



# Instruction Manual

## S-Series Mixer

### Sanitary Stainless Steel

### Portable and Fixed Mount Mixers



Read and understand this manual prior to operating or servicing this product.





611 Sugar Creek Road  
Delavan, WI 53115 USA

Tel: (800) 252-5200 or (262) 728-1900

Fax: (800) 252-5012 or (262) 728-4904

E-mail: [wcb@spx.com](mailto:wcb@spx.com)

Web site: [www.gowcb.com](http://www.gowcb.com)



**THE WILLIAMS - CARVER COMPANY, INC.**

**4001 MISSION RD P.O. BOX #3140**

**KANSAS CITY, KS 66103-0140**

**Office (913) 236-4949 Fax (913) 236-9331**

**[www.williamscarver.com](http://www.williamscarver.com)**

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## Waukesha Cherry-Burrell Warranty

Seller warrants its products to be free from defect in materials and workmanship for a period of one (1) year from the date of shipment. This warranty shall not apply to products which require repair or replacement due to normal wear and tear or to products which are subjected to accident, misuse or improper maintenance. This warranty extends only to the original Buyer. Products manufactured by others but furnished by Seller are exempted from this warranty and are limited to the original manufacturer's warranty.

Seller's sole obligation under this warranty shall be to repair or replace any products that Seller determines, in its discretion, to be defective. Seller reserves the right either to inspect the products in the field or to request their prepaid return to Seller. Seller shall not be responsible for any transportation charges, duty, taxes, freight, labor or other costs. The cost of removing and/or installing products which have been repaired or replaced shall be at Buyer's expense.

Seller expressly disclaims all other warranties, express or implied, including without limitation any warranty of merchantability of fitness for a particular purpose. The foregoing sets forth Seller's entire and exclusive liability, and Buyer's exclusive and sole remedy, for any claim of damages in connection with the sale of products. In no event shall Seller be liable for any special consequential incidental or indirect damages (including without limitation attorney's fees and expenses), nor shall Seller be liable for any loss of profit or material arising out of or relating to the sale or operation of the products based on contract, tort (including negligence), strict liability or otherwise.

### Shipping Damage or Loss

If equipment is damaged or lost in transit, file a claim at once with the delivering carrier. The carrier has signed the Bill of Lading acknowledging that the shipment has been received from WCB in good condition. WCB is not responsible for the collection of claims or replacement of materials due to transit shortages or damages.

### Warranty Claim

Warranty claims must have a **Returned Goods Authorization (RGA)** from the Seller before returns will be accepted.

Claims for shortages or other errors, exclusive of transit shortages or damages, must be made in writing to Seller within ten (10) days after delivery. Failure to give such notice shall constitute acceptance and waiver of all such claims by Buyer.

## Safety

### READ AND UNDERSTAND THIS MANUAL PRIOR TO INSTALLING, OPERATING OR SERVICING THIS EQUIPMENT

Waukesha Cherry-Burrell recommends users of our equipment and designs follow the latest Industrial Safety Standards. At a minimum, these should include the industrial safety requirements established by:

1. Occupational Safety and Health Administration (OSHA), Title 29 of the CFR  
Section 1910.212 - General Requirements for all Machines
2. National Fire Protection Association, ANSI/NFPA 79  
ANSI/NFPA 79 - Electrical Standards for Industrial Machinery
3. National Electrical Code, ANSI/NFPA 70  
ANSI/NFPA 70 - National Electrical Code  
ANSI/NFPA 70E - Electrical Safety Requirement for Employee Workplaces
4. American National Standards Institute, Section B11

**Attention:** Servicing energized industrial equipment can be hazardous. Severe injury or death can result from electrical shock, burn, or unintended actuation of controlled equipment. Recommended practice is to disconnect and lockout industrial equipment from power sources, and release stored energy, if present. Refer to the National Fire Protection Association Standard No. NFPA70E, Part II and (as applicable) OSHA rules for Control of Hazardous Energy Sources (Lockout-Tagout) and OSHA Electrical Safety Related Work Practices, including procedural requirements for:

- Lockout-tagout
- Personnel qualifications and training requirements
- When it is not feasible to de-energize and lockout-tagout electrical circuits and equipment before working on or near exposed circuit parts

**Locking and Interlocking Devices:** These devices should be checked for proper working condition and capability of performing their intended functions. Make replacements only with the original manufacturer's renewal parts or kits. Adjust or repair in accordance with the manufacturer's instructions.

**Periodic Inspection:** Industrial equipment should be inspected periodically. Inspection intervals should be based on environmental and operating conditions and adjusted as indicated by experience. At a minimum, an initial inspection within 3 to 4 months after installation is recommended. Inspection of the electrical control systems should meet the recommendations as specified in the National Electrical Manufacturers Association (NEMA) Standard No. ICS 1.3, Preventative Maintenance of Industrial Control and Systems Equipment, for the general guidelines for setting-up a periodic maintenance program.

**Replacement Equipment:** Use only replacement parts and devices recommended by the manufacturer to maintain the integrity of the equipment. Make sure the parts are properly matched to the equipment series, model, serial number, and revision level of the equipment.

Warnings and cautions are provided in this manual to help avoid serious injury and/or possible damage to equipment.

## Safety Check List

**All WCB Mixers are provided with proper safety covers to avoid potential injury and/or equipment damage.**

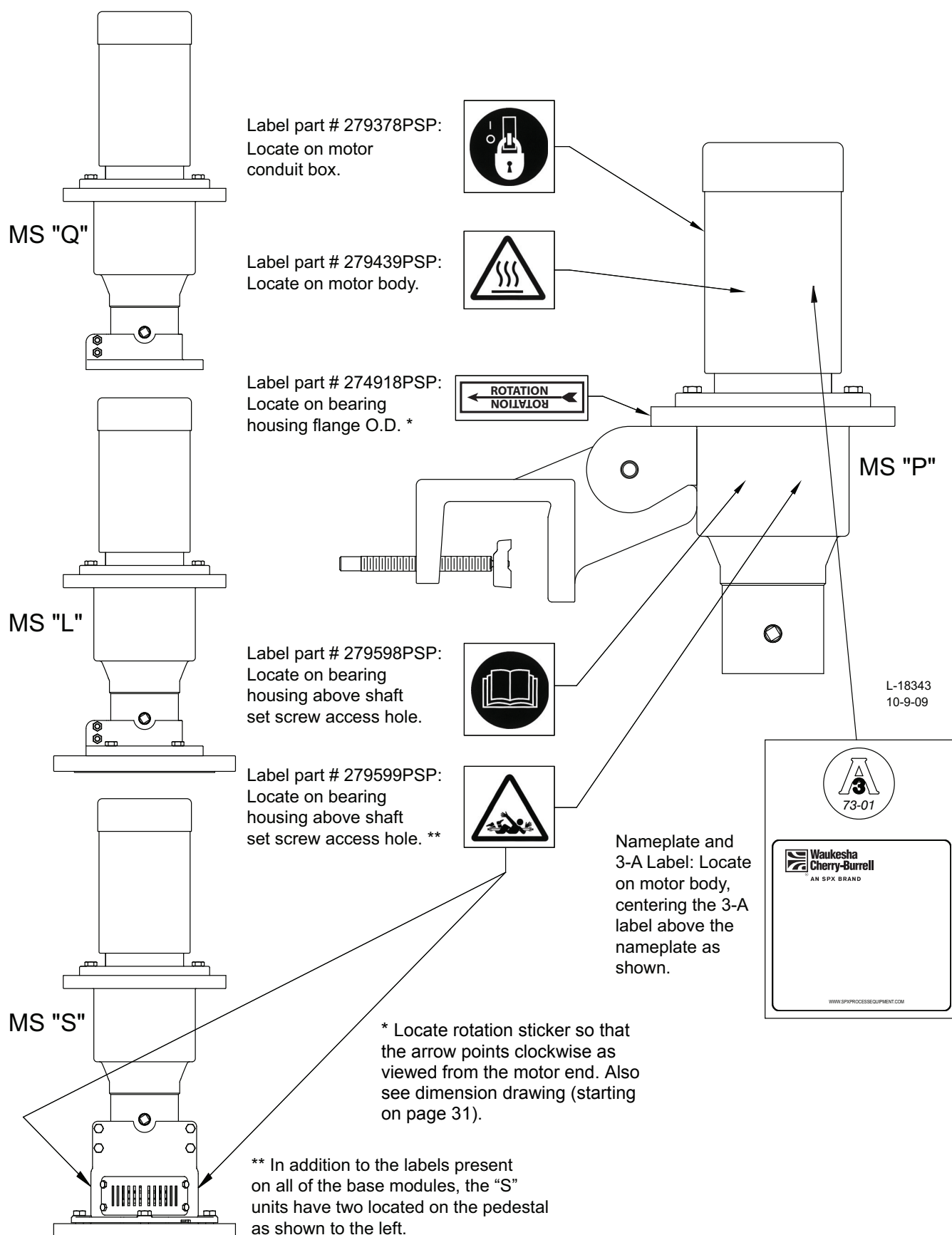
**Thoroughly review and adhere to the following safety check list before installing, operating or performing maintenance on the mixer.**

**Failure to follow these instructions could result in serious injury. Ensure the use of qualified, quality trained and safety conscious personnel.**

## Important Warnings

1. Use only the lifting device, if provided, on your unit to install the mixer. We strongly recommend that the hoist rings be of safety swivel type with 360° rotational capability. Lift per instructions in section 1.3 on page 10.
2. DO NOT connect the motor to the power source until all components are assembled, the mixer is installed, and all hardware is tightened to the proper torque, which is specified in Table 2 on page 17.
3. DO NOT operate shaft sealing devices at temperatures or pressures higher than those specified in the manual or on the nameplates.
4. DO NOT service the mixer until you have followed your "Control of Hazardous Energy Sources" (lockout, tagout procedure) as required by OSHA 29 CFR Part 1910.
5. DO NOT touch rotating mixer parts or any part of mixer that has the potential of having a hot surface including motor, gear drive housing, seal, shafting and flange.
6. DO NOT operate mixer for service other than its intended use, that being fluid mixing with the mixer attached to a rigid structure and connected to a power source appropriate to operate the drive motor.
7. DO NOT make any field changes or modifications (horsepower, seal material components, output speed, shaft lengths, impellers, etc.) without reviewing the changes with your local distributor or the WCB Customer Service Department.
8. DO NOT install an aftermarket Variable Frequency Drive without first consulting your local distributor or the WCB Customer Service Department to determine the compatibility of the existing motor with the Variable Frequency Drive.
9. DO NOT operate mixer until you have checked the following items:
  - a. Make sure the mixer is properly grounded.
  - b. Ensure all protective guards and covers are installed. Guarding of the impeller shaft below mixer mounting surface is the responsibility of the customer.
  - c. Ensure all detachable components are securely coupled to the mixer.
  - d. Thoroughly REVIEW and ADHERE TO the mixer operating instructions starting on page 10.
  - e. Ensure the mixer output shaft rotates freely by hand.
  - f. Ensure all personnel and equipment are clear of rotating parts.
  - g. Ensure all external connections (electrical, hydraulic, pneumatic, etc.) have been completed in accordance with all applicable codes and regulations.
10. DO NOT enter the mixing vessel UNLESS:
  - a. The mixer power supply is locked out (follow Item number 4, above).
  - b. The impeller shaft is firmly attached to the mixer drive or the shaft is supported securely from below.
  - c. You have followed applicable confined space regulations.

## Safety Labels



## CE Compliance

Equipment furnished conforms to the following directives:

98/37/EC Machinery Directive

89/336/EEC Electro-Magnetic Compatibility

73/23/EEC Low Voltage

Any CE marking and/or associated documentation applies to the mixer only. This has been supplied on the basis that the mixer is a unique system. When the mixer is installed, it becomes an integral part of a larger system which is not within the scope of supply and CE marking is the responsibility of others.

## Environmental Notices



**NOTICE:** There are no user re-usable components within this equipment. All materials are recyclable. Dispose of equipment responsibly at the end of its service.

**NOTICE:** Refer to the MSDS data sheet for the grease for disposal. Data sheet for the grease supplied with the unit is supplied in the machine book. If grease type is unknown to the user, dispose of the material in accordance with local laws and directives.



**IMPORTANT:** Dispose of this equipment responsibly. Correct disposal is the responsibility of the end user. If in doubt, consult with local environmental agencies for advice on the best method of disposal. Failure to dispose of this equipment correctly could result in prosecution.



**IMPORTANT:** This equipment does not produce high noise or vibration. However, the operator may experience high noise or vibration in the location of this equipment due to another source. Ensure that all environments are correctly labeled such that any operator or bystander is informed as to the potential risks and the correct action he should take to prevent injury.

## Noise Levels

Sound Pressure Levels: Maximum 85 dBa @ 1 meter

This product may be covered by one or more of the following U. S. Patents:

5427450	5454986	5470152	5478149	5480228	5501523
5511881	5560709	5568975	5568985	5655780	5720286
5746536	5758965	5779359	5842377	5925293	5951162
5972661	5988604	6089748	6109449	6142458	6158722
6250797	6299776	6334705	6386753	6457853	6634784
6715913	6742923	6746147	6789314	6796707	6796770
6808306	6843612	6860474	6877750	6935771	6986507
6997444	7001063	7056095	7168641	7168848	7168849
7328809					



## Care of Stainless Steel

### **Stainless Steel Corrosion**

Corrosion resistance is greatest when a layer of oxide film is formed on the surface of stainless steel. If film is disturbed or destroyed, stainless steel becomes much less resistant to corrosion and may rust, pit or crack.

Corrosion pitting, rusting and stress cracks may occur due to chemical attack. Use only cleaning chemicals specified by a reputable chemical manufacturer for use with 300 series stainless steel. Do not use excessive concentrations, temperatures or exposure times. Avoid contact with highly corrosive acids such as hydrofluoric, hydrochloric or sulfuric. Also avoid prolonged contact with chloride-containing chemicals, especially in presence of acid. If chlorine-based sanitizers are used, such as sodium hypochlorite (bleach), do not exceed concentrations of 150 ppm available chlorine, do not exceed contact time of 20 minutes, and do not exceed temperatures of 104°F (40°C).

Corrosion discoloration, deposits or pitting may occur under product deposits or under gaskets. Keep surfaces clean, including those under gaskets or in grooves or tight corners. Clean immediately after use. Do not allow equipment to set idle, exposed to air with accumulated foreign material on the surface.

Corrosion pitting may occur when stray electrical currents come in contact with moist stainless steel. Ensure all electrical devices connected to the equipment are correctly grounded.

### **Elastomer Seal Replacement Following Passivation**

Passivation chemicals can damage product contact areas of WCB equipment. Elastomers (rubber components) are most likely to be affected. Always inspect all elastomer seals after passivation is completed. Replace any seals showing signs of chemical attack. Indications may include swelling, cracks, loss of elasticity or any other noticeable changes when compared with new components.

## S-Series Mixer Operation and Maintenance Instructions

### Section 1 - Initial Inspection, Shipping Arrangements and Storage

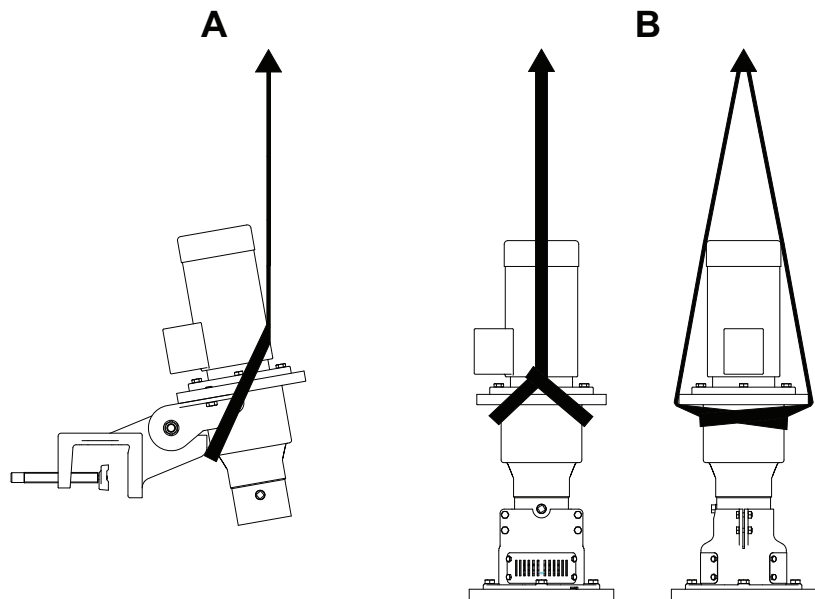


**WARNING: Eye protection must be worn at all times while servicing this mixer.**

- 1.1 Check the shipping container(s) and your equipment for possible shipping damage. Report any damage immediately to the carrier and our factory. See “Shipping Damage or Loss” on page 4.
- 1.2 Do not remove any protective coatings or wrappings until the mixer is ready to be put into service. If the mixer is to be stored, store only in an indoor, clean, dry location with controlled temperatures of 59°F to 104°F (15°C to 40°C). When gear drive models have been stored for more than one year, the gear lubricant should be replaced (see lubrication instructions on page 18). Motor shafts are to be rotated manually every month, at least 10 to 15 revolutions.
- 1.3 Lift the mixer from its container using one of the following lifting methods, depending on mixer mounting style:

The “P” units, which are clamp-mounted to the side of the tank, are lifted as shown in Figure 1, item A, with a single sling, choker method.

The “Q”, “L”, and “S” fixed-mounted units should be lifted in a similar fashion using two slings directly across from each other to vertically lift the mixer, as shown in Figure 1, item B.



**Figure 1 – Mixer Lifting Methods**

## Section 2 - Mixer Mounting Configurations



**WARNING: Eye protection must be worn at all times while servicing this mixer.**

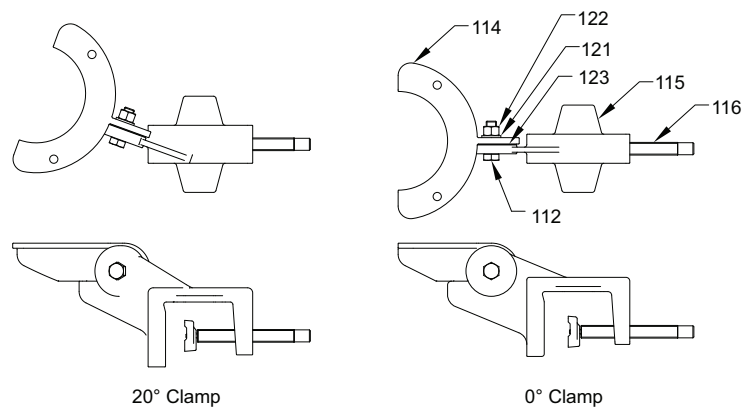
- 2.1 Refer to Dimension Drawings (starting on page 31) for mounting configurations.

Impeller Position Recommendations:

	Single Impeller	Dual Impeller
Basic	Position Impeller Mid-Batch	Lower Impeller: 1D Off Bottom Upper Impeller: 2D Spacing
Alternate	$0.75D \leq OB \leq 1.5D$	Lower Impeller: $0.75D \leq OB \leq 1.5D$ Upper Impeller: $1.5D \leq SP \leq 2.5D$

D: Impeller Diameter    OB: Impeller Off Bottom    SP: Impeller Spacing

- 2.2 Lock-out power before positioning the mixer, and review safety instructions before starting the mixer.
- 2.3 “P” Units - Clamp Mounting Module - The clamps are cast offset at recommended 20° horizontal plane and adjustable 0-10° in the vertical plane. Clamps are also available with zero degree offset in the horizontal plane and adjustable 0-10° in the vertical plane. The clamp assembly (115) is fastened by hex head cap screw (112), flat washer (121), and hex nut (122) to the yoke (114). There is an anti-rotation insert (123) between the pivoting faces of the yoke (114) and clamp assembly (115). Refer to Figure 2. The yoke is bolted directly to the mixer housing module with two hex head cap screws (113).



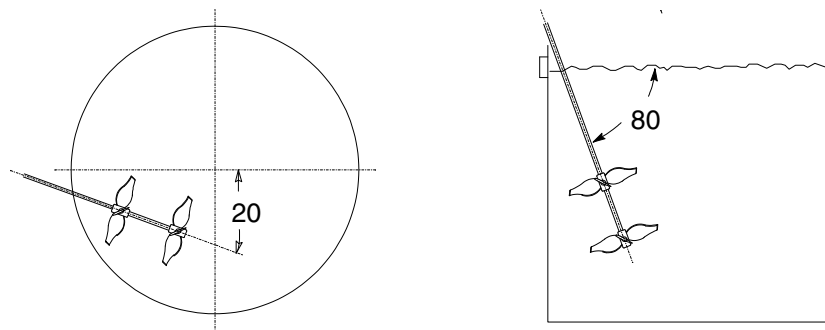
Preferred for  
Cylindrical Tanks

Preferred for  
Rectangular & Square Tanks

**Figure 2 – “P” Units – Clamp Mounting Module**

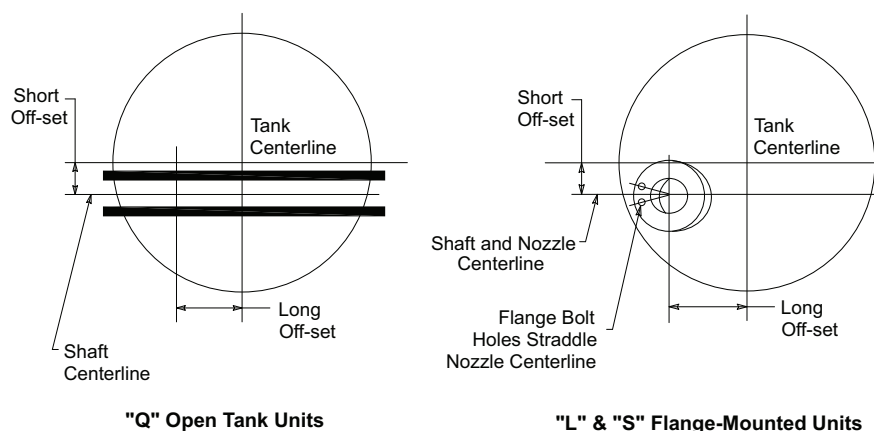
- 2.4 Loosen the clamp screw (116) sufficiently so that the clamp base will engage the tank lip or rim when the mixer is mounted. Set the clamp (115) squarely on the mounting surface so that the clamp rests on the lip of the tank, if a lip is present. Tighten the clamp screw (116) making sure the travel plate (118) is parallel to the tank lip when it contacts the tank wall. Using an M8 or 5/16” hex wrench, tighten the clamp screw to 40-50 ft-lbs (54-61 N-m) so that the mixer is held securely to the tank. **DO NOT IMPACT THE WRENCH OR USE AN EXTENSION.**

2.5 Refer to Figure 3 for recommended angular positions for “P” units.



**Figure 3 – “P” Units: Recommended Angular Positions**

2.6 For Mixer Positioning Data for fixed mounted “Q”, “L”, and “S” Units on unbaffled tanks, refer to Figure 4 and Table 1.



**Figure 4 – Mixer Positioning Data Based on 10° Angular Off-Set Mounting**

Table 1 - 10° Offset – For Tanks with a Z/T Less Than 1.2							
Tank Diameter		Maximum Tank Depth		Minimum Long Offset		Minimum Short Offset	
Inches	MM	Inches	MM	Inches	MM	Inches	MM
24	610	36	915	6.75	170	3.88	100
27	685	41	1040	7.63	195	4.38	110
30	760	45	1145	8.31	210	4.75	120
36	915	54	1370	9.88	250	5.75	145
42	1065	63	1600	11.50	290	6.63	170
48	1220	72	1830	13	330	7.50	190
54	1370	81	2055	14.50	370	8.50	215
60	1525	90	2285	16.13	410	9.31	235
66	1675	100	2540	17.88	455	10.31	260
72	1830	108	2745	19.25	490	11.13	280
78	1980	117	2970	20.75	525	12	305
84	2135	126	3200	22.38	570	13	330
90	2285	135	3430	24	610	13.75	350
96	2440	144	3660	25.50	650	14.75	375
102	2590	154	3910	27.25	690	15.75	400
108	2745	162	4115	28.63	730	16.56	420
114	2895	171	4345	30.19	765	17.44	445
120	3050	180	4575	31.75	810	18.31	465

\* Z = Tank Depth, T =Tank Diameter

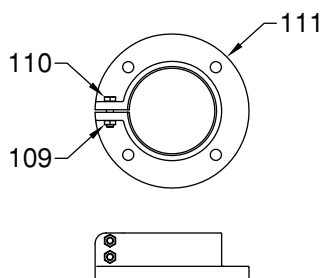


Figure 5 – “Q” Units



**WARNING: Eye protection must be worn at all times while servicing this mixer.**

2.7 “Q” Units – Open Tank Mounting Module – The mixer housing module mounts in the bore of the Pedestal (111) and is secured by tightening the two hex head cap screws (110) and hex nuts (109). Refer to Figure 5.

2.8 “L” Units – Closed Tank, Flange Mounted Lip Seal Module - The mixer housing module mounts in the bore of the Pedestal (111) and is secured by tightening the two hex head cap screws (110) and hex nuts (109). The pedestal (111) bolts to the mounting flange (130) with four hex head cap screws (140). Tank contents are sealed off by the flange mounted lip seal (209) which is retained by retaining ring (208). Refer to Figure 6.

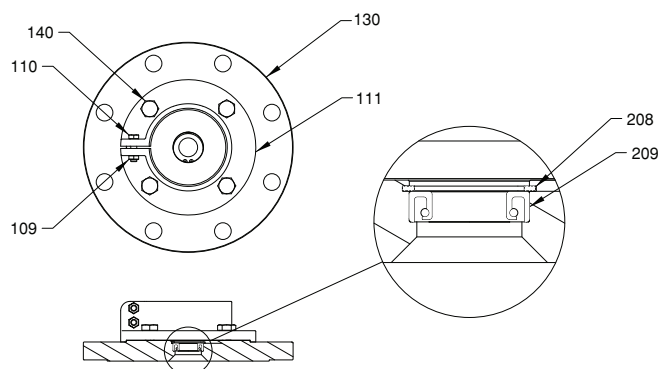


Figure 6 – “L” Units

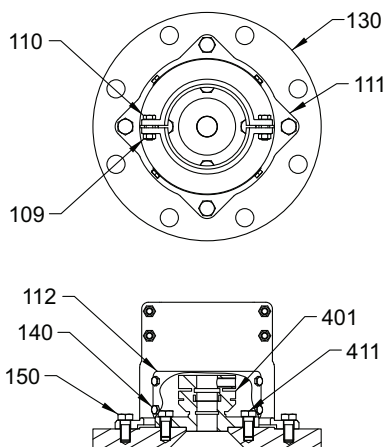


Figure 7 – “S” Units



**WARNING: Disconnect motor leads or use power supply lock-out procedures before servicing this mixer.**

2.9 “S” Units – Closed Tank, Flange Mounted Mechanical Seal Module (see Figure 7) - The mixer housing module mounts in the bore of the Pedestal (111) and is secured by tightening the four hex head cap screws (110) and hex nuts (109). The pedestal (111) bolts to the mounting flange (130) with four hex head cap screws (150). Tank contents are sealed off by the flange mounted Mechanical Seal (401). Access to the Mechanical Seal (401) is achieved by removing the eight hex head cap screws (140) then removing the two safety covers (112). Assemble the Mechanical seal as shown in Figure 7.

#### 2.10 Mechanical Seal Installation

See Figure 8 on page 14, and also refer to the seal assembly drawing on page 46 for the type of seal furnished with this mixer.

**CAUTION:** The sealing surface of the stationary sealing face (405) and rotary sealing face (403) is lapped and polished to a mirror finish. It is imperative that these two faces be handled with care and kept perfectly clean.

Assemble the Mechanical Seal as follows:

- Install the O-ring (406) in the groove in the bottom of the stationary sealing face (405).
- Lower stationary sealing face (405) onto seal flange (130) and align with center of flange.
- Align the mounting holes in the stationary sealing face with the mounting holes in the mounting flange (130), then secure to the mounting flange with four hex head cap screws (411).
- Lightly lubricate sealing ring (407) with silicone grease.
- Insert the impeller shaft (42), up through the mounting flange (130).

- f. Carefully slide the shaft (42), through the rotary seal head (402).
- g. Refer to Section 4 (page 15) for impeller shaft installation.
- h. Slide the rotary seal head (402) down into position until it just touches the face of the stationary seal face (405). Care should be taken to avoid getting silicone grease on the sealing faces.
- i. Evenly tighten spring holder set screws (412). Remove seal setting tabs (459) and store for use during seal removal.
- j. Install two safety covers (112) and secure with eight hex head cap screws (140).

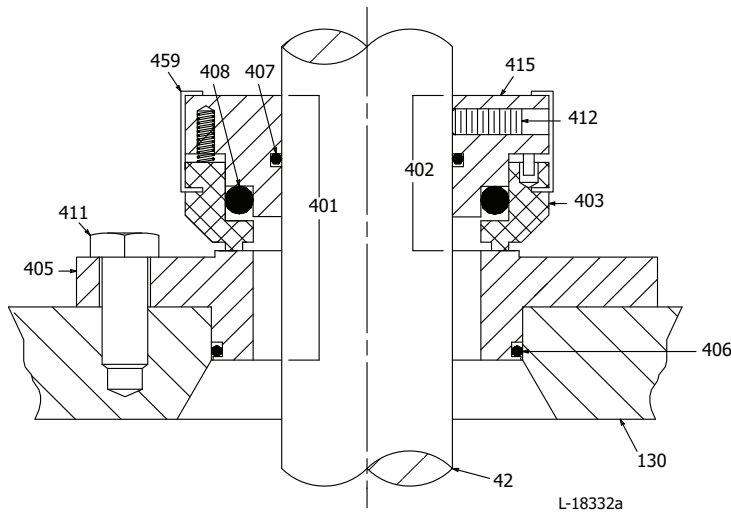


Figure 8 – Mechanical Seal

#### 2.11 Mechanical Seal Removal (see Figure 8)

- a. Remove eight hex head cap screws (140) and two safety covers (112).
- b. Install seal setting tabs (459), then loosen spring holder set screws (412).
- c. Refer to Sections 9 or 10 (pages 20 or 23) for impeller shaft (42) removal procedure.
- d. Slide the impeller shaft (42) down through the rotary seal head (402).
- e. CAREFULLY remove the rotary seal head assembly (402).
- f. If removal of the stationary seal face (405) becomes necessary, remove the four hex head cap screws (150) and remove the complete mixer/pedestal assembly. The stationary seal face (405) can then be removed by removing the four hex head cap screws (411).



**WARNING:**  
Disconnect motor  
leads or use  
power supply  
lock-out  
procedures before  
servicing this  
mixer.

## Section 3 - Motor Connections

#### 3.1 Three Phase Motors:

- a. All three phase motors must be field wired for proper rotation. If rotation does not agree with nameplate, reverse any two line leads.
- b. Dual voltage motors can be wired for the desired voltage. Refer to the connection diagrams provided on the motor nameplate and inside the conduit box cover.

## Section 4 - Mixer Impeller and Shaft Installation



**WARNING:** Eye protection must be worn at all times while servicing this mixer.



**WARNING:** Disconnect motor leads or use power supply lock-out procedures before servicing this mixer.

- 4.1 Position the impeller(s), if a welded assembly is not provided, on the impeller shaft. Refer to Section 2 on page 11 for recommended dual impeller spacing.
- FP100 impeller** - "Motor End" is cast on the upper side of the impeller. Figure 9 shows how to determine the upper face of the impeller in the event the lettering becomes illegible.
- NOTE:** Lettering is removed on polished impellers. Tighten impeller set screws securely. For unusually severe conditions, the shaft should be spotted for the set screws.
- Hydrofoil impeller** - The larger wedge-shaped portion of the hub body must face up towards the mixer. The bottom of the hub is stamped "Down."

**NOTE:** Stamping is not present on polished impellers. Refer to Figure 9 for general orientation reference. Tighten impeller set screws securely. For unusually severe conditions, the shaft should be spotted for the set screws.

  - PBT impeller** - Impeller orientation is not a concern since this impeller is symmetrical. Tighten impeller set screws securely. For unusually severe conditions, the shaft should be spotted for the set screws.

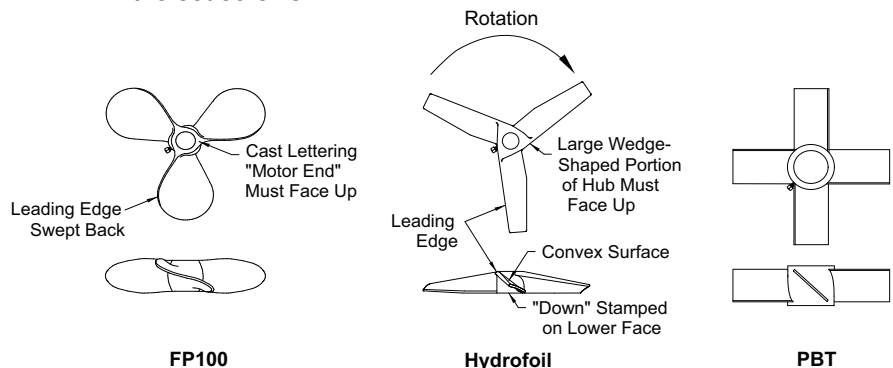


Figure 9 – Impeller Designs

**NOTE:** On 3-A units, the impeller is welded to the shaft; the set screw does not protrude as shown above.

**NOTE:** Please refer to the assembly drawing for the appropriate model, starting on page 36.

- 4.2 Before installing the impeller shaft (42), clean the impeller shaft end and drive quill (35) thoroughly. To install the impeller shaft, remove the access plug (97), and orient the drive quill so that the set screw (96) aligns with the access hole. Align the drive quill by inserting the impeller shaft (42) into the quill and rotate quill manually.

Insert the impeller shaft into the quill bore as far as it will go. Draw up the set screw, rotating the shaft slightly back and forth to make sure the set screw (96) seats against the flat of the shaft. Tighten the set screw (96) to 29 ft-lbs (39 Nm). **DO NOT IMPACT THE WRENCH OR USE AN EXTENSION.**

**NOTE:** A safety feature is provided by a slight taper in the flat on the impeller shaft. The shaft cannot drop out unless the set screw is intentionally loosened.

**NOTE:** On 3-A units, the impeller is welded to the shaft; the set screw does not protrude as shown in Figure 9.

## Section 5 - Mixer Operation

- 5.1 This mixer is designed for continuous operation, and normally needs no additional maintenance.
- 5.2 Variable speed units have specified critical speed ranges where the unit should not be operated during draw off condition or operated in air.
- CAUTION: These conditions must be avoided when the unit is being operated with a variable speed drive. It is also not recommended to operate the mixer with extreme vortexing or surging of the liquid being mixed.***
- 5.3 All bolts should be retightened 12 hours after assembly and at each scheduled shutdown thereafter.
- 5.4 Turn on the mixer. Allow time for the mixing pattern to be established, then make any required adjustments of position as outlined in Section 2, starting on page 11.

## Section 6 - Bolt Tightening Torque Recommendations

Inadequately or improperly tightened hardware can loosen due to vibration or the load reactions imposed by fluid forces. This can result in reduced equipment service life or damage and failure.

- 6.1 Recommended torques for tightening metric bolts and screws on mixers and their mounting structures are listed in Table 2 (page 17) for your general reference. These average torque values should be considered only as guides and not as absolute values.

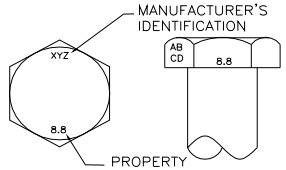
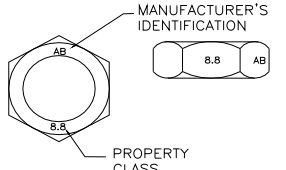
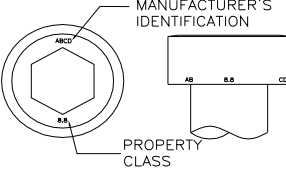
The amount of torque required to maintain a tight connection can vary considerably for bolts of the same size under different operating conditions. Variations such as basic joint design, compression factors, type and strength of base and hardware material, surface finish of mating parts and lubrication are only some of the factors that influence the tightness of bolted connections for given bolt torques.

**Unless specifically listed elsewhere in the detailed instructions, tighten the mixer and mounting hardware to the recommended torques in Table 2.** A torque wrench must be used to insure compliance with these torque requirements.

Certain assembly connections may require special torques which are not listed in the table. These torques can be found in the detailed assembly and disassembly sections of this manual. See Sections 2.4 (page 11) and 4.2 (page 15), which reference the shaft connection and clamp to the tank. **Review this manual carefully to determine where special torques are required.**

**All bolts should be retightened 12 hours after assembly, and at each scheduled shutdown thereafter.**



Table 2 - Recommended Tightening Torques for Commercial Grade Steel, Gr5, 304 and 316 Stainless Steel (1) (2)			
BOLT THREAD SIZE	TIGHTENING TORQUES (FT-LBS) (3) GRADE 5.6 OR 304/316 SS BOLTS LUBRICATED	TIGHTENING TORQUES (FT-LBS) (3) GRADE 8.8 BOLTS LUBRICATED	ISO MARKING REFERENCE GUIDE (2)
M5	1.7	4.1	<b>HEX HEAD CAP SCREWS</b> 
M6	3.0	7.0	
M7	5.0	12	
M8	7.0	17	
M10	14	34	
M12	25	59	
M14	39	93	<b>HEX NUT</b> 
M16	62	146	
M18	85	200	
M20	120	284	
M22	178	386	
M24	207	491	
M27	303	718	<b>SOCKET HEAD CAP SCREWS</b> 
M30	412	975	
M33	561	1327	
M36	720	1704	
M39	932	2205	
M42	1153	2727	

Metric values in N-m

1FT-LB = 1.3558 N-m

## Notes:

- All bolts should be coated with oil, grease or an anti-seize compound whenever possible. The threads and bearing face of bolt heads and/or nuts should be lubricated.
- Torque values shown supersede previous tables that may have allowed lower values. It is recommended that only fasteners be used that are properly marked, including manufacturer's trade marking. Only fasteners marked as shown are guaranteed to meet specification and performance requirements.
- Conversion factors:

Friction locking devices: multiply lubricated value by 1.15. These torques pertain to bolts or nuts with friction locking devices such as nylon pellets or patches, fiber inserts or upset threads.

Dry values: multiply lubricated value by 1.33.

## Section 7 - Lubrication

- 7.1 Your mixer has been lubricated at the factory with the correct type and amount of high quality lubricants. Lubricant cleanliness is protected by properly designed closures.
- 7.2 All mixer bearings are sealed type and are pre-packed with lubricant. Re-lubrication of these bearings is not necessary.
- 7.3 The gear chamber in the model MS5 (P,Q,L, or S) and MS6 (P,Q,L, or S) Series mixers has been factory filled with a grease suitable for ambient temperature ranges of -4°F to +122°F (-20°C to +50°C). Under normal operating conditions, this lubricant need not be changed until the unit has been dismantled for some reason. Refer to Table 3 for lubricant specifications.
- 7.4 Under adverse operating conditions, periodic changes of lubricant may be necessary. Adverse conditions are defined as operating in very humid, dust-laden, chemical atmospheres, or where wide variations in ambient temperatures occur. Such adverse conditions can lead to deterioration of lubricant compounds and additives, and it is recommended that the condition of the grease be checked within six months of start-up.

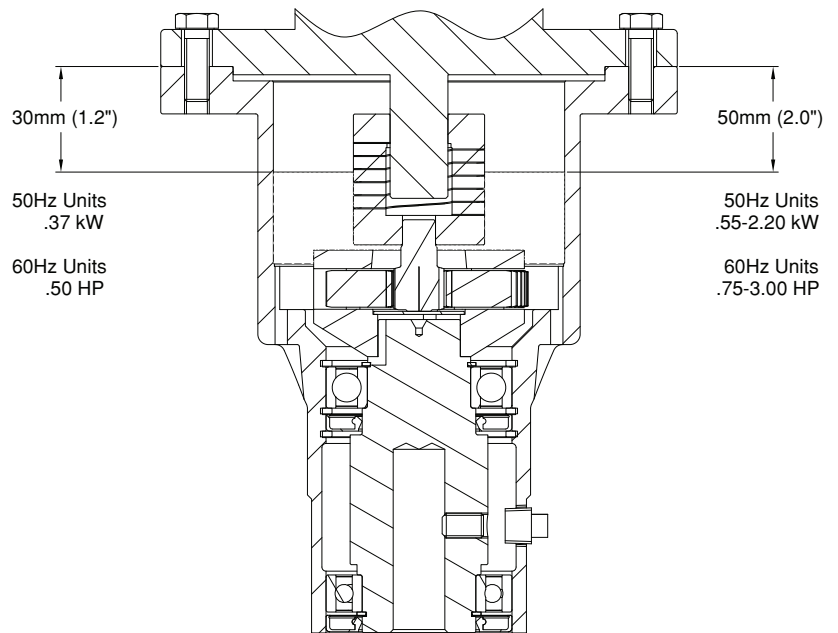
Refer to Section 10 (page 23) for instructions on disassembling the gear drive.

**NOTE:** The gear chamber should be filled per Table 3 capacities. All sealing surfaces should be cleaned and new gasket eliminator applied. Loctite® Gasket Eliminator 515 Sealant is recommended by the factory.

Table 3 - Lubrication Capacities				
Model		Recommended grease	Grease capacity	
		Food Grade	lbs.	kg
50Hz	MS5 & MS6 (P,Q,L,S) 1	BEL-RAY NO-TOX® HD 0	0.9	0.4
	MS5 & MS6 (P,Q,L,S) 2-5		1.6	0.7
	MS5 & MS6 (P,Q,L,S) 6		1.6	0.7
60Hz	MS5 & MS6 (P,Q,L,S) 1		0.9	0.4
	MS5 & MS6 (P,Q,L,S) 2-5		1.6	0.7
	MS5 & MS6 (P,Q,L,S) 6		1.6	0.7

Food grade grease is available. See page 30.

- 7.5 An alternate method to achieve the proper amount of grease required is to measure from the top of the mixer housing (36) down to the grease level as shown in Figure 10.



**Figure 10 – Grease Level**

7.6 Changing Gear Lubricant

Food Grade Grease: Gear sets are initially lubricated at the factory with BEL-RAY NO-TOX<sup>®</sup> HD 0 grease. This is the optimum lubricant. **NO OTHER FOOD GRADE GREASE IS ALLOWED.** It will give the best performance, with no derate necessary, and is available from WCB.

- Make sure the gear housing is vertical to prevent spillage.
- Remove all old grease from the gear chamber and wipe the gear chamber clean.
- Pack the gear chamber with fresh grease (see Table 3 on page 18 or Figure 10, above). Paddle the grease to fill voids and remove air pockets, rotating the shaft and shaking the housing while paddling.
- Check for free movement of all components by rotating the drive shaft. If satisfactory, refer to Section 10 (page 24) and complete assembly.

## Section 8 - Preparation for Disassembly and Assembly



**WARNING: Eye protection must be worn at all times while servicing this mixer.**



**WARNING: Disconnect motor leads or use power supply lock-out procedures before servicing this mixer.**

- 8.1 S-Series mixers are precision manufactured and assembled to provide long, trouble free service when properly maintained. If it becomes necessary to disassemble the unit, careful, precise reassembly is necessary.

Refer to the assembly drawing (starting on page 36) for location of parts.

Equipment that will be required to service the mixer, in addition to standard mechanics tools, is a rubber mallet, retaining ring pliers, arbor press and torque wrench.

When disassembling the mixer, clean adjacent external surfaces to prevent dirt from entering the housings.

It is recommended that oil seals be replaced and gasket eliminator sealer be reapplied when the mixer is disassembled.

### 8.2 Seal Replacement

New oil seals should always be used. Drive out all old oil seals and remove accumulations of sealing compound. When replacing seals:

- Coat the lips of seals with bearing grease.
- Install oil seals with the lip facing in the direction indicated on the assembly drawing.
- Coat the section of the shaft sealing surface with oil. If the oil seal must pass over a keyway, wrap the shaft with thin paper or tape, coat with grease, and pass the seal over.

### 8.3 Bearing Replacement

Inspect the bearings carefully and replace if necessary.

- Old bearings can be removed with a puller or an arbor press.
- New bearings can be pressed onto the shafts. Be careful to apply load only to the inner race.
- Make sure the bearings are tightly seated against the shaft or housing shoulder with no clearance.

## Section 9 - Direct Drive Units

**NOTE:** Please refer to the assembly drawing for the appropriate model, starting on page 36.

### Disassembly of Direct Drive Units

#### 9.1 Motor Removal

- Remove set screw access plug (97) from the mixer housing (36).
- Remove the impeller shaft (42) from the drive quill (35), by loosening the set screw (96) enough to release the impeller shaft. The impeller shaft is now free from the chuck and can be withdrawn.

**“P” Units:** Turn the clamp screw counterclockwise to loosen the clamp assembly (116). Remove the mixer from the tank. Remove the yoke/clamp assembly (114/115), from the housing (36) by removing the two hex head cap screws (113).

**“Q” and “L” Units:** Hold the two hex head cap screws (110) and loosen the two hex nuts (109). Remove the mixer from the pedestal (111).

**“S” Units:** Hold the four hex head cap screws (110) and loosen the four hex nuts (109). Remove the mixer from the pedestal (111).

**NOTE:** Please refer to the assembly drawing for the appropriate model, starting on page 36.

- c. Set the mixer upright on a workbench.
- d. Remove the four hex head cap screws (160), (or four nuts (161) on D70 and D90 motors) holding the motor (101) to the housing (36).
- e. Separate and remove the motor (101) from the housing (36). One half of the motor coupling half (150) will remain attached to the motor shaft.
- f. Loosen the set screw, and remove the motor coupling half (150) and key (106).
- g. Loosen the set screw, remove the quill shaft coupling half, and coupling insert.

#### 9.2 Quill Shaft and Housing Disassembly

- a. Place the housing (36) upright on a workbench and remove the retaining rings (44 and 56).
- b. Place the housing upright in a press, and press out the quill shaft (35), bearing (41) and oil seal (49).
- c. Press the lower bearing (41) off the shaft.
- d. Turn the housing over and press out the upper bearing (37).
- e. Remove the lower retaining ring (44), only if necessary.
- f. Inspect the bearings (37 and 41). Replace if there is excessive wear.

**NOTE:** Please refer to the assembly drawing for the appropriate model, starting on page 36.

### Assembly of Direct Drive Units

#### 9.3 Preparing for Assembly

- a. Clean all parts thoroughly.
- b. Inspect for the following defects:
  - 1. Cracks or damage of the housing.
  - 2. Dents, gouges or scoring of the drive shaft, housing bore, and particularly the mating faces of the motor and housing.
- c. Repair or replace defective parts. It is good practice to replace an oil seal which has been removed from the housing. Apply a small quantity of bearing grease to the housing bore, and around the oil seal lip to provide lubrication and make the seal more effective.
- d. Replace the bearings if they show indications of wear.

#### 9.4 Quill Shaft Assembly

- a. Press the lower bearing (41) onto the quill shaft (35). The bearing must seat against the shoulder with no visible gap.

#### 9.5 Quill Shaft and Housing Assembly

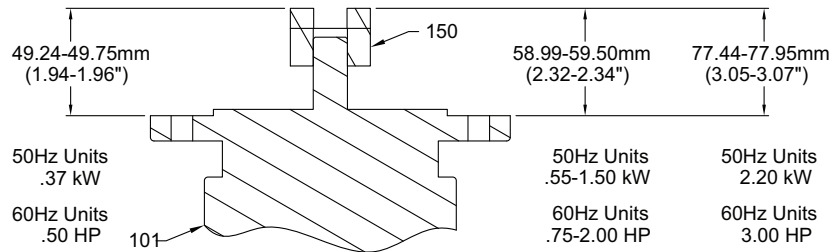
- a. Install the lower retaining ring (44) (if removed) in the housing (36).
- b. Mount the housing (36) in an arbor press, large end up.
- c. Press the bearing (37) on its outer race to seat against retaining ring (44).

**NOTE:** Please refer to the assembly drawing for the appropriate model, starting on page 36.

- d. Install the upper retaining ring (44).
- e. Support the housing, large end down, by resting the inner race of the bearing on a suitable sleeve.
- f. Press the quill shaft (35) into the bearing until the shoulder of the shaft registers against the inner race of the bearing.
- g. Install the upper retaining ring (56) in the shaft groove.
- h. Turn the housing large end down, and press the lower oil seal (49) until it is flush with the end of the housing.

## 9.6 Motor Coupling Assembly

- a. Position the motor coupling hub (150) as shown in Figure 11.
- b. Tighten the set screws.
- c. Place the drive coupling half and key onto the quill shaft until it bottoms on the shaft shoulder. Tighten the set screw.
- d. Install the coupling insert into the quill shaft coupling half.



**Figure 11 – Motor Coupling Placement**

## 9.7 Motor Assembly

- a. Apply Loctite® Gasket Eliminator 515 Sealant on the motor mounting face of the housing (36).
- b. Align the housing so the set screw access hole is to the right. Orient the motor, so the conduit box (or junction box) of the motor is facing you.
- c. Move the motor, over the housing (36) and align the motor coupling (150) with the coupling insert on the quill shaft coupling half.
- d. Once the coupling halves engage, align the housing rabbets, screw holes, and conduit box (or junction box) of the motor, with the set screw access hole in the housing, to the right.

**NOTE:** Units using D80 and D90 frame motors will use a spacer ring (98) on motor rabbet to mixer housing rabbet connection.

- e. Install the housing cap screws (160) (or four nuts 161 on D70 and D90 motors) and tighten evenly.

## 9.8 Mixer Mounting

- a. Refer to Section 2 (page 11) for attachment of applicable mounting configuration.

## Section 10 - Gear Drive Units

**NOTE:** Please refer to the assembly drawing for the appropriate model, starting on page 39.

### Disassembly of Gear Drive Units

#### 10.1 Motor Removal

- a. Remove set screw access plug (97) from the mixer housing (36).
- b. Remove the impeller shaft (42) from the drive quill (35) by loosening the set screw (96) enough to release the impeller shaft. The impeller shaft is now free from the chuck and can be withdrawn.

**“P” Units:** Turn the clamp screw counterclockwise to loosen the clamp assembly (116). Remove the mixer from the tank. Remove the yoke/clamp assembly (114/115), from the housing (36) by removing the two hex head cap screws (113).

**“Q” and “L” Units:** Hold the two hex head cap screws (110) and loosen the two hex nuts (109). Remove the mixer from the pedestal (111).

**“S” Units:** Hold the four hex head cap screws (110) and loosen the four hex nuts (109). Remove the mixer from the pedestal (111).

- c. Set the mixer upright on a workbench.
- d. Remove the four hex head cap screws (160) (or four nuts 161 on D70 and D90 motors) holding the motor (101) to the mixer housing (36).
- e. Separate and remove the motor (101) from the mixer housing (36). The helical coupling (150) and sun gear will remain attached to the motor shaft.
- f. Move the mixer housing over a suitable container, remove the old lubricant and dispose of properly.
- g. Remove the sun gear (9) and motor coupling (150).
- h. Remove the gear carrier assembly (1), retaining ring (7), ring gear (2), four dowel pins (5) and any remaining old lubricant.

#### 10.2 Quill Shaft and Housing Disassembly

- a. Place the housing (36) upright on a workbench and remove the retaining rings (44 and 56).
- b. Place the housing upright in a press, and press out the quill shaft (35), bearing (41) and oil seal (49).
- c. Press the lower bearing (41) off the shaft.
- d. Turn the housing over and press out the upper bearing (37).
- e. Turn the housing over, remove middle retaining ring (44).
- f. Turn the housing over and press the oil seal (38) from the housing (36).
- g. Inspect the bearings (37 and 41). Replace if there is excessive wear.

**NOTE:** Please refer to the assembly drawing for the appropriate model, starting on page 39.

## Assembly of Gear Drive Units

### 10.3 Preparing For Assembly

- a. Clean all parts thoroughly.
- b. Inspect for the following defects:
  1. Cracks or damage of the housing.
  2. Dents, gouges or scoring of the quill shaft, housing bore, and particularly the mating faces of the motor and housing.
- c. Repair or replace defective parts. It is good practice to replace an oil seal which has been removed from the housing. Apply a small quantity of bearing grease to the housing bore, and around the oil seal lip to provide lubrication and make the seal more effective.
- d. Replace the bearings if they show indications of wear.

### 10.4 Quill Shaft Assembly

- a. Press the lower bearing (41) onto the quill shaft (35). The bearing must seat against the shoulder with no visible gap.

### 10.5 Quill Shaft and Housing Assembly

- a. Install the lower retaining ring (44) in the housing (36).
- b. Mount the housing (36) in an arbor press, large end up.
- c. Press the oil upper seal (38) into the housing (36) with the seal cavity facing the large end of the housing.
- d. Install the middle retaining ring (44) in the housing (36).
- e. Press the bearing (37) on its outer race to seat against the middle retaining ring (44).
- f. Install the upper retaining ring (44).
- g. Support the housing, large end down, by resting the inner race of the bearing on a suitable sleeve.
- h. Press the quill shaft (35) into the bearing until the shoulder of the shaft registers against the inner race of the bearing.
- i. Install the upper retaining ring (56) in the shaft groove.
- j. Turn the housing large end down, and press the lower oil seal (49) until it is flush with the end of the housing.

### 10.6 Gear Assembly

- a. Install the ring gear retaining pins (5).
- b. Install the ring gear (2) in the bearing housing (36).
- c. Install the retaining ring (7) in the groove above the ring gear.
- d. **Pack the gear carrier (1) with grease** and rotate the gears several times to distribute the grease to the needle bearings (13). Refer to Section 7 (page 18) of these instructions for lubricant recommendations.
- e. 50Hz Units, .37-1.50 kW and 60Hz Units .50-2.00 HP: Align the flats on the inside of the gear carrier (1) with the flats on the quill shaft (35).

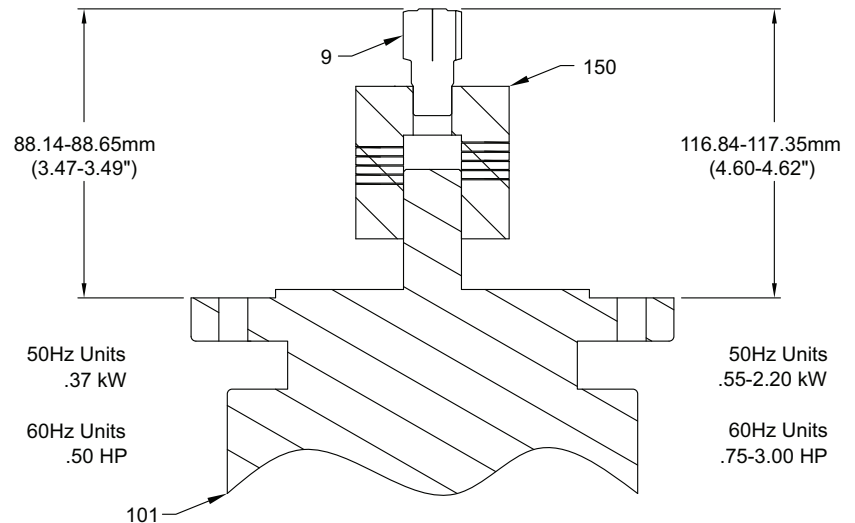


**NOTE:** Please refer to the assembly drawing for the appropriate model, starting on page 39.

- f. 50Hz Units, 2.20kW and 60Hz Units 3.00 HP: Install the key (27) in the quill shaft (35). Align the keyway in the gear carrier (1) with the keyway on the quill shaft (35).
- g. Place the gear carrier assembly onto the quill shaft.

#### 10.7 Motor Coupling Assembly

- a. Assemble the sun gear (9), the drive coupling (150) and key (Item 107 – On all models except: 50Hz .37kW and 60Hz .50 HP sizes) until the sun gear shoulders against the drive coupling. Tighten the set screws.
- b. Set the elevation of the sun gear to the dimension shown in Figure 12, and tighten the remaining set screws.



**Figure 12 – Sun Gear Placement**

- c. Fill the gear housing with lubricant. Refer to Section 7 (page 18) of these instructions for lubricant recommendations.

#### 10.8 Motor Assembly

- a. Apply Loctite® Gasket Eliminator 515 Sealant on the motor mounting face of the housing (36).
- b. Align the housing so the set screw access hole is to the right. Orient the motor so the conduit box (or junction box) of the motor is facing you.
- c. Move the motor over the housing (36) and align the sun gear (9) in the center of the gear carrier so it meshes with the planet gears.
- d. Once the gears engage, align the housing rabbets, screw holes, and conduit box (or junction box) of the motor, with the set screw access hole in the housing, to the right.

**NOTE:** Units using D80 and D90 frame motors will use a spacer ring (98) on motor rabbet to mixer housing rabbet connection.

- e. Install the housing cap screws (160) (or four nuts 161 on D70 and D90 motors) and tighten evenly.

#### 10.9 Mixer Mounting

- a. Refer to Section 2 (page 11) for attachment of applicable mounting configuration.

## Electric Motor Instructions

### Section 11 - Initial Inspection

- 11.1 Care is taken at the factory to assure that the motor arrives at its destination in first class condition. If there is evidence of rough handling or damage in shipment, file a claim at once with the carrier and notify our factory. See "Shipping Damage or Loss" on page 4.
- Examine the outside of the motor carefully for damage, with particular attention to the conduit box, fans and covers. Check nameplate for correct speed, kilowatt, voltage, hertz and phase for conformance with power supply.
- 11.2 General Data
- Single phase totally enclosed motors are wired at our factory for correct rotation.
  - All three phase must be field wired for proper rotation. If rotation does not agree with nameplate, reverse any two line leads.
  - Dual voltage motors must be wired for the desired voltage. Refer to the connection diagrams provided on the motor nameplate, inside the conduit box cover or in this manual.
  - Refer to Section 12 (page 27) for motor maintenance and storage instructions.
- 11.3 **WARNING**
- If the thermal protector continues to trip, some abnormal condition exists. This condition must be corrected before motor will operate normally.
  - Always disconnect power line before servicing any part of the mixer.** Unexpected motor start-up may occur after the thermal protection circuit trips.
- 11.4 After unpacking and inspection to see that all parts are in good condition, turn the shaft by hand to be sure there are no obstructions to free rotation. Equipment which has been in storage should be tested prior to being put into service.
- It is best to check the insulation resistance of the stator winding with a megohmmeter. If resistance is lower than one megohm, consult WCB.
  - Motors are shipped from the factory with sealed, shielded bearings properly packed with grease and ready to operate. Bearings are not regreaseable.
- 11.5 Wiring
- Examine the nameplate data to see that it agrees with the power circuit to which the motor is to be connected. The motor is guaranteed to operate successfully with frequency not more than 5% and voltage not more than 10% above or below the nameplate data, or combined variation of voltage and frequency of not more than 10% above or below nameplate data. Efficiency, power factor and current may vary from nameplate data.
- 11.6 Connect the motor leads to a power source that matches the line voltage and wiring diagram specified on the motor nameplate.
- 11.7 Check impeller shaft rotation by jogging the motor until it is determined that rotation is correct.

**11.8 CAUTION**

Repeated trial starts can overheat the motor (particularly for across-the-line starting). If repeated trial starts are made, allow sufficient time between trials to permit heat to dissipate from the windings or rotor to prevent overheating. Starting currents are several times running currents, and heating varies as the square of the current. Do not exceed 12 starts per hour.

**11.9 WARNING**

The frames and other metal exteriors of motors should be grounded to limit their potential to ground in the event of accidental connection or contact between live electrical parts and the metal exteriors. All motors should be grounded through the conduit box.

**11.10 WARNING**

Before starting motor, remove all unused shaft keys and loose rotating parts to prevent them from flying off.

- 11.11** Start motor and operate at minimum load prior to filling the tank or basin. Look for any unusual condition. The motor should run smoothly with little noise. If the motor should fail to start and produces a decided hum, it may be that the load is too great for the motor or that it has been connected improperly. Shut down immediately and investigate for trouble.

## Section 12 - Motor Maintenance and Storage

Electric motors or other prime movers are not prepared by WCB for indoor storage beyond 12 months in a dry ambient atmosphere with controlled temperatures, or 6 months in a dry ambient atmosphere with no temperature control. **OUTDOOR STORAGE OF ELECTRIC MOTORS IS NOT RECOMMENDED BY ANY MOTOR MANUFACTURER.** For information on storage periods beyond those shown, consult WCB.

- 12.1** To insure continued reliable operation of electric motors, the following basic rule applies: **Keep the motor clean and dry.** Motors should be inspected, and output shaft rotated, at a minimum of 6 month intervals with increased frequency as needed depending upon the type of motor and the service.

- 12.2** Terminal connections and assembly hardware may loosen from vibration during service and should be tightened.

- 12.3** Insulation resistance should be checked at operative temperature and humidity conditions to determine possible deterioration of insulation due to excessive moisture or extremes in operating environment. If wide variations are detected, motors should be reconditioned.

- 12.4** Lubrication

The ball bearing has deep grooved, double shielded sealed bearings with sufficient lubricant packed into the bearings by the manufacturer for "life lubrication". The initial lubricant is supplemented by a supply packed into larger reservoirs in the end shield at time of assembly. No grease fittings are provided, as the initial lubrication is adequate for up to 10 years of operation under normal conditions.

## 12.5 Storage Requirements for Motors

These extended storage requirements must be followed to allow the submission of a valid warranty claim.

- a. The motors, if not mounted, are to be stored in the original containers in a clean, dry, protected warehouse.
- b. The storage area is to be free from any vibration and from extremes in temperature.
- c. Windings to be megged at the time equipment is put in storage. At the time of removal from storage, the resistance reading must not have dropped more than 50% from the initial reading. Any drop below this point, consult WCB.
- d. All external parts and motors subjected to corrosion should be protected by a corrosive resistant coating.

## Spare Parts List

For service and repair, contact WCB at (262)728-1900 or (800)252-5200, Fax: (262)728-4904 or (800)252-5012.

DESCRIPTION	QTY.	PART NO.	NOTE
<b>MOTOR SELECTIONS</b> (item 101)			2
.37kW (.5 HP), 3 Phase, TEFC, D71 Frame 50Hz, 1500 RPM, 190/380 volts 60Hz, 1800RPM, 230/460 volts	1	226962PSP	
.55kW (.75 HP), 3 Phase, TEFC, D80 Frame 50Hz, 1500 RPM, 190/380 volts 60Hz, 1800RPM, 230/460 volts	1	226963PSP	
.75kW (1.0 HP), 3 Phase, TEFC, D80 Frame 50Hz, 1500 RPM, 190/380 volts 60Hz, 1800RPM, 230/460 volts	1	226964PSP	
1.1kW (1.5 HP), 3 Phase, TEFC, D90 Frame 50Hz, 1500 RPM, 190/380 volts 60Hz, 1800RPM, 230/460 volts	1	226965PSP	
1.5kW (2.0 HP), 3 Phase, TEFC, D90 Frame 50Hz, 1500 RPM, 190/380 volts 60Hz, 1800RPM, 230/460 volts	1	226966PSP	
2.2kW (3.0 HP), 3 Phase, TEFC, D100 Frame 50Hz, 1500 RPM, 190/380 volts 60Hz, 1800RPM, 230/460 volts	1	226967PSP	
.37kW (.50 HP), 3 Phase, TEFC, D71 Frame 60Hz, 1800RPM, 575 volts	1	226970PSP	
.55kW (.75 HP), 3 Phase, TEFC, D80 Frame 60Hz, 1800RPM, 575 volts	1	226971PSP	
.75kW (1.0 HP), 3 Phase, TEFC, D80 Frame 60Hz, 1800RPM, 575 volts	1	226972PSP	
1.1kW (1.5 HP), 3 Phase, TEFC, D90 Frame 60Hz, 1800RPM, 575 volts	1	226973PSP	
1.5kW (2.0 HP), 3 Phase, TEFC, D90 Frame 60Hz, 1800RPM, 575 volts	1	226974PSP	
2.2kW (3.0 HP), 3 Phase, TEFC, D100 Frame 60Hz, 1800RPM, 575 volts	1	226985PSP	

### Notes:

1. See mixer label for unit size and ratio.
2. See Assembly Drawing (starting on page 36) for item no. identifier.

## Spare Parts List, cont'd

For service and repair, contact WCB at (262)728-1900 or (800)252-5200, Fax: (262)728-4904 or (800)252-5012.

DESCRIPTION	QTY.	PART NO.	NOTE
<b>REBUILD KITS: for Direct Drive Units</b> Includes items: 37, 41, 44, 49, 56, 96 and 150			2
1 Size, D71 Motor Frame	1	873145PSP	3
2 Size, D80 Motor Frame	1	873148PSP	3
2 Size, D90 Motor Frame	1	873151PSP	3
3 Size, D100 Motor Frame	1	873154PSP	3

REBUILD KITS: for Gear Drive Units				2
Includes items: 1, 2, 5, 7, 37, 38, 41, 44, 49, 56, 96 and 150				
1 Size, D71 Motor Frame	5:1 Ratio	1	873146PSP	3
	6:1 Ratio	1	873147PSP	3
2 Size, D80 Motor Frame	5:1 Ratio	1	873149PSP	3
	6:1 Ratio	1	873150PSP	3
2 Size, D90 Motor Frame	5:1 Ratio	1	873152PSP	3
	6:1 Ratio	1	873153PSP	3
3 Size, D100 Motor Frame	5:1 Ratio	1	873155PSP	3
	6:1 Ratio	1	873156PSP	3

<b>FOOD-GRADE LUBRICANT (see page 18)</b>			
BEL-RAY NO-TOX® HD 0	14 oz	275255PSP	5

<b>LIP SEAL, item 209</b>			2
1 Size	1	226968PSP	
2 Size and 3 Size	1	226937PSP	

<b>MECHANICAL SEAL, item 401</b>			2
1 Size	1	226945PSP	4
2 Size and 3 Size	1	226946PSP	4

**Notes:**

1. See mixer label for unit size and ratio.
2. See Assembly Drawing (starting on page 36) for item no. identifier.
3. Available only as a kit.
4. Available only as a complete seal.
5. As required. See page 18.

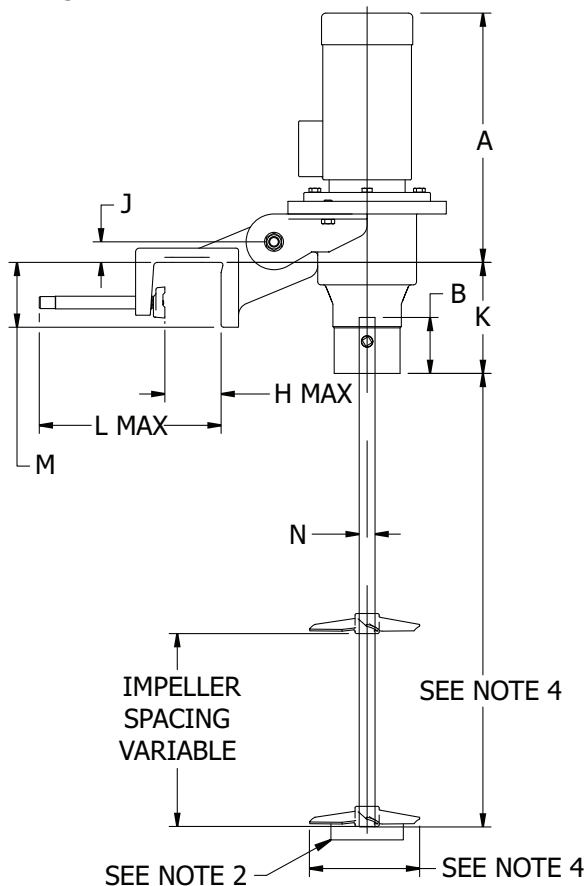
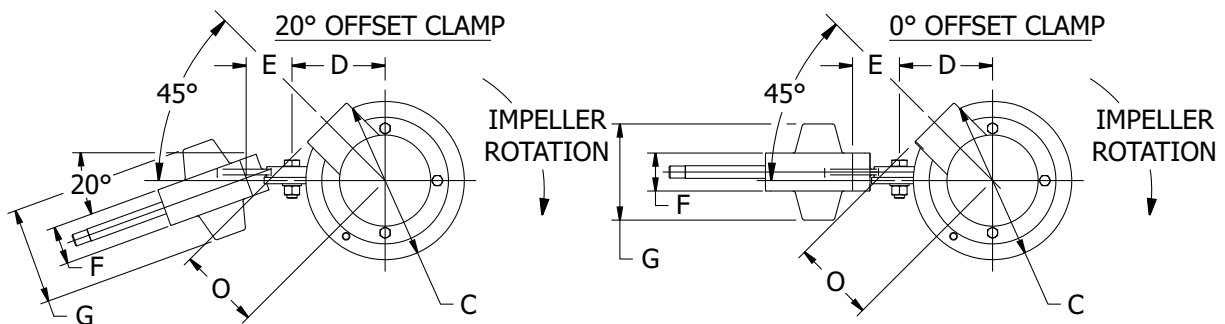
## Dimension Drawings

### Model MS P

Models MS1P1 through MS1P6, MS5P1 through MS5P6, MS6P1 through MS6P6

Direct and gear drive with electric motor

mm (inch)																							
MODEL	MOTOR		WEIGHT (SEE NOTE 3)		A Max	B	C	D	E		F		G		H	J		K		L	M	N	O
									OFFSET		OFFSET		OFFSET			OFFSET		OFFSET					
	kW	HP	KG	LBS					0°	20°	0°	20°	0°	20°		0°	20°						
MS_P1	0.37	0.50	36	80	312 (12.3)	89 (3.5)	200 (7.9)	123 (4.8)	67 (2.6)	73 (2.9)	37 (1.5)	45 (1.8)	111 (4.4)	119 (4.7)	65 (2.6)	28 (1.1)	45 (1.8)	129 (5.1)	113 (4.5)	235 (9.3)	82 (3.2)	20	105 (4.1)
MS_P2	0.55	0.75	65	144	411 (16.2)	89 (3.5)	250 (9.8)	147 (5.8)	84 (3.3)	77 (3.0)	46 (1.8)	60 (2.4)	138 (5.4)	152 (6.0)	85 (3.3)	33 (1.3)	49 (1.9)	176 (6.9)	159 (6.3)	260 (10.2)	103 (4.1)	25	130 (5.1)
MS_P3	0.75	1.00	67	148																			135 (5.3)
MS_P4	1.10	1.50	69	153																			
MS_P5	1.50	2.00	74	164																			
MS_P6	2.20	3.00	96	212																			



#### NOTES:

1. DIMENSIONS ARE FOR REFERENCE ONLY UNLESS CERTIFIED.
2. LOWER IMPELLER IS EQUIPPED WITH STABILIZER WHEN REQUIRED.
3. MIXER WEIGHT IS LESS SHAFT AND IMPELLERS.
4. DEPENDENT UPON SPECIFIC APPLICATION.

DS-E-1145  
09-28-09

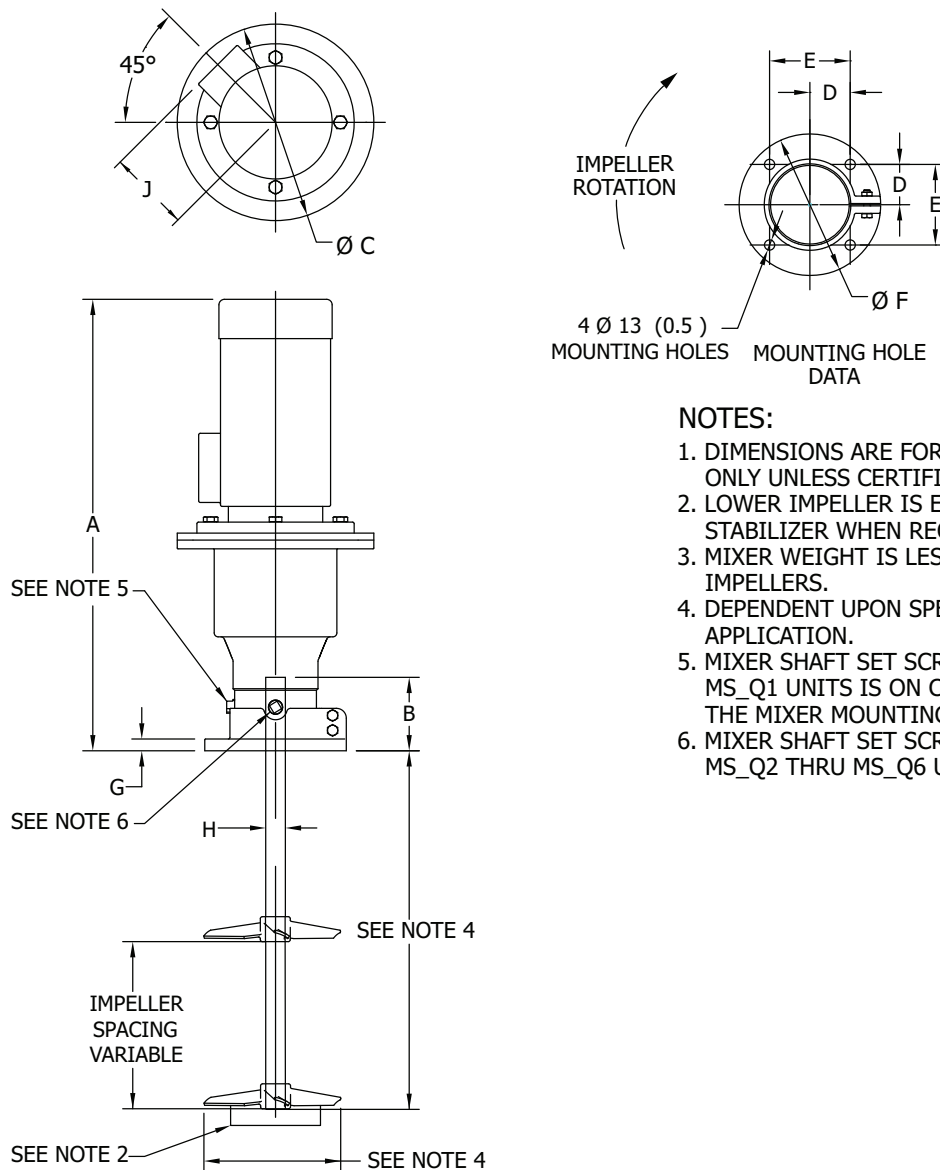
**Model MS Q**

Models MS1Q1 through MS1Q6, MS5Q1 through MS5Q6, MS6Q1 through MS6Q6

Direct and gear drive with electric motor

mm  
(inch)

MODEL	MOTOR		WEIGHT (SEE NOTE 3)		A	B	C	D	E	F	G	H	J
	kW	HP	KG	LBS									
MS_Q1	0.37	0.50	33	73	429 (16.9)	94 (3.7)	200 (7.9)	51 (2.0)	102 (4.0)	180 (7.1)	10 (0.4)	20	105 (4.1)
MS_Q2	0.55	0.75	59	131									130 (5.1)
MS_Q3	0.75	1.00	61	135									
MS_Q4	1.10	1.50	63	139	575 (22.6)	94 (3.7)	250 (9.8)	51 (2.0)	102 (4.0)	180 (7.1)	15 (0.6)	25	135 (5.3)
MS_Q5	1.50	2.00	68	150									
MS_Q6	2.20	3.00	90	199									150 (5.9)

**NOTES:**

1. DIMENSIONS ARE FOR REFERENCE ONLY UNLESS CERTIFIED.
2. LOWER IMPELLER IS EQUIPPED WITH STABILIZER WHEN REQUIRED.
3. MIXER WEIGHT IS LESS SHAFT AND IMPELLERS.
4. DEPENDENT UPON SPECIFIC APPLICATION.
5. MIXER SHAFT SET SCREW ACCESS FOR MS\_Q1 UNITS IS ON CENTER WITH THE MIXER MOUNTING SPLIT LINE.
6. MIXER SHAFT SET SCREW ACCESS FOR MS\_Q2 THRU MS\_Q6 UNITS.

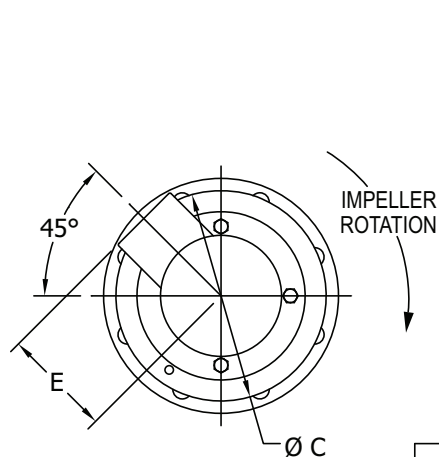
DS-E-1146  
05-29-09



**Model MS L**

Models MS1L1 through MS1L6, MS5L1 through MS5L6, MS6L1 through MS6L6

Direct and gear drive with electric motor

mm  
(inch)

MODEL	MOTOR		WEIGHT (SEE NOTE 3)		A Max	C	D	E
	kW	HP	KG	LBS				
MS_L1	0.37	0.50	45	100	447 (17.6)	200 (7.9)	20	105 (4.1)
MS_L2	0.55	0.75	70	155	598 (23.5)	250 (9.8)	25	130 (5.1)
MS_L3	0.75	1.00	73	161				135 (5.3)
MS_L4	1.10	1.50	75	166				
MS_L5	1.50	2.00	80	177				150 (5.9)
MS_L6	2.20	3.00	101	223				

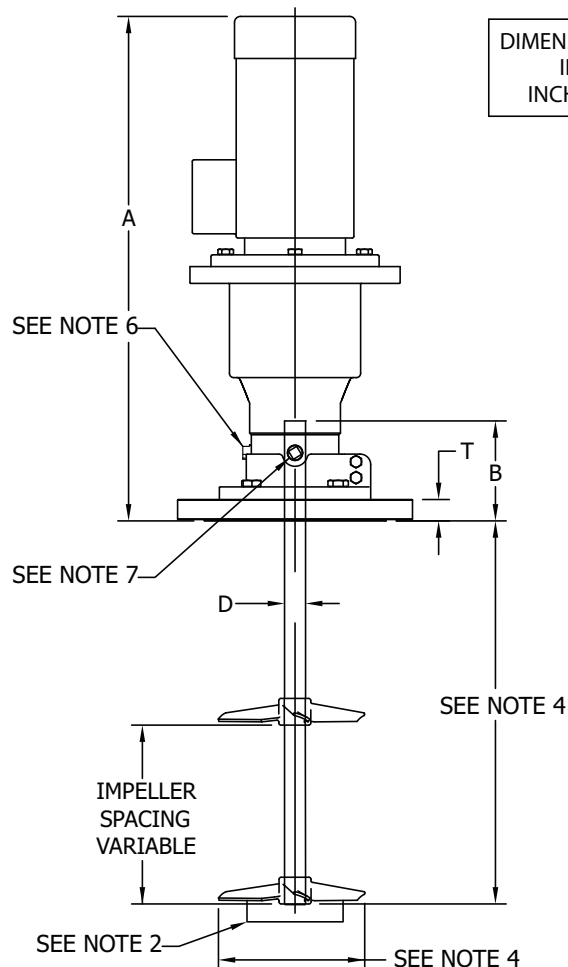
## PN10 DRILLING (SEE NOTE 5)

DIMENSIONS IN MILLIMETERS	DN SIZE	O.D.	BOLT CIRCLE	NO. OF HOLES	BOLT DIA. Δ	B	T
	150	285	240	8	M20	112	17.7

## 150LB. ANSI DRILLING (SEE NOTE 5)

DIMENSIONS IN INCHES	ANSI SIZE	O.D.	BOLT CIRCLE	NO. OF HOLES	BOLT DIA. Δ	B	T
	6	11	9.50	8	0.75	4.5	.83

Δ BOLT HOLES STRADDLE MIXER CENTERLINE

**NOTES:**

1. DIMENSIONS ARE FOR REFERENCE ONLY UNLESS CERTIFIED.
2. LOWER IMPELLER IS EQUIPPED WITH STABILIZER WHEN REQUIRED.
3. MIXER WEIGHT IS LESS SHAFT AND IMPELLERS.
4. DEPENDENT UPON SPECIFIC APPLICATION.
5. STANDARD MOUNTING FLANGE DATA.
6. MIXER SHAFT SET SCREW ACCESS FOR MS\_L1 UNITS IS ON CENTER WITH THE MIXER MOUNTING SPLIT LINE.
7. MIXER SHAFT SET SCREW ACCESS FOR MS\_L2 THRU MS\_L6 UNITS.

DS-E-1147  
09-28-09

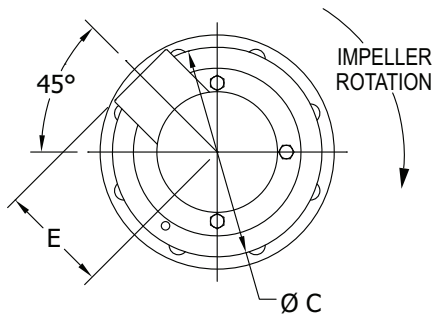
**Model MS S**

Models MS5S1 through MS5S6, MS6S1 through MS6S6

Direct and gear drive with electric motor

mm  
(inch)

MODEL	MOTOR		WEIGHT (SEE NOTE 3)		A	C	D	E
	kW	HP	KG	LBS	Max			
MS_S1	0.37	0.50	48	106	566 (22.3)	200 (7.9)	20	105 (4.1)
MS_S2	0.55	0.75	74	164	698 (27.5)	250 (9.8)	25	130 (5.1)
MS_S3	0.75	1.00	77	170				135 (5.3)
MS_S4	1.10	1.50	79	175				
MS_S5	1.50	2.00	84	186				150 (5.9)
MS_S6	2.20	3.00	105	232				



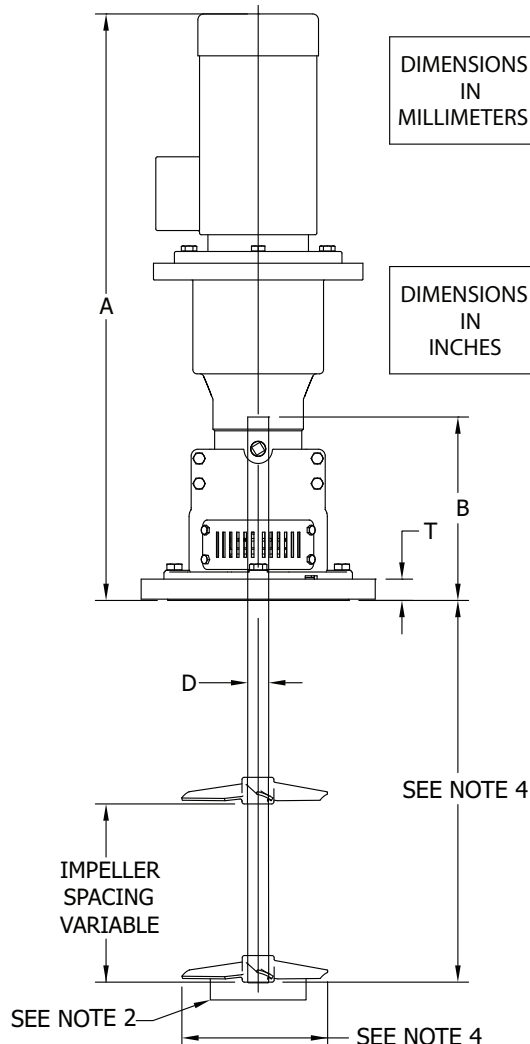
DIMENSIONS IN MILLIMETERS		PN10 DRILLING (SEE NOTE 5)							
		DN SIZE	O.D.	BOLT CIRCLE	NO. OF HOLES	BOLT DIA. Δ	B		T
							MODEL		
							MS_S1	MS_S2 THRU MS_S6	
		150	285	240	8	M20	225	212	17.7

DIMENSIONS IN INCHES		150LB. ANSI DRILLING (SEE NOTE 5)							
		ANSI SIZE	O.D.	BOLT CIRCLE	NO. OF HOLES	BOLT DIA. Δ	B		T
							MODEL		
							MS_S1	MS_S2 THRU MS_S6	
		6	11	9.50	8	0.75	9.0	8.5	.83

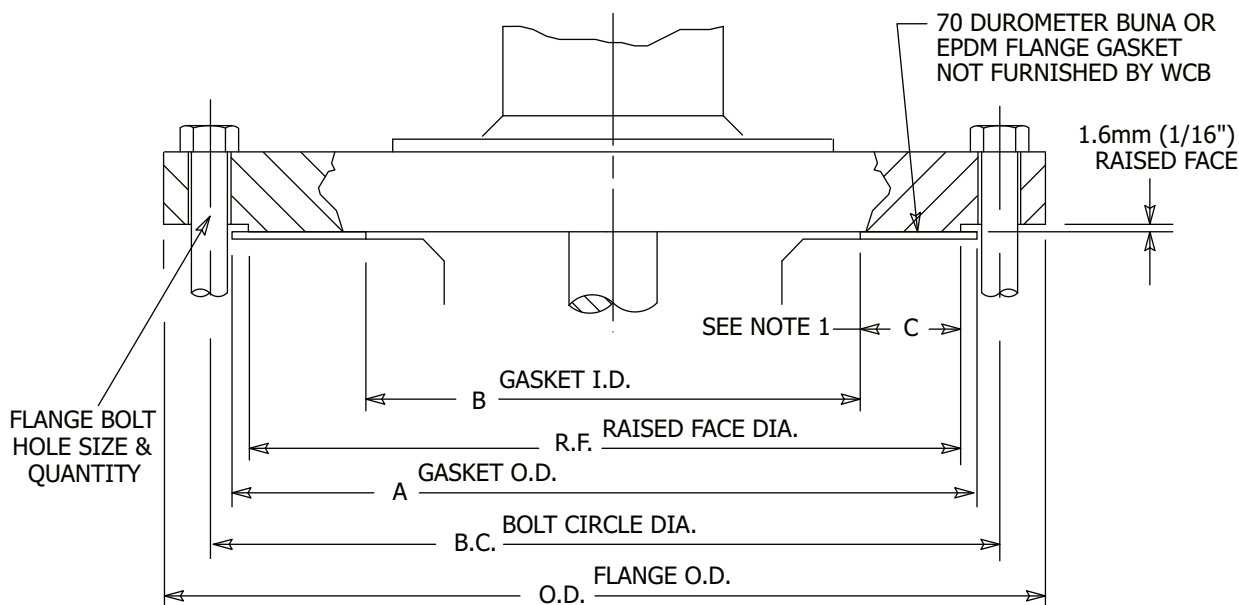
Δ BOLT HOLES STRADDLE MIXER CENTERLINE

**NOTES:**

1. DIMENSIONS ARE FOR REFERENCE ONLY UNLESS CERTIFIED.
2. LOWER IMPELLER IS EQUIPPED WITH STABILIZER WHEN REQUIRED.
3. MIXER WEIGHT IS LESS SHAFT AND IMPELLERS.
4. DEPENDENT UPON SPECIFIC APPLICATION.
5. STANDARD MOUNTING FLANGE DATA.

DS-E-1148  
10-5-09

## Standard Flange and Gasket Proportions



DIMENSIONS ARE IN INCHES

(3)

ANSI 150 LB. FLANGE DATA						ANSI RING GASKET DATA			
NOM. SIZE	O.D.	R.F.	B.C.	HOLE QUAN.	HOLE DIA.	A (O.D.)	B (I.D.)	WIDTH	C MIN.
6	11.0	8.50	9.50	8	.88	8.750	6.625	1.062	.94

DIMENSIONS ARE IN MILLIMETERS

(3)

DN PN10 FLANGE DATA						DN RING GASKET DATA			
NOM. SIZE	O.D.	R.F.	B.C.	HOLE QUAN.	HOLE DIA.	A (O.D.)	B (I.D.)	WIDTH	C MIN.
150	285	212	240	8	22	218	169	24.5	21.5

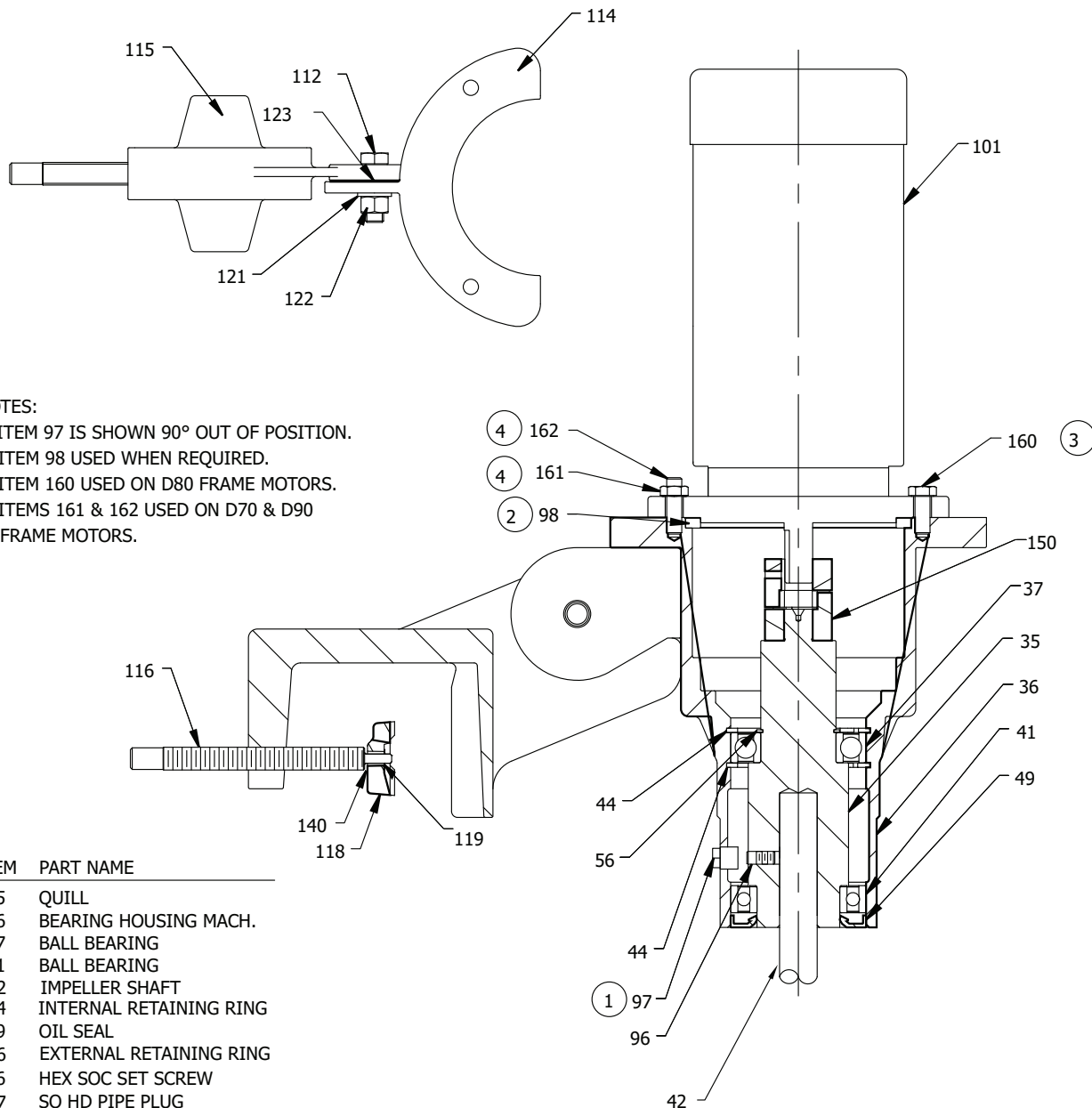
DS-E-1149  
05-13-09**Notes:**

- Gaskets must be seated between the raised faces of the mixer and tank flange to effectively seal against pressure, vapor leaks and/or product contamination. Dimension "C" is the minimum gasket contact area for 150 lb. ANSI and DIN PN10 raised faces.
- Flange pressure rating (150 lb.) based on using a BUNA or EPDM, 70 durometer gasket. Torque bolts to 120 ft. lbs. (162 Nm).
- The standard ring gasket outside diameter extends to the inner edges of the flange bolts, which act as centering devices.
- Full face ANSI and DIN gaskets are gaskets which extend to the O.D. of the flange. Flange bolt clearance holes must be drilled in this full face type gasket. See table for hole size and bolt circle.
- Gaskets can also be made equal to the raised face (R.F.) diameter with the same I.D. as shown in the table (Dim. "B")
- Gasket material and thickness are the responsibility of the user. They must be product compatible and suitable for all service conditions.
- Gasket styles other than flat face ring gaskets are available, but are usually more expensive. Gaskets for flanges with ratings in excess of 150 lbs. are not shown due to variable design conditions encountered. Specifications for other than ring gaskets and higher pressure designs can be found in ASME unfired pressure vessel codes or ANSI standards.

# Assembly Drawings

## Model MS1P

Direct Drive Motor

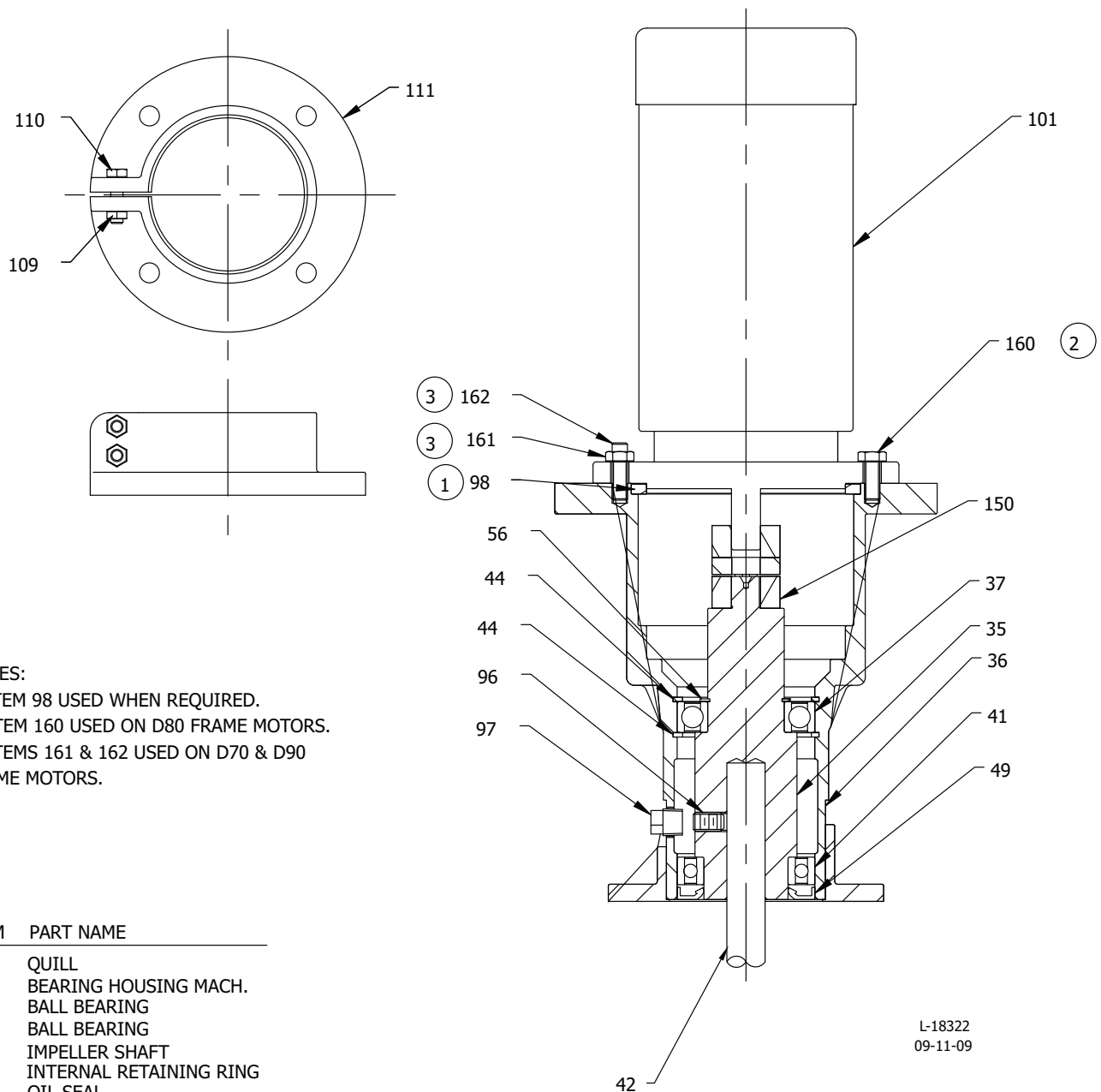


L-18321  
09-11-09

ITEM	PART NAME
35	QUILL
36	BEARING HOUSING MACH.
37	BALL BEARING
41	BALL BEARING
42	IMPELLER SHAFT
44	INTERNAL RETAINING RING
49	OIL SEAL
56	EXTERNAL RETAINING RING
96	HEX SOC SET SCREW
97	SQ HD PIPE PLUG
98	MOTOR SPACER RING
101	MOTOR
112	HEX HEAD CAP SCREW
114	YOKE
115	CLAMP
116	CLAMP SCREW
118	TRAVEL PLATE
119	RETAINING RING
121	WASHER
122	HEX NUT
123	ANTI-ROTATION INSERT
140	PLAIN WASHER
150	COUPLING
160	HEX HEAD CAP SCREW
161	NUT
162	STUD

**Model MS1Q**

Direct Drive Motor

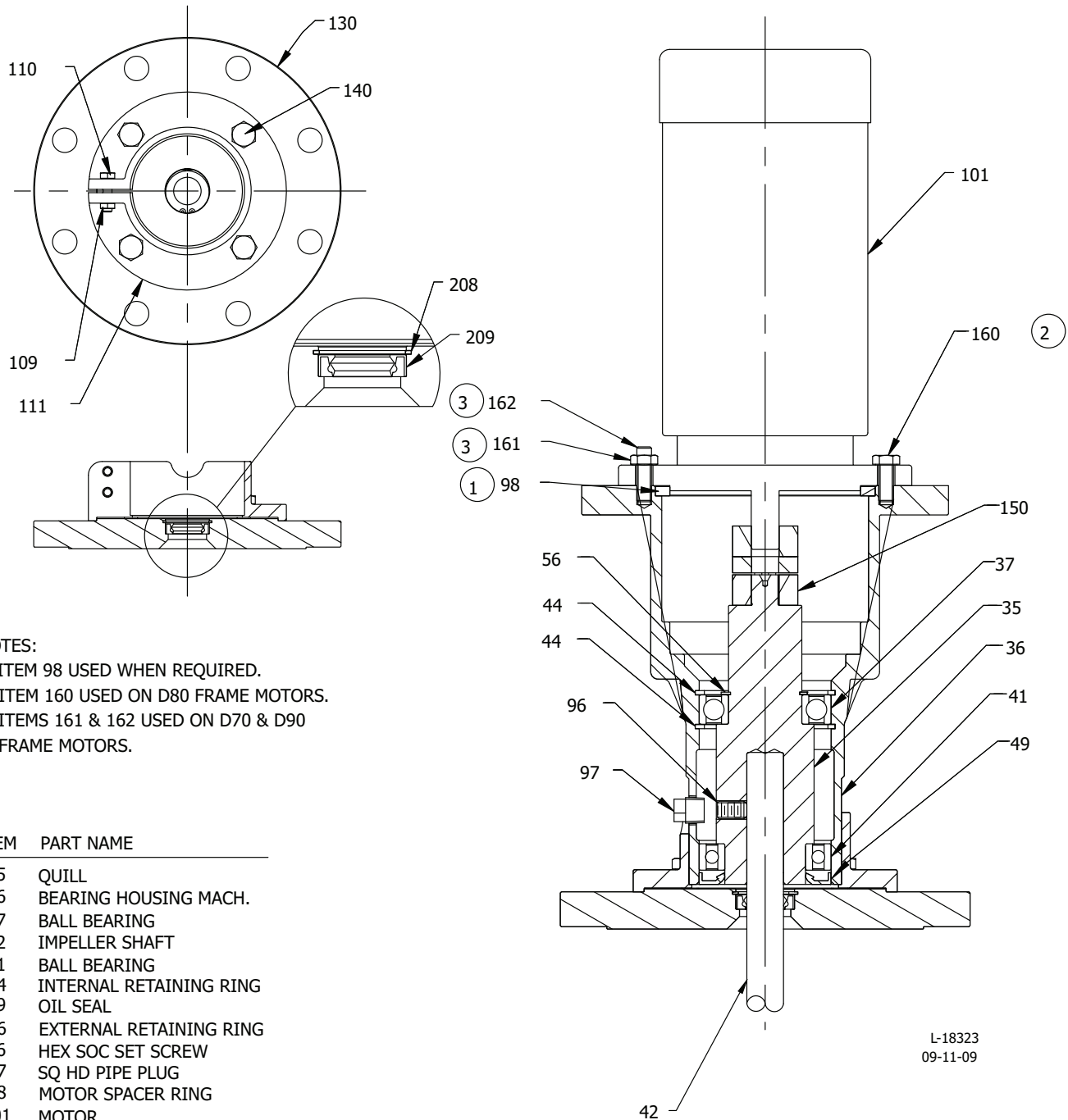
**NOTES:**

1. ITEM 98 USED WHEN REQUIRED.
2. ITEM 160 USED ON D80 FRAME MOTORS.
3. ITEMS 161 & 162 USED ON D70 & D90 FRAME MOTORS.

ITEM	PART NAME
35	QUILL
36	BEARING HOUSING MACH.
37	BALL BEARING
41	BALL BEARING
42	IMPELLER SHAFT
44	INTERNAL RETAINING RING
49	OIL SEAL
56	EXTERNAL RETAINING RING
96	HEX SOC SET SCREW
97	SQ HD PIPE PLUG
98	MOTOR SPACER RING
101	MOTOR
109	HEX NUT
110	HEX HEAD CAP SCREW
111	PEDESTAL
150	COUPLING
160	HEX HEAD CAP SCREW
161	NUT
162	STUD

## Model MS1L

Direct Drive Motor



### NOTES:

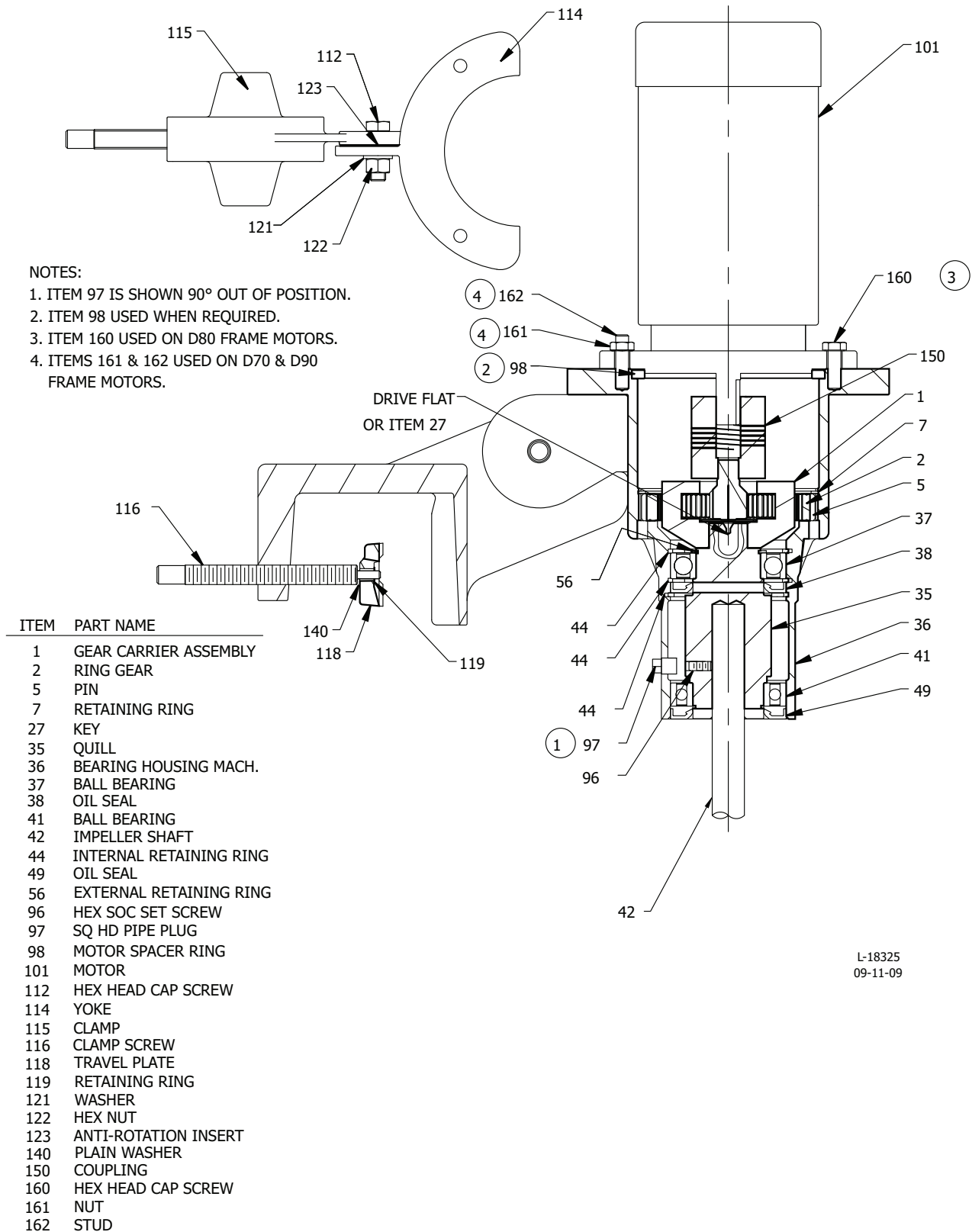
1. ITEM 98 USED WHEN REQUIRED.
2. ITEM 160 USED ON D80 FRAME MOTORS.
3. ITEMS 161 & 162 USED ON D70 & D90 FRAME MOTORS.

ITEM	PART NAME
35	QUILL
36	BEARING HOUSING MACH.
37	BALL BEARING
42	IMPELLER SHAFT
41	BALL BEARING
44	INTERNAL RETAINING RING
49	OIL SEAL
56	EXTERNAL RETAINING RING
96	HEX SOC SET SCREW
97	SQ HD PIPE PLUG
98	MOTOR SPACER RING
101	MOTOR
109	HEX NUT
110	HEX HEAD CAP SCREW
111	PEDESTAL
130	MOUNTING FLANGE
140	HEX HEAD CAP SCREW
150	COUPLING
160	HEX HEAD CAP SCREW
161	NUT
162	STUD
208	INTERNAL RETAINING RING
209	LIP SEAL

L-18323  
09-11-09

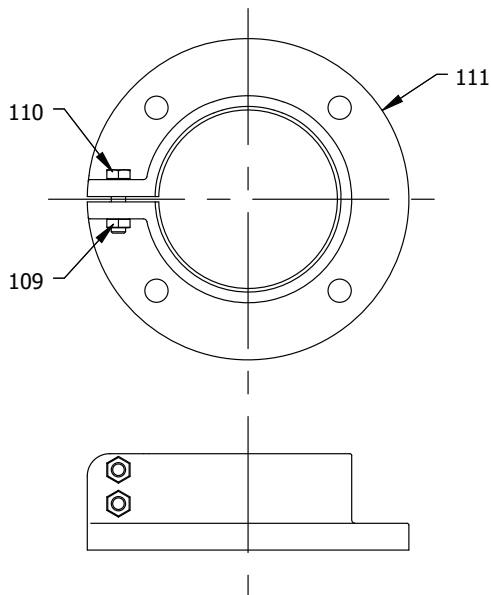
**Model MS5P and MS6P**

Gear Drive Motor



## Model MS5Q and MS6Q

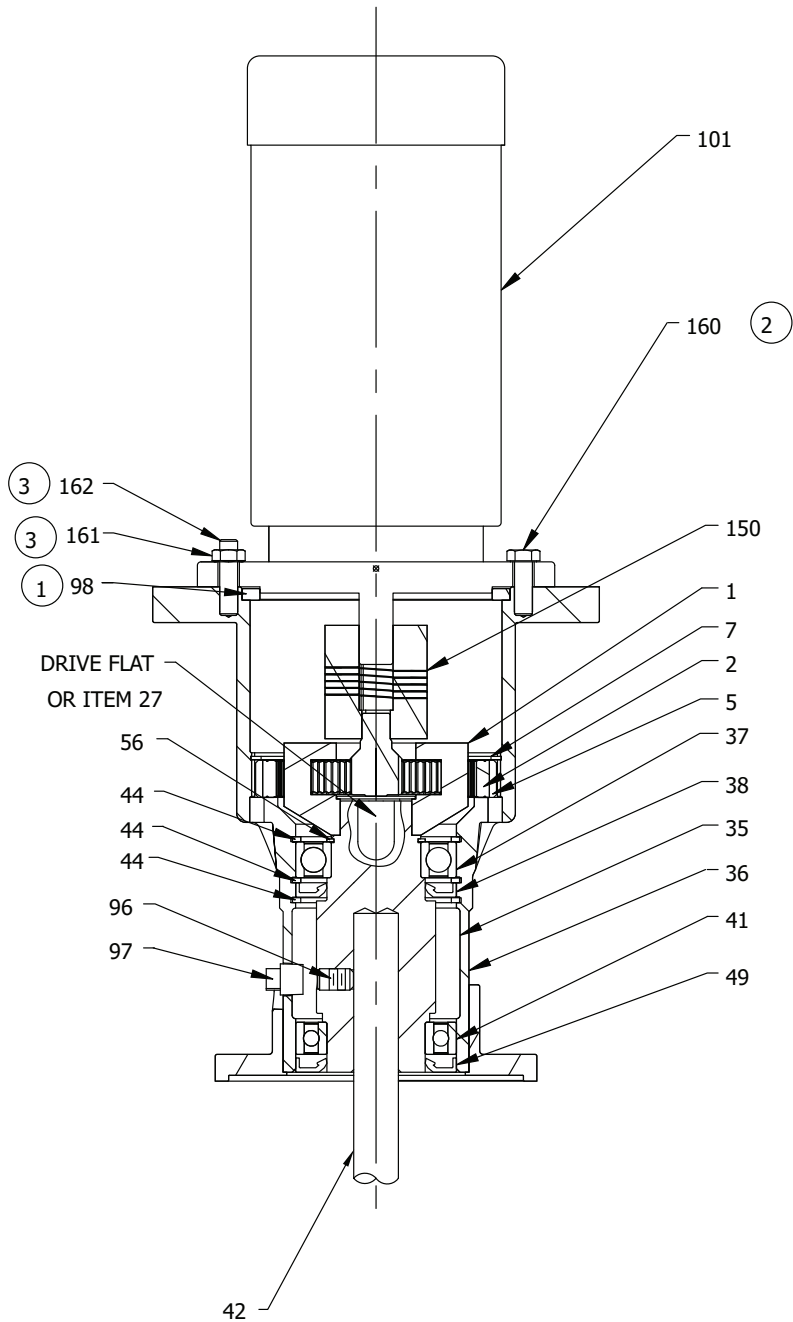
Gear Drive Motor



### NOTES:

1. ITEM 98 USED WHEN REQUIRED.
2. ITEM 160 USED ON D80 FRAME MOTORS.
3. ITEMS 161 & 162 USED ON D70 & D90 FRAME MOTORS.

ITEM	PART NAME
1	GEAR CARRIER ASSEMBLY
2	RING GEAR
5	PIN
7	RETAINING RING
27	KEY
35	QUILL
36	BEARING HOUSING MACH.
37	BALL BEARING
38	OIL SEAL
41	BALL BEARING
42	IMPELLER SHAFT
44	INTERNAL RETAINING RING
49	OIL SEAL
56	EXTERNAL RETAINING RING
96	HEX SOC SET SCREW
97	SQ HD PIPE PLUG
98	MOTOR SPACER RING
101	MOTOR
109	HEX NUT
110	HEX HEAD CAP SCREW
111	PEDESTAL
150	COUPLING
160	HEX HEAD CAP SCREW
161	NUT
162	STUD

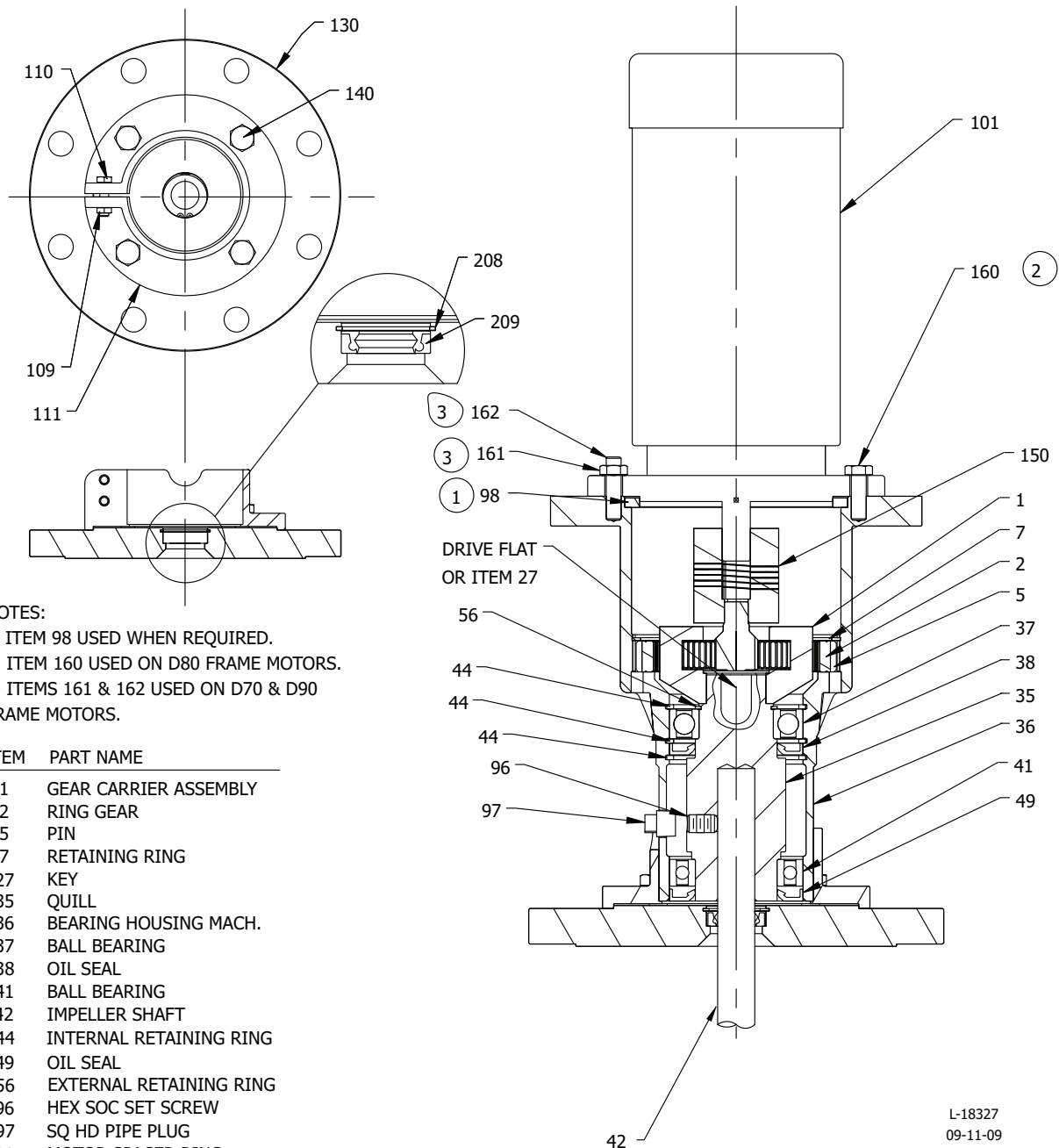


L-18326  
09-11-09



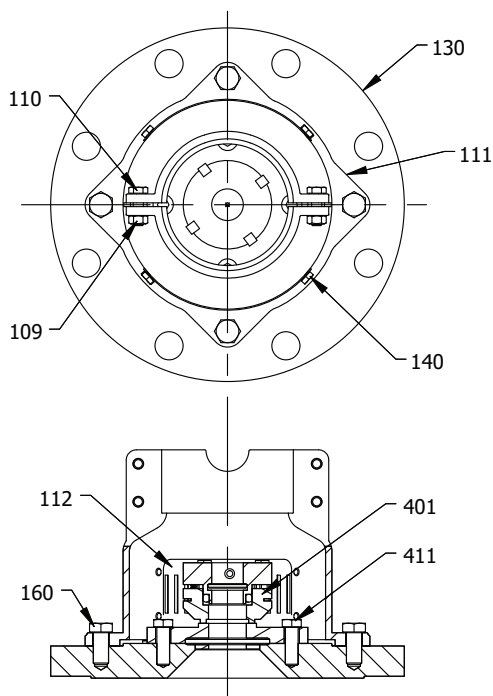
**Model MS5L and MS6L**

Gear Drive Motor



## Model MS5S and MS6S

Gear Drive Motor

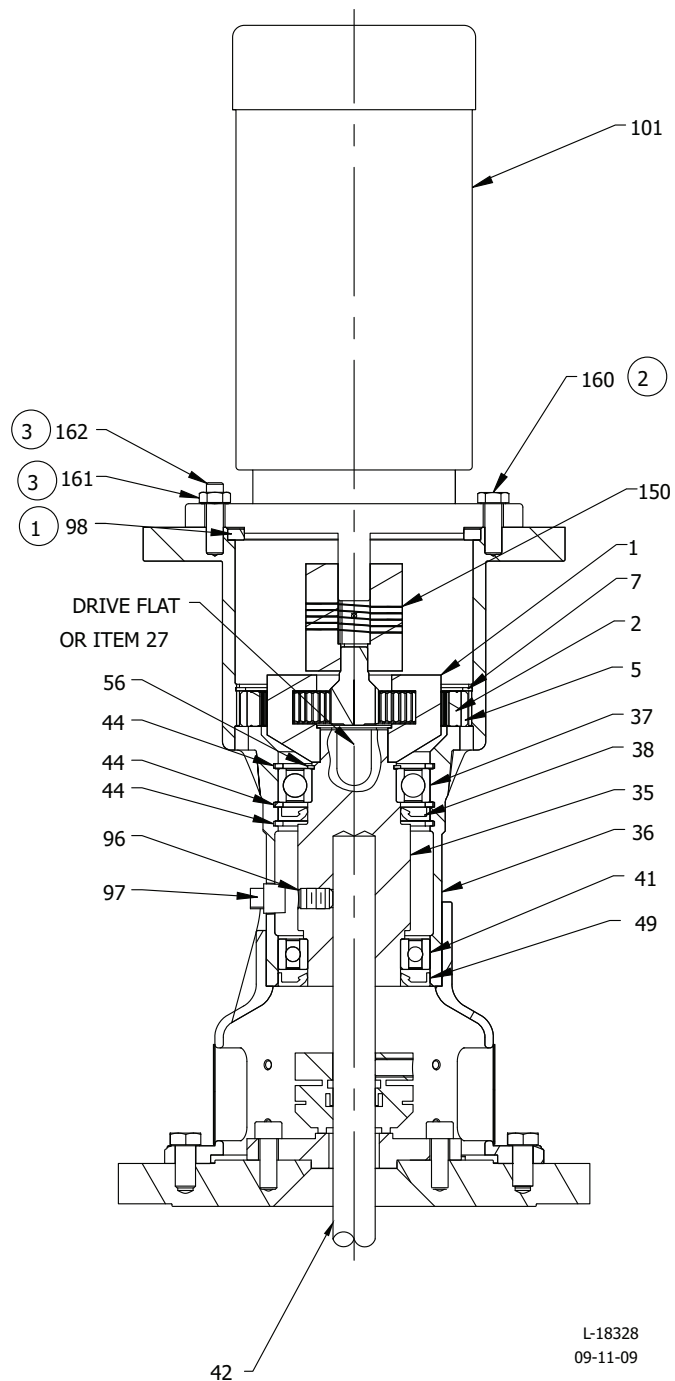


### NOTES:

1. ITEM 98 USED WHEN REQUIRED.
2. ITEM 160 USED ON D80 FRAME MOTORS.
3. ITEMS 161 & 162 USED ON D70 & D90 FRAME MOTORS.

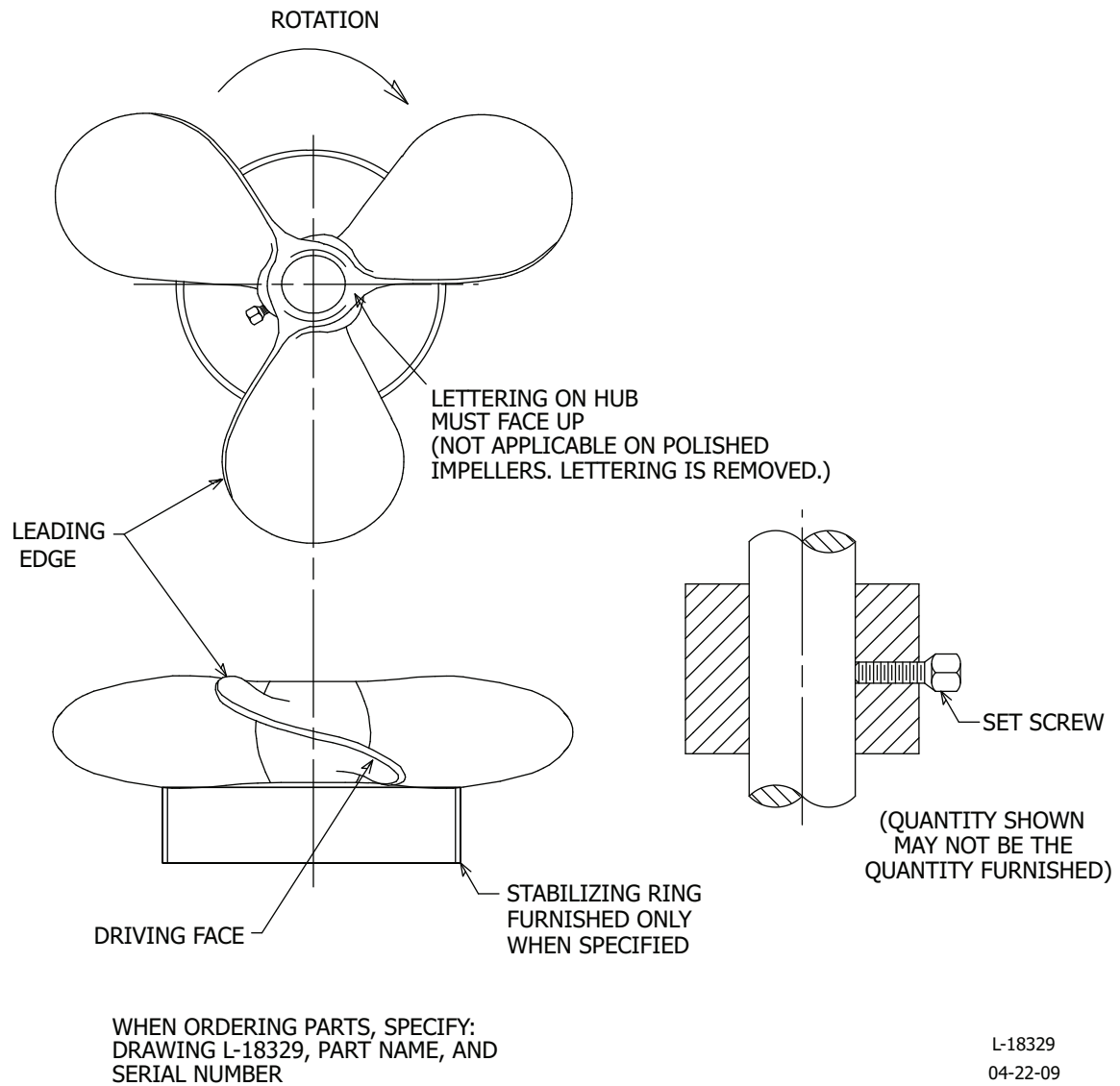
### ITEM PART NAME

1	GEAR CARRIER ASSEMBLY
2	RING GEAR
5	PIN
7	RETAINING RING
27	KEY
35	QUILL
36	BEARING HOUSING MACH.
37	BALL BEARING
38	OIL SEAL
41	BALL BEARING
42	IMPELLER SHAFT
44	INTERNAL RETAINING RING
49	OIL SEAL
56	EXTERNAL RETAINING RING
96	HEX SOC SET SCREW
97	SQ HD PIPE PLUG
98	MOTOR SPACER RING
101	MOTOR
109	HEX NUT
110	HEX HEAD CAP SCREW
111	PEDESTAL
112	SAFETY COVER
130	MOUNTING FLANGE
140	HEX HEAD CAP SCREW
150	COUPLING
160	HEX HEAD CAP SCREW
161	NUT
162	STUD
401	MECHANICAL SEAL
411	HEX HEAD CAP SCREW



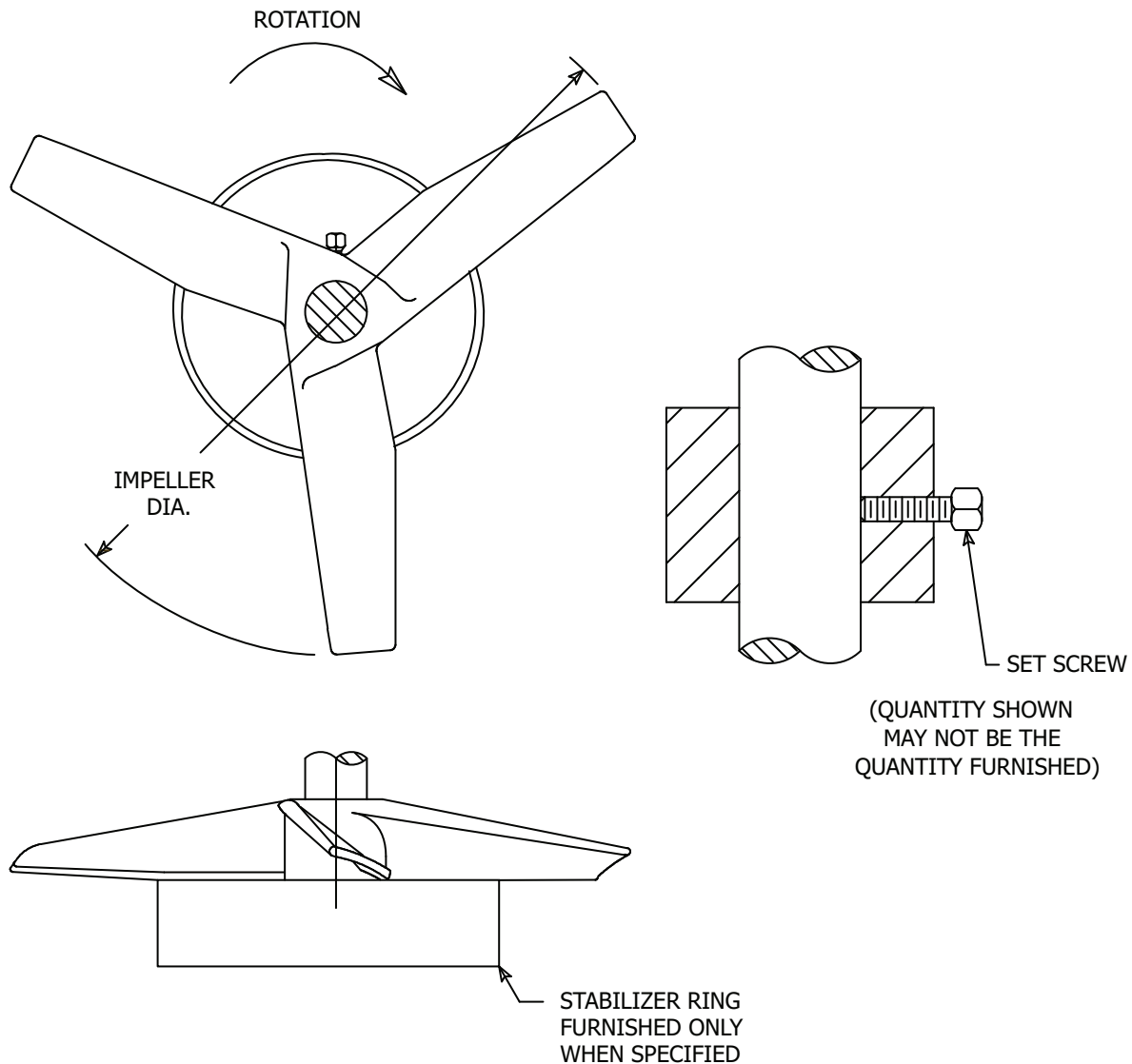
L-18328  
09-11-09

## FP100 Impeller



**NOTE:** On 3-A units, the impeller is welded to the shaft; the set screw does not protrude as shown.

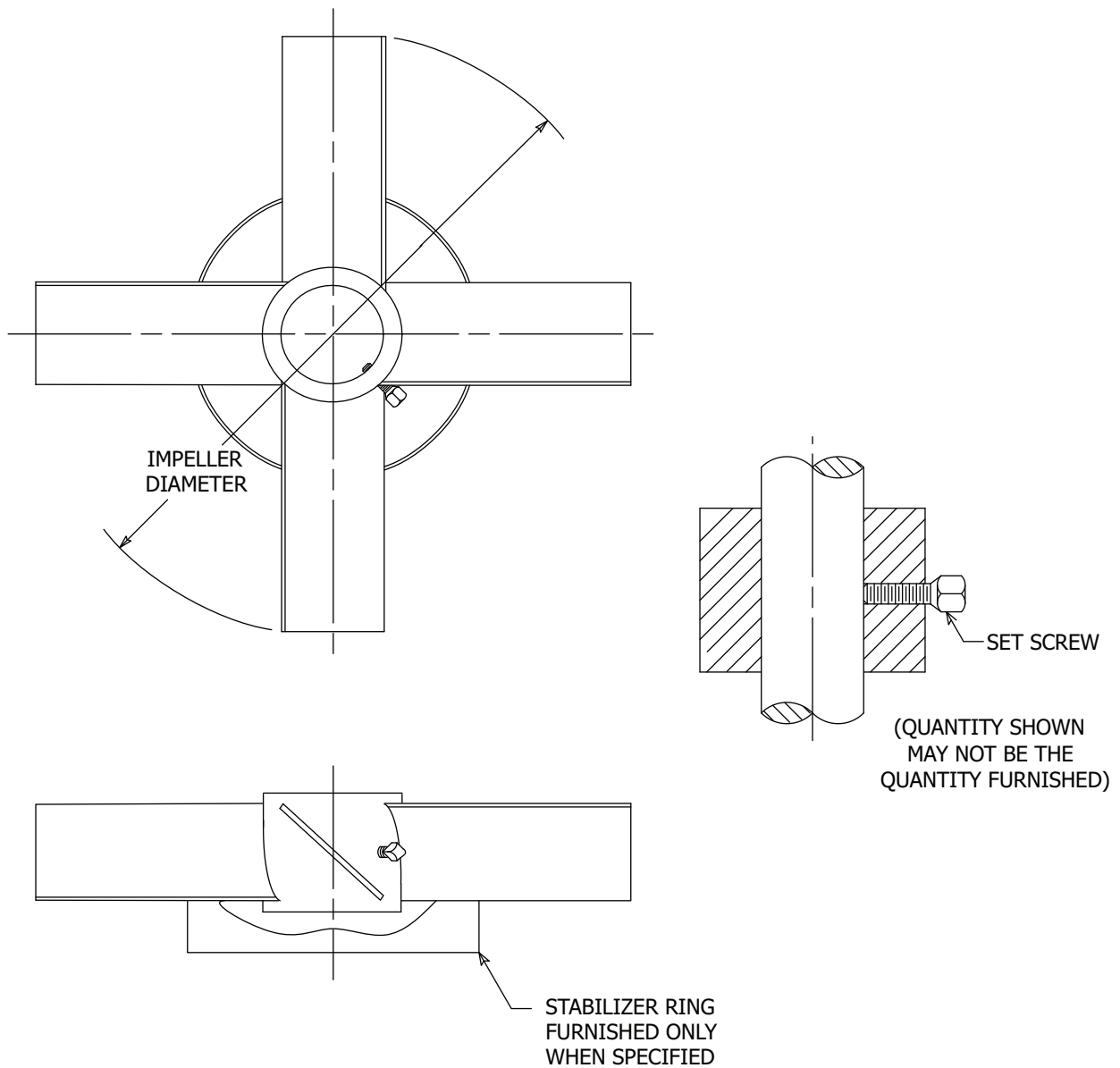
# Hydrofoil Impeller



WHEN ORDERING PARTS, SPECIFY:  
DRAWING L-18330, PART NAME AND  
SERIAL NUMBER

L-18330  
04-22-09

**NOTE:** On 3-A units, the impeller is welded to the shaft; the set screw does not protrude as shown.

**PBT Impeller**

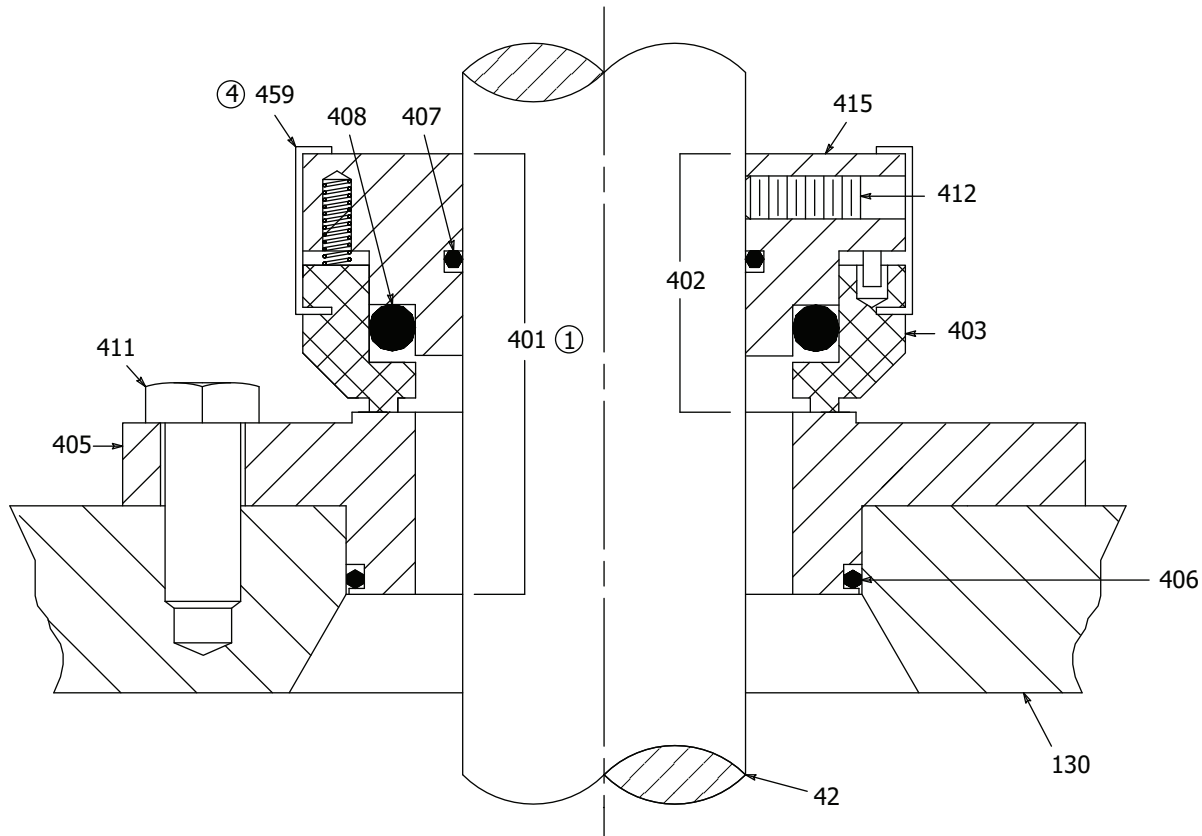
WHEN ORDERING PARTS, SPECIFY:  
DRAWING L-18331, PART NAME, AND  
SERIAL NUMBER

L-18331  
04-22-09

**NOTE:** On 3-A units, the impeller is welded to the shaft; the set screw does not protrude as shown.

## Mechanical Seal

### Style 10 Seal Assembly



#### NOTES:

L-18332  
05-11-09

1. **THE SEAL ASSEMBLY (401) IS AVAILABLE AS AN ASSEMBLY ONLY. INTERNAL COMPONENTS ARE NOT AVAILABLE AS INDIVIDUAL ITEMS.**

2. 

SEAL OPERATING LIMITS			
SEAL SHAFT DIA.	MAX. TANK PRESSURE PSIG	MAX. SHAFT SPEED RPM	MAX. TANK TEMP.
20mm	75	350	250° F
25mm			

3. Standard seal assembly materials:  
Metal components - 316SS / 316LSS  
Stationary seal face - 316SS / 316LSS / Durchrome, FDA GRAS  
Rotary seal face - CARBON, FDA GRAS  
Seal rings - EPDM, USP Class VI, FDA CFR21, Peroxide Cured
4. Remove and store item 459 before operating seal.
5. Certifications Included:  
CE Declaration of Incorporation  
Food grade certification for items 403, 405, 406, 407, & 408.  
Mechanical finish to be 32 Ra or better on items 405 & 415.

ITEM	PART NAME
459	SEAL SETTING TAB
415	SPRING HOLDER
412	SET SCREW
411	HEX HEAD CAP SCREW
408	SEALING RING
407	SEALING RING
406	SEALING RING
405	STATIONARY SEALING FACE
403	ROTARY SEALING FACE
402	ROTARY SEAL HEAD ASSEMBLY
401	SEAL ASSEMBLY
130	MOUNTING FLANGE
42	IMPELLER SHAFT





Your local contact:



**THE WILLIAMS - CARVER COMPANY, INC.**

**4001 MISSION RD P.O. BOX #3140**

**KANSAS CITY, KS 66103-0140**

**Office (913) 236-4949 Fax (913) 236-9331**

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Waukesha Cherry-Burrell, An SPX Brand  
611 Sugar Creek Road  
Delavan, WI 53115  
Phone: (262)728-1900 or (800)252-5200 Fax: (262)728-4904 or (800)252-5012  
E-mail: [wcb@spx.com](mailto:wcb@spx.com)

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