

**BTNS Bio-Tech Agitators  
Installation, Operation  
Maintenance Manual**

**Equipment Reference**

**For Service and  
Information Contact:**

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## TABLE OF CONTENTS

<b>Initial Inspection</b>	<b>1</b>
<hr/>	
<b>Chemineer Assistance</b>	<b>1</b>
<hr/>	
<b>Storage</b>	<b>2</b>
<hr/>	
Mounting .....	2
<b>Installation</b>	<b>4</b>
<hr/>	
Motor .....	4
Agitator .....	4
<b>Lubrication</b>	<b>8</b>
<hr/>	
Motor .....	8
Gear Drive .....	11
Shaft Seals .....	11
<b>Operation</b>	<b>12</b>
<hr/>	
Agitator .....	12
Motor .....	14
Gear Drive .....	15
<b>Maintenance</b>	<b>16</b>
<hr/>	
Gear Drive .....	16
Seal Change Procedure .....	16
Seal Disassembly .....	17
Seal Assembly .....	18

## TABLE OF CONTENTS

	Page
<hr/>	
Tables	
<hr/>	
Table 1: Bolt Tightening Torque .....	7
Table 2: Typical NLGI No. 2 Greases .....	9
Table 3: Motor Bearing Grease Addition .....	10
Table 4: Lubrication Frequency .....	11

### Figures

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Figure 1: Impeller Installation .....	3
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### Vendor Data

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Durametallic Seal Instructions

### Supplemental Data

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Agitator Assembly Drawings

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## INITIAL INSPECTION

**Step 1: Inspect crates.** Upon receipt, inspect all crates and equipment for shipping damage. Report shipping damage to your local Chemineer office or to the factory in Dayton, Ohio. A claim should be filed immediately with the carrier involved.

**Step 2: Uncrate. Check the contents.** Do not uncrate the unit until you have read the *Installation* section of this manual and looked at the assembly drawing shipped with the unit. Be careful in uncrating and handling. Do not discard the crating without carefully making sure that all agitator parts have been removed. Correct assembly of this unit requires referring to both the unit assembly drawing and this manual.

**Step 3: Questions? Call Chemineer.** If the shipment is not complete or you do not understand what you have received, please contact *your local Chemineer office* immediately.

## CHEMINEER ASSISTANCE

Chemineer maintains a fully staffed Parts and Field Service Department ready to help you with any service requirement. Simply contact *your local Chemineer office*, or you can contact Parts/Field Service at the Chemineer Factory in Dayton, Ohio:

Chemineer, Inc.  
P.O. Box 1123  
Dayton, OH 45401  
Phone: (513) 454-3200  
FAX: (513) 454-3375

Services available are as follows:

Installation and maintenance training seminars,  
Installation and start-up supervision,  
Preventive maintenance planning,  
Parts order service,  
Special instructions.

## STORAGE

Do not remove protective coatings until the agitator is to be put into service. If the shipment is to be stored, *do not stack crates*. Store in a clean dry indoor location which is free from wide variations in temperature. The storage area should be free from vibration and excessive heat.

At six-month intervals, inspect for external rust. Apply rust preventative as required. If the unit has been in storage for more than six months or subjected to adverse moisture conditions, the motor windings may have to be dried prior to operation.

Coated/rubber covered agitator parts require special storage procedures. Contact Chemineer Field Service for instructions.

### Short-Term Indoor Storage

Agitators should be stored indoors in areas with no vibration and relatively constant temperatures and humidity. The factory storage preparations should be acceptable for up to six months storage.

Rotate the motor and gear drive shafts 10 to 15 revolutions at least once per month to reduce the possibility of brinelling of the bearings and to redistribute bearing grease.

## Mounting

*CAUTION! Angle mounted units must be supported vertically during shaft, seal and bearing installation.*

Bolt unit securely to mounting nozzle. Mounting fasteners and flange-to-vessel seal are not supplied with agitator unless specified. Total weight is shown on the assembly print. Support structure must be rigid enough to prevent deflection and vibration. Center mounted units require the installation of anti-swirl tank baffles. Angle mounted units must be positioned as shown in *Figure 1* to properly provide optimum mixing results.

If required, install impellers as shown on installation drawings. Propellers should be installed with the flat or concave side of the blades away from the driver.

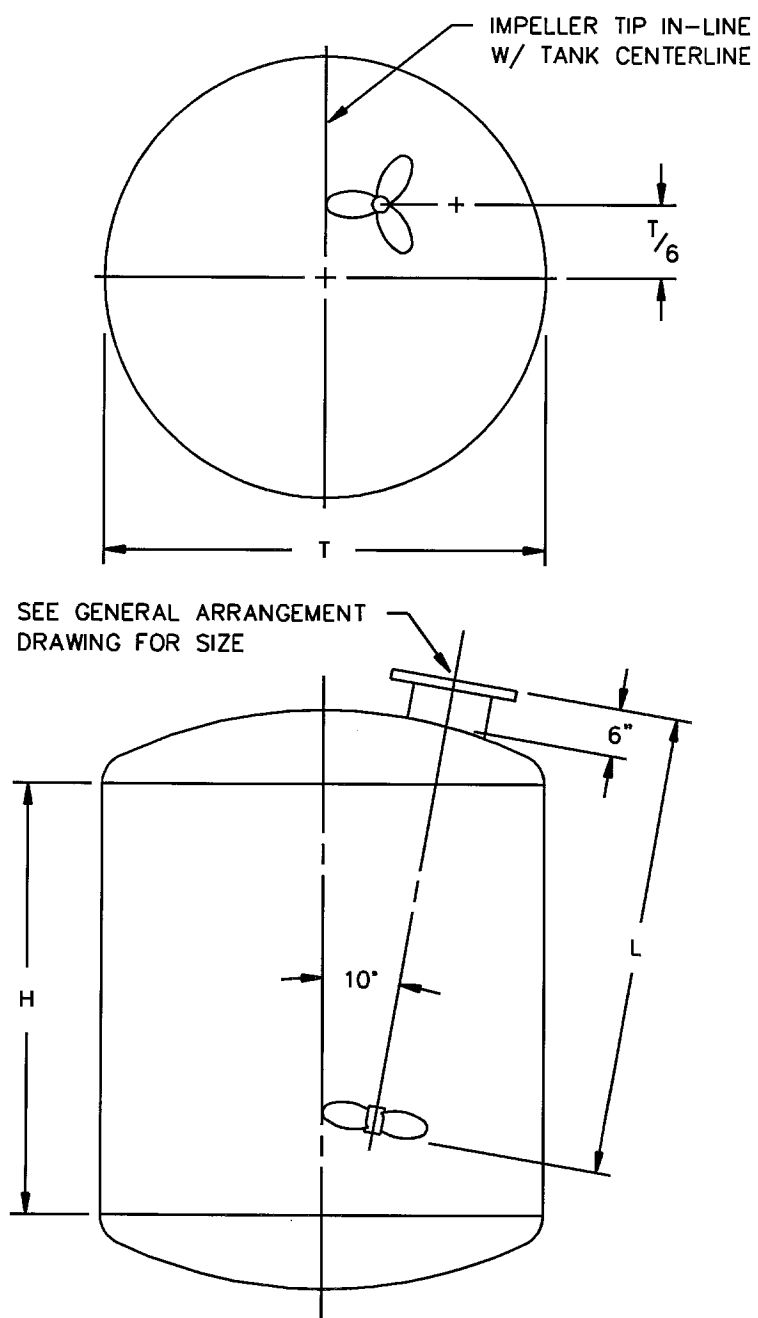


Figure 1: Impeller Installation

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## INSTALLATION

### MOTOR

1. Check the nameplate data on the motor to assure that the available power supply agrees with the motor requirements. Protective devices should be of the proper size and rating to safely carry the load and interrupt the circuit on overloads.
2. If the motor has been stored in a damp location, the windings may require drying.

*NOTE: Do not obstruct the normal flow of ventilating air through or over the motor.*

3. Connect the motor in accordance with the National Electric Code and local requirements, but do not make the connections permanent until the motor rotation has been checked.

Identify motor auxiliary devices such as space heaters or temperature sensors. Connect them in proper circuits and insulate them from motor power cables.

4. Jog the motor to check for correct rotation prior to securing wiring.

### AGITATOR

Correct installation requires both the unit assembly drawing and this manual.

Completely read and understand all of the following instructions before attempting to install or service this equipment.

1. The unit is shipped with the shaft, impeller and mechanical seal rotating assembly loose. Locate these items, the drive/pedestal/mounting flange assembly, and the mounting hardware. Where multiple units are to be installed at the same time, match the serial number (right-hand number in the sequence) on the nameplate with the number stamped in the end of the shaft.



## INSTALLATION

### Agitator (Cont'd)

*NOTE: In order to properly assemble and align the unit, the unit must be oriented so that the shaft is vertical. Do not attempt to support the shaft using the setscrews in the bearing or seal rotary part.*

2. Remove all shipping constraints, including any protective covering on the mounting flange face.
3. Remove the coupling guard, if required.
4. Unbolt and remove the bearing just above the seal area. Make sure the setscrews do not protrude into the bearing bore.
5. Carefully remove the protective covering taped over the seal seat. Protect the exposed seal seat from contamination.
6. Check to see that the setscrews in the mechanical seal rotating assembly do not extend into the bore and that the bore o-ring is in place.
7. Apply a small amount of lubricant (compatible with both the o-ring material and the process materials) to the o-ring in the bore of the seal rotary part.
8. Carefully set the seal rotary part, shown on the unit assembly drawing, in place with the sealing faces in contact and install the bearing. Bearing standoff bolts should be finger tight only.
9. Thoroughly inspect and clean the shaft, if required. Remove any burrs or other imperfections from this surface.
10. Set the proper mounting flange seal (gasket or o-ring) on the vessel flange and protect it from damage. Install a clamp on the shaft which will hold the shaft above the flange and support the weight of the entire machine (see unit assembly drawing for weight). The length of shaft required above the clamp is the distance from the mixer flange face to the drive coupling split line.

*CAUTION! The clamp will sit on the vessel flange seal but must not damage it.*

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## INSTALLATION

### Agitator (Cont'd)

*NOTE: To provide support for the shaft use two smooth 4x4's with "V" grooves clamped around the shaft and drawn together with two 5/8" (15.9 mm) diameter threaded rods.*

11. Carefully lower the drive assembly over the shaft, guiding the shaft through the seal rotary part, bearing and into the split sleeve coupling.
12. Tighten the coupling setscrews to 220 in-lbs torque. Loosen the shaft clamp.
13. Using cross-corner method, slowly tighten the bearing standoff bolts in three or four rounds. Then evenly tighten the bearing setscrews.
14. Compress the seal rotary unit to achieve the "set height" indicated on the unit assembly drawing. Tighten the setscrews in the seal rotary part.
15. Remove the shaft clamp. Inspect vessel and mixer flange faces and clean if required. Properly locate the vessel flange to agitator flange seal.
16. Locate the "OUT" port in the side of the agitator mounting flange at the lowest point on angle mounted units. Attach the agitator flange to the vessel flange using the proper fasteners (supplied by others). Torque to values shown in *Table 1, page 7*.
17. Install the coupling guard and attach the purge inlet and outlet lines.

## INSTALLATION

### Agitator (Cont'd)

TABLE 1: BOLT TIGHTENING TORQUE<sup>(1),(2)</sup>

Bolt Size	CARBON STEEL <sup>(3)</sup>				300 Series Stainless Steel, Alloy 20, Monels, Inconels & Hastelloys B & C <sup>(4)</sup>	
	Grade 2		Grade 5			
	ft-lb	Nm	ft-lb	Nm	ft-lb	Nm
3/8-16	15	20	23	31	15	20
1/2-13	38	51	56	76	38	51
9/16-12	50	68	83	113	50	68
5/8-11	68	92	113	153	68	92
3/4-10	120	163	200	271	120	163
7/8-9	105	143	296	401	182	247
1-8	165	224	443	601	273	370
1-1/8-7	225	305	596	808	386	523
1-1/4-7	315	428	840	1139	545	739
1-3/8-6	417	566	1103	1495	715	969
1-1/2-6	555	752	1463	1983	948	1286

<sup>(1)</sup>Tighten all fasteners to values shown unless specifically instructed to do otherwise.

<sup>(2)</sup>Lubricate all fasteners at assembly with grease, oil or an anti-seize material. Bolt threads and contact surfaces of bolt heads and nuts should be lubricated.

<sup>(3)</sup>If fasteners cannot be lubricated, multiply table values by 1.33.

<sup>(4)</sup>If fasteners cannot be lubricated, multiply table values by 1.25.

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## LUBRICATION

This section defines the proper oils and greases that must be used with this equipment.

*CAUTION! Check the gear drive for proper oil fill before operating.*

### MOTOR

The motor bearings have been properly greased by the manufacturer. Motor bearings should be regreased at intervals indicated in *Table 4, page 11*. Any good quality general purpose grease consisting of a refined base oil stock and a lithium or calcium-complex based soap, with an NLGI No. 2 classification, will work satisfactorily. Most major oil companies offer such products, usually with extreme pressure (EP) additives for additional protection. *Table 2, page 9* lists some commonly available greases.

When regreasing, stop the motor, remove the outlet plug and add grease according to *Table 3, page 10* with a hand lever gun only. Run the motor for about ten minutes before replacing the outlet plug. Certain TEFC motors have a spring relief outlet fitting on the fan end. If the outlet plug is not accessible at the surface of the hood, it is the spring relief type and need not be removed when regreasing.

*CAUTION! Overgreasing is a major cause of bearing and motor failure.*

**MOTOR**

TABLE 2: TYPICAL NLGI NO. 2 GREASES

<i>For Ambient Temperature Range of 0° to 150° F (-18° to 66° C)</i>		
<b>MANUFACTURER</b>	<b>GENERAL PURPOSE</b>	<b>EP</b>
Amoco Oil Co.	Amolith grease: Grade 2	Amolith grease: Grade 2EP
Ashland Oil Co.		Multi-lube Lithium EP grease: Grade 2
		EP Lithium #2
Chevron U.S.A.Inc.	Industrial grease: Grade medium	Dura-Lith greases EP: Grade 2
CITGO Petroleum Corp.		Premium Lithium EP grease: Grade 2
Conoco Inc.		EP Conolith grease: Grade 2
Exxon Co. U.S.A.	Unirex N: Grade 2	Nebula EP: Grade 2
		Ronex MP: Grade 2
Mobil Oil Corp.		Mobilux EP 2
Pennzoil Products Co.		Pennlith EP grease 712
Phillips 66 Co.	Philube L Multi-purpose grease L-2	Philube EP grease: EP-2
Shell Oil Co.	Alvania grease 2	Alvania grease EP 2
		Alvania grease EP LF 2
Texaco Lubricants Co.	Premium RB grease	Multifak EP 2
Unocal 76		Unoba EP grease: Grade 2
		Multiplex EP: Grade 2

**MOTOR**

TABLE 3: MOTOR BEARING GREASE ADDITION

Motor Frame Size	RELIANCE		SIEMENS		BALDOR	
	in <sup>3</sup>	cm <sup>3</sup>	in <sup>3</sup>	cm <sup>3</sup>	in <sup>3</sup>	cm <sup>3</sup>
140T	sealed for life		0.4	6.6	0.6	9.8
180T	0.5	8.2	0.6	9.8	0.6	9.8
210T	0.5	8.2	3.1	50.8	0.6	9.8
250T	1.0	16.4	4.4	72.1	1.2	19.7
280T	1.0	16.4	5.0	82.0	1.2	19.7
320T	1.5	24.6	10.6	173.7	1.5	24.6
360T	1.5	24.6	14.4	236.0	1.5	24.6
400T	2.5	41.0	14.4	236.0	4.1	67.2
440T	2.5	41.0	14.4	236.0	4.1	67.2
Other	(consult motor manufacturer's data)					

## LUBRICATION

The following table may be used as a guide in determining frequency of lubrication. The periods listed assume a clean dry environment with a temperature not exceeding 150°F (66°C).

If conditions are less desirable than this, adjust the frequency accordingly. (*Table 4* is for motor speeds of 1800 RPM or slower.)

TABLE 4: LUBRICATION FREQUENCY

Duty	Lubrication Interval (Months)
Intermittent	36
8-16 hours/day	30
Continuous	24

### Gear Drive

The gear drive on this agitator has been charged at the factory with a special lubricant which need not be changed for the life of the unit. If grease is ever added, use Mobilux® EP023 or equivalent.

### Shaft Seals

Do not lubricate the mechanical seal faces. They are designed to operate dry.

## OPERATION

### AGITATOR

Your Chemineer agitator has been designed for your specific application. Proper operating procedures will allow maximum performance. The following list will aid in the safe operation of your unit.

- **Do not** operate the unit before reading and following the instructions on all tags and nameplates attached to the unit.
- **Do not** operate the unit with less than (1) impeller's diameter liquid coverage above the lowest impeller. Increased side loading caused by operations at the liquid level will decrease unit life.
- **Do not** operate the unit in a fluid with a specific gravity or viscosity higher than that for which the unit was designed.
- **Do not** attempt to start a unit with the mixing impeller buried in solids or a "set up" fluid.
- **Do not** operate face type mechanical seals at temperatures or pressures higher than those for which the unit was designed. Refer to unit assembly drawing.
- **Do not** locate large pump discharges, other agitators, down comers, coils, baffles, or other vessel internals close to the agitator impellers and extension shaft.
- **Do not** make any changes in the field (i.e. motor horsepower, agitator speed, shaft length, impeller diameter, impeller blade width, etc.) without reviewing the change with *your local Chemineer office* or Chemineer Field Service Department.

Should there be problems operating the unit, confirm that installation is correct. If you are unable to resolve the problem, contact *your local Chemineer office*.



## OPERATION

### **Agitator (Cont'd)**

For variable speed units the liquid level may be allowed to pass through the impeller zone on filling or draining by operating at a reduced speed. Prolonged operation with the liquid level at the impeller location should be avoided at any operating speed as the side forces on the impeller will decrease machine life.

There may also be a speed range where the unit cannot be operated because of shaft resonant frequency. This range must be avoided or passed through quickly or destructive forces can be generated. Refer to the installation drawing in this manual for each individual piece of equipment since the permissible operating speeds will vary as a function of shaft diameter and length and impeller size.

Most mixers are supplied with one or two tapped holes in the side of the mounting flange. These are plugged at the factory. The upper fitting marked "IN" is channeled to an annulus around the seal seat. It can be used to introduce gasses such as nitrogen to aid in removal of material trapped in the debris well or steam or liquids to help in sterilization of the seal area. A hole in the seal seat allows this port to connect to the vessel interior.

The lower fitting marked "OUT" is channeled to the bottom of the debris well. This fitting will discharge material trapped in the debris well whether it is carbon dust from the mechanical seal head, steam condensation or liquids injected in the "IN" port for sterilization, vessel liquids which may have splashed into the well, etc. To aid in its function the "OUT" port should be at the low point on angle-mounted units. It should be fitted with a valve that will not restrict particle passage (don't use a needle valve). There should be a pressure differential to expel material from the flange. Outlet lines should not rise above the level of the flange. Care must be exercised with the handling of specific materials and pressure differentials.

## OPERATION

### MOTOR

*Electric motors furnished on Chemineer agitators are designed to deliver their rated output when properly installed and maintained.*

Air circulation is very important to get full performance and long life from an electric motor. Do not block the suction inlets on fan cooled motors. Life of the motor will be decreased if its temperature exceeds its thermal rating. The allowable temperature is stamped on the motor nameplate.

Prior to permanently wiring the electric motor:

- Check nameplate data on motor to assure that the available power supply agrees with the motor requirements. Protective devices should be the proper size and rating to safely carry the load and to interrupt the circuit on overloads.
- Check motor leads with connection diagrams on motor nameplate and/or conduit box so that the proper connections are made. All motors should be installed in accordance with the National Electric Code and local requirements.
- Check the gear drive output shaft rotation against the proper rotation indicated on the unit nameplate. Single phase motors must be purchased with the proper direction of rotation; for standard three-phase electric motors, the rotation is reversed by switching any two power leads.
- Check operating motor amperage against motor nameplate amperage.

The motor should start quickly and run smoothly. If the motor should fail to start or it makes abnormal noise, immediately shut motor off, disconnect it from the power supply, and investigate the cause. If the problem cannot be corrected, contact *your local Chemineer office* for assistance.

## OPERATION

### GEAR DRIVE

Gearing and most bearings are grease lubricated. Be sure the gear drive has been filled with the proper amount and type of lubricant before operation. Refer to the *Lubrication* section of this manual. Improper lubrication will result in damage to gearing and bearings in a very short time.

## MAINTENANCE

### GEAR DRIVE

The gear drive on this agitator has been charged at the factory with a special lubricant which need not be changed for the life of the unit. Should any problem arise involving damage to the gear drive, replace the reducer in its entirety.

Tighten the bolts at the motor to the gear drive and the gear drive to the pedestal. Torque to the values shown in *Table 1, page 7*

The motor shaft fits in a quill in the gear drive. There is no flexible coupling. There is a key to transmit the motor torque.

The output shaft on the gear drive is fitted with a key driven split rigid coupling half. It is positioned so that the gear drive shaft end is flush with the coupling horizontal split line. This positioning creates approximately 1/8" (3.18 mm) between the gear drive and the agitator shaft.

### SEAL CHANGE PROCEDURE

Carefully read and understand all of the following instructions and refer to the unit assembly drawing before attempting to change the mechanical seal.

If the debris well outlet is utilized, it may be opened briefly where there is a positive vessel pressure to help flush out material which may have accumulated during operation.

*CAUTION! Lock out and disconnect all power to the gear drive motor and any optional devices, and depressurize the vessel before servicing this equipment.*

*NOTE: The unit must be oriented with the shaft vertical in order to change the seal.*

**Do not** attempt to support the shaft using the setscrews in the bearing or shaft seal rotary part.

## MAINTENANCE

The following seal change procedure should be followed after allowing the vessel to come to atmospheric pressure and closing the "IN" and "OUT" ports on the mounting flange.

### SEAL DISASSEMBLY

1. Remove the coupling guards if required.
2. Remove the mounting flange fastener(s). With a hoist lift the entire agitator drive assembly mounting flange and vessel flange seal far enough to install a clamp on the shaft which will hold the shaft above the vessel flange and support the agitator drive assembly with the shaft vertical.

*NOTE: To provide support for the shaft use two 4x4's with "V" grooves clamped around the shaft and drawn together with two 5/8" (15.9 mm) diameter threaded rods. Wedges may be required to hold the unit in the vertical position.*

3. Loosen the setscrews in the rotary part of the mechanical seal, the bearing adjacent to it and the socket head screws in the split sleeve coupling.
4. If the coupling is stuck on the shaft, a screw driver may be inserted in the split line and twisted to loosen it. Be sure to repair any damage done to this split line surface before reusing the coupling.
5. Carefully lift the pedestal and drive assembly off the top of the shaft. The shaft should remain supported by the clamp.
6. Remove the bearing stand off bolts, the bearing and the seal rotary part.
7. Remove the seal seat gland ring attached to the mounting flange inside the pedestal. This will expose the upper mechanical seal seat o-ring and back up ring and the gland o-ring.
8. Form two sturdy wire "L"-shaped hooks about 4 inches (101.6 mm) long with a 1/4 inch (6.35 mm) leg and reach down the inside of the mechanical seal seat just over 1 inch until the hooks can be turned outward. Lift the seat from the flange counterbore. Tape attached to the seat face may also be used as a puller to remove it.

## MAINTENANCE

### Seal Disassembly (Cont'd)

9. There is also a seal seat o-ring at the bottom of the counterbore which must be removed to complete the seal seat removal.
10. Worn seal parts should be replaced. Although it is always wise to replace all o-rings during a seal change, they may be re-used if undamaged. Check them very carefully.
11. While in this disassembled state, additional cleaning of the debris well can be performed using compressed air, a hand-held syringe for suction, etc. Care should be taken to avoid getting debris into the vessel.

## SEAL ASSEMBLY

1. Inspect the seal mounting area of the shaft for wear and/or damage. Clean the drive shaft and polish out any scratches.

*NOTE: Any time the agitator is removed from the vessel the agitator flange seal should be replaced.*

2. To replace the agitator flange seal, remove the agitator flange/pedestal assembly. Place a new flange seal over the shaft so that it rests on top of the shaft clamp for the time being. Protect it from damage.
3. Install the lower mechanical seal seat o-ring in the bottom of the mounting flange counterbore.
4. Install the mechanical seal seat with the cross hole 180° from the flange port hole labeled "IN".
5. Place the agitator flange/pedestal assembly over the shaft so that it rests on the shaft clamp. Exercise care to avoid damage to the agitator flange seal.
6. Install the upper mechanical seal seat o-ring back up ring and the seat gland ring.

## MAINTENANCE

### Seal Assembly (Cont'd)

7. Apply a small amount of lubricant (compatible with both the o-ring material and the process materials) to the o-ring in the seal rotary part bore.

*CAUTION! Do not attempt to support the shaft using the setscrews in the bearing or the seal rotary part.*

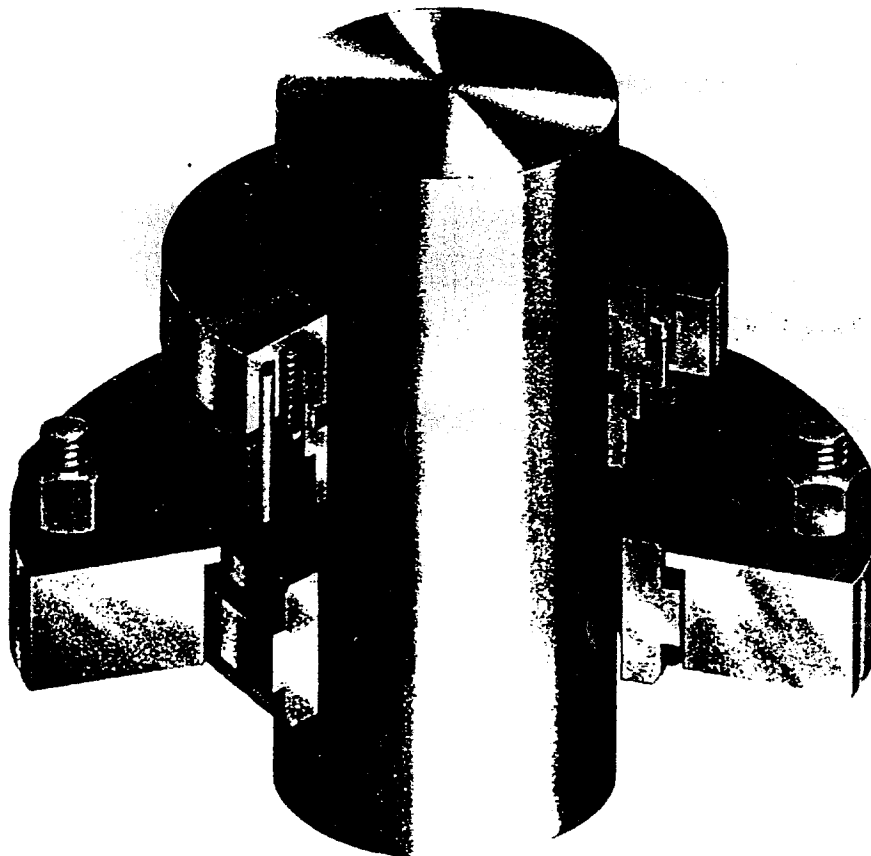
8. Carefully place the seal rotary part on the shaft with the sealing faces in contact. Place the bearing on the shaft. Install the bearing stand off bolts and spacers. Tighten bolts finger tight only.
9. Carefully lower the agitator drive assembly with split sleeve coupling over the shaft.
10. Tighten the coupling setscrews to 220 in-lbs torque. Lift the unit slightly and remove the shaft clamp.
11. Tighten the bearing standoff bolts. Evenly tighten the setscrews in the bearing.
12. Compress the seal rotary unit to achieve the "set height" indicated on the unit assembly drawing and tighten the setscrews.
13. Clean the faces of the vessel and agitator flanges, and properly locate the flange seal.
14. Locate the "OUT" port in the side of the mounting flange at the lowest point on angle mounted units. Attach the agitator to the vessel flange using the proper fasteners.
15. Install the coupling guard, attach the purge inlet and outlet lines, and reconnect the motor (see *Installation*, Motor) as required.
16. Check the rotation of the agitator to the rotation arrow on the nameplate. Correct the rotation if necessary.

# VRA & VRA-C Dura Seal®

## INSTALLATION INSTRUCTIONS

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Outside balanced seals designed to operate under relatively high pressures and low speeds.



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***Durametallic®***  
Sealing Systems Worldwide

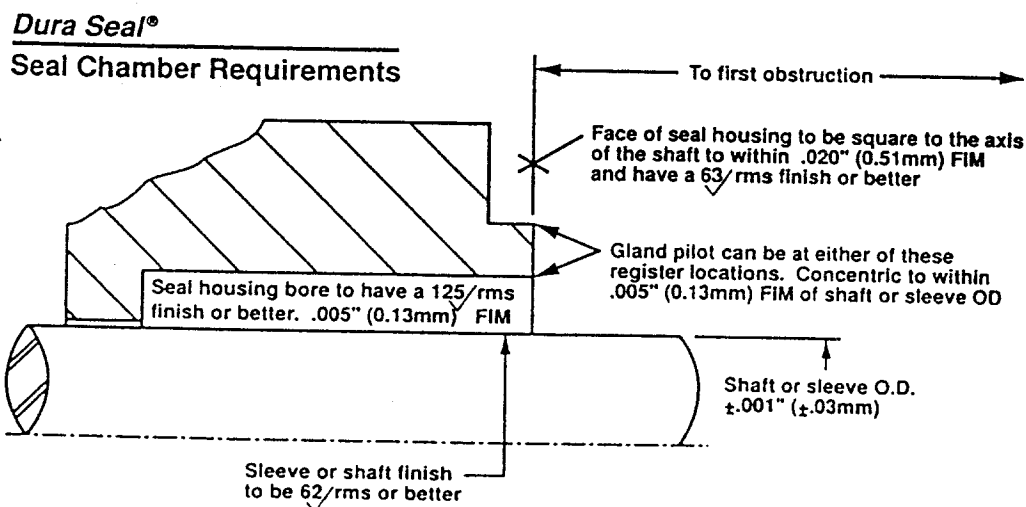


## Congratulations

You have just purchased a reliable, long-life product manufactured by the leading manufacturer of sealing systems in the world today. With proper installation and operation, this VRA *Dura Seal* can be a valuable contribution to your operation by significantly reducing the mean time between planned maintenance (MTBPM) on your rotary equipment.

### 1 Equipment Check

- 1.1 Refer to Figure 1 for shaft, sleeve and seal housing requirements.
- 1.2 Refer to assembly drawing included with seal package for specific seal design, materials of construction, dimensions, and piping connections.
- 1.3 Check shaft or sleeve O.D., box bore, and box depth to ensure that they are dimensionally the same as shown on the seal assembly drawing.
- 1.4 Check gland pilot and bolt holes to ensure they are adaptable to the equipment and are the same as shown on the assembly drawing.
- 1.5 **Seal Faces:** While all seal parts are manufactured to precise tolerances, the seal faces (Part No. 3, Seal Ring and Part No. 2, Insert) are of primary importance. These two sealing faces are lapped flat to three light bands or better (34.8 millionths of an inch) and polished. It is imperative that these two faces be handled with care and kept perfectly clean.
- 1.6 Do not apply oil or other lubricants to the seal faces or to the secondary seals.



- Bearings must be in good condition.
- Maximum lateral or axial movement of shaft (end play) -.005" (0.13mm) FIM
- Maximum shaft runout at face of seal housing -.062" (1.57mm) FIM
- Maximum dynamic shaft deflection at seal housing -.062" (1.57mm) FIM

Figure 1

## 2 Installation

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- 2.1 The two O-rings, Part No. 6, must be installed on the insert mounting shoulders with one ring per side.
- 2.2 Install the insert into the gland ring with the sealing face first so it will protrude out the back of the gland ring.
- 2.3 Install the gland and insert over the shaft and ease it into position. Bolt the gland ring to the face of the stuffing box or seal housing by drawing the nuts down evenly. The gland ring gasket is also the insert mounting O-rings, therefore, there is no concern for additional sealing elements in this area.
- 2.4 Install the O-ring, Part No. 11, into the O-ring groove of the Collar Assembly, Part No. 55.
- 2.5 Install the O-ring, Part No. P, on the first step and against the second step wall of the Collar Assembly.
- 2.6 Line up the slots on the seal ring O.D. with the drive pins in the collar assembly and slide the seal ring into place on the collar assembly extension surface.
- 2.7 Wipe the faces of the insert and the seal ring clean.  
Remember: **Do not oil the sealing faces.**
- 2.8 All outside VRA *Dura Seal* designs require that the rotating portion of the seal, collar assembly with seal ring, be slid on the shaft as an entire unit to prevent damage to the seal ring. Slide the entire unit on the shaft until the seal ring and insert faces touch.  
Remember: **Do not touch the seal face of the seal ring.**
- 2.9 Set the seal to the spring gap dimension (the distance from the front of the collar to the back of the seal ring) given on the assembly drawing that accompanied the seal. Make sure the spring gap is evenly spaced around the seal and lock the collar to the shaft with the collar set screws. An additional dimensional check can be performed by measuring from the back of the ring to the back of the drive collar which can be figured from the assembly drawing furnished.

## 3 Operational Recommendations

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- 3.1 The pressure acting on the seal must not exceed the pressure velocity rating of the seal design and materials of construction.
- 3.2 If the seal runs hot, check for proper seal setting and seal housing dimensions to insure that the seal is not over-compressed. Do not allow the equipment to run for any extended time if the seal gets hot.
- 3.3 When the gas being sealed is other than air, never start up the equipment without properly venting.
- 3.4 This seal can be used if a full vacuum pressure condition exists.

## 4 Repairs

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A *Dura Seal* is a precision sealing device. The design and dimension tolerances are critical to seal performance. Only parts supplied by Durametallic should be used to repair a *Dura Seal*. These are available from the Durametallic Corporation at numerous stocking locations. To order replacement parts, refer to the part code number and B/M number. A spare back-up seal should be stocked to reduce repair time. The following parts can be stocked for emergency needs.

2	Inserts	E	Cap Screws
3	Seal Ring	G	Gasket
6	Gaskets	M	Damper
11	O-Rings	P	Shaft Packing
C	Springs	S	Set Screws

A *Dura Seal* can normally be reconditioned. Return the *Dura Seal* or parts to Durametallic Corporation with an order marked "Repair or Replace". They will be inspected and, if repairable they will be rebuilt, tested, and returned in their original condition.

**Total Quality** This *Dura Seal* was designed and manufactured by employees pledged to the Durametallic Corporation Total Quality Commitment. This commitment states that every employee is dedicated to provide you, the customer, with products and services that always meet or exceed your expectations.

We expect this *Dura Seal* to meet or exceed your expectations. If any concerns arise regarding the installation or operation, contact your nearest Durametallic Representative or Durametallic Customer Service: (616) 345-2744.

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All Durametallic Corporation products must be installed in accordance with Durametallic installation instructions. Failing to do so or attempting to change or modify Durametallic products will void Durametallic's limited warranty. Durametallic's limited warranty is described fully in Durametallic's Standard Terms and Conditions of Sale. Durametallic makes no warranty of merchantability or fitness for a particular purpose and in no event shall Durametallic be liable for consequential or incidental damages.

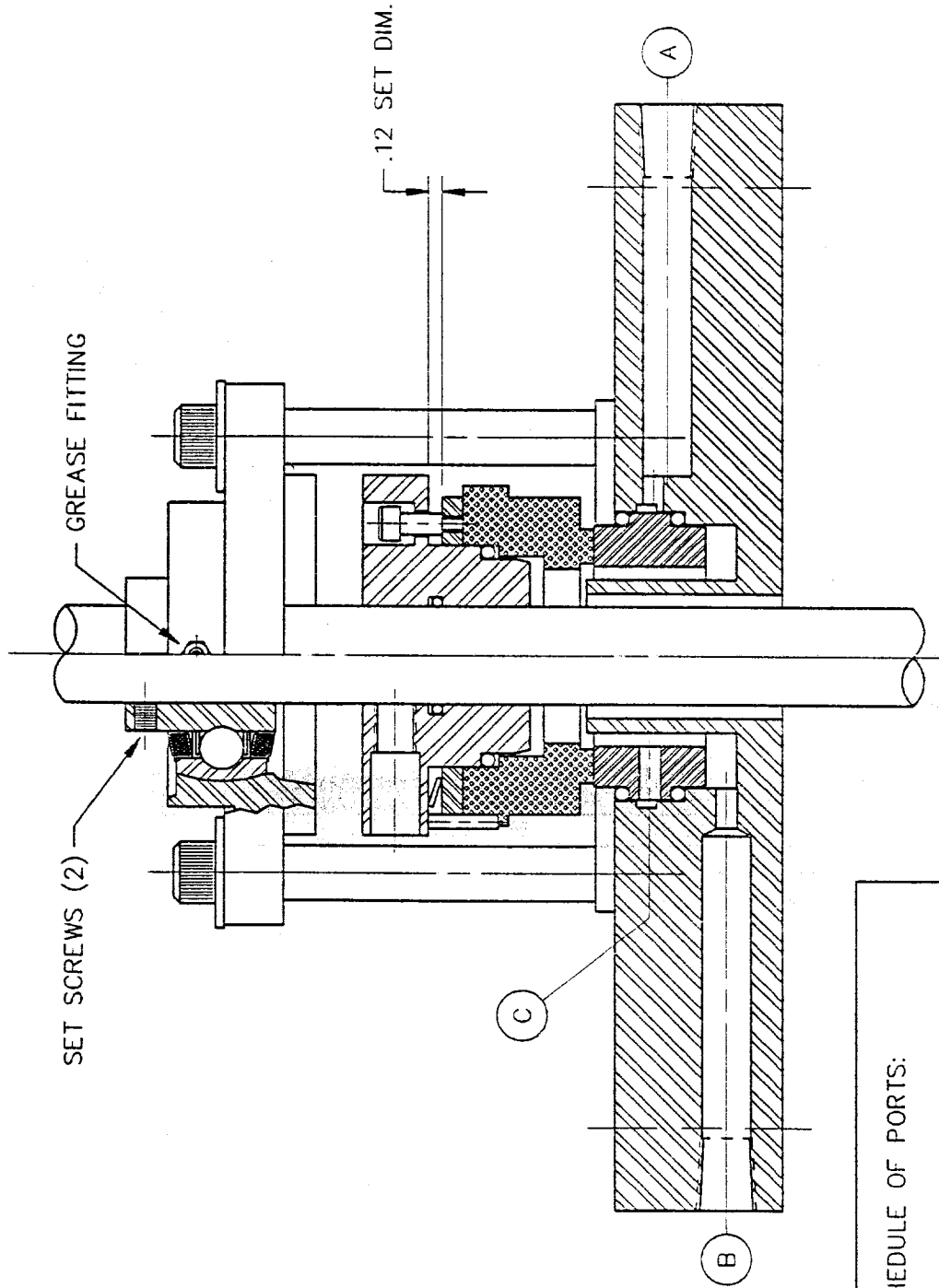
### ***Durametallic Corporation*** **International Headquarters**

2100 Factory Street, Kalamazoo, Michigan 49001-4163

Telephone: (616) 381-2650 • FAX: (616) 381-8368

Customer Service U. S. (616) 345-2744 • International (616) 382-8720

NO.	DATE	REVISION	ECN#



SCHEDULE OF PORTS:

- "A" - PURGE INLET: 1/4" NPT WITH 316SS PIPE PLUG
- "B" - PURGE OUTLET: 1/4" NPT WITH 316SS PIPE PLUG
- "C" - SEAT PURGE HOLE

1  
**Chemineer**  
 CAD Generated

MECHANICAL SEAL ASSEMBLY  
 (TYPICAL DURA VRA)

DWG. NO.	FIG. II	DKH	REV.	B
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**John Crane**

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**Type 32 Seal**

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**Installation**

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**Instructions**

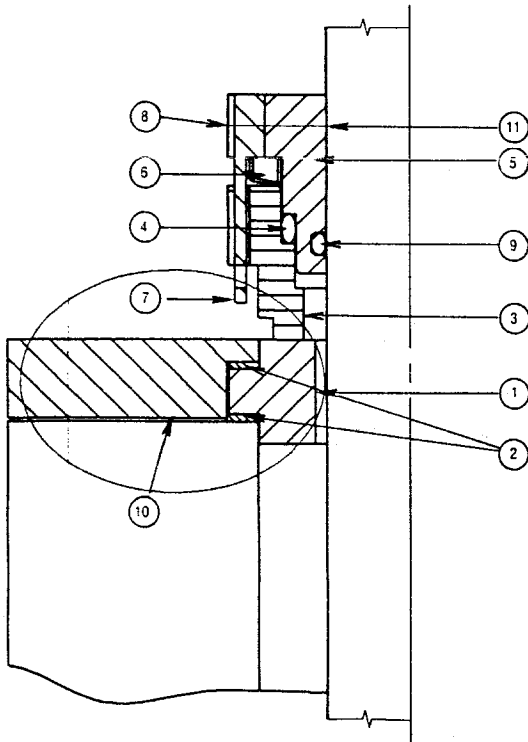
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# Typical Type 32 Seal Arrangement

## General Instructions

1. Be sure to read all instructions carefully before installing seal.
2. The John Crane Type 32 Seal is a precision product. To assure satisfactory operation, handle seal with care. Take particular caution to see that the lapped sealing faces are not scratched or marred.

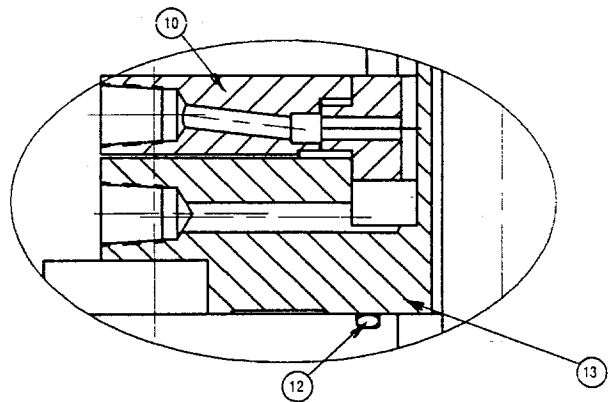


## Part Name

1 Mating Ring	7 T-Bar
2 Gaskets	8 Socket head cap screw
3 Primary Ring	9 O-Ring
4 O-Ring	10 Gland
5 Retainer	11 Set screw
6 Springs	

## Optional Debris Well

10 Gland
12 O-Ring
13 Debris Well



## Congratulations

You have just purchased a reliable, long-life product manufactured by the leading manufacturer of sealing systems in the world today. With proper installation and operation, this VRA *Dura Seal* can be a valuable contribution to your operation by significantly reducing the mean time between planned maintenance (MTBPM) on your rotary equipment.

### 1 Equipment Check

- 1.1 Refer to Figure 1 for shaft, sleeve and seal housing requirements.
- 1.2 Refer to assembly drawing included with seal package for specific seal design, materials of construction, dimensions, and piping connections.
- 1.3 Check shaft or sleeve O.D., box bore, and box depth to ensure that they are dimensionally the same as shown on the seal assembly drawing.
- 1.4 Check gland pilot and bolt holes to ensure they are adaptable to the equipment and are the same as shown on the assembly drawing.
- 1.5 **Seal Faces:** While all seal parts are manufactured to precise tolerances, the seal faces (Part No. 3, Seal Ring and Part No. 2, Insert) are of primary importance. These two sealing faces are lapped flat to three light bands or better (34.8 millionths of an inch) and polished. It is imperative that these two faces be handled with care and kept perfectly clean.
- 1.6 Do not apply oil or other lubricants to the seal faces or to the secondary seals.

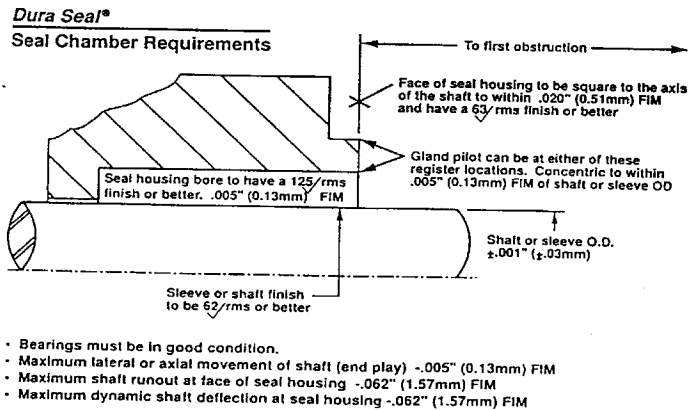
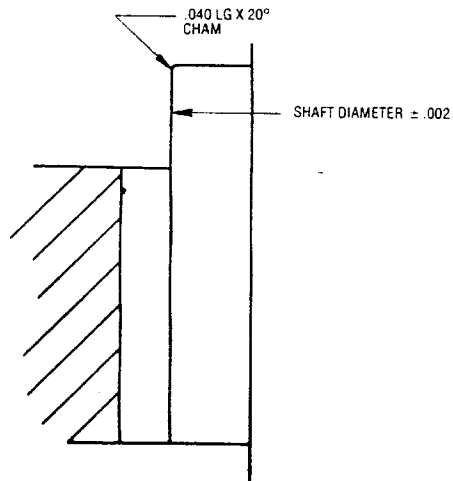


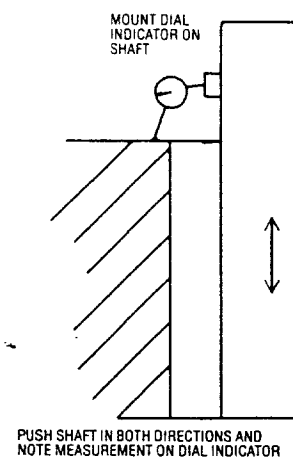
Figure 1

## Preparing the Equipment

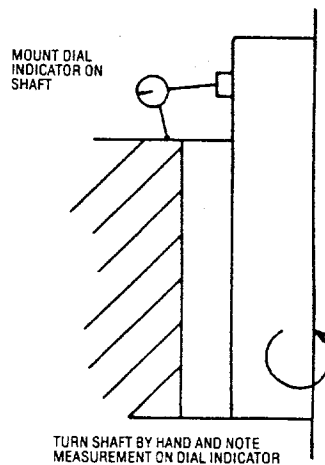
1. Check shaft and housing dimensions and finishes.



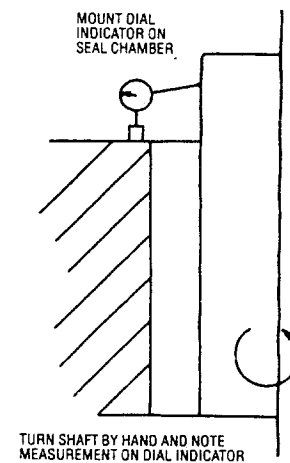
2. Measure axial end play (.062" T.I.R. max).



3. Determine squareness of seal housing face to shaft (.031" T.I.R. max).



4. Measure shaft runout (.062" T.I.R. max).





# Type 32 Seal Installation Dimensions

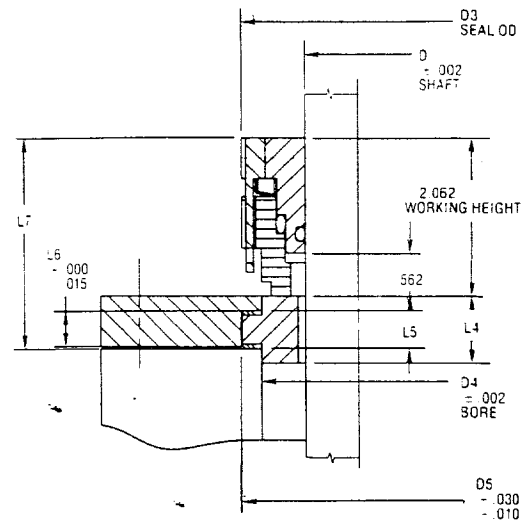


Chart 1. Type 32 Dimensional Data (Inches)

Seal Size	D	D3	D4	D5	L4	L5	L6	L7	Set Screw Size	Torque Value for Set Screws (Inch/Lbs)
1.000	1.000	2.500	1.875	2.281	.812	.500	.468	2.718	1/4-20 x 1/2 Lg.	80 (160 max)
1.125	1.125	2.625	2.000	2.406	.812	.500	.468	2.718	1/4-20 x 1/2 Lg.	80 (160 max)
1.250	1.250	2.750	2.125	2.656	.875	.500	.468	2.750	1/4-20 x 1/2 Lg.	80 (160 max)
1.375	1.375	2.875	2.250	2.781	.875	.500	.468	2.750	1/4-20 x 1/2 Lg.	80 (160 max)
1.500	1.500	3.000	2.500	3.031	.875	.500	.468	2.750	1/4-20 x 1/2 Lg.	80 (160 max)
1.625	1.625	3.125	2.625	3.156	.875	.500	.468	2.750	1/4-20 x 1/2 Lg.	80 (160 max)
1.750	1.750	3.250	2.750	3.281	.875	.500	.468	2.875	1/4-20 x 1/2 Lg.	80 (160 max)
1.875	1.875	3.375	2.875	3.531	1.000	.625	.593	2.875	1/4-20 x 1/2 Lg.	80 (160 max)
2.000	2.000	3.500	3.125	3.871	1.000	.625	.593	2.875	1/4-20 x 1/2 Lg.	80 (160 max)
2.125	2.125	3.625	3.125	3.906	1.000	.625	.593	2.875	1/4-20 x 1/2 Lg.	80 (160 max)
2.250	2.250	3.750	3.375	4.031	1.000	.625	.593	2.875	1/4-20 x 1/2 Lg.	80 (160 max)
2.375	2.375	3.875	3.500	4.156	1.000	.625	.593	2.875	1/4-20 x 1/2 Lg.	80 (160 max)
2.500	2.500	4.000	3.625	4.281	1.000	.625	.593	2.875	1/4-20 x 1/2 Lg.	80 (160 max)
2.625	2.625	4.125	3.750	4.406	1.000	.625	.593	2.875	1/4-20 x 1/2 Lg.	80 (160 max)
2.750	2.750	4.250	3.875	4.531	1.000	.625	.593	2.875	1/4-20 x 1/2 Lg.	80 (160 max)
2.875	2.875	4.375	4.000	4.656	1.000	.625	.593	2.875	1/4-20 x 1/2 Lg.	80 (160 max)
3.000	3.000	4.500	4.065	4.718	1.000	.625	.593	2.875	1/4-20 x 1/2 Lg.	80 (160 max)
3.125	3.125	4.625	4.250	4.906	1.000	.625	.593	2.875	1/4-20 x 1/2 Lg.	80 (160 max)
3.250	3.250	4.750	4.375	5.031	1.000	.625	.593	2.875	1/4-20 x 1/2 Lg.	80 (160 max)
3.375	3.375	4.875	4.500	5.156	1.000	.625	.593	2.875	1/4-20 x 1/2 Lg.	80 (160 max)
3.500	3.500	5.000	4.625	5.281	1.000	.625	.593	2.875	5/16-24 x 1/2 Lg.	160 (240 max)
3.625	3.625	5.125	4.750	5.406	1.000	.625	.593	2.875	5/16-24 x 1/2 Lg.	160 (240 max)
3.750	3.750	5.250	4.875	5.531	1.000	.625	.593	2.875	5/16-24 x 1/2 Lg.	160 (240 max)
3.875	3.875	5.375	5.000	5.656	1.000	.625	.593	2.875	5/16-24 x 1/2 Lg.	160 (240 max)

Seal Size	D	D3	D4	D5	L4	L5	L6	L7	Set Screw Size	Torque Value for Set Screws (Inch/Lbs)
4.000	4.000	5.500	5.250	5.906	1.000	.625	.593	2.875	5/16-24 x 1/2 Lg.	160 (240 max)
4.125	4.125	5.625	5.375	6.031	1.000	.625	.593	2.875	5/16-24 x 1/2 Lg.	160 (240 max)
4.250	4.250	5.750	5.500	6.156	1.000	.625	.593	2.875	5/16-24 x 1/2 Lg.	160 (240 max)
4.375	4.375	5.875	5.625	6.281	1.000	.625	.593	2.875	5/16-24 x 1/2 Lg.	160 (240 max)
4.500	4.500	6.000	5.750	6.406	1.000	.625	.593	2.875	5/16-24 x 1/2 Lg.	160 (240 max)
4.625	4.625	6.125	5.875	6.531	1.000	.625	.593	2.875	5/16-24 x 1/2 Lg.	160 (240 max)
4.750	4.750	6.250	6.000	6.656	1.000	.625	.593	2.875	5/16-24 x 1/2 Lg.	160 (240 max)
4.875	4.875	6.375	6.125	6.781	1.000	.625	.593	2.875	5/16-24 x 1/2 Lg.	160 (240 max)
5.000	5.000	6.500	6.250	6.906	1.000	.625	.593	2.875	5/16-24 x 1/2 Lg.	160 (240 max)
5.125	5.125	6.625	6.625	7.281	1.000	.625	.593	2.875	5/16-24 x 1/2 Lg.	160 (240 max)
5.250	5.250	6.750	6.750	7.406	1.000	.625	.593	2.875	5/16-24 x 1/2 Lg.	160 (240 max)
5.375	5.375	6.875	6.875	7.531	1.000	.625	.593	2.875	5/16-24 x 1/2 Lg.	160 (240 max)
5.500	5.500	7.000	7.000	7.656	1.000	.625	.593	2.875	5/16-24 x 1/2 Lg.	160 (240 max)
5.625	5.625	7.125	7.125	7.781	1.000	.625	.593	2.875	5/16-24 x 1/2 Lg.	160 (240 max)
5.750	5.750	7.250	7.250	7.906	1.000	.625	.593	2.875	5/16-24 x 1/2 Lg.	160 (240 max)
5.875	5.875	7.375	7.375	8.031	1.000	.625	.593	2.875	5/16-24 x 1/2 Lg.	160 (240 max)
6.000	6.000	7.500	7.500	8.156	1.000	.625	.593	2.875	5/16-24 x 1/2 Lg.	160 (240 max)
6.125	6.125	7.625	7.625	8.281	1.000	.625	.593	2.875	5/16-24 x 1/2 Lg.	160 (240 max)
6.250	6.250	7.750	7.750	8.406	1.000	.625	.593	2.875	5/16-24 x 1/2 Lg.	160 (240 max)
6.375	6.375	7.875	7.875	8.531	1.000	.625	.593	2.875	5/16-24 x 1/2 Lg.	160 (240 max)
6.500	6.500	8.000	8.000	8.656	1.000	.625	.593	2.875	5/16-24 x 1/2 Lg.	160 (240 max)
6.625	6.625	8.125	8.125	8.781	1.000	.625	.593	2.875	5/16-24 x 1/2 Lg.	160 (240 max)
6.750	6.750	8.250	8.250	8.906	1.000	.625	.593	2.875	5/16-24 x 1/2 Lg.	160 (240 max)
6.875	6.875	8.375	8.375	9.031	1.000	.625	.593	2.875	5/16-24 x 1/2 Lg.	160 (240 max)
7.000	7.000	8.500	8.500	9.156	1.000	.625	.593	2.875	5/16-24 x 1/2 Lg.	160 (240 max)

Note: For larger sizes, contact your John Crane Sales/Service Engineer.

**Chart 2. Type 32 Dimensional Data (mm)**

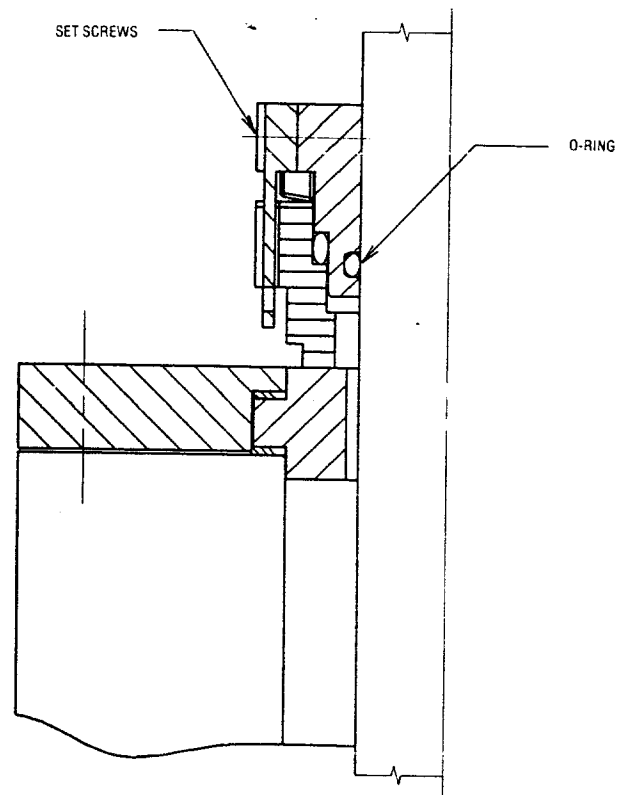
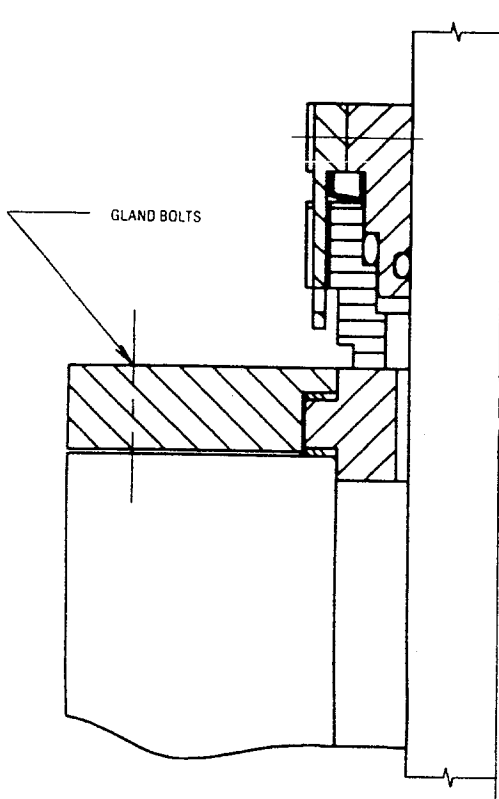
Seal Size	Seal Size Code	D	D3	D4	D5	L4	L5	L6	L7	Set Screw Size	Torque Value for Set Screws (Inch/Lbs)
25	0250	25	63.5	47.6	57.9	20.6	12.7	11.9	69.0	1/4-20 x 1/2 Lg.	80 (160 max)
28	0280	28	66.6	50.8	61.1	20.6	12.7	11.9	69.0	1/4-20 x 1/2 Lg.	80 (160 max)
30	0300	30	69.8	53.9	67.5	22.2	12.7	11.9	69.9	1/4-20 x 1/2 Lg.	80 (160 max)
32	0320	32	69.8	53.9	67.5	22.2	12.7	11.9	69.9	1/4-20 x 1/2 Lg.	80 (160 max)
33	0330	33	73.0	57.1	70.6	22.2	12.7	11.9	69.9	1/4-20 x 1/2 Lg.	80 (160 max)
35	0350	35	73.0	57.1	70.6	22.2	12.7	11.9	69.9	1/4-20 x 1/2 Lg.	80 (160 max)
38	0380	38	76.2	60.3	77.0	22.2	12.7	11.9	69.9	1/4-20 x 1/2 Lg.	80 (160 max)
40	0400	40	79.3	63.6	80.2	22.2	12.7	11.9	69.9	1/4-20 x 1/2 Lg.	80 (160 max)
43	0430	43	82.5	66.8	83.3	22.2	12.7	11.9	73.0	1/4-20 x 1/2 Lg.	80 (160 max)
45	0450	45	85.7	70.0	89.7	25.4	15.9	15.1	73.0	1/4-20 x 1/2 Lg.	80 (160 max)
50	0500	50	88.9	73.3	98.3	25.4	15.9	15.1	73.0	1/4-20 x 1/2 Lg.	80 (160 max)
53	0530	53	92.0	76.3	99.2	25.4	15.9	15.1	73.0	1/4-20 x 1/2 Lg.	80 (160 max)
55	0550	55	95.2	79.7	102.4	25.4	15.9	15.1	73.0	1/4-20 x 1/2 Lg.	80 (160 max)
58	0580	58	98.4	82.9	105.6	25.4	15.9	15.1	73.0	1/4-20 x 1/2 Lg.	80 (160 max)
60	0600	60	98.4	82.9	105.6	25.4	15.9	15.1	73.0	1/4-20 x 1/2 Lg.	80 (160 max)
63	0630	63	101.6	86.0	108.7	25.4	15.9	15.1	73.0	1/4-20 x 1/2 Lg.	80 (160 max)
65	0650	65	104.7	89.2	111.9	25.4	15.9	15.1	73.0	1/4-20 x 1/2 Lg.	80 (160 max)
68	0680	68	107.9	92.4	115.1	25.4	15.9	15.1	73.0	1/4-20 x 1/2 Lg.	80 (160 max)
70	0700	70	107.9	92.4	115.1	25.4	15.9	15.1	73.0	1/4-20 x 1/2 Lg.	80 (160 max)
75	0750	75	114.3	98.3	119.8	25.4	15.9	15.1	73.0	1/4-20 x 1/2 Lg.	80 (160 max)
80	0800	80	120.6	104.1	127.8	25.4	15.9	15.1	73.0	1/4-20 x 1/2 Lg.	80 (160 max)

Seal Size	Seal Size Code	D	D3	D4	D5	L4	L5	L6	L7	Set Screw Size	Torque Value for Set Screws (Inch/Lbs)
85	0850	85	127.0	117.4	134.1	25.4	15.9	15.1	73.0	1/4-20 x 1/2 Lg.	80 (160 max)
90	0900	90	133.3	123.8	140.5	25.4	15.9	15.1	73.0	5/16-24 x 1/2 Lg.	160 (240 max)
95	0950	95	133.3	123.8	140.5	25.4	15.9	15.1	73.0	5/16-24 x 1/2 Lg.	160 (240 max)
100	1000	100	139.7	133.3	150.0	25.4	15.9	15.1	73.0	5/16-24 x 1/2 Lg.	160 (240 max)
105	1050	105	146.0	139.7	156.4	25.4	15.9	15.1	73.0	5/16-24 x 1/2 Lg.	160 (240 max)
110	1100	110	149.2	142.8	159.5	25.4	15.9	15.1	73.0	5/16-24 x 1/2 Lg.	160 (240 max)
115	1150	115	155.5	149.2	165.9	25.4	15.9	15.1	73.0	5/16-24 x 1/2 Lg.	160 (240 max)
120	1200	120	158.7	152.4	169.1	25.4	15.9	15.1	73.0	5/16-24 x 1/2 Lg.	160 (240 max)
125	1250	125	165.1	158.7	175.4	25.4	15.9	15.1	73.0	5/16-24 x 1/2 Lg.	160 (240 max)
130	1300	130	168.2	168.2	184.9	25.4	15.9	15.1	73.0	5/16-24 x 1/2 Lg.	160 (240 max)
135	1350	135	174.6	174.6	191.3	25.4	15.9	15.1	73.0	5/16-24 x 1/2 Lg.	160 (240 max)
140	1400	140	180.9	180.9	197.6	25.4	15.9	15.1	73.0	5/16-24 x 1/2 Lg.	160 (240 max)
145	1450	145	184.1	184.1	200.8	25.4	15.9	15.1	73.0	5/16-24 x 1/2 Lg.	160 (240 max)
150	1500	150	190.5	190.5	207.2	25.4	15.9	15.1	73.0	5/16-24 x 1/2 Lg.	160 (240 max)
155	1550	155	193.6	193.6	210.3	25.4	15.9	15.1	73.0	5/16-24 x 1/2 Lg.	160 (240 max)
160	1600	160	200.0	200.0	216.7	25.4	15.9	15.1	73.0	5/16-24 x 1/2 Lg.	160 (240 max)
165	1650	165	203.2	203.2	217.6	25.4	15.9	15.1	73.0	5/16-24 x 1/2 Lg.	160 (240 max)
170	1700	170	209.5	209.5	226.2	25.4	15.9	15.1	73.0	5/16-24 x 1/2 Lg.	160 (240 max)
175	1750	175	215.9	215.9	232.6	25.4	15.9	15.1	73.0	5/16-24 x 1/2 Lg.	160 (240 max)

**Note:** For larger sizes, contact your John Crane Sales/Service Engineer.

## Installing the Seal

1. Place the mating ring and gaskets in position.
2. Bolt the gland plate to the face of the housing and tighten bolts finger tight.
3. Tighten gland plate by tightening bolts alternately until secure. Increase torque by no more than 5 ft.-lbs. per bolt at one time. Overtightening bolts can overstress mating ring.
4. Lubricate the O-ring with silicone grease and slide complete assembly on the shaft.
5. Compress seal to proper working height. (See diagram pg. 4)
6. Tighten set screws on retainer to shaft. (See Chart #1)



## **Before starting unit**

- 1.** Check unit at coupling for proper alignment of the driver or motor.
- 2.** Complete assembly of the unit. Turn shaft by hand to ensure free rotation.
- 3.** Ensure before start-up that all personnel and assembly equipment have been removed to a safe distance, so there is no contact with rotating parts on the agitator, seal coupling, or motor.

## Ordering Information

1. Select seal size.
2. Determine materials of construction. Select seal assembly.

### Materials of Construction

Primary Ring	Carbon
Mating Ring	Tungsten Carbide
Hardware	316 Stainless Steel
Springs	316 Stainless Steel
Secondary Seal	Viton*

### Operating Limits\*\*

#### Pressure

Full vacuum to 225 psig (15 bar)

#### Temperature

-50°F to +300°F (-45°C to +149°C)  
depending on materials used.

#### Speed

To 400 rpm

\*Trademark of DuPont

\*\*For specific operating conditions, see  
Bulletin S-3008.

## Type 32 Assembly Numbers

Seal Size (inches)	Type 32 Assembly Numbers	Mating Ring*	Mating Ring Ceramic
1.000	A32-1000-010	D-1125-625	D-1125-751
1.125	A32-1125-010	D-1250-296	D-1250-507
1.250	A32-1250-010	D-1375-193	D-1375-539
1.375	A32-1375-010	D-1501-119	D-1500-486
1.500	A32-1500-010	D-1625-380	D-1625-491
1.625	A32-1625-010	D-1750-199	D-1750-207
1.750	A32-1750-010	D-1875-292	D-1875-235
1.875	A32-1875-010	D-2000-318	D-2000-313
2.000	A32-2000-010	D-2125-147	D-2125-264
2.125	A32-2125-010	D-2250-156	D-2250-190
2.250	A32-2250-010	D-2375-443	D-2375-190
2.375	A32-2375-010	D-2500-441	D-2500-177
2.500	A32-2500-010	D-2625-139	D-2625-217
2.625	A32-2625-010	D-2750-256	D-2750-205
2.750	A32-2750-010	D-2875-083	D-2875-115
2.875	A32-2875-010	D-3000-140	D-3000-193
3.000	A32-3000-010	D-3125-094	D-3125-095*
3.125	A32-3125-010	D-3250-145	D-3250-151
3.250	A32-3250-010	D-3375-075	D-3375-322
3.375	A32-3375-010	D-3500-076	D-3500-099
3.500	A32-3500-010	D-3625-047	D-3625-094
3.625	A32-3625-010	D-3750-125	D-3750-079
3.750	A32-3750-010	D-3875-051	D-3875-064
3.875	A32-3875-010	D-4000-355	D-4000-083

Seal Size (inches)	Type 32 Assembly Numbers	Mating Ring*	Mating Ring Ceramic
4.000	A32-4000-010	D-4125-127	-
4.125	A32-4125-010	D-4250-019	-
4.250	A32-4250-010	D-4375-108	-
4.375	A32-4375-010	D-4500-203	D-4500-116
4.500	A32-4500-010	-	-
4.625	A32-4625-010	D-4750-053	D-4750-079
4.750	A32-4750-010	D-4875-085	-
4.875	A32-4875-010	D-5000-136	-
5.000	A32-5000-010	D-5125-045	D-5125-047
5.125	A32-5125-010	-	-
5.250	A32-5250-010	D-5375-082	-
5.375	A32-5375-010	D-5500-077	-
5.500	A32-5500-010	D-5625-066	-
5.625	A32-5625-010	-	-
5.750	A32-5750-010	-	-
5.875	A32-5875-010	-	-
6.000	A32-6000-010	-	-
6.125	A32-6125-010	-	-
6.250	A32-6250-010	-	-
6.375	A32-6375-010	D-6500-022	-
6.500	A32-6500-010	-	-
6.625	A32-6625-010	-	D-6750-049
6.750	A32-6750-010	-	-
6.875	A32-6875-010	-	D-7000-057
7.000	A32-7000-010	-	-

\*Mating ring available in tungsten carbide or optional material chrome oxide coated metal.

Note: Larger sizes are available. Consult your John Crane Sales/Service Engineer.

Note: Seal installation should be undertaken only by qualified personnel. If questions arise, contact John Crane Inc.'s Engineering Department.

Our experience is your expertise.



### John Crane International

#### John Crane Inc.

6400 West Oakton Street  
Morton Grove, Illinois 60053 U.S.A.  
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#### John Crane UK Ltd

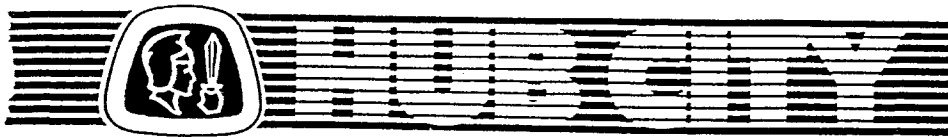
Crossbow House, 40 Liverpool Road  
Slough, England SL1 4QX  
Tel: 44-753-31122  
Fax: 44-753-73677

#### John Crane Far East and Asia

21 Tuas Avenue 11  
Singapore 2263  
Tel: 65-861-1288  
Fax: 65-861-2604

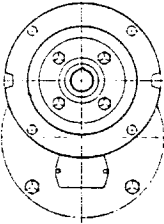
If the products featured here are for use on dangerous and/or hazardous processes, the Company should be consulted prior to selection and use. Continuing research results in product improvements; therefore, any specifications may be subject to change without notice.

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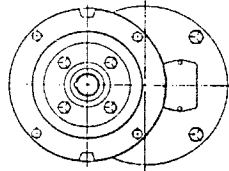


# Helical Ratio Multipliers

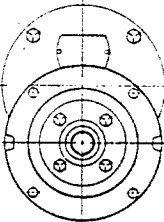
LUBRICATION AND INSTALLATION



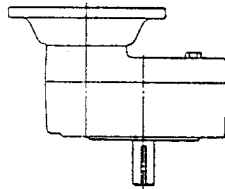
**FIG. 1 — FOOT MOUNTING AVAILABLE**



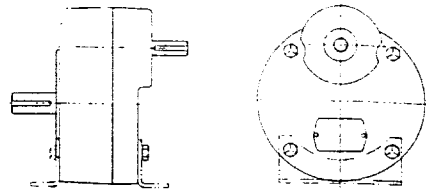
**FIG. 2 — FOOT MOUNTING AVAILABLE**



**FIG. 3**



**FIG. 4 — VERTICAL SHAFT MOUNTING REQUIRES FACTORY MODIFICATION**



**SHAFT VERSION**  
(Optional mounting feet shown)

## INSTALLATION

**OPERATING POSITIONS** — Normal speed reducer mounting positions are shown in Fig. 1-4. Because of varying requirements, mounting hardware is not supplied with this unit, however foot mounting kits are available. Good quality cap screws should always be used. Base and fasteners for motor and reducers must be rigid enough to maintain alignment between reducer and motor and between reducer and couplings. Input rotation of this speed reducer can be either clockwise or counterclockwise.

**COUPLINGS** — Flexible couplings to input and output shafts are recommended because they minimize bearing and gear wear caused by slight misalignment. Follow coupling manufacturer's recommendations for installation.

**SHEAVES AND SPROCKETS** — When mounting sheaves or sprockets, the center of the load should be located as close to the reducer as possible. Excessive overhung loading could result in early failures of bearings or shaft. Refer to the general catalog or contact your local distributor for overhung load ratings.

### CAUTION

If any noticeable resistance is encountered when installing sheaves or sprockets on shafts, inspect bore for paint, weld burrs or imperfections and hone smooth. Force fitting can easily damage shafts and bearings.

### WARNING

All rotating shafts and couplings must be adequately shielded by the user for maximum safety.

## LUBRICATION

Hub City Helical Ratio Multipliers are factory filled with an anhydrous calcium, semi-fluid grease de-

signed for a wide variety of applications. No lubrication change is necessary.

**VARIATION FROM NORMAL CONDITIONS** — When operating High Speed Shaft at speeds above 1800 RPM or below 400 RPM, special adjustment in lube level may be required. Consult the Hub City Sales Office nearest you for recommendations.

When position selected is Output Vertical-Up, Output Vertical Down (Figure 4) or included more than 15° from horizontal, an adequate means of lubricating the upper bearing must be provided. This may require factory modifications. Consult Hub City Service Department prior to ordering units that are to be used in vertical or inclined applications.

**IMPORTANT** — Unit should not be operated when internal temperature exceeds 225° F. or below 40° F. unless a special duty lubricant is used. Reduced seal life due to lubrication failure could result.

## PREVENTATIVE MAINTENANCE

Keep shafts clean to prevent foreign particles from damaging seals or entering gear cases. Inspect periodically for oil leaks. Check coupling set screws and Reducer mounting bolts for tightness (loose fasteners can cause alignment problems and excessive wear). Check end play in shafts. Noticeable movement might indicate service or parts replacement. **NOTE:** When seals are new a small amount of lubricant leakage is sometimes noted until seals seat on the shaft. This condition is normal but if leakage persists, it would indicate a damaged seal and must be replaced.

## FURTHER INFORMATION OR PARTS ORDERING

A metal tag is attached to the gear case of each Reducer which gives the assembly number, model number, ratio, style and shipping code. When requesting additional information or ordering parts, all tag data must be furnished to identify your unit.

An illustrated parts list is supplied with each Reducer and includes instructions for ordering repair kits and replacement parts.

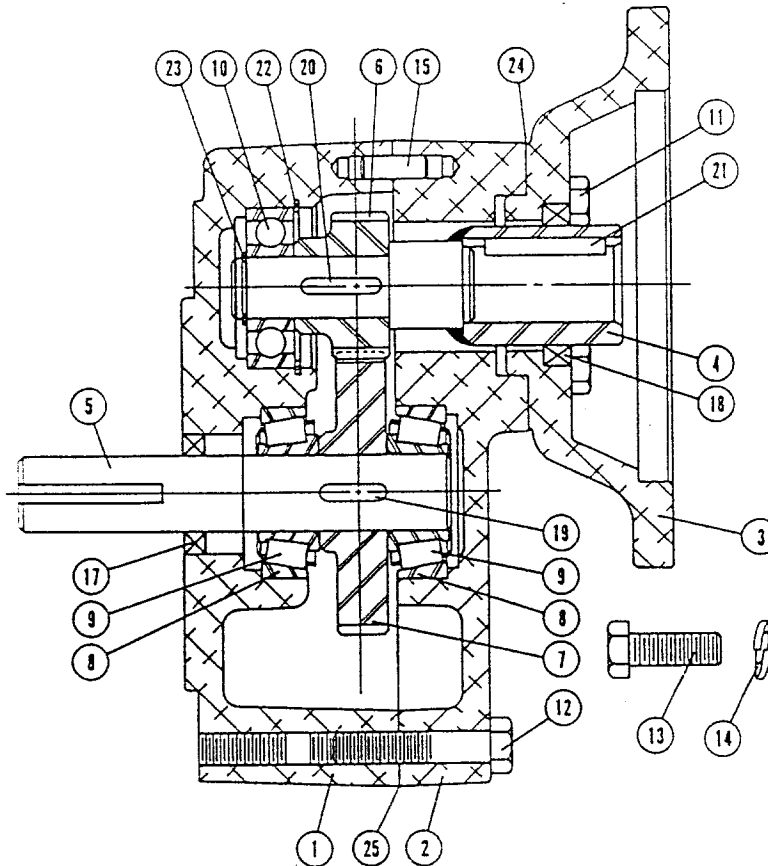
Hub City has Sales Offices and a network of Industrial Power Distributors that can service your needs world wide. Check the Yellow Pages for one near you or contact the Factory Sales Office.



# Hub City

## HELICAL RATIO MULTIPLIER PARTS LIST

### SERIES 250 MODEL 254 NEMA "C" FLANGE INPUT



REF. NO.	PART NUMBER	DESCRIPTION	NO. REQ.	REF. NO.	PART NUMBER	DESCRIPTION	NO. REQ.
1	02-23-04459-0250	Housing, Half, Output	1	6		Gear, Input, (Continued)	
2	02-23-04461-0250	Housing, Half, Input	1		02-23-04497-0250	$\frac{5}{8}$ Diameter Quill (56C)	
3	02-23-04484-0250	Frame, Motor (56C, 143TC, 145TC, 182C, 184C)	1		02-23-04498-0250	4:1 Ratio, Intg. Gear and Shaft Helical, LH, 18T	
4		Shaft, Input	1		02-23-04499-0250	5:1 Ratio, Intg. Gear and Shaft Helical, LH, 15T	
	02-23-04495-0250	$\frac{5}{8}$ Diameter Quill (56C)			02-23-04500-0250	$\frac{7}{8}$ Diameter Quill (143TC, 145TC, 182C, 184C)	
		2:1, 3:1 Ratios				4:1 Ratio, Intg. Gear and Shaft Helical, LH, 18T	
		4:1, 5:1 Ratios — (Integral Shaft and Gear) See Ref. No. 6				5:1 Ratio, Intg. Gear and Shaft Helical, LH, 15T	
	02-23-04496-0250	$\frac{7}{8}$ Diameter Quill (143TC, 145TC, 182C, 184C)		7		Gear, Output	1
		2:1, 3:1 Ratios			02-23-04506-0250	2:1 Ratio, Helical, RH, 60T	
		4:1, 5:1 Ratios — (Integral Shaft and Gear) See Ref. No. 6			02-23-04507-0250	3:1 Ratio, Helical, RH, 66T	
5		Shaft, Output	1		02-23-04508-0250	4:1 Ratio, Helical, RH, 72T	
	02-23-04510-0250	$\frac{5}{8}$ Diameter			02-23-04509-0250	5:1 Ratio, Helical, RH, 75T	
	02-23-04511-0250	$\frac{7}{8}$ Diameter		8	8-32-20-58-069	Cup, Bearing (Timken M12610)	2
<b>CAUTION</b> — Hub City recommends that the complete gear set be replaced to obtain maximum life from the repaired unit. Replacement of only one member will result in an unsatisfactory life.				9	8-32-20-68-069	Cone, Bearing (Timken M12648)	2
6		Gear, Input	1	10	8-32-11-16-071	Bearing, Ball (ND 3303)	1
	02-23-04501-0250	2:1 Ratio, Helical, LH, 30T		11	8-47-14-04-024	Screw, Hex Cap ( $\frac{5}{16}$ NC x 1) GR5	4
	02-23-04502-0250	3:1 Ratio, Helical, LH, 22T		12	8-47-14-04-028	Screw, Hex Cap ( $\frac{5}{16}$ NC x 1 $\frac{1}{4}$ ) GR5	4
16	02-23-04518-0250	<b>KIT, REPAIR (INCLUDES ITEMS 17-26) THESE ITEMS ARE AVAILABLE IN REPAIR KIT ONLY</b>		13	8-47-14-04-023	Screw, Hex Cap ( $\frac{5}{16}$ NC x 1) GR5	4
17	8-74-21-25-006-017	Seal, Output Shaft (C/O 18660)	1	14	8-47-16-11-003	Washer, Locking ( $\frac{3}{8}$ Diameter)	4
18	8-74-21-25-017-017	Seal, Input Shaft (C/O 13535)	1	15	8-47-17-09-013	Pin, Dowel ( $\frac{1}{4}$ x $\frac{3}{4}$ )	2
19	8-47-17-05-021-021	Key, P&W ( $\frac{1}{2}$ sq. x 2 $\frac{1}{2}$ )	1	21	8-47-17-05-030	Key, P&W ( $\frac{1}{2}$ sq. x 1 $\frac{1}{4}$ )	1
20	8-47-17-05-022-022	Key, P&W ( $\frac{1}{2}$ sq. x 1)	1	22	8-47-17-06-081-081	Ring, Retaining (Truarc 5000-185)	1
		2:1, 3:1 Ratios		23	8-47-17-06-135-135	Ring, Retaining (Truarc 5100-66)	1
		4:1, 5:1 Ratios — No Key Required		24	02-23-00844-310	Gasket	1
				25	02-23-04458-0250	Gasket	1
				26	8-63-12-61-001	Plug, Pipe, Socket ( $\frac{1}{2}$ NPT) (not shown)	1

### PARTS ORDERING INFORMATION

When ordering replacement or spare parts, check metal tag on the gear case of your unit and furnish ALL of the following information:

GENERAL			SPECIFIC		PHONE OR WRITE	
1. Assembly Number	4. Style	6. Part Number	7. Complete Description	9. Your Name, Address, Zip Code and Phone Number	Your nearest Hub City Sales Office or Industrial Power Transmission Distributor listed in the Yellow Pages, or the Factory Sales Office.	
2. Model Number	5. Shipping Code	8. Quantity Desired				
3. Ratio						

**NOTE** — When more than one part number is listed after a reference number, examine each description carefully to determine which parts fit your need. Parts will be shipped "best way" unless specified.

