Due to their high load capacities, B-LOC Shrink Disc couplings are frequently used to shaft-mount hydraulic drives and speed reducers. This design solution:

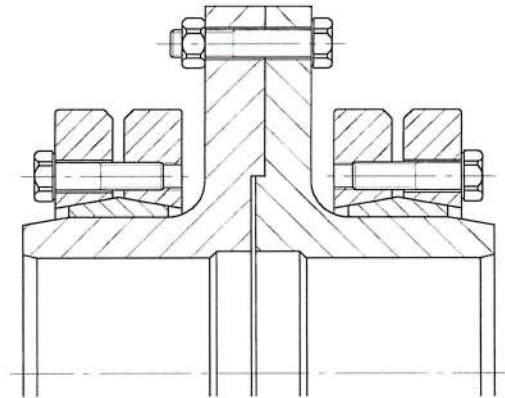
- Can easily accommodate different sized shafts.
- Results in a zero backlash interference fit that will never wear out or pound out, even when subjected to repeated shock or reversing loads.
- Eliminates the need for support structures or foundations, since the drive/reducer is mounted directly to the shaft.
- Eliminates the need for costly flexible couplings, since shaft misalignment issues disappear.
- Facilitates quick and easy coupling mounting and disassembly, even in field installations.
- Permits infinite radial and axial adjustment.

B-LOC can supply a complete coupling or the Shrink Discs only. We're also happy to provide coupling design and Shrink Disc selection assistance. Note that flange-type couplings can also be designed to be mounted with Locking Assemblies instead of Shrink Discs.

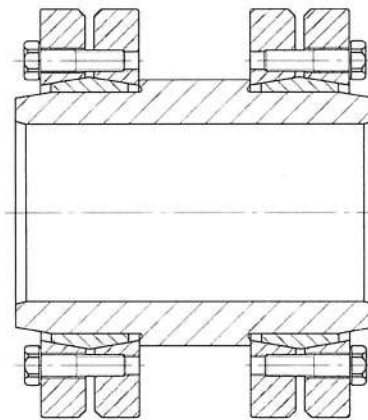
In applications using different sized shafts where space is limited, it may be possible to employ a "dowel" type coupling, as illustrated below:



**Dowel-type Shrink Disc Coupling**



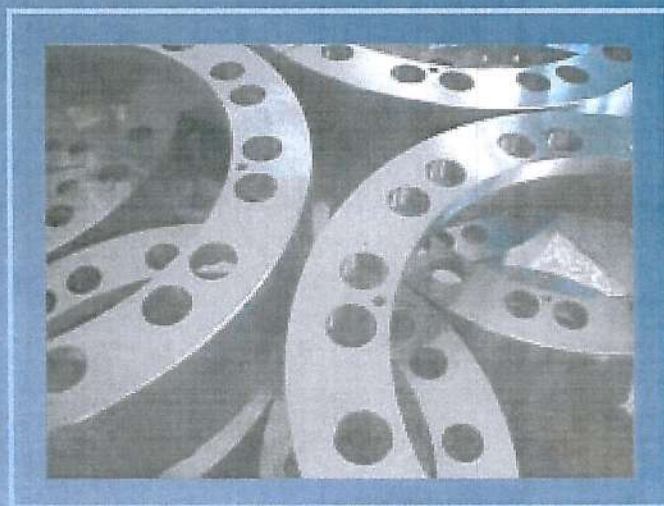
**F Series  
Flange-type Shrink Disc Coupling**



**Sleeve-type Shrink Disc Coupling**

*Please contact us for more information  
on B-LOC Rigid Couplings.*





**AUTHORIZED DISTRIBUTOR**

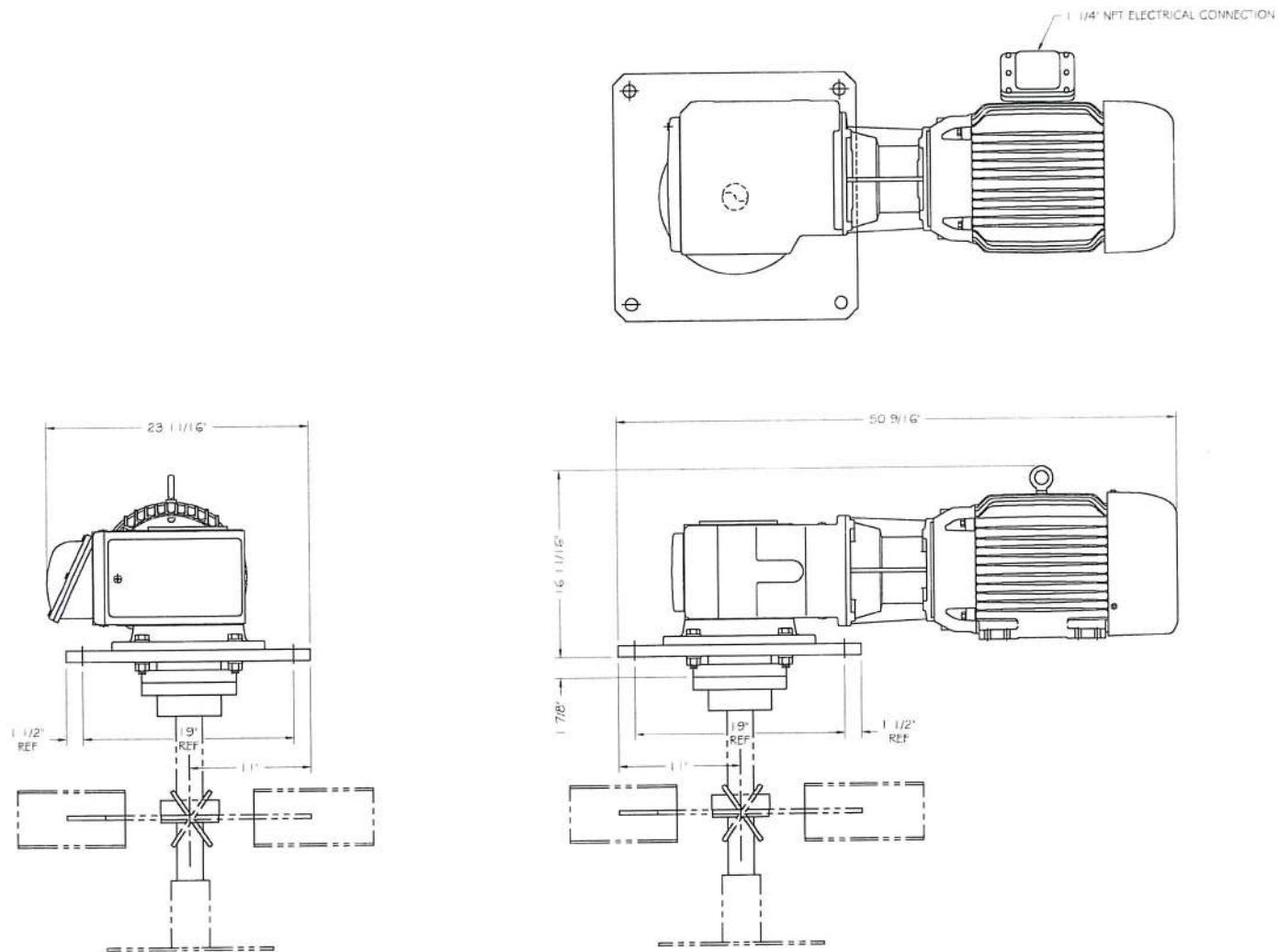


**B-LOC** CORP.  
KEYLESS FRICTIONAL LOCKING DEVICES

26 Gilbert St.  
Monroe, NY 10950  
**800-865-7756**

Phone: (845) 782-5650 • Fax: (845) 783-0271  
Web: [www.b-loc.com](http://www.b-loc.com) • Email: [info@b-loc.com](mailto:info@b-loc.com)

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MUD AGITATOR  
 MA-15

DRAWN BY: F. ALLEY	CHECKED BY:	APPROVED BY:
SCALE: NTS	PART NUMBER:	QUANTITY:
DATE: 12.01.09	MATERIAL:	STREET: 0



# **BALDOR® • RELIANCE**

**Product Information Packet**  
**DRAGON PRODUCTS LTD**

**CEM7054T-I**

**15//10HP, 1765//1470RPM, 3PH, 60//50HZ, 254T**



Part Detail									
Revision:	K	Status:	PRD/A	Change #:		Proprietary:	No		
Type:	AC	Prod. Type:	0942M	Elec. Spec:	09WGW980	CD Diagram:			
Enclosure:	XPFC	Mfg Plant:		Mech. Spec:	09F368	Layout:			
Frame:	254TC	Mounting:	F1	Poles:	04	Created Date:	06-10-2010		
Base:	RG	Rotation:	R	Insulation:	F	Eff. Date:	02-14-2013		
Leads:	9#12	Literature:		Elec. Diagram:		Replaced By:			
Nameplate NP0977XPSL									
NO.				CC	010A				
SER.				TEMP CODE	T3C				
SPEC.	09F368W980G1								
CAT.NO.	CEM7054T-I								
HP	15//10								
VOLTS	230/460//190/380								
AMPS	36/18//28.8/14.4								
RPM	1765//1470			MOTOR WEIGHT	370				
HERTZ	60//50			PH	3	CL	F	DE BRG	6309
SER.F.	1.15			DES	B	CODE	H	ODE BRG	6208
FRAME	254TC			GREASE	POLYREX EM				
RATING	40C AMB-CONT								
USABLE AT 208V	37			NEMA-NOM-EFF	92.4	PF	84		
55C AMB @ 1.0 SF 60C RISE									

Parts List		
Part Number	Description	Quantity
SA198387	SA 09F368W980G1	1.000 EA
RA185755	RA 09F368W980G1	1.000 EA
HW1002A63	WASHER, 5/8 HI-COLLAR SPRCKWASHER	1.000 EA
MJ5000A01	SEALANT, CHICO A COMPOUND	0.050 LB
09CB1003A01	CONDUIT BOX MACH. GROUP C MTRS	1.000 EA
10XN3118K24	5/16-18 X 1.50" HEX HD, GRADE 5	4.000 EA
HW1001A31	LOCKWASHER 5/16, ZINC PLT.591 OD, .319 I	4.000 EA
WD1000B25	BURNDY TERMINAL L125HP	1.000 EA
10XN3118K12	5/16-18 X .75 GRADE 5, ZINC PLATED	1.000 EA
HW1001A31	LOCKWASHER 5/16, ZINC PLT.591 OD, .319 I	1.000 EA
09EP1700A33P	FR ENDPLATE, MACH, XPFC W/DRN HW4505A02	1.000 EA
HW4505A02	BREATHING/DRAIN-EXP PROOF-.250-18 PTF AIS	1.000 EA
HW3023E06	.125 X .625 SPIRAL SPRING PIN	1.000 EA
10XN3816K28	3/8-16 X 1.75 HEX HD CAP SCREW, GRADE 5	4.000 EA
HW1001A38	LOCKWASHER 3/8, ZINC PLT .688 OD, .382 I	4.000 EA
HW5100A08	W3118-035 WVY WSHR (WB)	1.000 EA
10XN2520K36	1/4-20 X 2.25" HX HD SCRWGRADE 5, ZINC P	4.000 EA
HW1001A25	LOCKWASHER 1/4, ZINC PLT .493 OD, .255 I	4.000 EA
09EP1708A19P	PUEP, MACH W/METAL SLINGER & HW4505A02 W	1.000 EA
HW4505A02	BREATHING/DRAIN-EXP PROOF-.250-18 PTF AIS	1.000 EA
HW3023E06	.125 X .625 SPIRAL SPRING PIN	1.000 EA
10XN3816K28	3/8-16 X 1.75 HEX HD CAP SCREW, GRADE 5	4.000 EA
HW1001A38	LOCKWASHER 3/8, ZINC PLT .688 OD, .382 I	4.000 EA
HA2066A01	SLINGER, ALUM (AUTO)	1.000 EA

Parts List (continued)		
Part Number	Description	Quantity
80XN1032A07	SET SCREW, HEX XOCK, ZN	1.000 EA
09FH1004A03	FAN COVER, MACH	1.000 EA
10XN2520K14	1/4-20 X .88 HEX GRD 5 (20001)	3.000 EA
HW1001A25	LOCKWASHER 1/4, ZINC PLT .493 OD, .255 I	3.000 EA
09CB1502A01	CONDUIT BOX LID MACH. GROUP C MTRS	1.000 EA
84XN5013J24	1/2-13 X 1-1/2 HEX SOCKET HD CAP SCREW	6.000 EA
HW1001A50	LOCKWASHER 1/2, ZINC PLT .879 OD, .509 I	6.000 EA
HW2501G25	KEY, 3/8 SQ X 2.875	1.000 EA
LB1115	LABEL,LIFTING DEVICE	1.000 EA
HW4500A20	1/8NPT SL PIPE PLUG	2.000 EA
MJ1000A75	GREASE, POLYREX EM EXXON	0.080 LB
HW4500A20	1/8NPT SL PIPE PLUG	2.000 EA
09FN3001D01SP	EXTERNAL FAN, PLASTIC	1.000 EA
HW2500A25	WOODRUFF KEY USA #1008 #BLOW CARBON STEE	1.000 EA
51XB1214A20	12-14X1.25 HWSSLD SERTYB	1.000 EA
MG1025G05	PAINT 789.201 (WILCO) DARK GRAY METALLIC	0.050 GA
85XU0407A04	#4-7 X 1/4 DRIVE PIN	6.000 EA
LB1081	ALUM XP CAUTION LABEL	1.000 EA
LB5040	INSTRUCTION TAG, AC & DC	1.000 EA
LB1119	WARNING LABEL	1.000 EA
LB1125C02	SUPER-E (STOCK CTN LABEL SUPER-E WITH FL	4.000 EA
LC0145B01	CONNECTION LABEL	1.000 EA
NP0977XPSL	SS XP UL CSA CC CL-I GP-C&D	1.000 EA
40PA1005	PACKAGING GROUP, 09 STD	1.000 EA



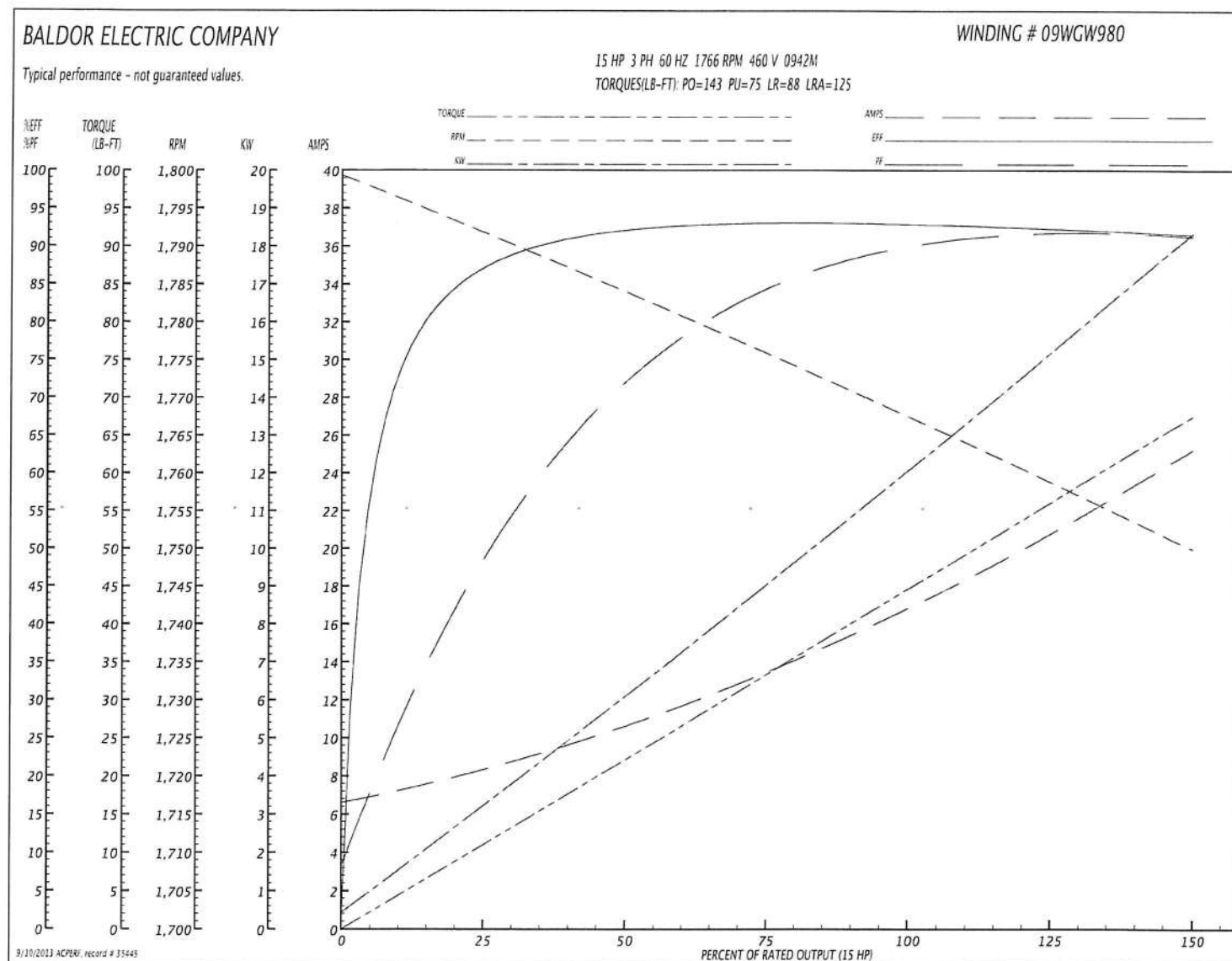
**Performance Data at 460V, 60Hz, 15.0HP (Typical performance - Not guaranteed values)**
**General Characteristics**

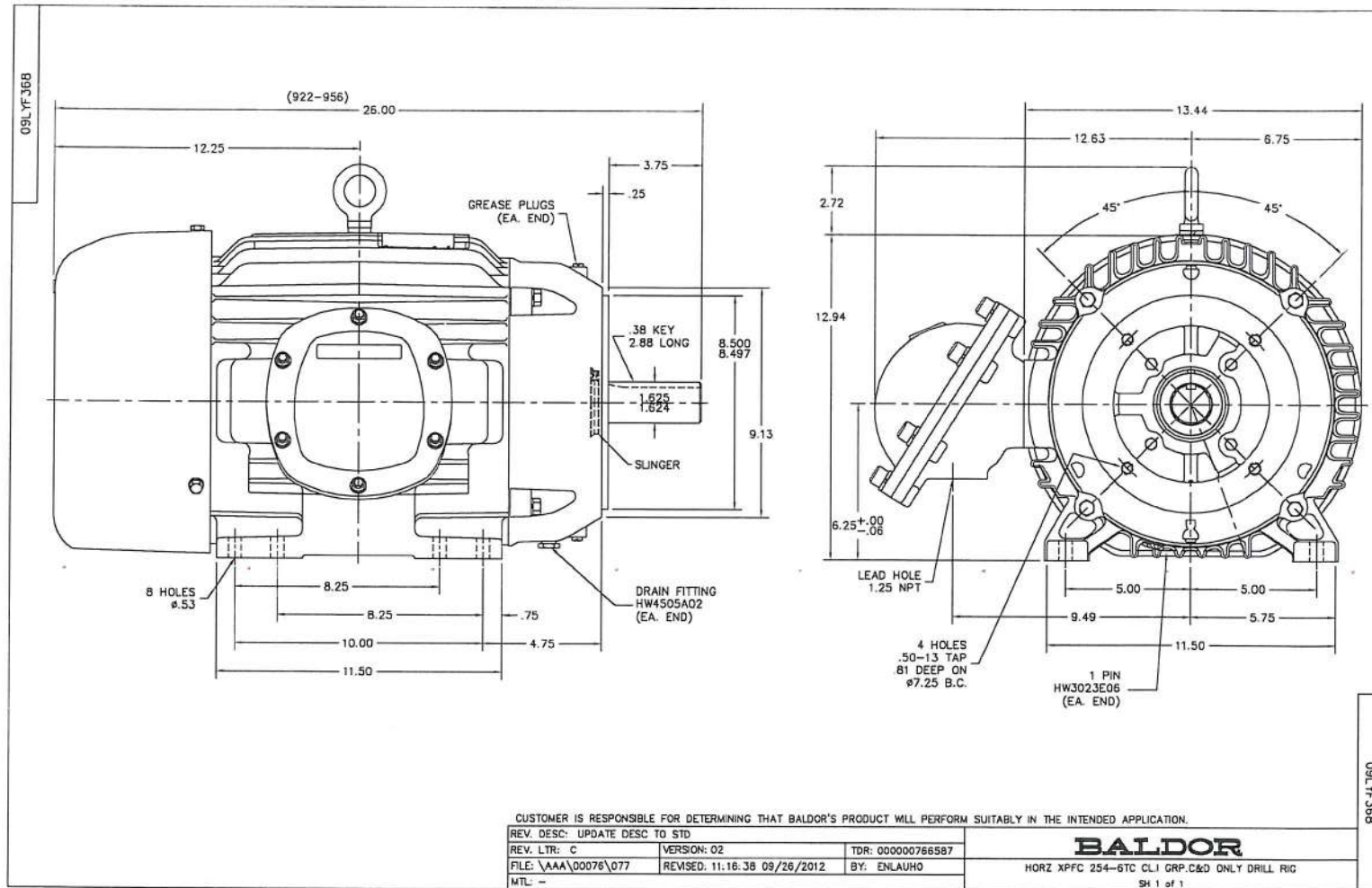
Full Load Torque:	45.0 LB-FT	Start Configuration:	DOL
No-Load Current:	6.95 Amps	Break-Down Torque:	143.0 LB-FT
Line-line Res. @ 25°C.:	0.577 Ohms A Ph / 0.0 Ohms B Ph	Pull-Up Torque:	75.0 LB-FT
Temp. Rise @ Rated Load:	47 C	Locked-Rotor Torque:	88.0 LB-FT
Temp. Rise @ S.F. Load:	56 C	Starting Current:	125.0 Amps

**Load Characteristics**

% of Rated Load	25	50	75	100	125	150	S.F.
Power Factor:	49.0	71.0	81.0	86.0	88.0	89.0	87.0
Efficiency:	87.9	92.1	93.0	92.8	92.3	91.5	92.5
Speed:	1792.0	1784.0	1776.0	1766.0	1759.0	1750.0	1762.0
Line Amperes:	7.9	10.5	13.7	17.2	21.0	25.0	19.5

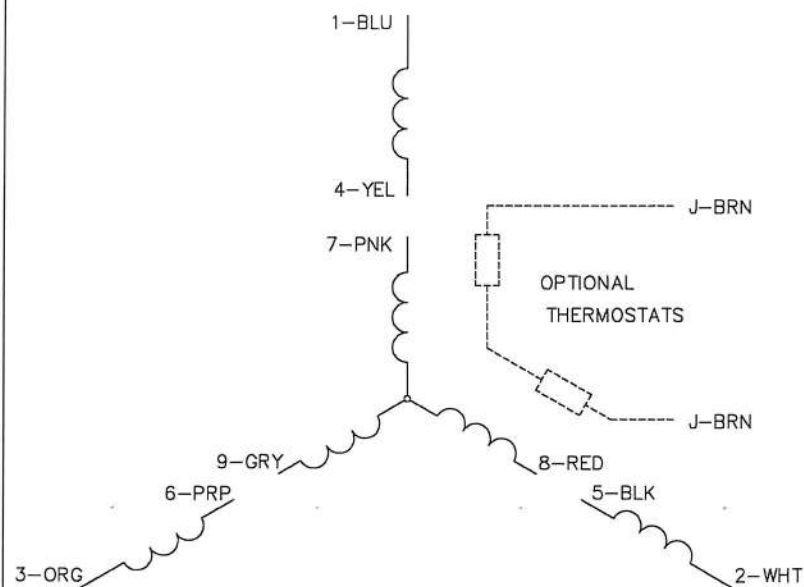
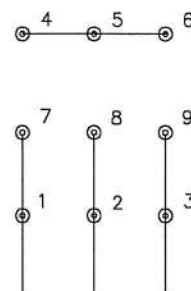
Performance Graph at 460V, 60Hz, 15.0HP Typical performance - Not guaranteed values



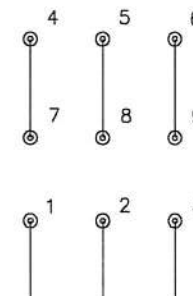




CD0005


 LOW VOLTAGE  
(2Y)


LINE

 HIGH VOLTAGE  
(1Y)


LINE

## NOTES:

1. INTERCHANGE ANY TWO LINE LEADS TO REVERSE ROTATION.
2. OPTIONAL THERMOSTATS ARE PROVIDED WHEN SPECIFIED.
3. ACTUAL NUMBER OF INTERNAL PARALLEL CIRCUITS MAY BE A MULTIPLE OF THOSE SHOWN ABOVE.
4. LEAD COLORS ARE OPTIONAL. LEADS MUST ALWAYS BE NUMBERED AS SHOWN.

REV. DESC: REVISE TO SHOW OPTIONAL COLORS

REV. LTR: E BY: JLP REVISED: 01/19/99 10:15 TDR: 0171435

S00000

FILE: AAA00005140

MDL: -

MTL: -

**BALDOR ELECTRIC Co.**

3PH, DV, 9 LEADS

CD0005



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# **INSTALLATION/SERVICE MANUAL**

for

## **Off-Highway Stabilizing Systems**

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# Ordering Information

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**POWER GEAR**  
950 Green Valley Road  
P.O. Box 695  
Beaver Dam, WI 53916  
800-334-4712  
Fax (920) 887-0841

## **ORDERING INFORMATION**

When ordering parts, please provide the following information:

1. Your Name
2. Phone Number
3. Company Name
4. Shipping Address
5. Billing Address
6. Purchase Order Number

## **FOR EACH PART NEEDED**

1. Part Number
2. Description
3. Quantity

# Warranty

Power Gear warrants to the Purchaser that the product shall be free from defects in material and workmanship at the time of manufacture and appearing within 12 months from the Product's date of sale by Power Gear.

Power Gear makes no other warranties or representations, express or implied, by operation of law or otherwise, including but not limited to any express or implied warranty as to merchantability or fitness for a particular purpose.

This warranty shall not extend to claims that result, in Power Gear's judgement, from misuse, negligence, neglect, accident, alteration, use contrary to instructions (including, but not limited, to moving a vehicle without retracting the leveler product), installation contrary to instructions or recommended installation practice, use of unauthorized components or parts, or unauthorized repair or service.

In addition, Power Gear shall not be liable on any claims under this warranty with respect to which purchaser shall not have given notice to Power Gear within 30 days of purchaser receiving notice of the facts giving rise to such claim.

POWER GEAR

P.O. BOX 695

BEAVER DAM, WI 53916

PHONE (920) 887-0317 OR (800) 334-4712

FAX (920) 887-0841

**Power Gear reserves the right to  
change or modify specifications without notice.**

# Hydraulic Fluid Specifications

## Part No. 100500

**PG-AWF** is a specially-formulated hydraulic fluid to be used on all power gear systems. **PG-AWF** hydraulic fluid assures better overall life and performance. **PG-AWF** fluid has been formulated for hydraulic systems that must operate in subzero temperatures and it has a viscosity which prevents the sluggish action experienced with most other oils operating in subzero conditions.

Protect your investment and prevent freeze-up and sluggish performance. Save dollars in downtime and repair...specify **PG-AWF** hydraulic fluid for your power gear systems. Available in 5-gallon easy-pour cans.

- Assures easy flow at zero and below.
- Prevents seal deterioration and swelling .
- Assures proper lubrication and better overall performance.
- All-weather. Operating temperature range -20° F to 180° F
- Low pour point is -40° F
- Filtered to 10 microns nominal

### RECOMMENDED HYDRAULIC FLUIDS FOR POWER GEAR

In the past, there has been confusion as to what fluid(s) should be used with power gear systems. Extensive research and experience by our engineering department has determined the following:

In most applications, Type A automatic transmission fluid (ATF, Dextron II, etc.,) will work satisfactorily. If operating in cold temperatures (below freezing) slow operation will occur. If slower operation in cold weather affects your operations, we recommend using a fluid specially-formulated for cold temperatures. We have found the following fluids work well with power gear systems to -20° F.

Power Gear AWF  
Mobil DTE 11  
Mil. Spec. H5606

Texaco Rando HDZ-15HVI  
Kendall Hyden Glacial Blu

If consistently operating at temperatures below -20° F, then we recommend using fluids conforming to MIL-H-5606 (aeronautical fluid). If you have any questions regarding fluid recommendations, please call us.

**NOTE:** Our experience indicates that mixtures of oil and fuel oil cause seals to swell, resulting in subsequent sticking or sluggish action on the landing legs.

## Maintenance/Control Box Operation Instructions

### Maintenance

- A. Grease the legs (if applicable) every 6 months with NLGA Grade "OO" or "O" grease. Pump grease until grease is observed exiting the lower area close to the shoe.

**NOTE:** Always grease leg in the fully retracted position.

- B. Seals and lock valves - no maintenance is required. Repair only if malfunction is observed (see trouble shooting).

### C. Fluid

1. Drain fluid and change oil filter every 12 months. With legs (cylinders) retracted, drain the reservoir fluid using the drain plug on bottom of the reservoir. Change filter P/N 06-1014. Remove fill plug, add specified fluid until oil level reaches the top of the sight gage, and reinstall fill plug.
2. Check fluid level every 2 months as indicated in (1) above.

- D. Perform engine maintenance as specified in engine manual.

### AC Operation

To Operate System:

- A. Connect power to system per local codes.

- B. Move the lever of control valve of the leg you wish to raise or lower.

### DC Operation

To Operate System:

- A. Turn key switch fully clockwise.
- B. "Flip" paddle switch up to energize the pump. Release switch to stop pump. (It is spring centered to "off" position.)
- C. Move the lever of control valve of the leg you wish to raise or lower.

### Gas Engine Operation:

To Operate System:

- A. Check engine oil and gas level.
- B. Start engine.
- C. Move the lever of control valve of the leg you wish to raise or lower.

**DANGER:** Do not place any body parts (feet) below leg shoe while in operation. The operator must be fully aware of people position in the vehicle/machine area.



# 3.00 Bore Leg Installation

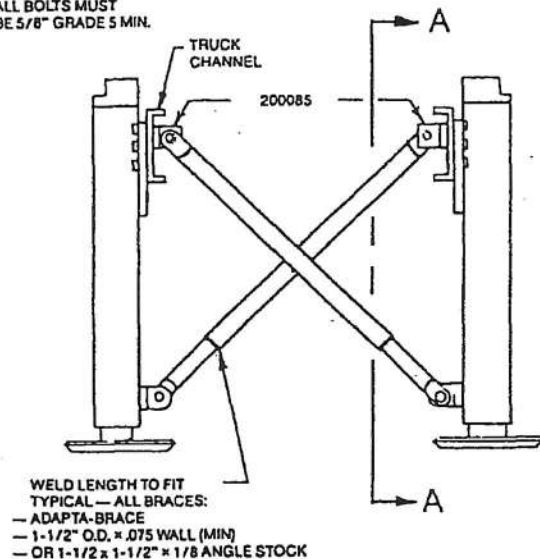
CAUTION:  
DO NOT WELD ON TRUCK FRAME

## NOTES:

1. ALL BOLTS (5/8-18UNF x 1-3/4 lg.)  
NUTS AND LOCK WASHERS (13)  
SUPPLIED IN HARDWARE KIT,  
P/N 200061

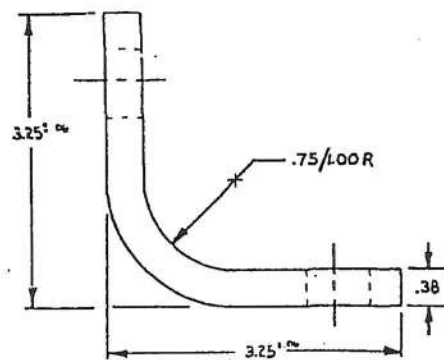
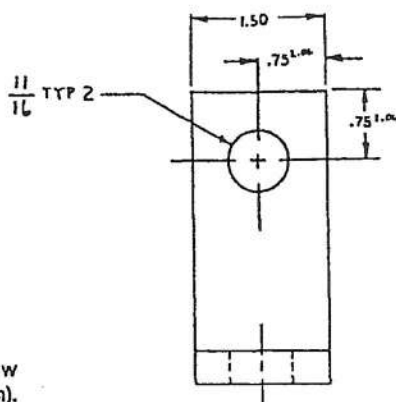
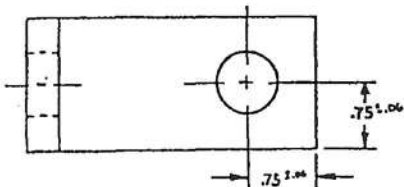
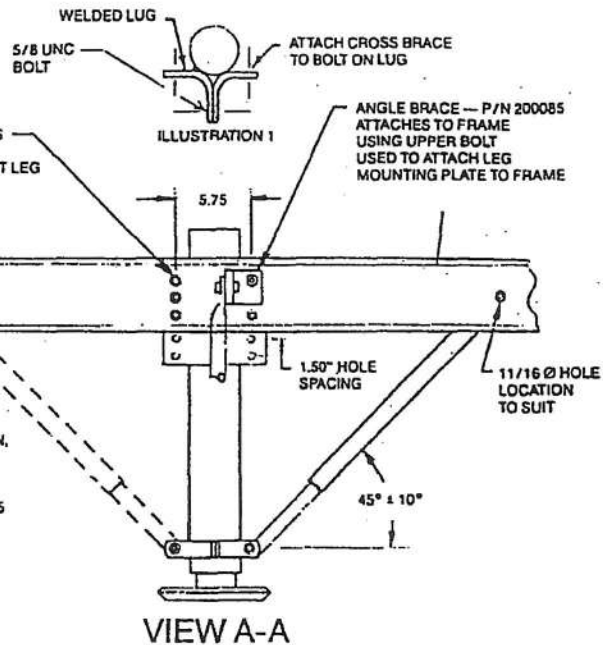
BRACE KIT, P/N 200073,  
OPTIONAL INCLUDES ADAPTA-  
BRACE PLUS FASTENERS

3. ALL BOLTS MUST  
BE 5/8" GRADE 5 MIN.



ONE BRACE PER  
LEG REQUIRED IN FRONT  
OR BEHIND LEG AS SHOWN,  
TO OBTAIN BRACING  
FACING THE SAME  
DIRECTION BOLT THE  
SUPPLIED LUG, P/N 200085  
TO LEG BOTTOM LUG. SEE  
ILLUSTRATION 1

RETRACTED ROAD  
CLEARANCE 8"-12"  
(TRUCK EMPTY)  
TO SUIT APPLICATION



Brace lug use for:

1. Cross brace to frame connection.
2. Fore and aft leg lug (bolts on leg to allow fore and aft bracing in the same direction).

Bracing Lug  
P/N 200085

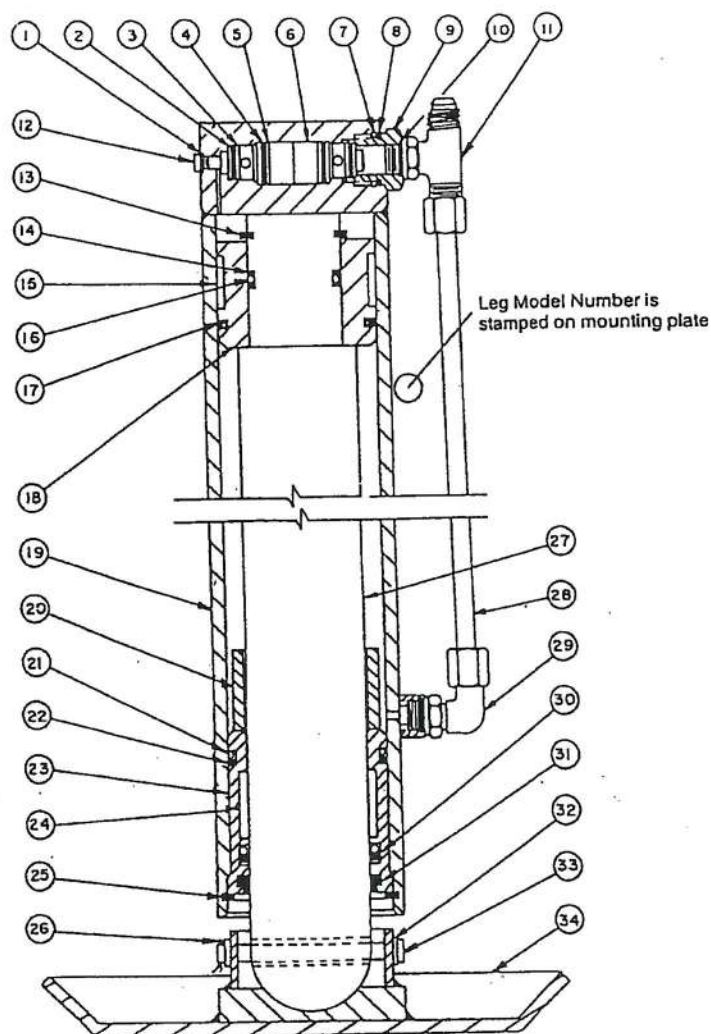
# 3.00 Bore Leg Parts List

## Parts List

Item	Part No.	Description	Qty.	Notes
1		o-ring	1	1,2
2		o-ring	2	1
3		back-up washer	2	1
4		o-ring	2	1
5		back-up washer	2	1
6	09-1029	lock valve	2	1
7		o-ring	2	1,2
8		back-up washer	1	1
9	200037	retaining nut	1	1
10		o-ring	2	1
11	07-1070	tee, branch	1	
12	07-1061	plug	1	
13	17-1003	snap ring	1	2
14		back-up	2	2
15		wear ring	1	2
16		o-ring	1	2
17		seal, piston	1	2
18	200003	piston	1	
19	2035-"A"	cylinder barrel	1	3
20	2019-"A"	stop tube	1	3
21		o-ring	1	2
22		back-up washer	1	2
23	200015	rod guide	1	2
24		wear ring	1	2
25	17-1010	snap ring	1	2
26	18-1014	cotter pin	1	
27	2002-"A"	rod	1	3
28	2020-"A"	transfer tube	1	3
29	07-1059	90° elbow	1	
30		seal, rod	1	2
31		wiper	1	2
32	16-1005	washer	2	
33	18-1013	pin	1	
34	200004	show assembly	1	

### NOTES:

1. These items included in lock valve repair kit P/N 200079.
2. These items included in leg repair kit P/N 200080.
3. - "A" designates item length.





## 3.00 Bore Leg Repair Procedure

### Kit No. 200080

(See pg. 5 for detailed leg drawing.)

#### 1. Replacing Leg Seals:

- A. Fully retract leg(s).
- B. Remove leg from mounting on trailer or vehicle.
  1. Loosen hose connections going from ports "A", "B" and "R". **CAUTION:** Crack all connections gradually to allow trapped pressure to bleed completely down (eye protection is recommended). Slowly remove hose fitting connections completely.
  2. Using a 1/8" allen wrench, slowly turn **plug**, Item 12 to bleed trapped pressure from the cylinder base side. (Eye protection recommended.) Remove plug completely when pressure is bled down.
- C. Remove shoe by removing **cotter pin**, Item 26 and **pin**, Item 33.
- D. Loosen the tube nuts on Item 28 approximately two turns to bleed pressure.
- E. Place leg on a table or horizontal surface and remove **snap ring**, Item 25 using a Waldes snap ring pliers No. S-6700 or equivalent. **WARNING:** Do not stand in front of rod end. Use eye protection.
- F. Hang legs upside down using a hoist, use shoe pin hole to attach chain or cable. Tap on mounting plate with wood block and hammer to force the piston rod assembly to slide within the cylinder barrel. Continue to tap until the **rod guide**, Item 23 and **piston assembly**, Items 18, 27 and 20 can be pulled out of barrel.
- G. Place **rod piston assembly**, Items 18 and 27 and rod guide on clean table.
- H. Remove **rod guide**, Item 23 from the rod by tapping it over the rod end.
- I. Remove **piston retainer snap ring**, Item 13 using Waldes pliers No. S-6600 or equivalent. (Use eye protection.) Tap piston off of rod (use rubber cap mallet).

#### 2. Installation of New Seals and Cylinder Assembly:

- A. Rod Guide - Remove **wiper**, **rod seal**, **wear ring**, **back-up ring** and **o-ring**, Items 31, 30, 24, 22 and 21 respectively. Install new seals.
  1. **Wiper**, Item 31 lips facing outward.
  2. **Shaft seal**, Item 30 lips facing inward.
  3. **Wear ring**, Item 24 work in with screwdrivers.
  4. Install **back-up ring**, Item 22 to outside of groove. Radius portion must face inward (touching o-ring).
  5. Install **o-ring**, Item 21 as shown.
  6. Lubricate all seals thoroughly.
- B. Piston Rod Assembly
  1. Remove Items 17, 15, 14 and 16.
  2. Install new **piston seal**, Item 17 (similar to installing a tire on a bicycle wheel).
  3. Install new **wear ring**, Item 15.
  4. Install new **back-up rings** and **o-ring**, Items 14 and 16 on rod. The back-up rings sandwich the o-rings with the curved portion touching the o-ring on both sides.
  5. Lubricate all seals and rod thoroughly, tap piston over rod until bottomed on the rod shoulder. Install new **snap ring**, Item 13 with Waldes pliers No. S-6600. (Use eye protection.)
- C. Cylinder Assembly
  1. With cylinder barrel resting on its head (upside down) lubricate the opening of the cylinder barrel. Drop the piston rod assembly straight and gentle into the barrel. Tap drive in to approximately full retraction.
  2. Lubricate the round end of the rod, gently tap the rod guide fully into the barrel. Use a brass/bronze drift to tap around until the rod guide is bottomed out and a new **snap ring**, Item 25 can be installed using Waldes pliers No. S-6700. (Use eye protection.)
  3. Install new **o-ring**, Item 1 on **plug**, Item 12 and fully insert **plug**, Item 12.
  4. Install leg(s) on trailer in reverse manner of "1" A, B and C.
  5. After all hose connections are complete, cycle legs up and down (full stroke 2 or 3 times to purge trapped air.)

## Lock Valve Repair

### Kit No. 200079

1. Retract legs fully. (If space permits, it may be done on vehicle; if not, remove legs.)
2. Slowly crack all fittings on port connections "A", "B" and "R". (**CAUTION:** Use eye protection to bleed down pressure.)
3. Slowly loosen **plug**, Item 12 to relieve pressure (use eye protection). Remove **plug**, Item 12.
4. Remove **transfer tube**, Item 28 and loosen **elbow**, Item 29 **swing away**, Item 29 to remove **tube**, Item 28. Loosen **tee fitting**, Item 11 and remove **retainer nut**, Item 10.
5. Using a small drift (1/8") tap through the **plug hole**, Item 12 to push the lock valve cartridges out (two cartridges will come out of large opening where Item 9 was removed).

#### 6. Install new lock valves.

- A. Lubricate thoroughly with hydraulic oil.
- B. The inner most lock valve must be inserted with small end first. Use **retainer nut**, Item 9 to drive in.
- C. The outside lock valve must be inserted with the small end to the outside. Push the nose of the cartridge into the retaining nut and screw the combination into the cylinder. Torque retaining nut to 15 ft.-lb. Install **tee**, Item 11, **tube**, Item 28 and **swing elbow**, Item 29 up and tighten all connections.
- D. Install new **o-ring**, Item 1 on **plug**, Item 12 and install **plug**, Item 12.



# 3.5/4.0 Bore Leg Installation Instructions

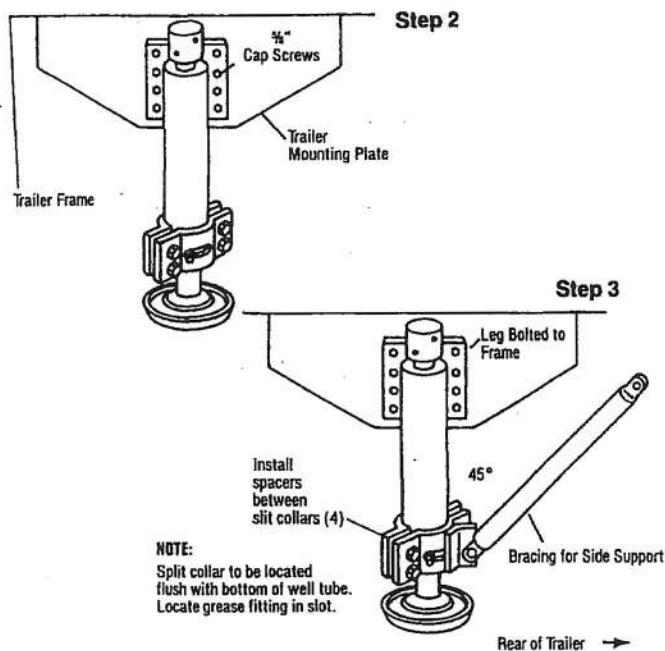
The following instructions and parts lists are furnished as a helpful guide for installation of your stabilizer system. Check shipment to be sure there has been no damage or loss in shipping. Refer to the packing list, packed in the hardware kit. Note location of serial number plate on the control box cover. Always provide serial number and part numbers when ordering parts or requesting technical assistance.

## FRONT MOUNT LEGS

**Step 1 - Remove manually operated landing gear (if applicable).**

### Step 2 - Leg Mounting

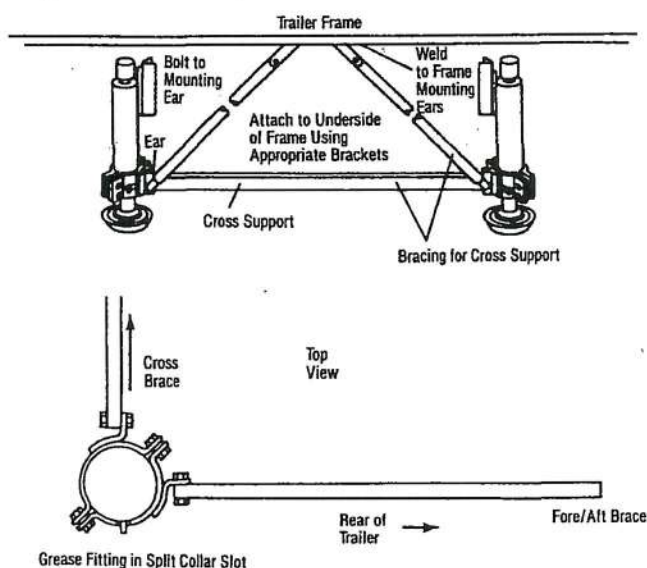
Install stabilizer legs to standard landing gear mounting brace. Allow 12" ground clearance with legs fully retracted. Use 5/8-18 UNF grade 5 hex head cap screws and hex nuts. Torque to 100 ft.-lbs.



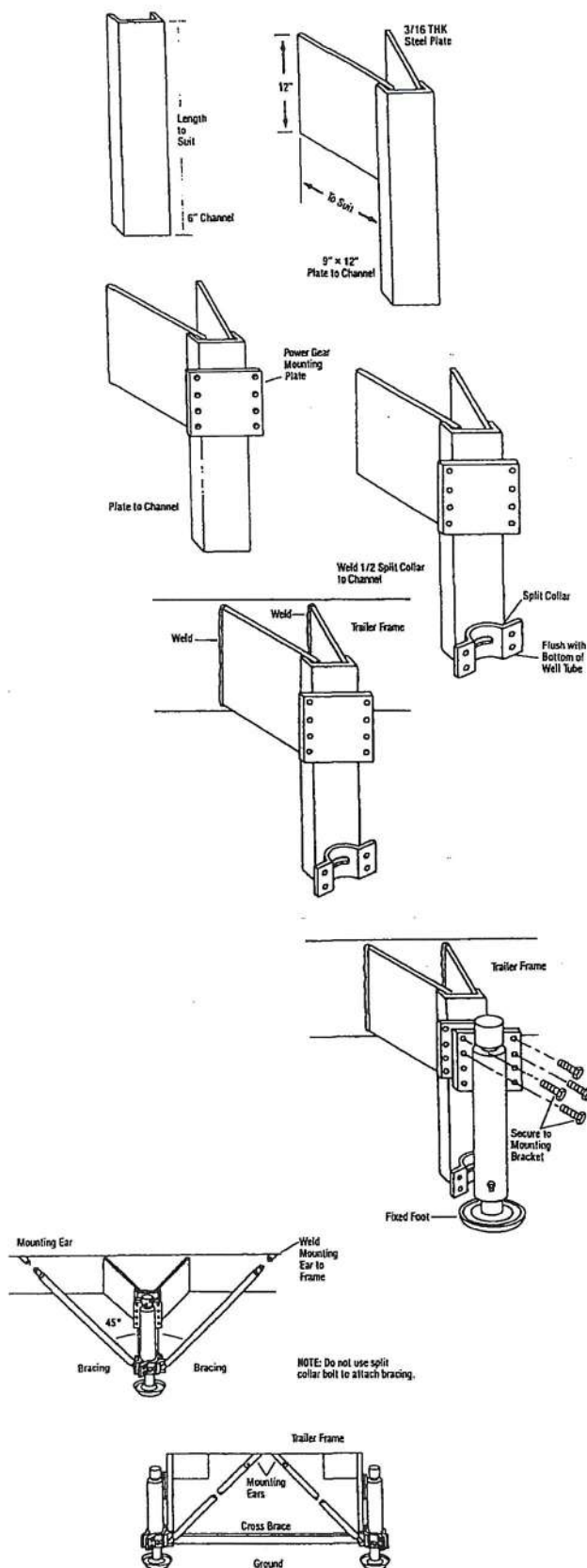
### Step 3 - Bracing

Brace leg as shown, your actual bracing system may be different from that shown. Any bracing system must brace the bottom of the stabilizer leg to structural members of the trailer in two directions 90° apart. Make sure bracing will not interfere with tractor.

Do not weld bracing and/or ears directly to well tube. Weld to split collar only. Do not weld split collar to leg. Split collar bolts should be torqued to approximately 20 ft.-lbs.



## 3.5/4.0 Bore Leg Installation Instructions (cont.)



### REAR MOUNT LEGS

**Step 4 -** Determine the location for stabilizer legs. Normally, legs will be mounted between the rear tires. You should allow 6" of ground clearance (4" absolute minimum). Remember to allow for spring deflection when trailer is loaded.

If you have difficulty finding a suitable mounting location, call Power Gear.

### Step 5 - Leg Mounting

This is one common way of mounting "rear mount" stabilizer legs. Other methods may be used. When designing a mounting structure, provide enough strength to lift the trailer and proper bracing to take any side loading. In case of questions, please call Power Gear.

Remove wheels, if necessary. Cut a 6" channel to desired length (varies with trailer frame and leg stroke).

Weld a 12" long piece of 3/16" steel plate to the inside of the channel. These plates should be wide enough to place the center of the leg between the tires when the leg is mounted to the channel.

Weld a loose mounting plate (supplied by Power Gear) to the channel at the proper height (per installation requirements).

Weld a split collar half to the mounting channel where the bottom of the well tube will be located.

Weld this fabrication to the trailer frame.

Fabricate second leg mounting leg structure in the same manner.

Mount legs using 5/8-18 UNF grade 5 bolts. Torque to 100 ft.-lbs.

Clamp remaining split collar halves in place with 1/2-20 UNF grade 5 bolts. Torque to 20 ft.-lbs.

### Step 6 - Bracing

Other bracing systems may be used to suit this application. The bottom of each leg must be braced to the trailer frame members in two directions 90° apart. These braces should not be welded to the leg. They may be mounted to the split collar, channel and/or the cross brace near the leg.

Weld cross brace from the bottom of one channel to the other.

Weld a brace from the bottom of each channel to the trailer frame at a 45° angle. This brace should be pointed directly away from the leg.

On each side, weld bracing pointing straight forward and/or backward at a 45° angle from each channel on the cross brace to the trailer frame.

# 3.5/4.0 Bore Leg Assembly Parts List

## Parts List

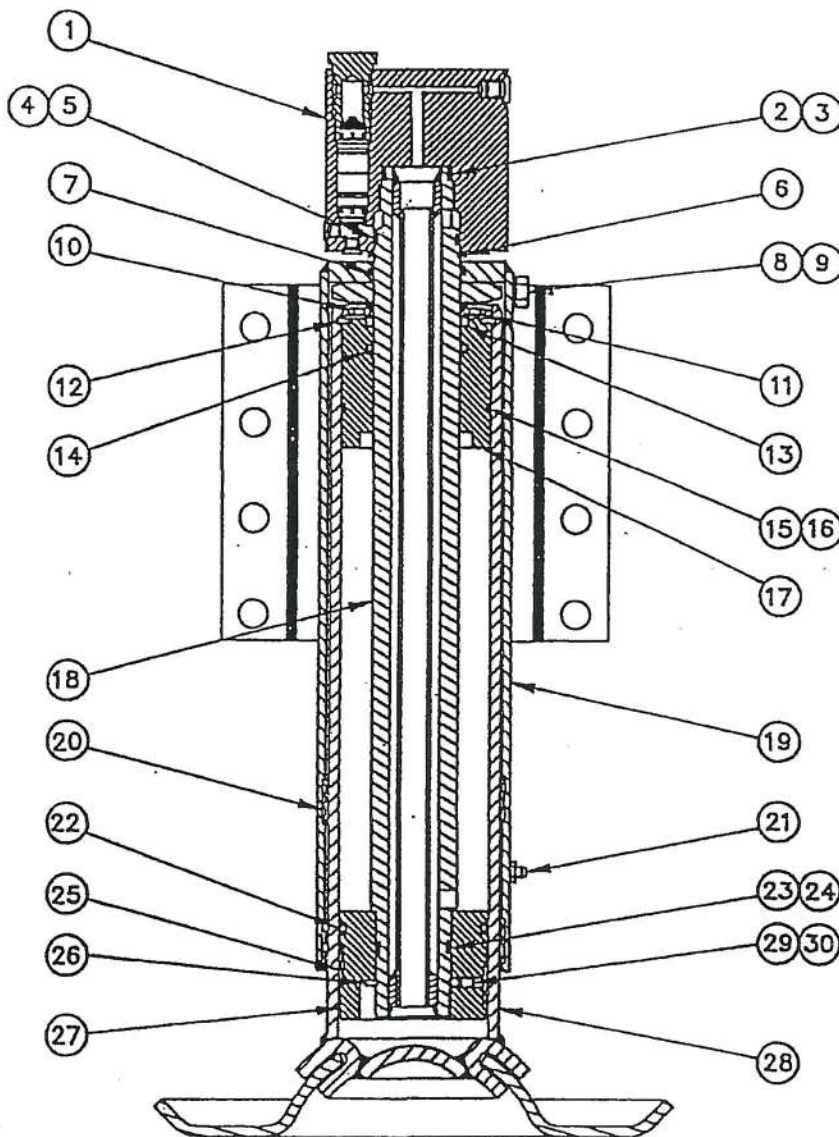
Item	3.5" Bore	4.0" Bore	Description	Qty.	Notes
1	300092	300092	4:1 lock valve assembly	1	
2			o-ring	1	1,2
3			back-up washer	2	1,2
4			o-ring	1	1,2
5			back-up washer	1	1,2
6			snap ring, 2" rod	1	2
7			o-ring	1	2
8	15-1004	15-1021	hex head cap screw	1	
9	16-1002	16-1002	3/8" lock washer	1	
10	15-1012	15-1012	hex head cap screw	4	
11	100278	100279	cylinder head retainer	1	
12			retaining ring	1	2
13			oil seal	1	2
14			rod seal	1	2
15			o-ring	1	2
16			back-up washer	1	2
17	100216	100276	cylinder head	1	
18	*	*	piston rod	1	
19	*	*	well tube	1	
20			wear ring	2	2
21	10-1001	10-1001	grease fitting	1	
22			piston seal	1	2
23			o-ring	1	2
24			back-up washer	2	2
25			wear ring	1	2
26	17-1003	17-1003	snap ring, 1.75 rod	1	
27	100217	*	piston	1	
28	*	*	cylinder tube	1	
29			nylon ball	1	2
30			set screw	1	2
31	100346	100348	split collar assembly (not shown)	1	

### NOTES:

1. These items are contained in lock valve repair kit P/N 300085 and are not available on an individual basis.

2. These items are contained in leg repair kit P/N 101086 (3.5 Bore) or P/N 100422 (4.0 Bore) and are not available on an individual basis.

\* State the model number and part description when ordering.





# 3.5/4.0 Bore Leg Repair Procedures

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## Repair Kit No. 101086 (3.5 Bore)

## Repair Kit No. 100422 (4.0 Bore)

The item numbers listed below are the same as those listed on the leg assembly drawing. See pg. 8 for detailed leg drawing.

### DISASSEMBLY/ASSEMBLY PROCEDURE

When disassembling and reassembling the leg, care should be taken to keep all parts clean and to prevent parts from being damaged. All seals should be coated lightly with grease before installation into leg.

**Step 1** - To remove leg from trailer, make sure no weight is being supported by legs. Have legs slightly extended from full retract position to relieve any internal pressure in legs. Disconnect the hoses from the leg. You may wish to mark which hose goes to what port. Remove the leg from the trailer.

**Step 2** - Remove the **lock valve**, Item 1 from the leg by screwing counter clockwise. If you need only to repair the lock valve, it may be removed from leg while still on trailer if you have a minimum of 2" clearance above.

**Step 3** - Remove **o-rings** and back-up washers, Items 2, 3, 4 and 5. Using a snap ring pliers, remove **snap ring**, Item 6. Loosen **ax screw**, Item 8.

**Step 4** - Lift **well tube**, Item 19 off lower leg assembly. Lift **piston rod**, Item 18 to gain access to top of **cylinder head**, Item 17. **CAUTION:** While lifting piston rod, oil will squirt out of side port at top of rod.

**Step 5** - Remove four **hex screws**, Item 10. Lift **cylinder head retainer**, Item 11. A wire or rubber band may be used to hold Item 11 to sprocket near the top of piston rod, out of the way.

**Step 6** - Using a small flat screwdriver, carefully remove **spiral retaining ring**, Item 12. Lift piston rod assembly out of **cylinder tube**, Item 28.

**Step 7** - Using a large snap ring pliers, remove heavy duty **snap ring**, Item 26 or remove the **set screw**, Item 30. Remove the **piston**, Item 27, **cylinder head**, Item 17, **retaining ring**, Item 12 and **cylinder head retainer**, Item 11.

**Step 8** - Remove all seals and wear rings. Clean all parts. Inspect all bearing surfaces for scratches, nicks, or other defects; replace if necessary. Replace all wear rings, and lightly lubricate all seals before installing on legs.

**Step 9** - Carefully reassemble the leg in reverse order as described above. Where applicable, torque **piston**, Item 27 to 40-50 ft.-lbs. Apply two drops of Loctite 277 or equivalent to **set screw**, Item 30 and torque to 50 in./lbs.

**Step 10** - Return leg to trailer and reconnect all hoses. Apply grease to **grease fittings**, Item 21 and cycle legs fully several times to bleed air from system. Check oil level as described in maintenance section of manual.

## 3.5/4.0 Bore Stiff Leg Parts List

When ordering parts for a stiff leg model, all parts are common with a non-stiff leg model (see page 8) except for the stated parts.

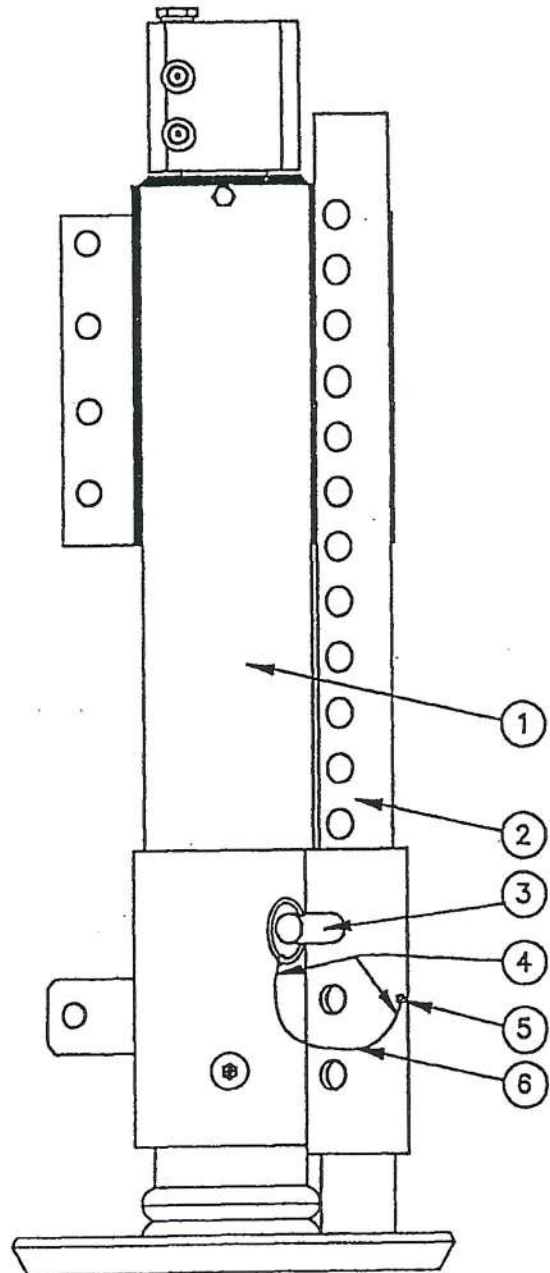
### Parts List

Item	Part No.	Description	Qty.
1	*	well tube	1
2	*	stiff leg	1
3	18-1019	cotterless hitch pin	1
4	99-1002	ferrule	2
5	15-1052	screw	1
6	087-009000	cable	1

#### NOTE:

\* = State the leg part number when ordering.

Items 3, 4, 5, and 6 can be purchased in Hitch Pin Kit P/N101504.



# 3.5/4.0 Bore Lock Valve Assembly

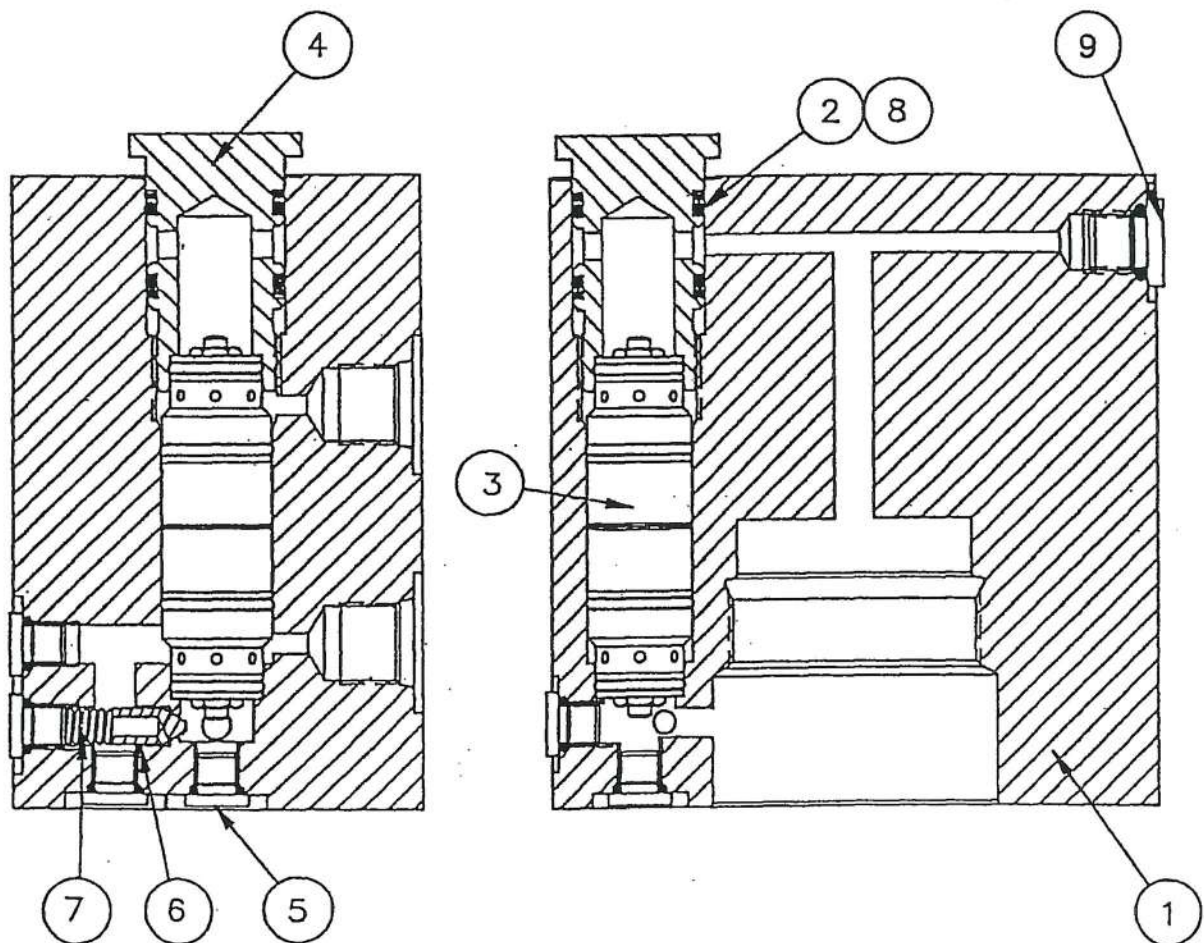
Part No. 300092

## Parts List

Item	Part No.	Description	Qty.
1	300093	4:1 lock valve body	1
2	01-1006	o-ring	2
3	300427	pilot operated check valve	2
4	300022	retaining plug	1
5	07-1061	#2 SAE hollow hex plug	5
6	300003	poppet	1
7	31-1016	spring	1
8	05-1009	back-up washer	2
9	07-1201	#4 SAE hollow hex plug	1

### NOTE:

Use kit P/N 300085 when rebuilding (see pg. 14).





## 3.5/4.0 Bore Lock Valve Repair Procedures

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### Kit No. 300085

#### NOTE:

Unless otherwise noted, item numbers refer to Lock Valve Assembly Drawing. See pg. 13 for detailed lock valve drawing.

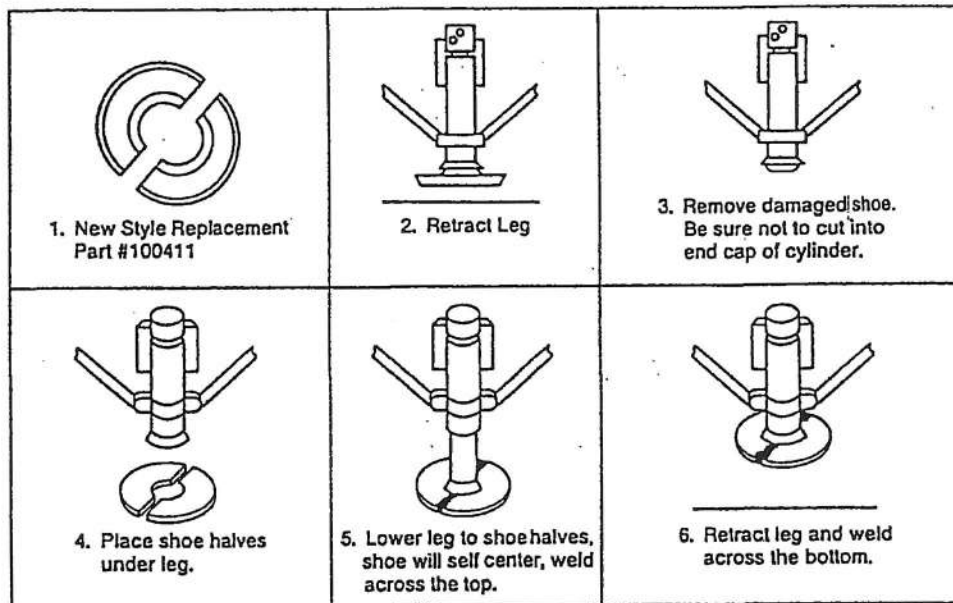
1. Remove lock valve as described in leg repair, step 2.
2. Remove **retaining plug**, Item 4.
3. Remove **o-ring plug**, Item 5 opposite Item 4 on rectangular block.
4. Using a drift small enough to fit through the port opened in 3 above, tap out **lock valve cartridges (2)**, Item 3.
5. Install new lock valve cartridges back to back, as illustrated, grease o-rings.
6. Install new **o-rings** and **back-up washers**, Items 2 and 8, quantity (2), on **retaining plug**, Item 4.
7. Thread **retaining plug**, Item 4 into **body**, Item 1. Tap gently to engage threads. Torque **retaining plug**, Item 4 to 15 ft.-lbs.
8. Install new o-rings on **plug**, Item 5. Thread plug into body. Torque to 70 in.-lbs.
9. Replace **spring** and **poppet**, Items 6 and 7. Replace the o-ring on **plug**, Item 5 and reinstall.
10. Install new **o-rings** and **back-up washers** on top of piston rod, Items 2, 3, 4 and 5 on leg assembly drawing.
11. Thread lock valve on piston rod until firmly seated. If the ports need to be relocated - loosen the screw at the top of the well tube and turn lock valve clockwise until ports are at the desired location. Retighten the set screw.

# 12" Replacement Shoes

## Part No. 100411

For the convenience of Power Gear customers, the replacement foot, or shoe, has been redesigned to facilitate an easier repair and replacement of damaged or worn feet. The new design should make changing feet simpler and less time-consuming. The following steps illustrate the procedure.

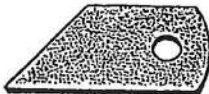
1. New Style Replacement Shoe Part #100411.
2. Retract leg.
3. Remove damaged shoe. Be sure not to cut into end cap of cylinder. Start burning at the two slots in shoe.
4. Place shoe halves under leg.
5. Lower leg to shoe halves, shoe will self center, weld across the top.
6. Retract leg and weld across the bottom.



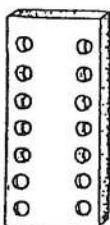
## Mounting Accessories



Part No. 100357  
Straight Ear



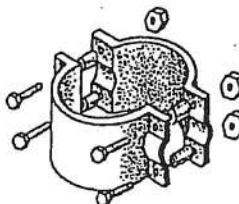
Part No. 100353  
Angle Ear



Part No. 100226  
Mounting Plate  
9 x 16 x 3/8, 10 Holes  
(400 Series)

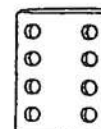


Part No. 100354  
Curved Ear



Part No. 100346  
Split Collar Assembly  
(100 Series)

Part No. 100348  
Split Collar Assembly  
(400 Series)



Part No. 100502  
Mounting Plate  
9 x 8 3/4 x 1/4, 8 Holes  
(100 Series)

## 5.0/6.0 Bore Leg Installation Instructions

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Mount legs to structure using a minimum of (10 ) 5/8 inch fasteners (grade 5 or better) on each side of the mounting plate. If two mounting plates are present, use a minimum of (4) 5/8 inch fasteners, (grade 5 or better) on each side of the lower mounting plate. Torque all hardware to specified fastener torque levels.



# 5.0 Bore Leg Assembly Parts List

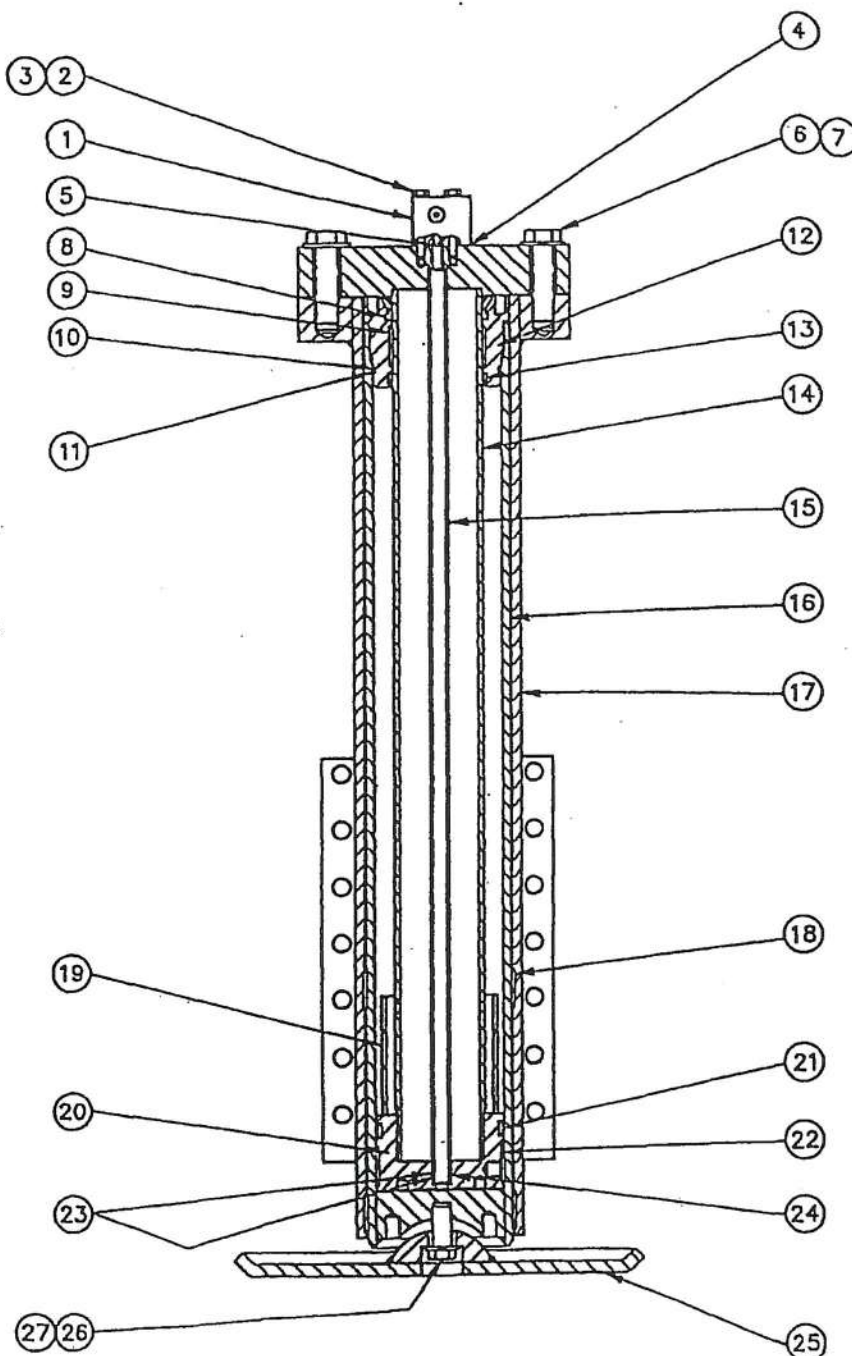
When ordering parts, indicate date code to ensure proper revision level.

## Parts List

Item	Part No.	Description	Qty.	Notes
1	300034	lock valve assembly	1	
2	15-1095	H.H.C.S. 5/16-18 UNC x 2.50 lg., gr. 8	4	
3	16-1010	5/16 SAE flat washer	4	
4		dual lock valve gasket	1	1,2
5		o-ring	2	1,2
6	15-1127	H.H.C.S. 7/8-14 UNF x 3.25 lg., gr. 5	6	
7	16-1044	7/8 flat washer	6	
8		wiper ring	1	2
9		wear ring	1	2
10		o-ring back-up washer	1	2
11		o-ring	1	2
12	300476	rod guide	1	
13		shaft seal	1	2
14		piston rod weldment	1	3
15		transfer tube	1	3
16		cylinder tube weldment	1	3
17		well tube weldment	1	3
18		wear ring	2	2
19		stop tube	1	3
20	300475	piston	1	
21		piston seal	1	2
22		wear ring	1	2
23		o-ring back-up washer	4	2
24		quad ring	2	2
25	300167	swivel shoe weldment	1	
26	15-1026	H.H.C.S.	1	
27	16-1032	flat washer	1	

### NOTES:

1. These items are contained in lock valve repair kit 300085 and are not available on an individual basis.
2. These items contained in leg repair kit 300508 and are not available on an individual basis.
3. State leg part number and part description when ordering these items.



# 5.0 Bore Leg Repair Procedure

## Leg Repair Kit No. 300508

This kit contains the necessary soft parts (seals) and associated parts to repair one (1) 5" bore leg.

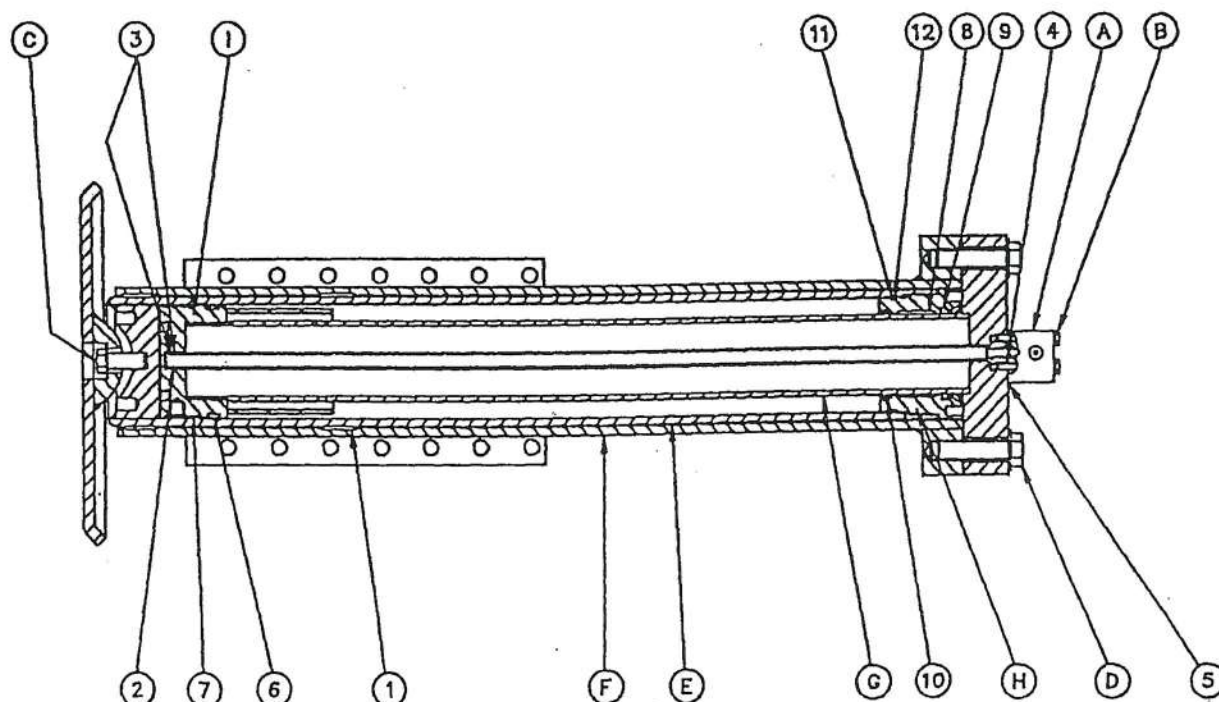
## Parts List

Item	Description	Qty.
1-1	Bag A (well tube)	
1	wear ring	2
2-5	Bag B (piston rod sub assembly)	
2	quad ring	2
3	back-up ring	4
4	o-ring	1
5	lock valve gasket	1
6-7	Bag C (piston)	
6	piston seal (5 bore)	1
7	wear ring (5 bore)	2
8-12	Bag D (rod guide)	
8	wear ring (3.5 rod)	1
9	wiper ring (3.5)	1
10	shaft seal (3.5)	1
11	o-ring	1
12	back-up ring	2

Be sure that no load is being supported by leg before servicing. With pump off, cycle valve to relieve any pressure. Disconnect hydraulic lines from leg. Remove leg from trailer.

Remove the **lock valve**, Item A by removing the four **H.H.C.S.**, Item B. Take the shoe off by removing **H.H.C.S.**, Item C. Remove the six **H.H.C.S.**, Item D and lift the **cylinder tube**, Item E off the **well tube**, Item F. Lift the **piston rod assembly**, Item G away from the **cylinder tube**, Item E, then remove the **rod guide**, Item H from the **cylinder tube**, Item E by unscrewing it. Lift the **piston rod assembly**, Item G out of the **cylinder tube**, Item E. Remove **wear ring**, Item 7 from **piston**, Item 1 and screw piston off using a 7/16 course bolt in the threaded hole.

Clean and inspect all metal parts and replace any damaged parts. **Replace all seals** and lightly coat with grease. Put Loctite 277 or equivalent on threaded parts. Assemble leg in reverse order. Coat bottom of lock valve and top of cylinder head with anti-seize. Place gasket in between and remount lock valve to leg. Remount leg to trailer.



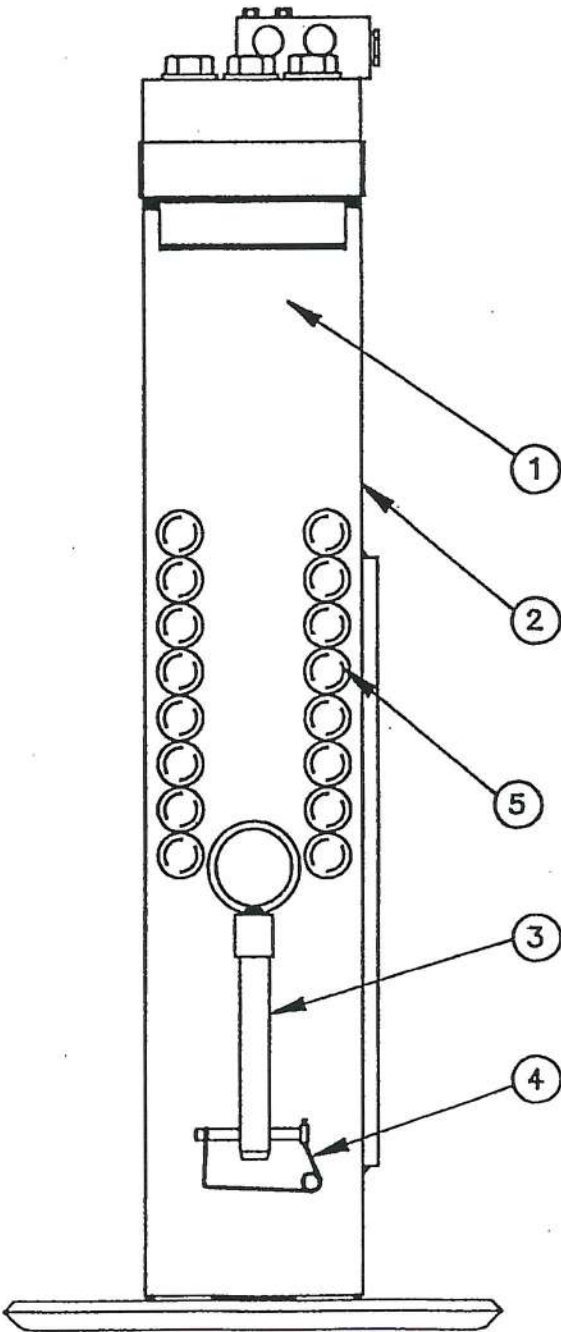
# 5.0 Bore Leg Repair Procedure

When ordering parts for a stiff leg model, all parts are common with a non stiff leg model (see page 17) except for the stated parts.

## Parts List

Item	Part No.	Description	Qty.
1	300496	rod guide (not shown)	1
2	*	well tube	1
3	300492	pin weldment	2
4	18-1028	snap lock pin	2
5	07-1232	plug, tube	AR

\* = State the part number when ordering.





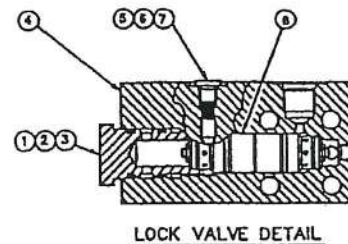
# 6.0 Bore Leg Assembly Parts List

## Parts List

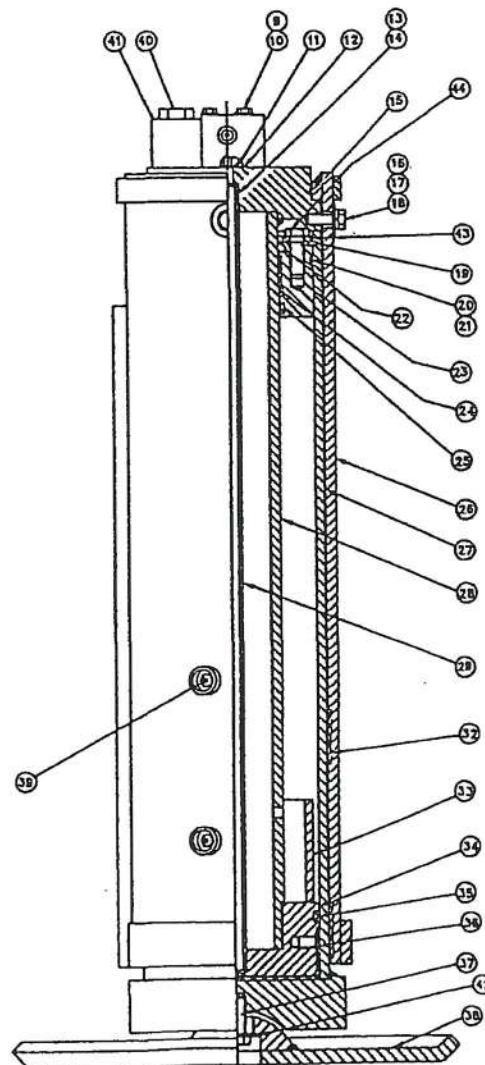
Item	Part No.	Description	Qty.	Notes
1	300022	retaining plug	1	
2		o-ring	2	1
3		back-up washer	2	1
4	300014	dual lock valve body	1	
5	07-1061	No. 2 o-ring plug	5	
6	31-1016	spring	1	
7	300003	poppet	1	
8		pilot operated check valve	2	1
9	15-1095	H.H.C.S. 5/16-18 unc x 2.50 lg., gr. 8	4	
10	16-1010	5/16 SAE flat washer	4	
11		o-ring	2	1,2
12		dual lock valve gasket	1	1,2
13		o-ring	2	2
14		o-ring back-up washer	4	2
15		o-ring	1	2
16	15-1076	H.H.C.S. 1/2-13 unc x 1" lg., gr. 9	2	
17	16-1030	1/2 lock washer	2	
18	16-1034	1/2 flat washer	2	
19	17-1020	6" snap ring	1	
20		o-ring	1	2
21		o-ring back-up washer	2	2
22		wiper ring	1	2
23	300040	rod guide	1	
24		wear ring	1	2
25		shaft seal	1	2
26		well tube	1	3
27		cylinder tube weldment	1	3
28		piston rod weldment	1	3
29		transfer tube	1	3
32		wear ring	2	2
33		stop tube	1	3
34	300041	piston	1	
35		piston seal	1	2
36		wear ring	1	2
37	15-1026	H.H.C.S.	1	
38	300167	swivel shoe weldment	1	
39	10-1001	grease fitting	2	
40	15-1112	H.H.C.S. 1.00-8 unc x 2.25 lg., gr. 5 2 (used before March 1, 1992)		
41	15-1117	H.H.C.S. 1.00-14 unf x 2.50 lg., gr. 5 2 (used before March 1, 1992)		
42	16-1032	flat washer	1	
43	300443	retaining ring	1	
44	15-1035	H.H.C.S.	6	

### NOTES:

1. These items are contained in lock valve repair kit 300085 and are not available on an individual basis.
2. These items contained in leg repair kit 300086 and are not available on an individual basis.
3. State leg part number and part description when ordering these items. Indicate date code when ordering to ensure proper revision level.



LOCK VALVE DETAIL



# 6.0 Bore Leg Repair Procedure

## Leg Repair Kit No. 300086

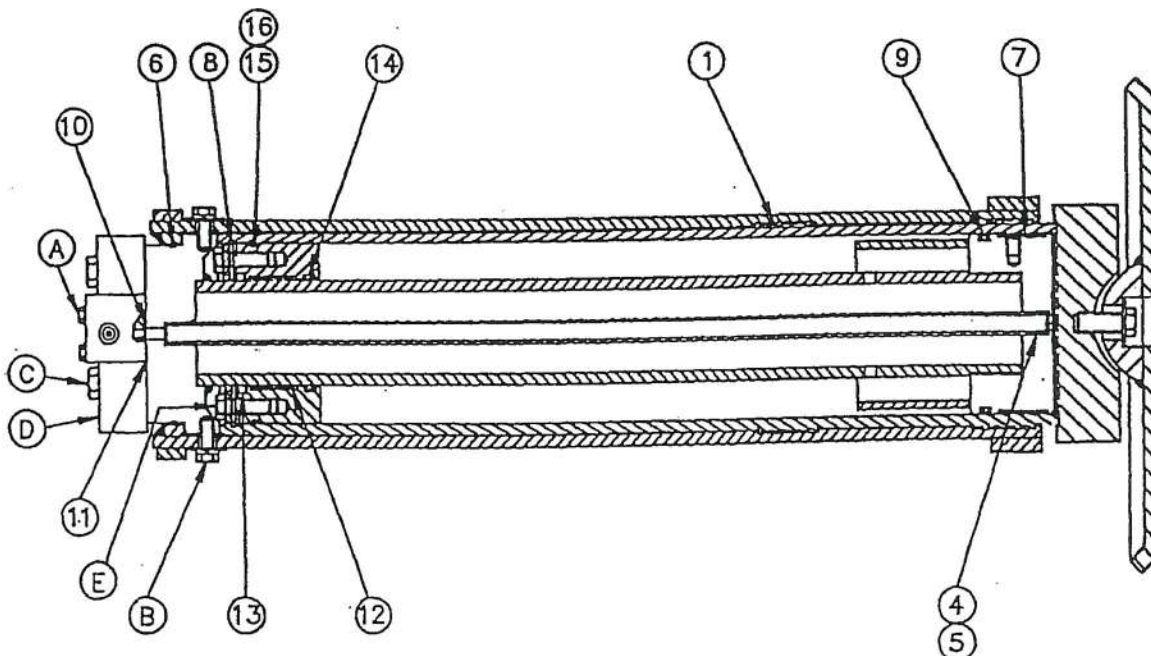
This kit contains the necessary soft parts (seals) and associated parts to repair one (1) 6" bore leg. Some items will not be used in a particular leg, but are included to form a universal kit.

Item	Description	Qty.
1-1	Bag A (well tube)	
1	wear ring	2
4-8	Bag B (Piston Rod Sub Assembly)	
4	o-ring	2
5	back-up ring	4
6	o-ring	1
7	wear ring	1
8	snap ring	1
9-11	Bag C (piston and final assembly)	
9	piston seal	1
10	o-ring	2
11	lock valve gasket	1
12-16	Bag D (rod guide)	
12	wear ring	1
13	wiper ring	1
14	shaft seal	1
15	o-ring	1
16	back-up ring	2

Be sure that no load is being supported by leg before-servicing. With the pump off, cycle valve to relieve any pressure. Disconnect hydraulic lines from leg. Remove leg from trailer.

Remove lock valve by removing the four bolts, Item A. (**CAUTION:** A small amount of low pressure fluid may be released in this procedure). Remove 2 bolts, Item C and Item D. Remove 3 bolts, Item B from leg and lift well tube off of cylinder tube. Lift piston rod assembly then remove the 6 hex head screws, Item E and the snap ring, Item 8. Lift piston rod assembly out of cylinder tube. Remove wear ring, Item 7 from piston and screw piston off rod using a 7/16" course thread bolt.

Clean and inspect all metal parts and replace any damaged parts. **Replace all seals** and lightly coat with grease. Assemble leg in reverse order. Coat bottom of lock valve and top of cylinder head with anti-seize. Place gasket in between and remount lock valve to leg. Remount leg to trailer.



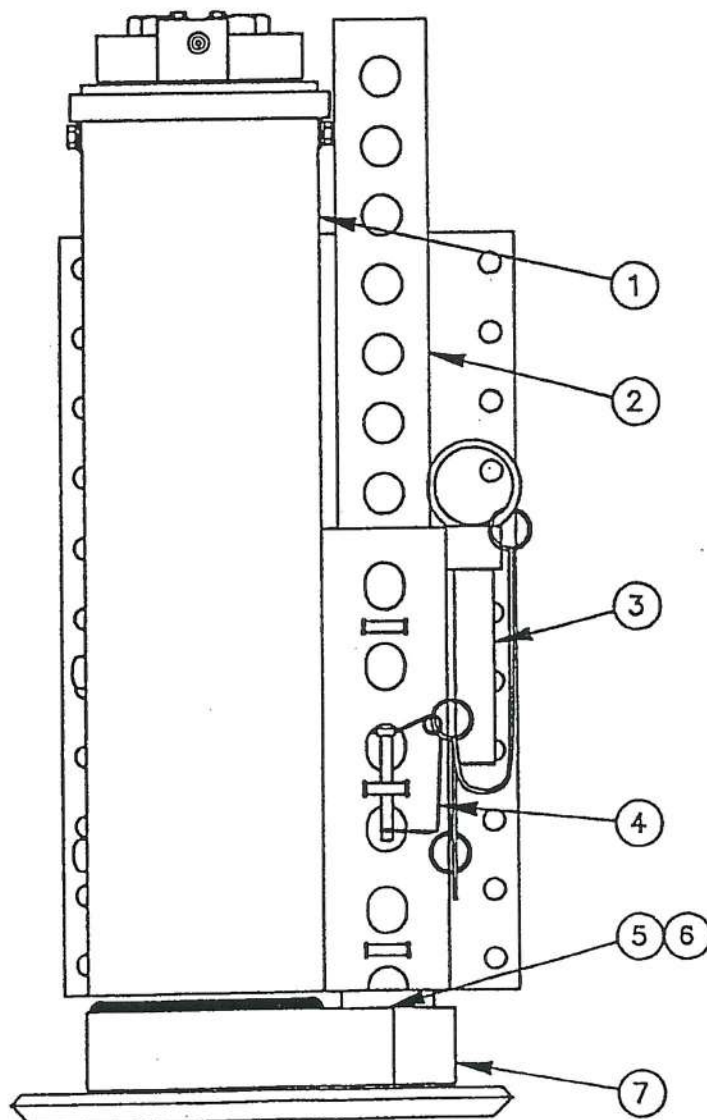
## 6.0 Bore Stiff Leg Parts List

When ordering parts for a stiff leg model, all parts are common with a non-stiff leg model (see page 20) except for the stated parts.

### Parts List

Item	Part No.	Description	Qty.
1	*	well tube	1
2	*	stiff legs	1
3	300177	pin weldment	1
4	300183	chain/pin assembly	1
5	15-1111	H.H.C.S. (not shown)	1
6	16-1040	lock washer (not shown)	1
7	*	cylinder tube	1

\* = State the part number when ordering.





# 5.0/6.0 Bore Lock Valve Assembly

## Lock Valve Repair Kit 300085

This kit contains the necessary soft parts (seals) and associated parts to repair one (1) 5.0/6.0 bore lock valve. Some items will not be used but are included to form a universal kit.

Item	Description	Qty.
1	o-ring	2
2	o-ring	3
3	pilot operated check valve	2
4	spring	1
5	poppet	1
6	lock valve body gasket	1
7	o-ring	2
8	o-ring	1
9	o-ring	1
10	back-up	1
11	back-up	2
12	back-up	2

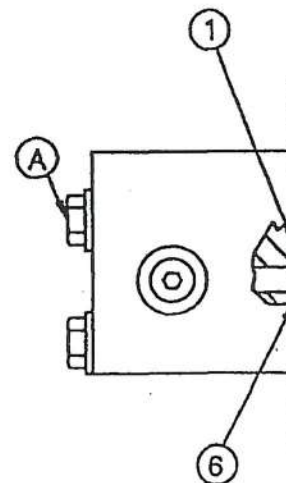
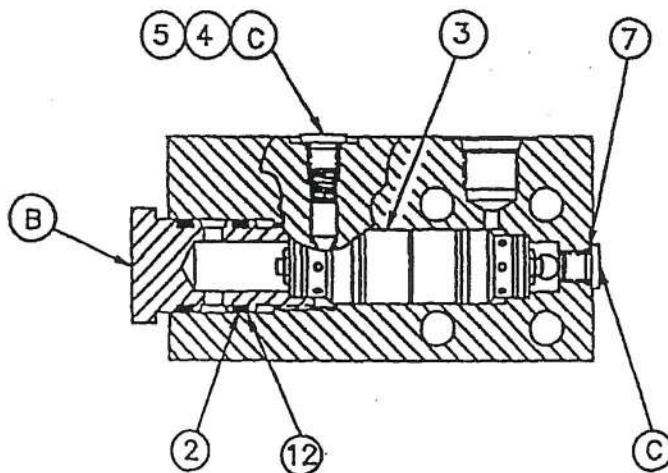
## Lock Valve Repair Procedure

Be sure that no load is being supported by leg before servicing. With pump off, cycle valve to relieve any pressure. Disconnect hydraulic lines from leg.

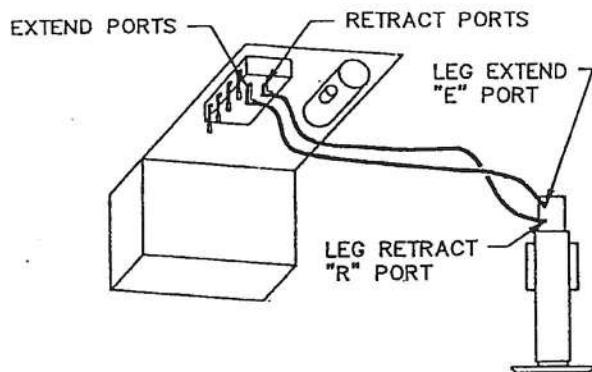
Remove lock valve by removing the four bolts, Item A on the 5.0/ 6.0 bore leg. (**CAUTION:** A small amount of low pressure fluid may be released in this procedure). Remove **retaining plug**, Item B and two **o-ring plugs**, Item C from lock valve body. Remove **spring**, Item 4, **poppet**, Item 5, and both **pilot operated check valves**, Item 3.

Clean and inspect all metal parts and replace any damaged parts. **Replace all seals** and lightly coat with grease. Assemble leg in reverse order.

Coat both bottom of lock valve and top of cylinder head with anti-seize. Remount lock valve to leg making sure to place gasket in between.



# AC Installation Instructions



## **Control Box Mounting**

Determine desired control box location. No part of the control box or handles should extend beyond the sides of the trailer. Hold control box in desired location. Be sure trailer cross members are free of rust and undercoating where control box hanger straps make contact. Tack weld hang straps in place. Replace hanger straps bolts and lower control box. Finish welding hanger straps to trailer cross members and remount control box. Torque mounting bolts to 20 ft.-lbs.

## **Plumbing**

Determine lengths of high pressure hose required. Hoses should be 5/16 i.d. min. 2,500 PSI working pressure with #6 37' SAE Flare Female Swivel ends. Hoses to be supplied by the customer or may be ordered from Power Gear once required lengths are determined.

The motor controls and starter for this unit are not supplied by Power Gear. Our customers are responsible for wiring this motor in compliance with all applicable electrical codes.

This pump/motor unit is sized for maximum flow. This means that the unit is sensitive to voltage drop caused by undersized wiring. If the unit stalls under load, check your voltage at the motor while the motor is operating. If substandard voltage is found, check and adjust your wiring.

## **For 120 or 220 Motors (Single Phase)**

This motor may be wired for either 120 or 220 volts, (21/11 amps respectively), 60 Hz AC single phase. This motor is internally wired in a manner that rotation is not reversible. Consult the motor tag for proper lead connection for the voltage you select.

## **For 220 or 440 Motor (Three Phase)**

This motor may be wired for either 220 or 440 volts, (5.6/2.8 amps respectively), 60 hz KAC three phase. The motor rotation is dependant on how it is wired, therefore removal of the pump during wiring is a must. The motor must have C.C.W. rotation (looking at shaft) prior to reinstallation of pump. Consult motor tag for proper lead connection for the voltage you select.

If you have any questions, please call Power Gear at 1-800-334-4712.

## **Filling**

See page 25.

# DC Installation Instructions

## Control Box Mounting

Determine desired control box location. No part of the control box or handles should extend beyond the sides of the trailer. Hold control box in desired location. Be sure trailer cross members are free of rust and undercoating where control box hanger straps make contact. Tack weld hanger straps in place. Replace hanger strap bolts and lower control box. Finish welding hanger straps to trailer cross members and remount control box. Torque mounting bolts to 20 ft.-lbs.

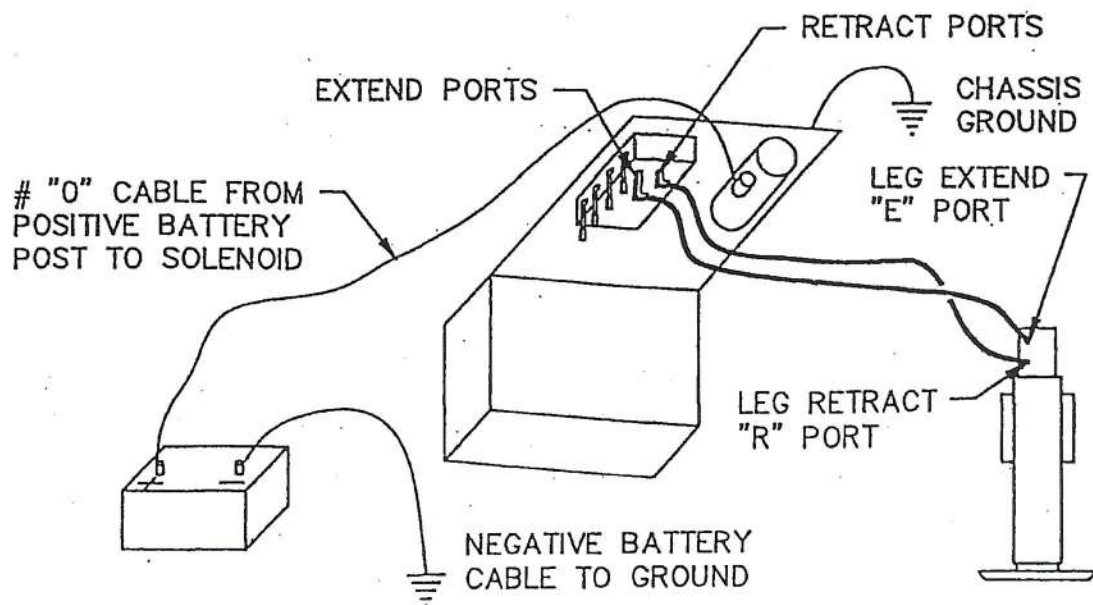
## Plumbing

Determine lengths of high pressure hose required. Hoses should be 5/16 i.d. min. 2,500 PSI working pressure with #6 37° SAE Flare Female Swivel Ends. Hoses to be supplied by the customer or may be ordered from Power Gear once required lengths are determined.

## Filling

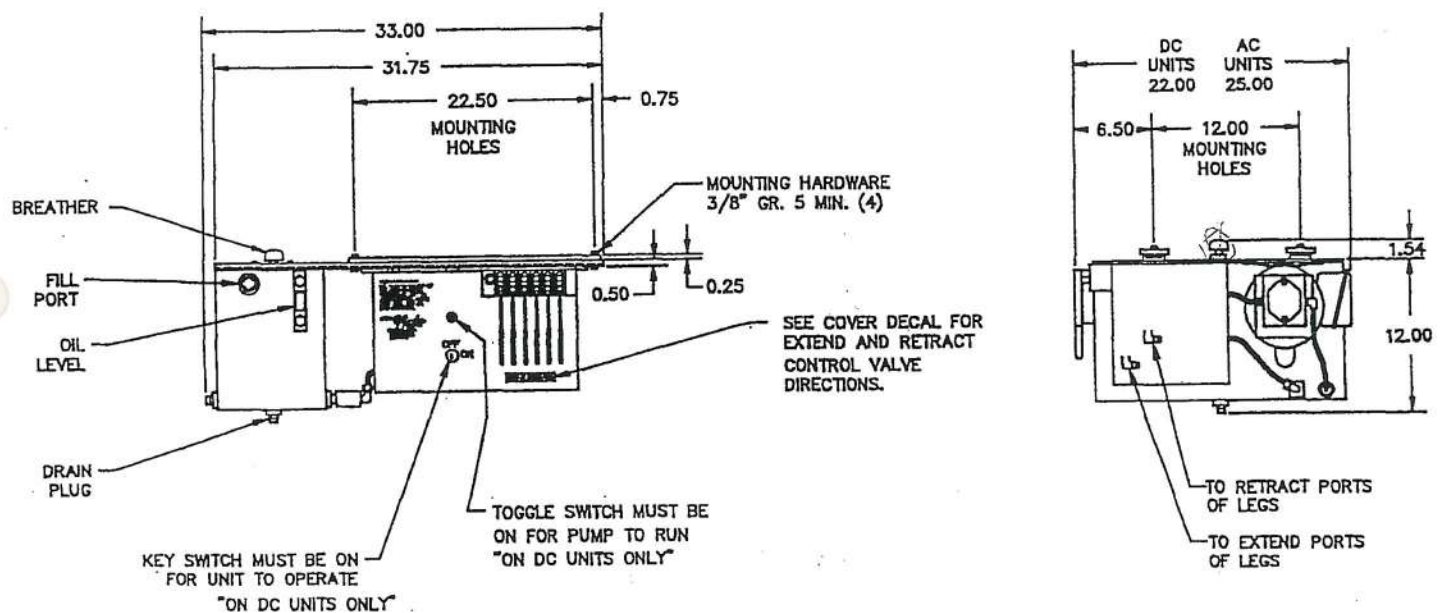
1. Remove pipe plug in front of oil tank.
2. Fill with approved oil until oil is at the top of sight gage.
3. Cycle legs twice to bleed air from system (If legs do not fully extend to full stroke after first fill, add oil until full stroke is able to be reached).
4. With legs fully retracted recheck oil level at sight gage.
5. Replace Plug.
6. Check fittings and hoses for leaks and tighten as required.
7. Secure all hoses in a manner that will not cause chafing.

Your system is now ready to use.





# Stabilizer Control Box For All AC and DC Units

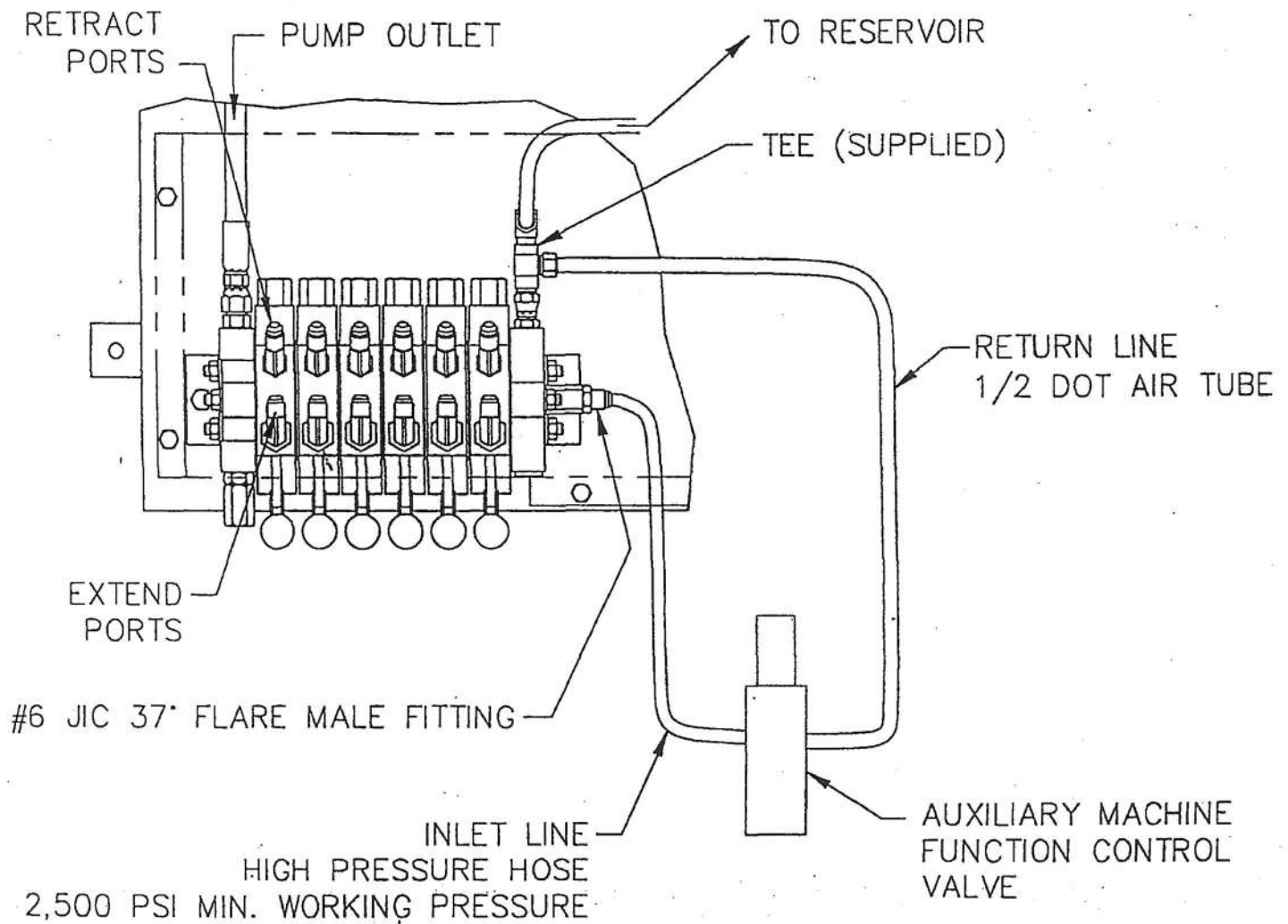


## NOTE:

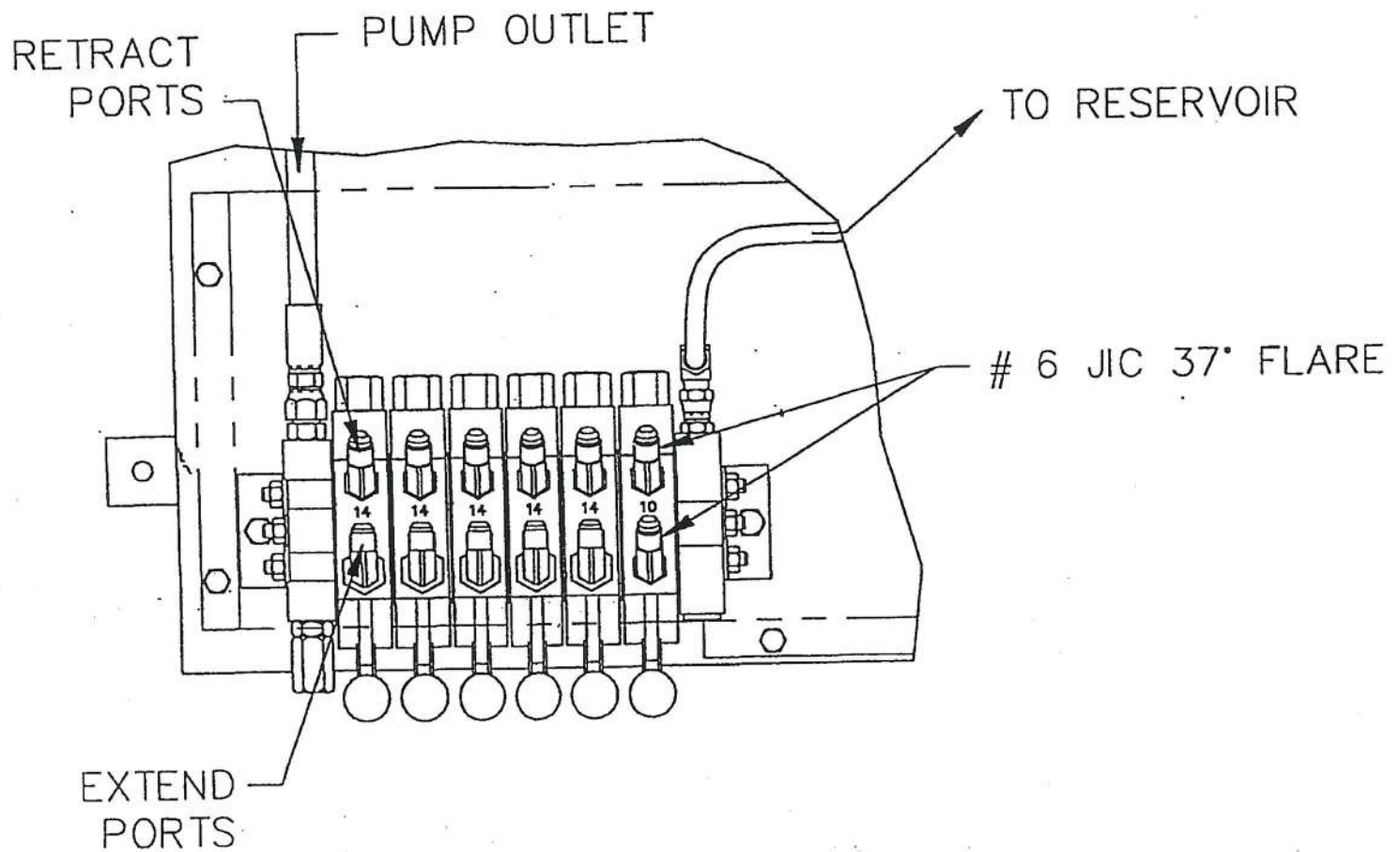
ALL HYDRAULIC CONNECTIONS ARE NUMBER 6 (9/16-18 THD.) 37° J.I.C. MALE FLARE (HOSE ASS'Y. MUST HAVE FEMALE SWIVEL)

DIMENSIONS APPLY FOR 1-6 BANK VALVE'S ON STABILIZER CONTROL BOXES

# Application For Power Beyond Valves



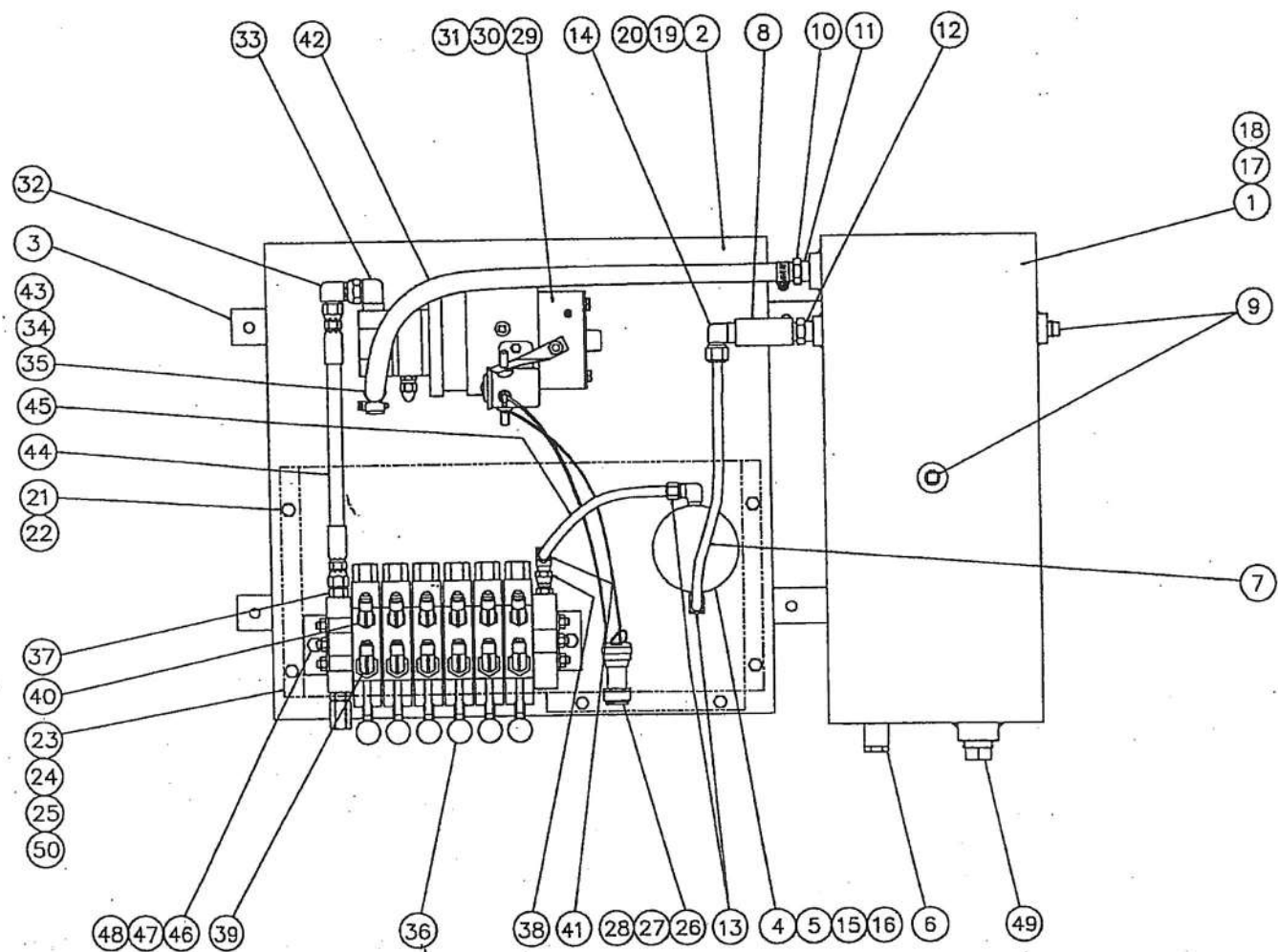
# Application For Last Section Closed Valves



Section(s) with 14 stamped on it connect to leg(s). Section(s) with 10 stamped on it connect to auxillary cylinder(s).



# 12 VDC Stabilizer Control Box



# 12 VDC Stabilizer Control Box Parts List

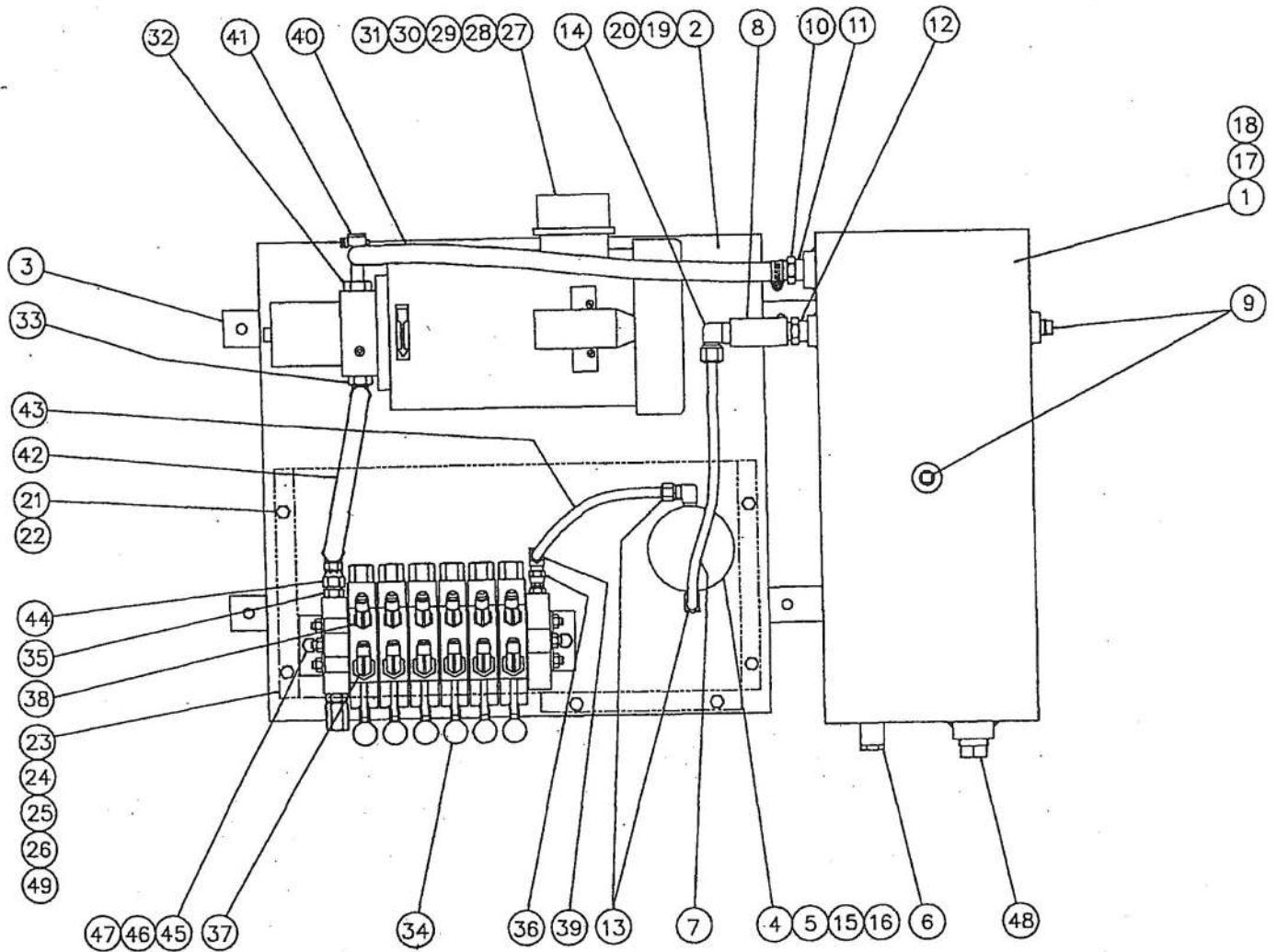
## Parts List

Item	Part No.	Description	Qty.
1-20	300208	reservoir plate assembly	1
1	300190	reservoir	1
2	300304	base plate	1
3	100316	base channel	2
4	06-1013	head	1
5	06-1014	element	1
6	06-1017	sight gage	1
7	001-028000	tube, 28.00 Long	1
8	09-1050	check valve	1
9	07-1099	plug, magnetic	2
10	07-1110	beaded nipple	1
11	07-1109	reducing bushing	1
12	07-1031	hex nipple	1
13	07-1158	90° elbow	2
14	07-1012	90° elbow	1
15	16-1001	lock washer	2
16	15-1012	H.H.C.S.	2
17	06-1004	vent	1
18	15-1050	lock nuts	4
19	15-1015	machine screw	4
20	15-1010	hex nut	4
21-28	300209	cover assembly, DC	1
21	15-1019	H.H.C.S.	4
22	16-1003	lock washer	4
23	101157	cover	1
24	128-019000	rubber molding	1
25	300212	cover decal	1
26	14-1048	wire harness	1
27	14-1018	toggle switch	1
28	14-1010	key switch	1
29-35	300211	12 VDC pump/motor assembly	1
29	16-1002	lock washer	2
30	15-1004	H.H.C.S.	2
31	13-1009	12 VDC pump/motor, wound	1
32	07-1063	90° swivel elbow	1
33	07-1076	90° elbow	1
34	07-1111	90° elbow	1
35	07-1110	beaded connector	1
36-41	*	valve assembly	1
36	*	valve	1
37	07-1085	male connector	1
38	07-1044	adaptor	*
39	300309	flow control assembly	*
40	07-1093	45° elbow	*

Item	Part No.	Description	Qty.
41	*	valve fitting assembly	1
42	005-025000	hose, 25.00 long	1
43	99-1015	hose clamp	2
44	2004-00975	hose assembly, 9.75 long	1
45	001-009000	tube, 9.00 long	1
46	15-1004	H.H.C.S.	2
47	16-1002	lock washer	2
48	15-1010	hex nut	2
49	07-1226	plug, fill	1
50	300510	decals, valve operation	1

\* = Consult factory when ordering

# 110 & 220 VAC Control Box





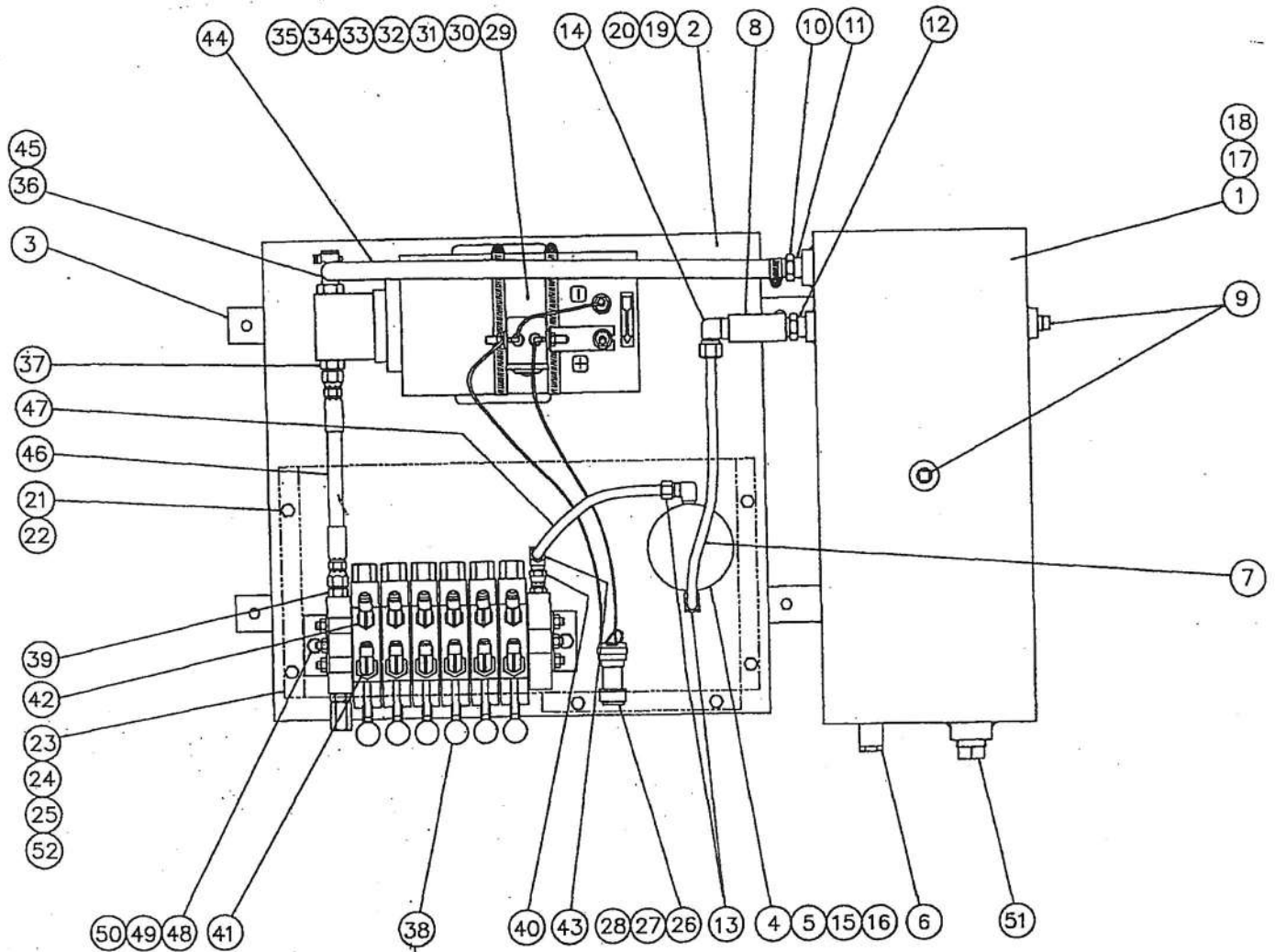
# 110 & 220 VAC Control Box Parts List

## Parts List

Item	Part No.	Description	Qty.	Item	Part No.	Description	Qty.
1-20	300208	reservoir plate assembly	1	39	*	valve fitting assembly	1
1	300190	reservoir	1	40	005-025000	hose, 25.00 long	1
2	300304	base plate	1	41	99-1015	hose clamp	2
3	100316	base channel	2	42	2004-013	hose assembly, 13.00 long	1
4	06-1013	head	1	43	001-009000	tube, 9.00 long	1
5	06-1014	element	1	44	07-1076	90° swivel elbow	1
6	06-1017	sight gage	1	45	15-1004	H.H.C.S.	2
7	011-028000	tube, 28.00 long	1	46	16-1002	lock washer	2
8	09-1050	check valve	1	47	15-1010	hex nut	2
9	07-1099	plug, magnetic	2	48	07-1226	plug, fill	1
10	07-1110	beaded nipple	1	49	300510	decals, valve operation	1
11	07-1109	reducing bushing	1				
12	07-1031	hex nipple	1				
13	07-1158	90° elbow	2				
14	07-1012	90° elbow	1				
15	16-1001	lock washer	2				
16	15-1012	H.H.C.S.	2				
17	06-1004	vent	1				
18	15-1050	lock nuts	4				
19	15-1015	machine screw	4				
20	15-1010	hex nut	4				
21-26	200210	cover assembly, AC	1				
21	15-1019	H.H.C.S.	4				
22	16-1003	lock washer	4				
23	101157	cover	1				
24	128-019000	rubber molding	1				
25	300212	cover decal	1				
26	300213	cover decal blanking	1				
27-37	300307	110 VAC pump/mtr. asm. sing. ph. or 220 VAC pump/mtr. asm. 3 ph.	1				
27	13-1018	110 sing. Ph. VAC pump/motor	1				
27	13-1022	220 3 Ph. VAC pump/motor	1				
28	15-1032	H.H.C.S.	4				
29	16-1003	lock washer	4				
30	16-1005	flat washer	4				
31	15-1005	hex nut	4				
32	07-1085	90° elbow	1				
33	07-1059	90° elbow	1				
34-39	*	valve assembly	1				
34	*	valve	1				
35	07-1085	male connector	1				
36	07-1044	adaptor	*				
37	300309	flow control assembly	*				
38	07-1093	45° elbow	*				

\* = Consult factory when ordering

# 12 & 24 VDC Permanent Magnet Motor Control Box



# 12 & 24 VDC Permanent Magnet Motor Control Box Parts List

## Parts List

Item	Part No.	Description	Qty.
1-20	300208	reservoir plate assembly	1
1	300190	reservoir	1
2	300304	base plate	1
3	100316	base channel	2
4	06-1013	head	1
5	06-1014	element	1
6	06-1017	sight gage	1
7	011-028000	tube, 28.00 long	1
8	09-1050	check valve	1
9	07-1099	plug, magnetic	2
10	07-1110	beaded nipple	1
11	07-1109	reducing bushing	1
12	07-1031	hex nipple	1
13	07-1158	90° elbow	2
14	07-1012	90° elbow	1
15	16-1001	lock washer	2
16	15-1012	H.H.C.S.	2
17	06-1004	vent	1
18	15-1050	lock nuts	4
19	15-1015	machine screw	4
20	15-1010	hex nut	4
21-28	300209	cover assembly, DC	1
21	15-1019	H.H.C.S.	4
22	16-1003	lock washer	4
23	101157	cover	1
24	128-019000	rubber molding	1
25	300212	cover decal	1
26	14-1048	wire harness	1
27	14-1018	toggle switch	1
28	14-1010	key switch	1
29-39	300189	12 VDC P.M. pump/motor assy. or	
	300194	24 VDC P.M. pump/motor assy.	1
29	13-1079	12 VDC P.M. pump/motor	1
29	13-1078	24 VDC P.M. pump/motor	1
30	99-1048	hose clamp	2
31	14-1033	12 VDC solenoid	1
31	14-1034	24 VDC solenoid	1
32	15-1101	H.H.C.S.	4
33	16-1003	lock washer	4
34	16-1010	flat washer	4
35	15-1005	hex nut	4
36	*	90° elbow	1
37	*	male connector	1
38-43	*	valve assembly	1
38	*	valve	1
39	07-1085	male connector	1
40	07-1044	adaptor	*
41	300309	flow control assembly	*
42	07-1093	45° elbow	*
43	*	valve fitting assembly	1
44	005-025000	hose, 25.00 long	1
45	99-1015	hose clamp	2

Item	Part No.	Description	Qty.
46	2004-00975	hose assembly, 9.75 long	1
47	001-009000	tube, 9.00 long	1
48	15-1004	H.H.C.S.	2
49	16-1002	lock washer	2
50	15-1010	hex nut	2
51	07-1226	plug, fill	1
52	300510	decals, valve operation	1

\* = Consult factory when ordering.

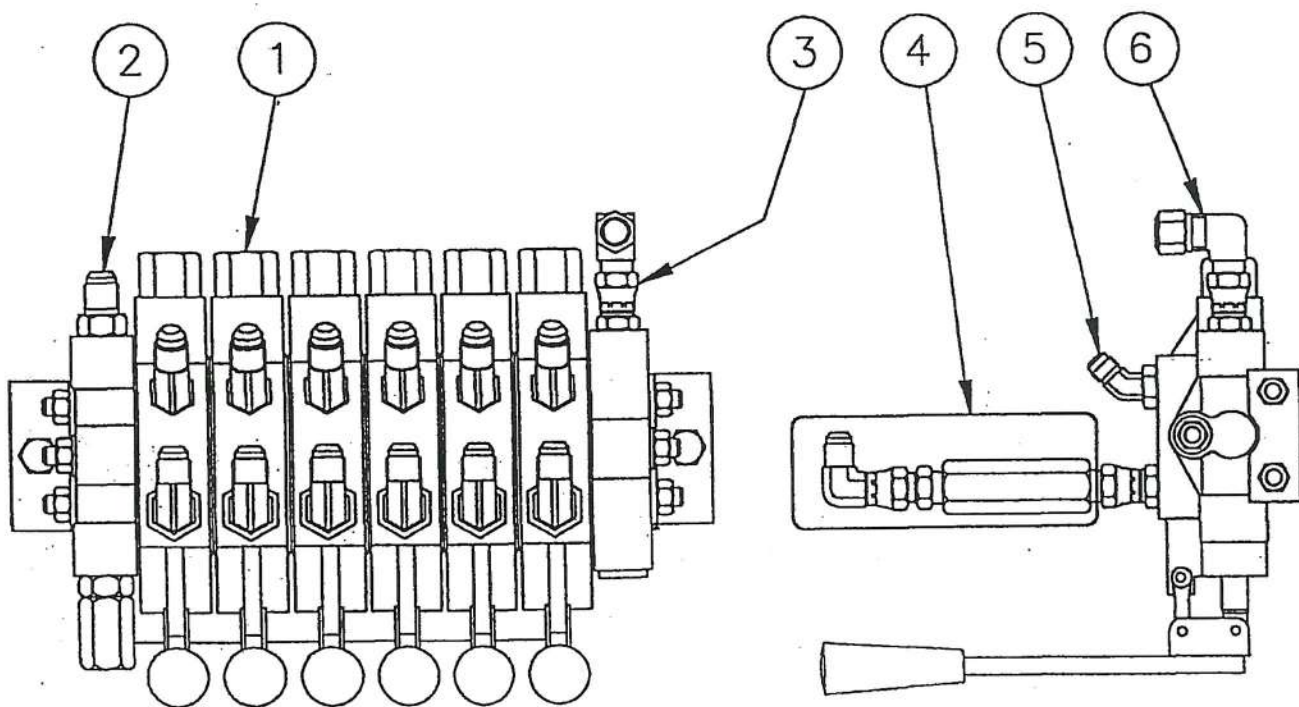


# Open Center Valve Assembly Parts List

## Parts List

Item	Part No.	Description	Qty.
1-6	*	valve assembly	1
1	*	valve	1
2	07-1085	male connector	1
3	07-1044	adaptor	*
4	300309	flow control assembly	*
5	07-1093	45° elbow	*
6	07-1012	90° elbow	1
6	300539	valve fitting assembly	1

\* = Consult factory when ordering.

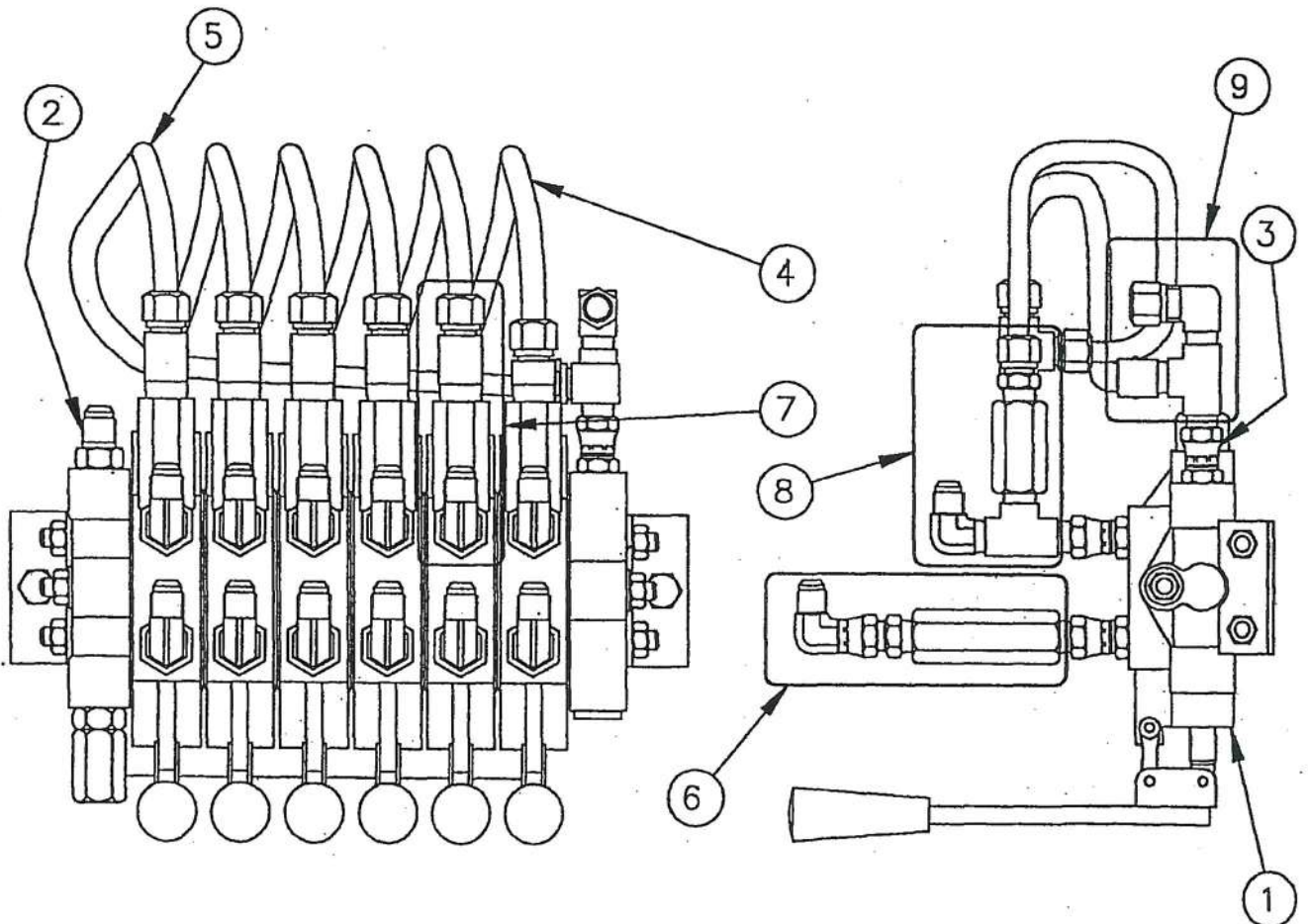


# Open Center Valve Assembly Parts List Before March 1996 & Closed Center Valve Assembly Parts List To Date

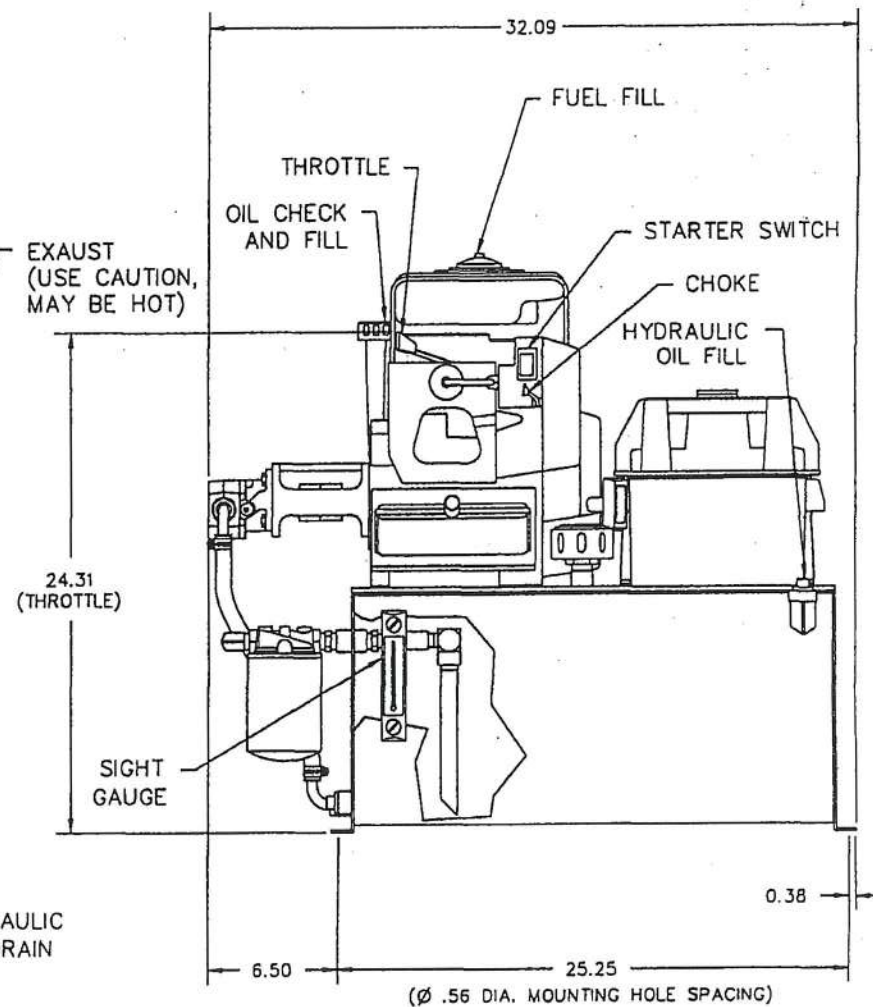
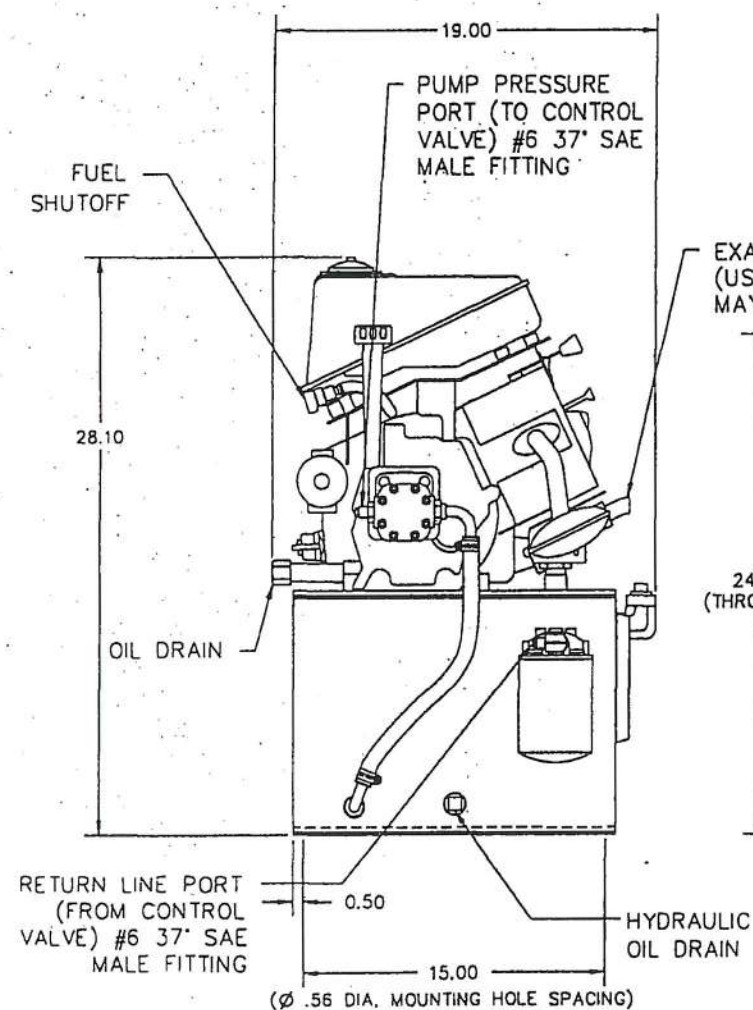
## Parts List

Item	Part No.	Description	Qty.
1-9	*	valve assembly	1
1	*	valve	1
2	07-1085	male connector	1
3	07-1044	adaptor	*
4	002-011000	tube, 11.00 long	*
5	002-014000	tube, 14.00 long	*
6	300309	flow control assembly	*
7	300310	relief valve assembly	*
8	300311	relief valve assembly	1
9	300312	valve fitting assembly	1
9	300225	valve fitting assembly for power beyond	1

\* = Consult factory when ordering.



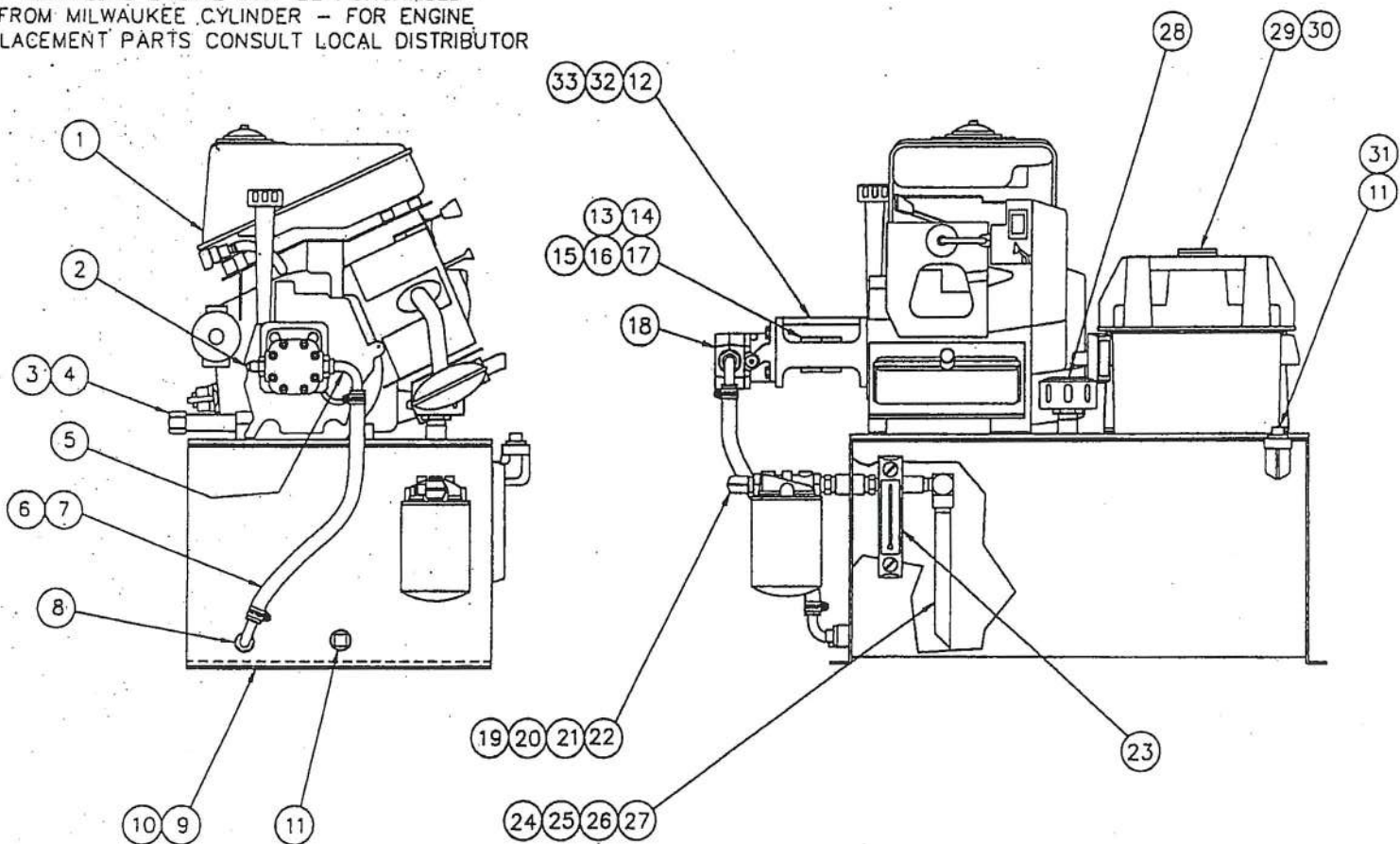
# 6 H.P. Kohler Gas Engine Control Box Drawing





# 6 H.P. Kohler Gas Engine Control Box Parts List

NOTE:  
COMPLETE ENGINE MAY BE PURCHASED  
FROM MILWAUKEE CYLINDER - FOR ENGINE  
REPLACEMENT PARTS CONSULT LOCAL DISTRIBUTOR



# 6 H.P. Kohler Gas Engine Parts List

## Parts List

Item	Part No.	Description	Qty.
1	13-1024	gas engine, 6 H.P.	1
2	07-1085	Str. Thd. o-ring connector (not shown)	1
3	07-1034	1/2" NPT Cap	1
4	07-1086	1/2" NPT pipe nipple x 3-1/2"	1
5	07-1185	1/2" beaded insert x 1/2" SAE	1
6	005-0145	hose, 1/2" i.d. x 14.50" lg	1
7	99-1015	hose clamp	2
8	07-1186	1/2" beaded insert x 1/2" NPT	1
9	300201	hydraulic oil reservoir	1
10	300202	hydraulic oil reservoir cover	1
11	07-1183	3/4" NPT pipe plug	2
12	13-1066	pump mount	1
13	13-1027	shaft coupling, 3/4" bore (not shown)	1
14	13-1028	shaft coupling, 7/16" bore (not shown)	1
15	13-1029	spider (not shown)	1
16	13-1030	3/16" sq. key x 1" lg. (not shown)	1
17	13-1031	1/8" sq. key x 1" lg. (not shown)	1
18	13-1065	pump	1
19	07-1187	90° male elbow	1
20	06-1013	oil filter head	1
21	06-1014	oil filter element	1
22	07-1188	pipe nipple, 1/2" NPT	1
23	06-1015	sight gauge	1
24	07-1189	pipe nipple, 1/2" x 3/8" NPT	1
25	09-1050	check valve	1
26	07-1190	90° elbow, 3/8" male x 1/2" female	1
27	07-1178	standpipe	1
28	06-1016	3/4" NPT breather	1
29	14-1027	battery	1
30	14-1028	battery case	1
31	07-1191	street elbow, 3/4" NPT	1
32	13-1069	shaft guard (not shown)	1
33	99-1034	shaft guard clamp (not shown)	1

# 6 H.P. Kohler Gas Engine Installation Instructions

## Plumbing

Determine length of high pressure hose required. Hoses should be 5/16 i.d. high pressure with #6 37° SAE Flare Female Swivel Ends. Hoses to be supplied by the customer or may be ordered from Power Gear once required lengths are determined.

## Engine

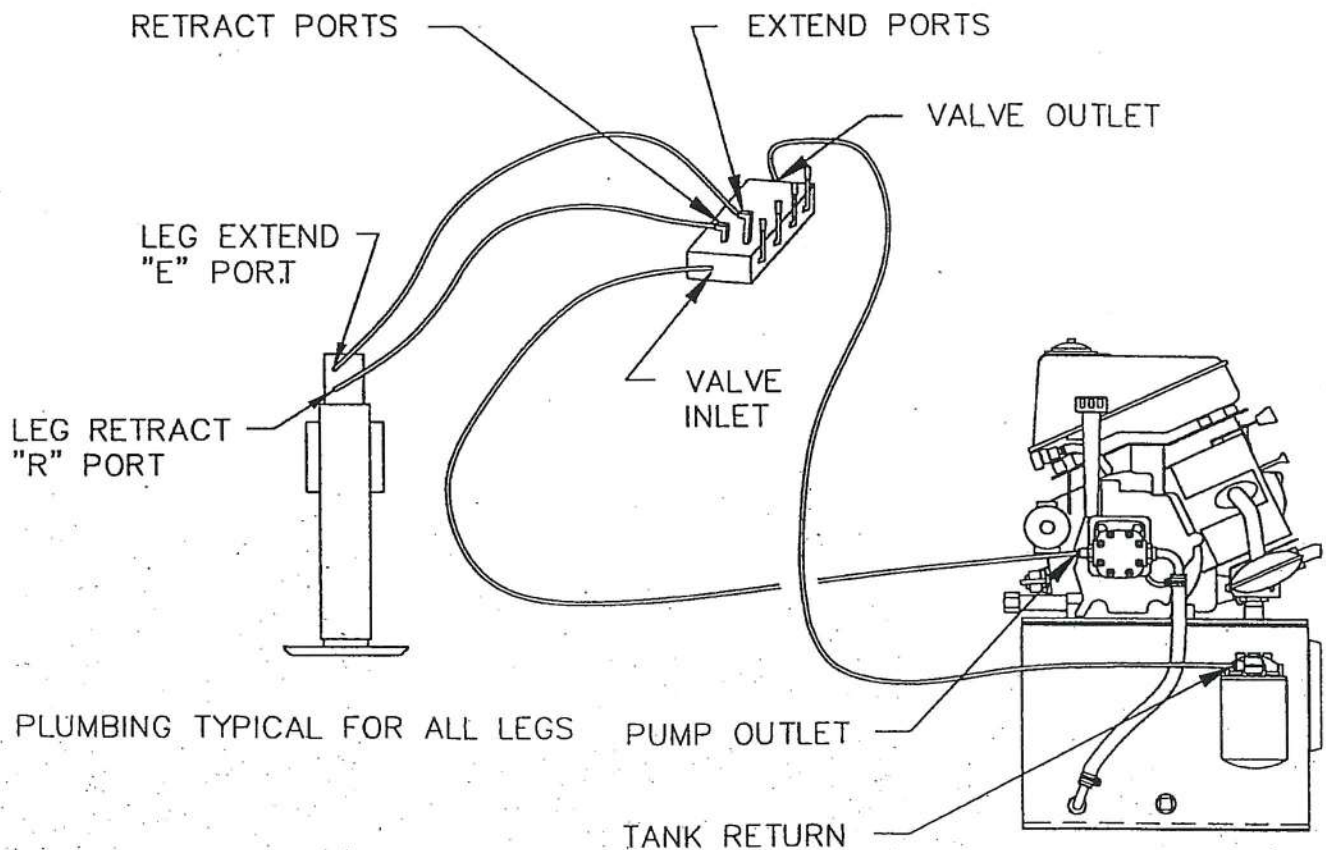
Make certain engine is ready to run according to engine manual (i.e. gas and oil). Don't run until hydraulic reservoir is filled, see filling.

## Filling

Remove pipe plug from elbow in front of reservoir. Fill reservoir to top of sight glass. Cycle legs twice to bleed air from system. With legs fully retracted, refill reservoir to top of sight glass. Replace plug.

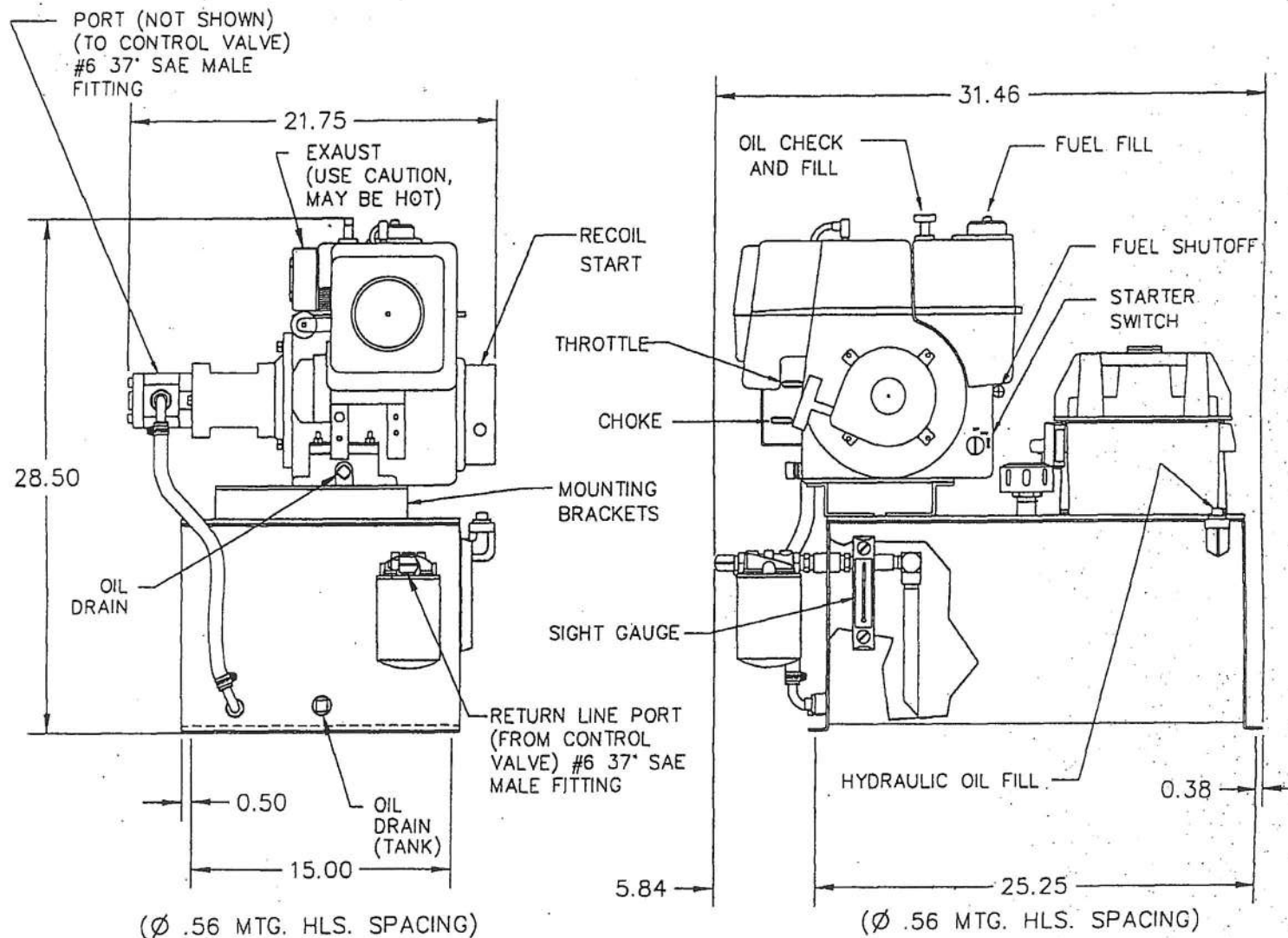
Check fitting and hoses for leaks and tighten as required. Secure all hoses in a manner that will not cause chafing.

Your system is now ready to use.

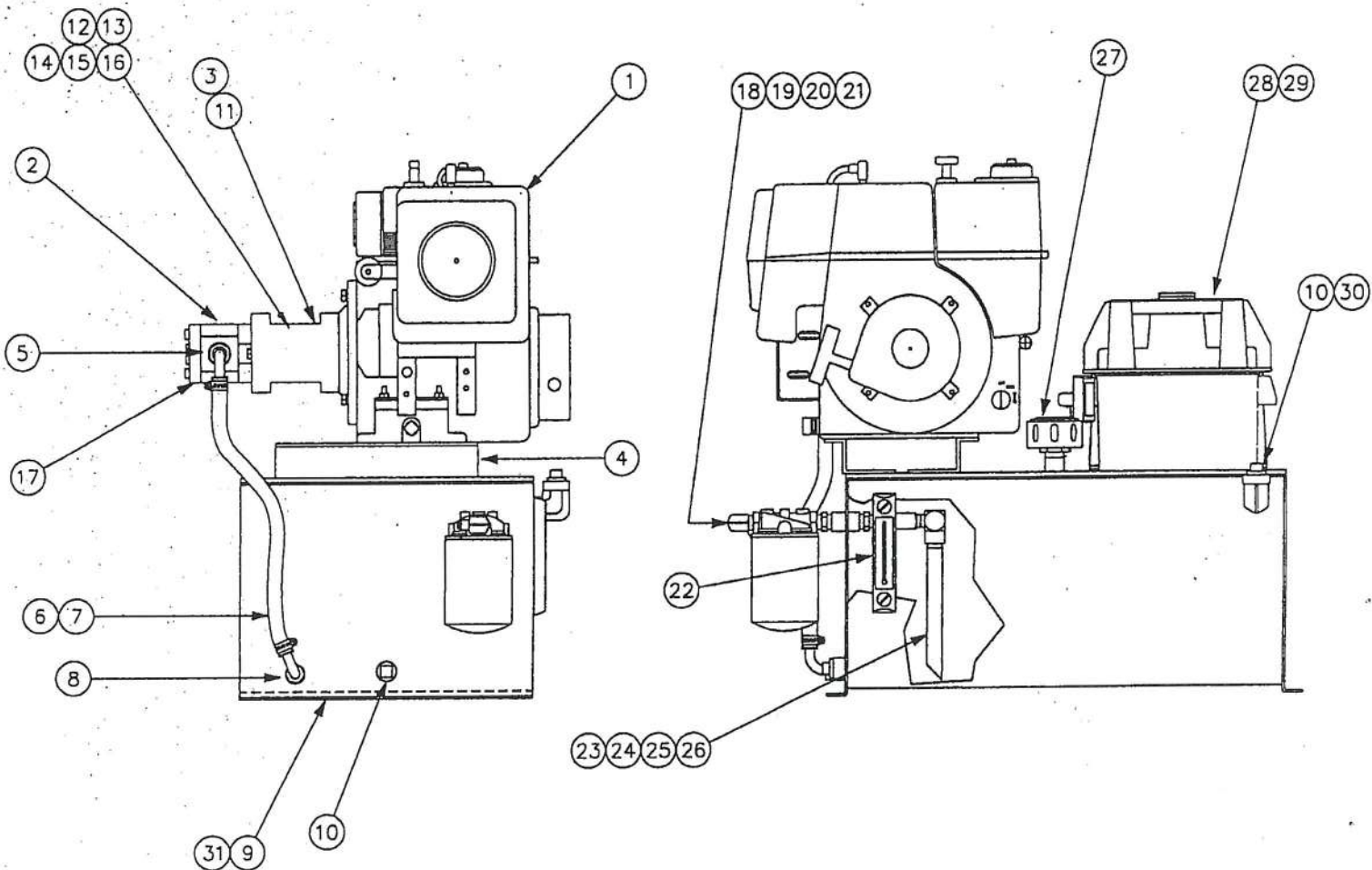




# 8 H.P. Kohler Gas Engine Control Box Drawing



# 8 H.P. Kohler Gas Engine Control Box Parts List



# 8 H.P. Kohler Gas Engine Parts List

## Parts List

Item	Part No.	Description	Qty.
1	13-1024	gas engine, 8 H.P.	1
2	07-1085	str. thd. o-ring con. (not shown)	1
3	13-1074	shaft guard (not shown)	2
4	300507	mounting bracket	2
5	07-1185	1/2" beaded insert x 1/2" SAE	1
6	005-0170	hose, 1/2" i.d. x 17.00" lg.	1
7	99-1015	hose, clamp	2
8	07-1186	1/2" beaded insert x 1/2" NPT	1
9	300201	hydraulic oil reservoir	1
10	07-1183	3/4" NPT pipe plug	2
11	13-1072	pump mount	1
12	13-1073	shaft coupling, 1" bore (not shown)	1
13	13-1037	shaft coupling, 1/2" bore (not shown)	1
14	13-1039	spider (not shown)	1
15	13-1059	1/4" sq. key x 1" lg. (not shown)	1
16	13-1031	1/8" sq. key x 1" lg. (not shown)	1
17	13-1075	pump	1
18	07-1187	90° male elbow	1
19	06-1013	oil filter head	1
20	06-1014	oil filter element	1
21	07-1188	pipe nipple, 1/2" NPT	1
22	06-1015	sight gauge	1
23	07-1189	pipe nipple, 1/2" x 3/8" NPT	1
24	09-1050	check valve	1
25	07-1189	90° 3/8" male X 1/2" female	1
26	07-1178	standpipe	1
27	06-1016	3/4" NPT breather	1
28	14-1027	battery	1
29	14-1028	battery case	1
30	07-1191	street elbow, 3/4" NPT	1



# 8 H.P. Kohler Gas Engine Installation Instructions

## Plumbing

Determine length of high pressure hose required. Hoses should be 5/16 i.d. high pressure with #6 37° SAE Flare Female Swivel Ends. Hoses to be supplied by the customer or may be ordered from Power Gear once required lengths are determined.

## Engine

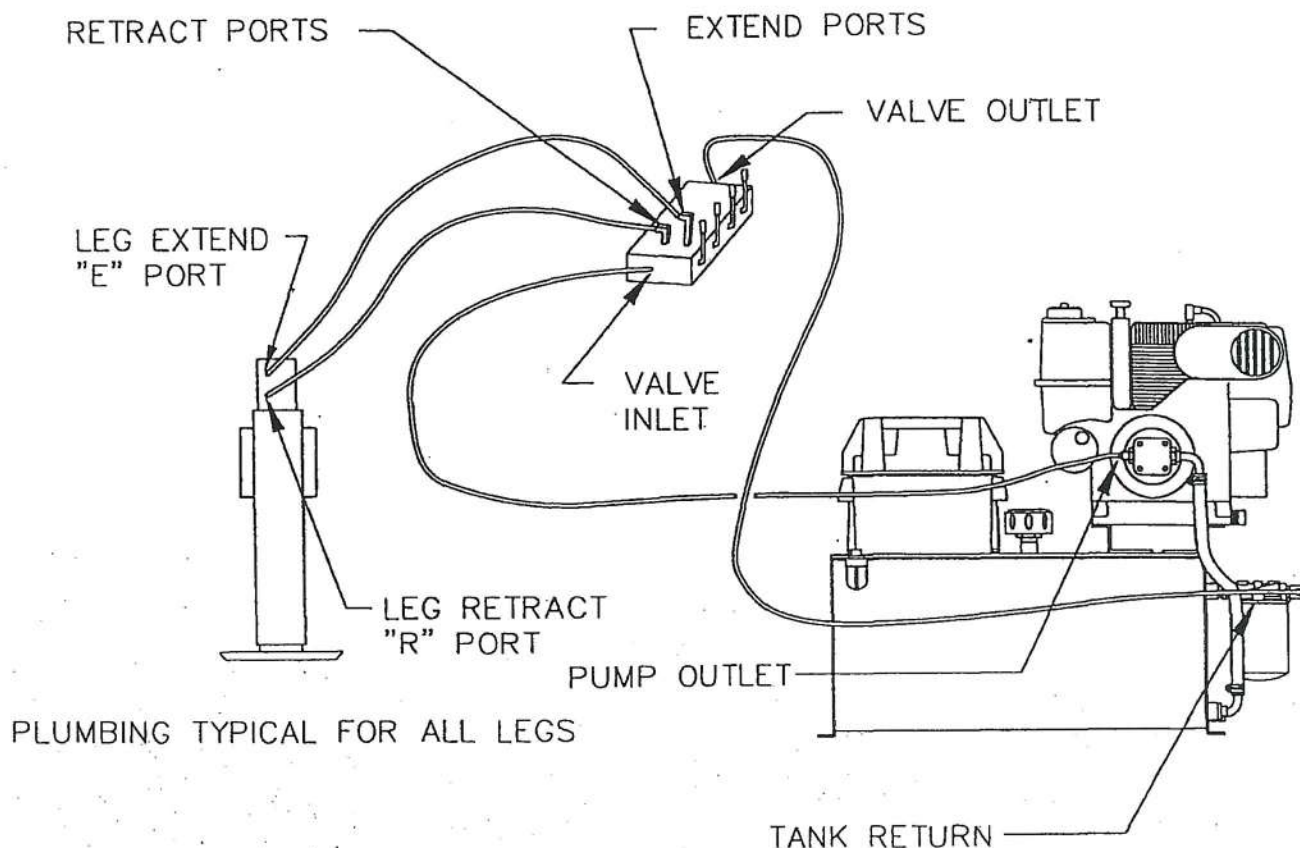
Make certain engine is ready to run according to engine manual (i.e. gas and oil). Do not run until hydraulic reservoir is filled, see filling.

## Filling

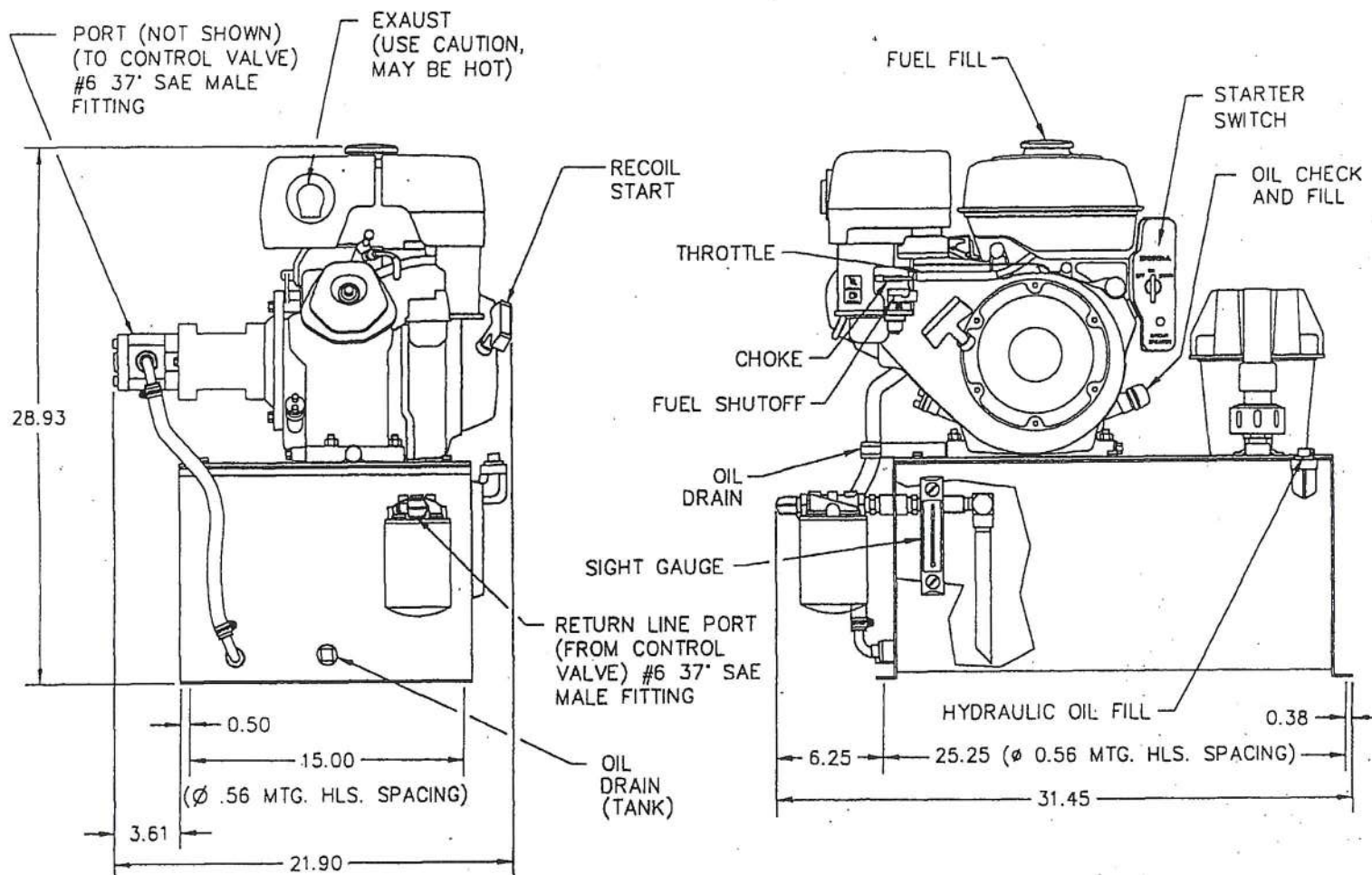
Remove pipe plug from elbow in front of reservoir. Fill reservoir to top of sight glass. Cycle legs twice to bleed air from system. With legs fully retracted refill reservoir to top of sight glass. Replace plug.

Check fitting and hoses for leaks and tighten as required. Secure all hoses in manner that will not cause chafing.

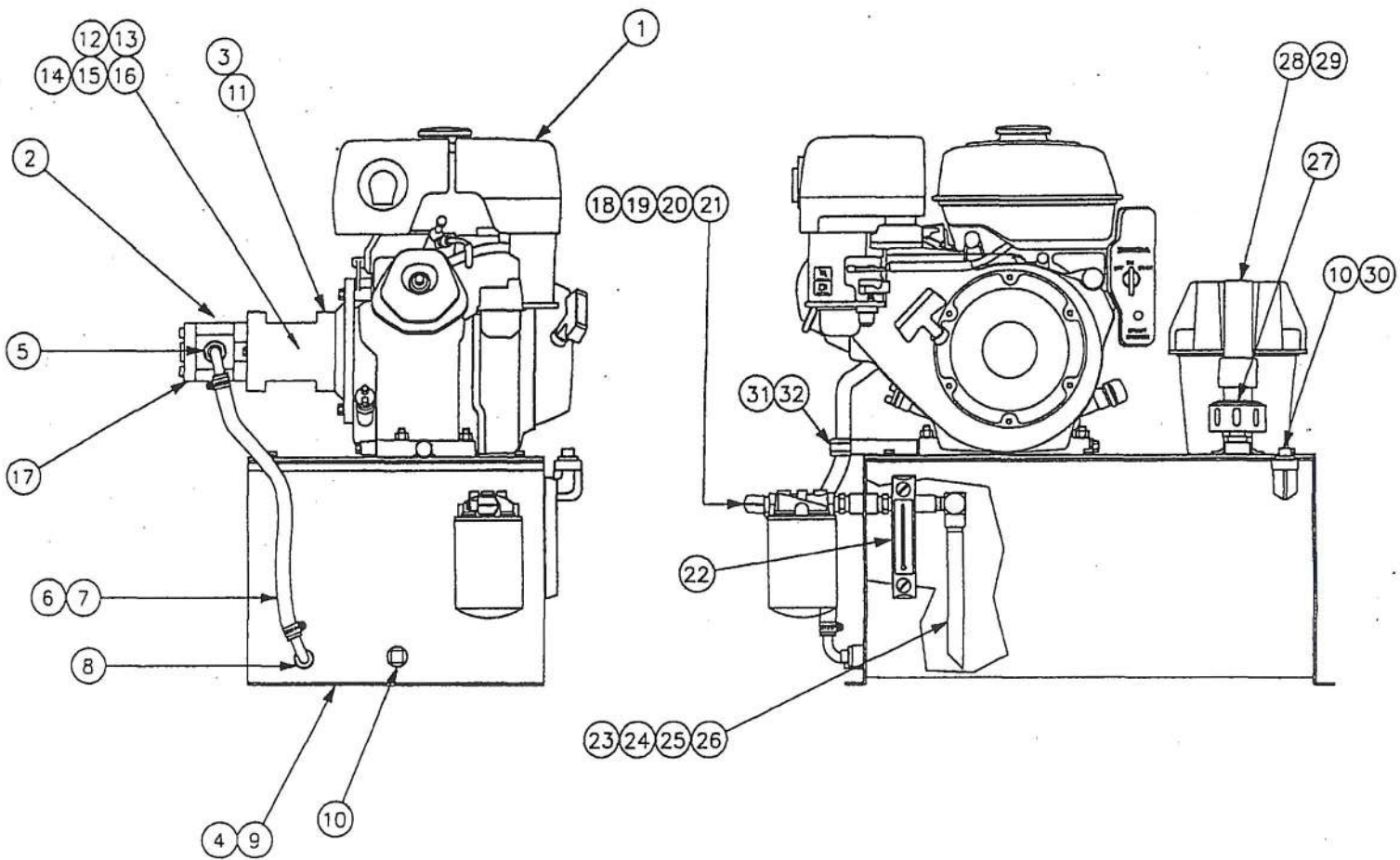
Your system is now ready to use.



# 8 H.P. Honda Gas Engine Control Box Drawing



# 8 H.P. Honda Gas Engine Box Parts List





# 8 H.P. Honda Gas Engine Parts List

## Parts List

Item	Part No.	Description	Qty.
1	13-1093	gas engine, 8 H.P.	1
2	07-1085	Str. Thd. o-ring con. (not shown)	1
3	13-1074	shaft guard (not shown)	2
4	300551	hydraulic oil reservoir cover	1
5	07-1185	1/2" beaded insert x 1/2" SAE	1
6	005-0180	hose, 1/2" i.d. x 18.00" lg.	1
7	99-1015	hose, clamp	2
8	07-1186	1/2" beaded insert x 1/2" NPT	1
9	300201	hydraulic oil reservoir	1
10	07-1183	3/4" NPT pipe plug	2
11	13-1072	pump mount	1
12	13-1073	shaft coupling, 1" bore (not shown)	1
13	13-1037	shaft coupling, 1/2" bore (not shown)	1
14	13-1039	spider (not shown)	1
15	13-1059	1/4" sq. key x 1" lg. (not shown)	1
16	13-1031	1/8" sq. key x 1" lg. (not shown)	1
17	13-1075	pump	1
18	07-1187	90° male elbow	1
19	06-1013	oil filter head	1
20	06-1014	oil filter element	1
21	07-1188	pipe nipple, 1/2" NPT	1
22	06-1015	sight gauge	1
23	07-1189	pipe nipple, 1/2" x 3/8" NPT	1
24	09-1050	check valve	1
25	07-1190	90° 3/8" male X 1/2" female	1
26	07-1178	standpipe	1
27	06-1016	3/4" NPT breather	1
28	14-1027	battery	1
29	14-1028	battery case	1
30	07-1191	street elbow, 3/4" NPT	1
31	07-1228	cap plug	1
32	300552	drain tube	1

# 8 H.P. Honda Gas Engine Installation Instructions

## Plumbing

Determine length of high pressure hose required. Hoses should be 5/16 i.d. high pressure with #6 37° SAE flare female swivel ends. Hoses to be supplied by the customer or may be ordered from Power Gear once required lengths are determined.

## Engine

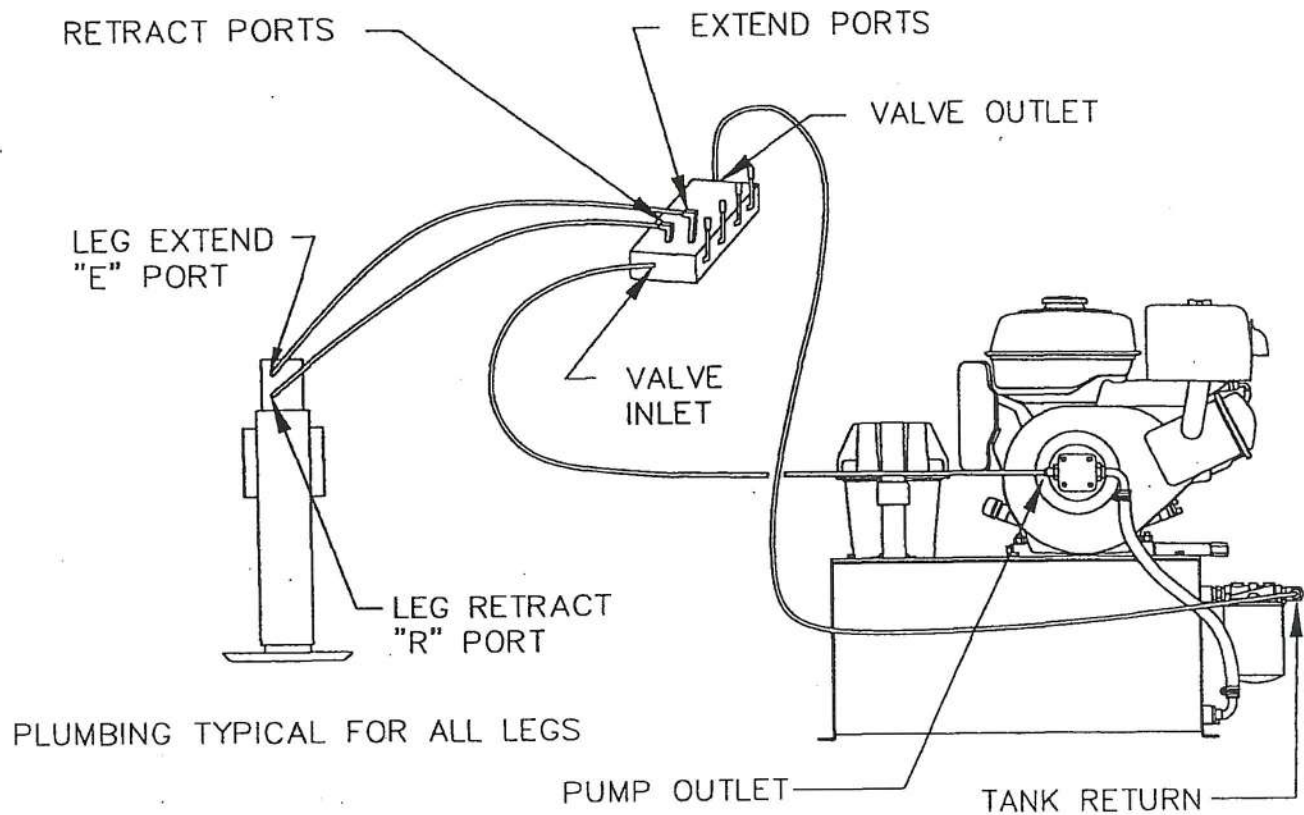
Make certain engine is ready to run according to engine manual (i.e. gas and oil). Do not run until hydraulic reservoir is filled, see filling.

## Filling

Remove pipe plug from elbow in front of reservoir. Fill reservoir to top of sight glass. Cycle legs twice to bleed air from system. With legs fully retracted, refill reservoir to top of sight glass. Replace plug.

Check fitting and hoses for leaks and tighten as required. Secure all hoses in manner that will not cause chafing.

Your system is now ready to use.



# Troubleshooting

## PROBLEM

## CAUSE

## SOLUTION

### FOR DC UNITS:

1. Pump won't turn on.

Keyswitch not turned on.

Turn keyswitch on.

Low or dead battery.

Charge or replace battery.

Loose or dirty electrical connections.

Repair.

Defective solenoid.

Replace solenoid.

Defective pump.

Replace.

Defective toggleswitch.

Replace P/N 14-1018.

Defective keyswitch.

Replace P/N 14-1010.

### FOR AC UNITS:

1. Pump won't turn on.

Power not connected to local system.

Connect power per codes.

Pump wired incorrectly.

Correct wiring per local codes.

Loose or dirty electrical connections.

Repair.

Defective pump.

Replace.

### FOR GAS ENGINE UNITS:

1. Engine won't start.

Battery discharged.

Change battery.

Battery wires loose or corroded.

Check and tighten or clean as necessary.

If the problem is not with the battery or wires, consult engine manual.



# Troubleshooting (cont.)

## PROBLEM

## CAUSE

## SOLUTION

### FOR GAS ENGINE UNITS CONT.:

2. Engine starts, but legs move slowly or not at all.

Control valve not fully activated.

Fully shift control valve.

Low fluid level.

Check and fill as required.

Lock valve sticking.

Replace cartridge, kit P/N 300085.\*

Legs (cylinders) loaded over capacity.

Reduce load.

Faulty or stuck relief valve at control valve.

Adjust relief valve clockwise, increase pressure.

Leaky piston seal in leg (cylinder).

Rebuild leg.\*

Engine won't run at proper speed.

Consult engine manual.

### FOR GAS, AC, & DC UNITS:

2. Pump turns on but legs move slowly or not at all.

Control valve not fully activated.

Fully "shift" control valve.

Low fluid level.

Check and refill as required.

Lock valve sticking.

Rebuild lock valves.

Legs (cylinders) loaded over capacity.

Reduce load.

Faulty or stuck relief valve at control valve.

Adjust relief valve clockwise, increases pressure.

Leaky piston seal in leg (cylinder).

Rebuild leg.\*

# Troubleshooting (cont.)

PROBLEM	CAUSE	SOLUTION
<b>FOR GAS, AC, &amp; DC UNITS CONT.:</b>		
3. Control valve will not center.	Valve spool is dirty and/or corroded or return springs broken.	Try lubricating spool or replace valve.
4. Legs leak down.	Extend legs so that they support the trailer 3 - 6" above jack stand. Remove both lines at each leg. Wipe any oil from around ports. Leave sit until oil is noticed leaking from one port or the other. If the extend port leaks, the check valve is defective. If the retract port leaks, the leg seals are defective.	Rebuild as needed.
	Worn or damaged piston seal.	Rebuild legs.*
	Leaking lock valve cartridge.	Rebuild lock valve.
5. Legs leak down from retracted position.	If the legs do not leak as described in "4" above, lock valves leak.	Rebuild lock valves.
	If the legs leaked as described in "4".	Rebuild legs.*
6. External oil leak.	Leaking rod seal or rod guide o-ring seal.	Rebuild legs.*
7. Erratic motion of legs.	Pump sucking air.	Tighten pump suction fittings. Low oil level. Replace pump (bad shaft seal).

# Troubleshooting (cont.)

## PROBLEM

## CAUSE

## SOLUTION

### FOR GAS, AC, & DC UNITS CONT.:

8. Leg(s) will not retract.

Faulty lock valve.

To retract legs, loosen the small plug at the lock valve, 1 to 1-1/2 turns counter-clockwise. This will allow bleeding oil out of the piston side of the cylinder. **CAUTION: use eye protection and trailer supports.** Once the pressure is relieved, remove the plug and retract the cylinder manually with a pry bar. Catch oil from the open port in a bucket. Repair lock valves.

Defective/clogged flow control.

Replace/clean flow control.

9. Control valve leaks externally.

Leaky seals at one or all joints.

Consult factory.

\* See leg repair section.



# INSTALLATION/MAINTENANCE INSTRUCTIONS

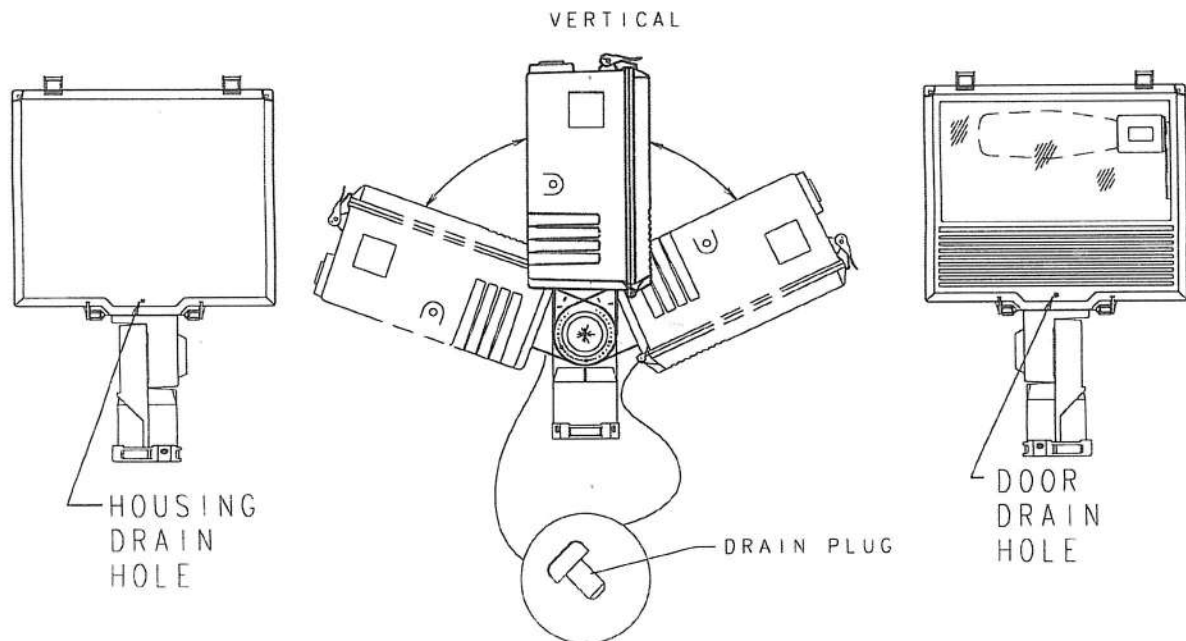
**CFB/UWR**  
**FLOODLIGHTS**

## INSTALLATION

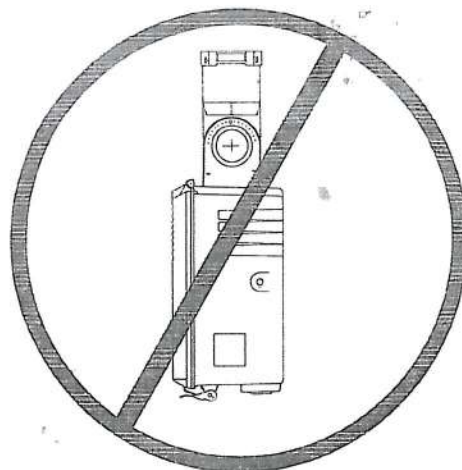
### DRAIN HOLE PLUG

NOTE: WHEN FIXTURE IS AIMED PAST VERTICAL (CCW DIRECTION) DRAIN PLUG MUST BE REMOVED FROM HOUSING AND INSTALLED IN THE DOOR DRAIN HOLE.

WHEN FIXTURE IS AIMED VERTICAL OR PAST VERTICAL CLOCKWISE, DRAIN PLUG MUST BE INSTALLED IN THE HOUSING DRAIN HOLE.



**CAUTION:** DO NOT MOUNT FIXTURE IN A DOWNWARD POSITION AS SHOWN BELOW. WATER LEAKAGE OR EXCESSIVE TEMPERATURES MAY RESULT CAUSING DAMAGE TO INTERNAL ELECTRICAL COMPONENTS.



# INSTALLATION INSTRUCTIONS

PRODUCT: WARRIOR  
FLOODLIGHT

IMI-216 SH.1

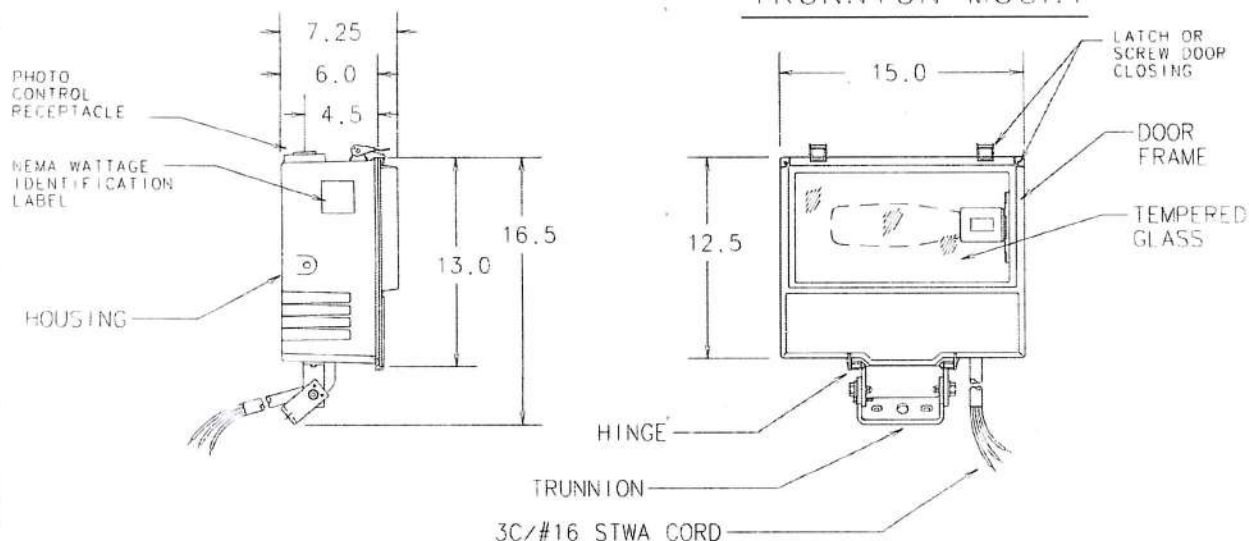
**IMPORTANT: READ CAREFULLY BEFORE INSTALLING FIXTURE. RETAIN FOR FUTURE REF**

GENERAL. UPON RECEIPT OF FIXTURE THOROUGHLY INSPECT FOR ANY FREIGHT DAMAGE, WHICH SHOULD BE BROUGHT TO THE ATTENTION OF THE DELIVERING CARRIER. COMPARE THE CATALOG DESCRIPTION LISTED ON THE PACKING SLIP WITH THE FIXTURE LABEL ON THE HOUSING TO ASSURE YOU HAVE RECEIVED THE CORRECT MERCHANDISE.

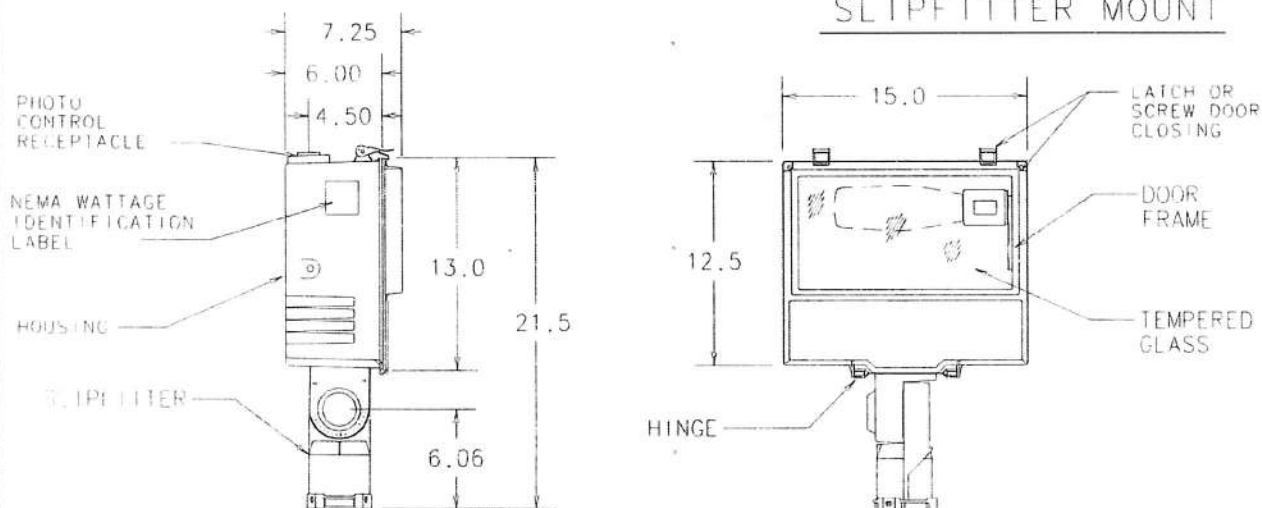
**SAFETY:** THIS FIXTURE MUST BE WIRED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE AND APPLICABLE LOCAL CODES AND ORDINANCES. PROPER GROUNDING IS REQUIRED TO INSURE PERSONAL SAFETY. CAREFULLY OBSERVE GROUNDING PROCEDURE UNDER INSTALLATION SECTION. ALL WORK SHOULD BE DONE BY A QUALIFIED ELECTRICIAN.

**WARNING:** Make certain power is OFF before starting installation or attempting any maintenance.

## TRUNNION MOUNT



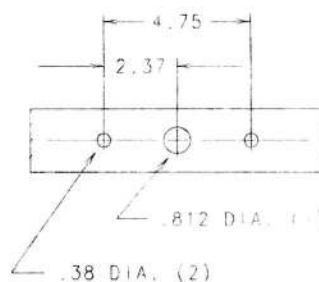
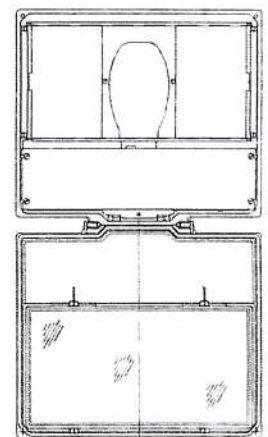
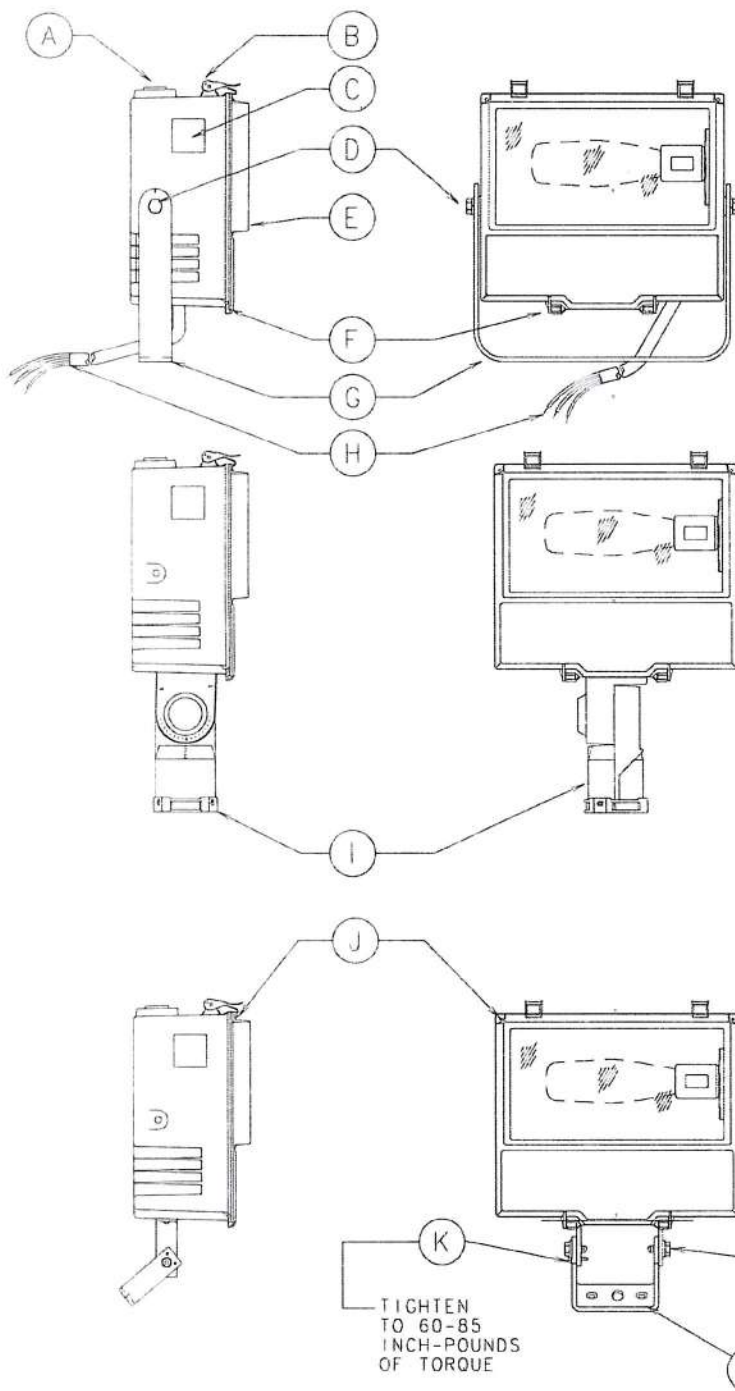
## SLIPFITTER MOUNT



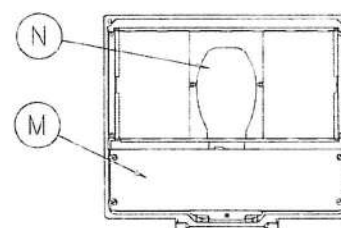
THESE INSTRUCTIONS DO NOT CLAIM TO COVER ALL DETAILS OR VARIATIONS IN THE EQUIPMENT, PROCEDURE, OR PROCESS DESCRIBED, NOR TO PROVIDE DIRECTIONS FOR MEETING EVERY POSSIBLE CONTINGENCY DURING INSTALLATION, OPERATION OR MAINTENANCE. WHEN ADDITIONAL INFORMATION IS DESIRED TO SATISFY A PROBLEM NOT COVERED SUFFICIENTLY FOR USER'S PURPOSE, PLEASE CONTACT YOUR NEAREST REPRESENTATIVE.

**COOPER** Lighting, Inc.

7/31/02 IMI-216 SH.1



YOKE MOUNTING HOLES



VERTICAL LAMP/  
POWER DRAWER  
ASSEMBLY

A. PHOTOELECTRIC CONTROL RECEPTACLE.  
B. LATCHES.  
C. NEMA WATTAGE IDENTIFICATION LABEL.  
D. YOKE BOLTS.  
E. LENS FRAME.

F. HINGES.  
G. MOUNTING YOKE.  
H. POWER CORD.  
I. SLIPFITTER  
J. LATCH SCREW

K. TRUNNION  
LOCKING SCREW  
L. TRUNNION  
M. POWER DRAWER  
N. VERTICAL LAMP



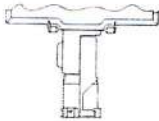
## YOKE MOUNTING

1. MOUNT FIXTURE USING APPROPRIATE HARDWARE. (HARDWARE BY OTHERS).
2. TO SET DESIRED AIM ANGLE, LOOSEN BOTH .50-13 YOKE BOLTS (D) AND SET AIM ANGLE. TIGHTEN YOKE BOLTS AND TORQUE TO  $45 \pm 5$  FOOT-POUNDS.
3. CONNECT POWER CORD (H) FROM FIXTURE FOLLOWING PROCEDURES THAT COMPLY WITH ALL APPLICABLE CODES.  
NOTE: ALLOW ENOUGH WIRE SLACK SO THAT FIXTURE MAY BE ROTATED THROUGH IT'S COMPLETE RANGE AND TO PROVIDE A DRIP LOOP.
4. RELEASE LATCHES (B) OR LATCH SCREWS (J) AND OPEN LENS FRAME (E).
5. FIXTURES SUPPLIED WITH MULTI-TAP BALLASTS ARE FACTORY WIRED FOR 277 VOLTS. TO CHANGE FACTORY WIRED SUPPLY VOLTAGE, REMOVE BALLAST SUPPLY WIRE FROM 277V TERMINAL AND INSERT ON TERMINAL OF OPERATING VOLTAGE DESIRED.

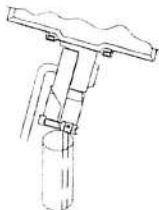
CAUTION: PHOTOCONTROL MUST BE RATED FOR REWIRED VOLTAGE.

6. INSTALL HID LAMP. MAKE CERTAIN LAMP MATCHES LAMP LABEL. MAKE SURE LAMP IS SCREWED IN TIGHT.
7. CLOSE LENS FRAME (E) AND SECURE WITH LATCHES (B) OR LATCH SCREWS (J).
8. FOR PROPER ORIENTATION OF PHOTOELECTRIC CONTROL RECEPTACLE (A) LOOSEN TWO SCREWS ON PHOTOELECTRIC CONTROL RECEPTACLE. ROTATE RECEPTACLE UNTIL "N" ON RECEPTACLE FACES NORTH. TIGHTEN RECEPTACLE SCREWS AND INSTALL PHOTOCONTROL (NOT INCLUDED).
9. ENERGIZE POWER CIRCUITS.

# SLIPFITTER POLE MOUNTING



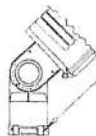
1. FIXTURE SUPPLIED WITH SLIPFITTER, HOUSING HALF ONLY. ASSEMBLE TENON HALF PER INSTRUCTION SUPPLIED WITH FITTER.



2. FEED POWER SOURCE LEADS FROM TENON UP THROUGH SLIPFITTER AND OUT WIRING CHAMBER OPENING, WHILE PLACING FLOODLIGHT OVER THEM.

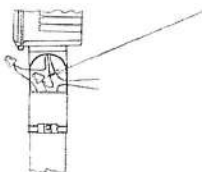
## CAUTION

USE CARE TO PREVENT DAMAGING THESE LEADS BETWEEN TENON AND SLIPFITTER.



NOTE:  
SET SCREWS ON  
120° SPACING  
AROUND  
SLIPFITTER

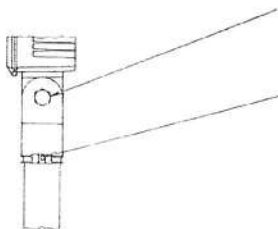
3. AIM FLOODLIGHT INTO APPROXIMATE DIRECTION DESIRED AND TIGHTEN SLIPFITTER SET SCREWS TEMPORARILY.



4. CONNECT FLOODLIGHT LEADS TO POWER SOURCE LEADS IN A MANNER THAT WILL COMPLY WITH REQUIREMENTS OF ALL APPLICABLE LOCAL AND NATIONAL ELECTRICAL CODES.

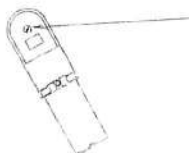
## WARNING

FIXTURE MUST BE PROPERLY GROUNDED TO COMPLY WITH THESE SAME ELECTRICAL CODE REQUIREMENTS FOR GROUNDING.



5. LOOSEN SLIPFITTER QUADRANT SCREW AND SLIPFITTER SET SCREWS ONLY ENOUGH TO ALLOW ADJUSTMENT. ADJUST ANGLE AS REQUIRED.

6. TIGHTEN SLIPFITTER QUADRANT SCREW TO 25-30 FT./LBS. TORQUE. TIGHTEN SLIPFITTER SET SCREWS TO NOT MORE THAN 12 FT./LBS. TORQUE.



7. PUSH ALL WIRES DOWN INTO SLIPFITTER AND REPLACE WIRING CHAMBER COVER. SECURELY TIGHTENING SCREW(S).

## THESE INSTRUCTIONS FOR CANADIAN USE ONLY!

This fixture has been certified for use in Canadian installations being supplied by 120, 277, or 347 volts (as applicable) only!

This fixture utilizes a ballast which should not be supplied by a supply circuit (e.g. 208, 240, 480, or 600V) not normally having a grounded circuit conductor.

In such cases, a fixture incorporating a two winding, isolating type ballast should be used instead. Consult factory.

L'utilisation de cet appareil au Canada a été approuvée pour de tensions de 120, 277, ou 347 V seulement, selon le cas!

Cet appareil utilise un ballast qui ne doit pas être alimenté par un circuit d'alimentation (par ex. 208, 240, 480, ou 600V) qui normalement n'a pas de conducteur à circuit avec mise à la terre.

Dans ces cas, il faut utiliser un appareil à enroulement bifilaire du type isolant. Consulter l'usine.

  
COOPER  
Cooper Lighting

IMI-352  
Rev. 11/95





100 FM 830  
WILLIS, TX 77318  
(936) 856-8551 PHONE  
(936) 856-5668 FAX

## CHECKLIST FOR TRANSPORT

Please ensure that the following items are covered on the  
UNIT for transportation.

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- ☐ 1. Lower catwalk and secure braces
- ☐ 2. Tighten mud slide braces
- ☐ 3. Ensure shaker tie downs are in place and tight. Shaker must not bounce.
- ☐ 4. Ensure that shaker screens and wedges are secured properly in place or removed from shakers
- ☐ 5. Secure the Mud Cleaner truck hose to unit
- ☐ 6. The electrical panel doors are secured/closed properly
- ☐ 7. The grounding rod is secured to unit
- ☐ 8. The light poles are retracted and secured
- ☐ 9. Handrails are taken down and secured to pallet and then pallet secured to trailer
- ☐ 10. Pit pump, pit pump electrical cord, and hose are secured to pallet and pallet secured to trailer
- ☐ 11. Check all lights that they are working on trailer
- ☐ 12. Check air pressure on trailer tires as part of visual inspection of trailer (loose bolts, etc.)
- ☐ 13. Ensure that both (2) hydraulic jacks are up and pins secured
- ☐ 14. Ensure that the tank is empty and dump gates/o rings are secured