

ENDURA®

MAG-DRIVE CENTRIFUGAL PUMPS



Group I - MC

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Forward:

This manual provides instructions for the installation, operation and maintenance of the Endura® Series centrifugal pump, group one, mag-drive. It is critical for any user to read and understand the information in this manual along with any documents this manual refers to prior to installation and start-up.

Liquiflo pumps shall not be liable for damage or delays caused by a failure to follow the instructions for installation, operation and maintenance as outlined in this manual.

These pumps are not warranted for service other than those specified on the order by Liquiflo applications engineering. If it is desirable to use this product for alternative services, please call Liquiflo applications engineering or your local Liquiflo distributor.

Thank you for purchasing a Liquiflo product.

LIQUIFLO STANDARD TERMS AND CONDITIONS APPLY UNLESS SPECIFIED IN WRITING BY LIQUIFLO.

Section 1: General Information

This manual covers the Endura® Series Mag-Drive Centrifugal Pump, all three sizes of Group I.

1.1 Model and Serial Number

The pump *Model Number* and *Serial Number* are stamped on the *Stainless Steel Tag* that is attached to the pump's bracket.

The Model Number completely describes the pump's construction and is required when ordering either a new pump or replacement parts for an existing pump. The Model Number for the pump is based on a 10-position *Model Coding* system that is described in **Section 1.4**.

1.2 General Instructions

The materials of construction of the pump are selected based upon the chemical compatibility of the fluid being pumped. The user must verify that the materials are suitable for the surrounding atmosphere.

Upon receipt of your Liquiflo pump:

- 1) Inspect pump and verify that it was not damaged during transit.
- 2) Inspect tag and verify that the Model Number of the pump matches the Model Number of the pump that was ordered.
- 3) Record the following information for future reference:

Model Number:
Serial Number:
Date Received:
Pump Location:
Pump Service:

1.3 Pump Specifications

Table 1: Dimensional Specifications

Parameter	Specification	Unit
Pump Sizes	1.5x1x6, 3x1.5x6, 1.5x1x8	in
Impeller Type	Closed	—
Port Type	Flanged (ANSI 150# RF)	—
Mounting Bracket	Close-Coupled, Motor Supported ¹	—
Motor Frame (C-Face)	NEMA 56C thru 286TC, IEC 71 thru 160 ¹	—

¹ - Power Frame option is available for long-coupling pump mounting bracket to other motor frames.

Table 2: Absolute Temperature & Pressure Ratings

Parameter	Specification	Unit
Minimum Operating Temperature	70	°F
Maximum Operating Temperature	350	°F
Maximum Operating Pressure	275 ²	PSI
Maximum Operating Speed	3600	RPM

² - Above 100°F contact factory for de-rating.

Table 3: Material Data

Component(s)	Material(s)
Pump Body & Impeller	316 Stainless Steel or Alloy-C
Bearings	Silicon Carbide
O-rings/Gaskets	Teflon, Viton, Kalrez or Graphoil
Mounting Bracket	Epoxy-painted Cast Iron
Mounting Hardware	18-8 Stainless Steel
Power Frame	Frame: Cast Iron/Epoxy; Shaft: Carbon Steel

1.4 Model Coding

Model Coding Example:

1	2	3	4	5	6	7	8	9	10
MC	N	A	S	2	T	S	A	0	C

Mag Coupled
Normal Temp
1.5x1x6
316 SS
150# Flanges
Teflon O-Rings
Stainless Containment Shell
Close Coupled
182/184 TC Motor

Table 4: Model Coding for Endura® Group II - MC

Position	Description	Code	Selection
1	Pump Model	MC	Magnetically Coupled
2	Temperature	N	Normal Temperature (70-350 °F)
		L	Low Temperature (Contact Factory)
3	Size	A	1.5x1x6
		B	3x1.5x6
		C	1.5x1x8
4	Wet End, Material of Construction	S	316 Stainless
		H	Alloy-C
5	Casing Flanges	2	ANSI RF 150#
		3	ANSI RF 300#
6	Elastomers	T	Teflon
		K	Kalrez
7	Containment Can	S	Stainless Steel
		H	Alloy-C
		Z	Transformation Toughened Zirconia (TTZ)
8	Magnet	A	NdFeB 1" - Metal Can
		B	NdFeB 1.5" - Metal Can
		C	NdFeB 2" - Metal Can
		E	SmCo 1" - Metal Can
		F	SmCo 1.5" - Metal Can
		G	SmCo 2" - Metal Can
		L	NdFeB 1.5" - Ceramic Can
		M	NdFeB 2" - Ceramic Can
		Q	SmCo 1.5" - Ceramic Can
		R	SmCo 2" - Ceramic Can
9	Coupling Option	O	Close Coupled
		I	Power Frame
10	Motor Frame Size	A	56 TC NEMA
		B	143/145 TC NEMA
		C	182/184 TC NEMA
		D	213/215 TC NEMA
		E	254/256 TC NEMA
		F	284/286 TC NEMA
		J	284/286 TSC NEMA
		Q	71 IEC
		R	80 IEC
		S	90 IEC
		T	100/112 IEC
		U	132 IEC
		V	160 IEC
W	180 IEC		

See Appendix 3 for Bill of Materials.

1.5 Returned Materials Authorization (RMA)

If it is necessary to return the pump to the factory for service,

- 1) Contact your local Liquiflo distributor to discuss the return, obtain a Returned Materials Authorization Number (**RMA #**) and provide the distributor with the required information (see RMA Record below).
- 2) Clean and neutralize pump.
- 3) Package the pump carefully and include the **RMA #** in a visible location on the outside surface of the box.
- 4) Ship pump to factory, freight prepaid.

Returned Materials Authorization (RMA) Record		
1	RMA #	(Supplied by Distributor)
2	Distributor Name	
3	Order Date	
4	Customer PO#	
5	Return Date	
6	Item(s) Returned	
7	Serial Number(s)	
8	Reason for Return	
9	Fluid(s) Pumped	
10	Notes	

NOTE: Pump must be cleaned and neutralized prior to shipment to the factory.

Section 2: Safety Precautions

2.1 General Precautions

- **Always** lock out the power to the pump driver when performing maintenance on the pump
- **Always** lock out the suction and discharge valves when performing maintenance on the pump
- **Never** operate the pump without safety devices installed
- **Never** operate the pump with suction and/or discharge valves closed
- **Never** operate the pump out of its design specifications
- **Never** start the pump without making sure that the pump is primed
- **Never** use heat to disassemble pump
- Inspect the entire system before start-up
- Monitor the system during operation and perform maintenance periodically or as required by the application
- Decontaminate pump using procedures in accordance with federal, state, local and company environmental regulations
- Before performing maintenance on the pump, check with appropriate personnel to determine if skin, eye or lung protection is required and how best to flush the pump
- When performing maintenance, pay special attention to all cautionary statements given in this manual. **Failure to observe safety precautions can result in personal injury, equipment damage or malfunction.**



Caution!

This pump cannot be run dry. Ensure the pump is primed before starting.

Section 3: Start-Up

3.1 Inspection of System

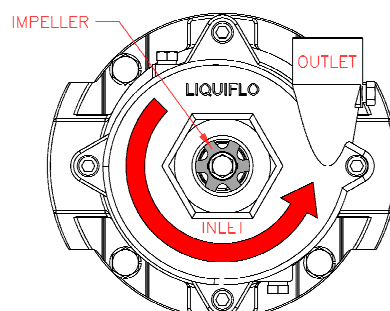
Before operating pump, inspect the pumping system and verify the following:

- 1) **Pump Construction:** The materials of construction of the pump must be compatible with the fluid to be pumped.
- 2) **Pump Mounting:** The pump must be securely fastened to the base and ground using the basic installation procedures as outlined by the Hydraulic Institute.
- 3) **Alignment:** Pumps that are close-coupled to a motor do not require manual alignment. Those that are long-coupled to a motor, using the power frame option, will require alignment of the motor and power frame shafts.
- 4) **Piping Layout:** Process piping procedures are extremely important and must be performed in accordance with the Hydraulic Institute. As a minimum, inlet piping must be equal to or larger in diameter than the pump inlet size. Twists and bends of pump inlet piping should be kept to an absolute minimum. Ensure that adequate NPSH is available for the pump to operate properly.
- 5) **Valves:** All suction and discharge valves must be open during start-up and operation or damage or malfunction may result.
- 6) **Motor Enclosure:** The motor enclosure must be suitable for the conditions of service.
- 7) **Electrical Hook-up:** The electrical connections to the motor should be performed by a certified electrician. It is critical that the supply voltage match the motor nameplate voltage or serious motor damage or fire can result.
- 8) **Safety:** Never operate pump without all safety devices installed.
- 9) **Priming & Direction of Rotation:** Prime the pump and fill the containment can and then briefly jog the motor to assure proper motor direction. Motor shaft direction must be counter-clockwise, as seen from the pump end.



Caution!

Never run this pump dry, serious damage can result



Section 4: Maintenance & Repair

The most common maintenance items for the pump are bearings. If a leak develops, a decrease in head is observed or an increase in power is required, repair is necessary. When rebuilding the pump, O-rings and gaskets should be replaced, never re-used. Whenever possible, use of anti-seize on stainless bolts is highly recommended.

4.1 Work Safety

Use common sense and basic workshop safety when rebuilding the pump.

Pump may have been used for hazardous or toxic fluids. Be sure to flush pump prior to removal.

Components of this pump are heavy, use proper lifting techniques.

Be sure power is disconnected and valves are locked out before starting maintenance.

4.2.1 Pump Disassembly

Refer to assembly section for pictures of components or Appendix 5 for reference drawings. Drawing numbers are given for reference in parenthesis.

Step 1. Be sure the motor power is disconnected, all valves are closed, and the pump is empty of fluid by using the drain plug located on the bottom of the casing.

Step 2. Remove the four bolts which attach the Bracket (10) to the motor.

Step 3. Remove the eight bolts which attach the Casing (1) to the pump.

Step 4. Remove the two bolts which attach the Bearing housing (5) to the Bracket.

Step 5. Remove the eight bolts which attach the Containment Can (6) to the pump. Be careful, fluid may remain inside the Containment can.

Step 6. Remove the one nut which holds on the Impeller (2). A bar may be used to prevent the impeller from rotating. Set aside Key and Nut for use during re-assembly. **1.5x1x8 Only** – Remove Adapter (46) and Bolts (56) and set aside for re-use.

Step 7. Carefully pull the shaft assembly from the bearing housing.

4.2.2 Removal of Bearings

Caution – Safety glasses required for these steps

Step 1. Bearings, rotating (**30**) are pressed onto the shaft and held in place with Tolerance rings (**32**). The best way to remove these one-time-use bearings from the shaft is to break them. Wrap a rag around the bearing and gently crack the top most bearing apart with a hammer.

Caution – Sharp fragments may remain on the rag.

Step 2. After the first bearing is removed, loosen the Set Screw (**58**) and remove the Spacer (**34**) and use an arbor press to carefully press the shaft out of the inner magnet. The second bearing will also be removed during this procedure. Place a rag over the assembly during the step as a shield in case the bearing fractures.

Step 3. Bearings, stationary (**23**) are pressed into the Bearing Housing (**5**) with an O-ring (**33**). Gently tap around the inside lip of the bearing to push the bearing out of the Bearing Housing.

Caution – Bearings may fracture during this step.

Step 4. Carefully dispose of the fragments of the old bearings as well as the tolerance rings and O-rings.

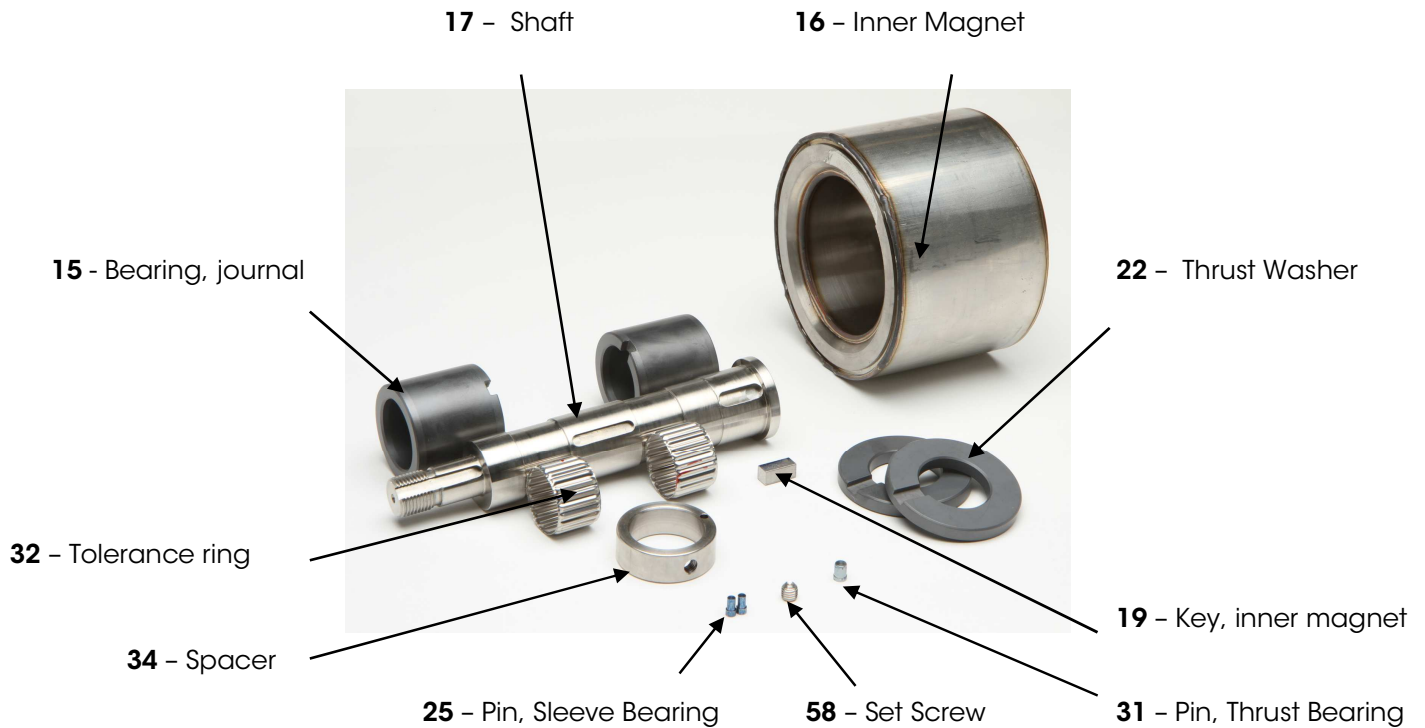
Step 5. Examine pump components for signs of wear, replace if needed.

END OF DISASSEMBLY PROCEDURE

4.3 Pump Assembly

Follow the procedure below and refer to the Sectional and Exploded View drawings in **Appendix 4**. Drawing item numbers are given in parentheses in the following procedure.

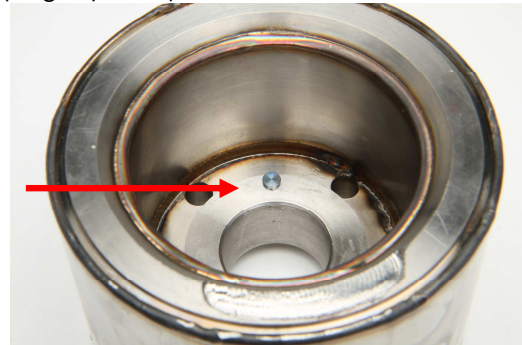
4.3.1 Shaft Assembly



Step 1. Using a marker and assembly tool **2976-070** or a straight edge, mark a line down the length of Shaft (**17**), 90 degrees from the keyway



Step 2. Insert Pin (**31**) into Inner Magnet (**16**). Tap lightly with punch and hammer if needed.



Step 3. Install Key, inner magnet (19) to Shaft (17)



Step 4. Install Inner Magnet (16) oriented as shown onto shaft.

Step 5. Install Thrust washer (22) with the groove down and aligned to Pin (31)



Step 6. Install one Tolerance Ring (32) onto the shaft, into the groove as shown.



Step 7. Slide one rotating Bearing (30) onto shaft and align single groove with line previously marked on shaft as shown.

Step 8. Using an arbor press, and assembly tool (2975-070), support the shaft (not the inner magnet) with a washer or assembly tool (2977-070) as shown and apply slow and even pressure to press the Bearing (30) over the Tolerance ring (32) and seat it flush with the Thrust Washer (22). Do NOT use a hammer for this step, the bearing may crack.



Step 9. Install two Pins (25) into each side of Spacer (34) such that the step of the pin is flush with the spacer as shown. Install Set Screw (58) into spacer but do not tighten.

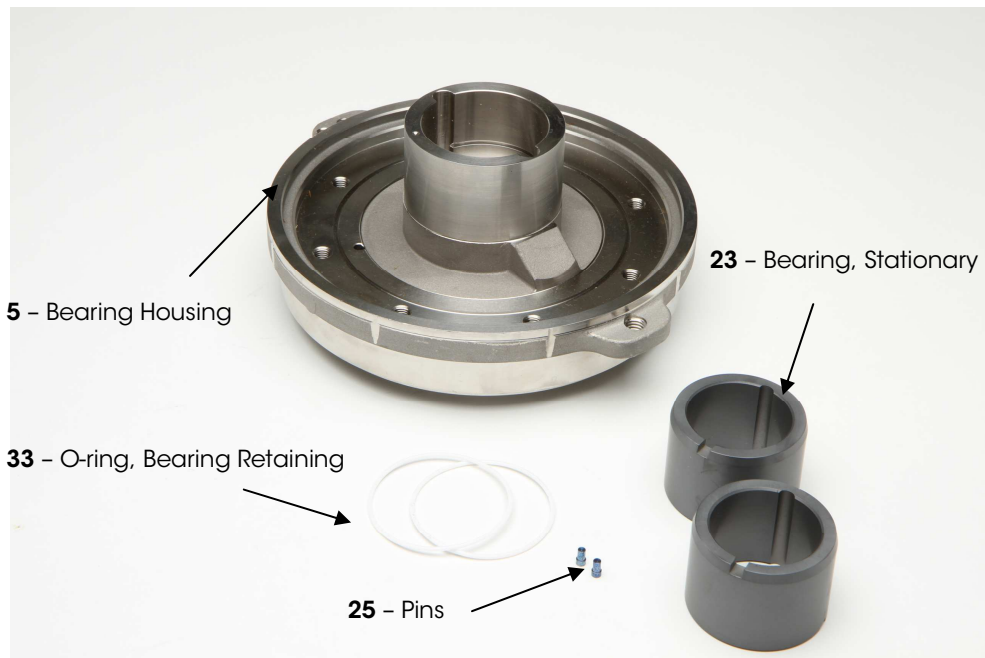
Step 10. Install Spacer (34) onto shaft, aligning Pin (25) into groove in Bearing (30). Do not tighten Set Screw (58) yet. Install second Tolerance ring (32) into tolerance ring groove on shaft.

Step 11. Install second Bearing (30) onto shaft. Align the single groove in the bearing facing down and aligned with the Pin (25) in Spacer (34) as shown.

Step 12. Similar to Step 9, press Bearing (30) onto shaft. Then tighten Set Screw (58).

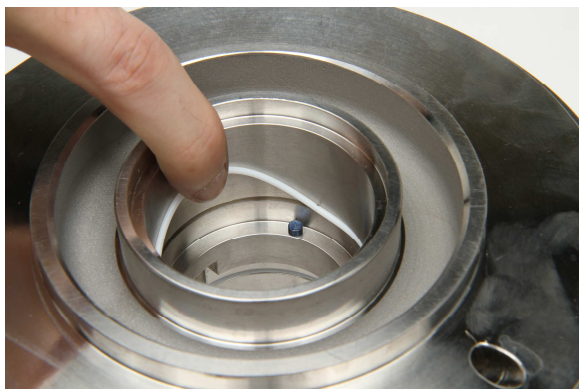


4.3.2 Bearing Housing Assembly



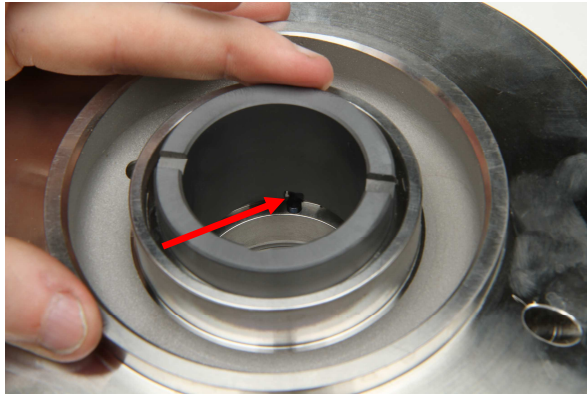
Step 1. Place Bearing housing (5) on a bench with the large diameter (pump side) facing up, as shown above. Assembly **MUST** begin from this side to prevent damage to bearings.

Step 2. Install Pin (25) into Bearing housing (5) such that the step of the pin is flush with the Bearing housing. Tap lightly if necessary.



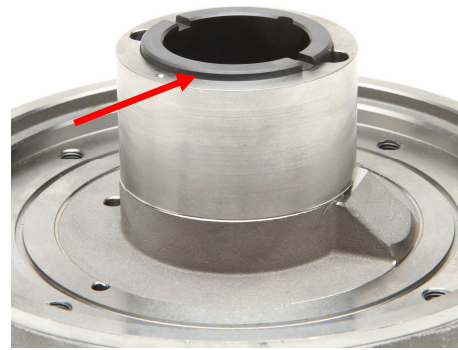
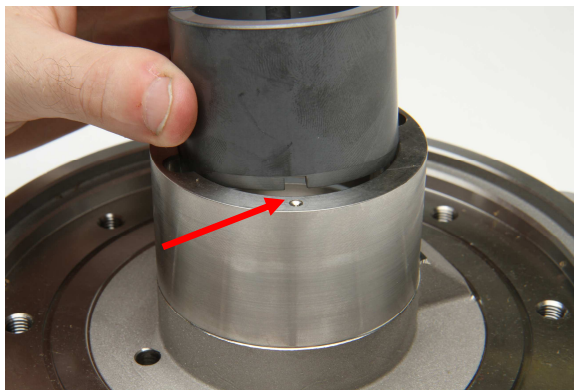
Step 3. Install O-ring, bearing retaining (33) into O-ring groove in Bearing housing. Do not re-use O-rings

Step 4. Install Bearing, stationary (23) into Bearing housing. The single groove aligns to the Pin (25) as shown.



Step 5. Using Assembly tool (2974-070) and an arbor press, press the bearing through the O-ring. The bottom of the bearing must seat against the Bearing housing.

Step 6. Repeat Step 1 to Step 5 for the other side of the Bearing housing. Note: The bottom of the bearing should seat flush against the Bearing housing, but the top of the second bearing will stick up approximately 1/16 in above the Bearing housing.



4.3.3 Impeller Assembly

Step 1. Install the Bearing housing assemble over the Shaft assembly in the direction shown. Assure the shaft assembly rotates freely in the bearings of the Bearing housing.

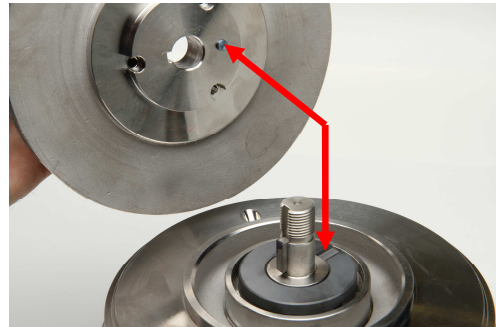
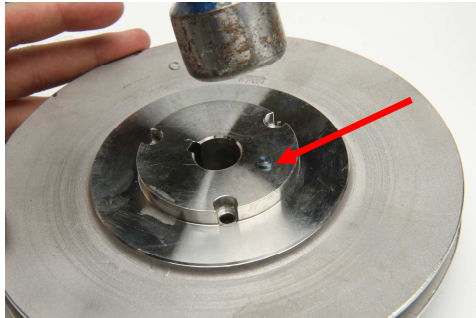


Step 2. Install the second Thrust washer (22) over the shaft with the groove facing up.



Step 3. Install Impeller key (18) into shaft.

Step 4. Install Pin (31) into Impeller (2) such that head of Pin is flush with Impeller. Tap with hammer if needed.



Step 5. Install Impeller (2) into Bearing housing assembly, aligning the Pin (25), with the groove in the Thrust washer (22).

Step 6. Install Nut, impeller (3) into shaft and tighten with a wrench. A bar can be used to keep the impeller from spinning. **Note:** for 1.5x1x8 pumps, leave Nut only finger tight until later in the assembly procedure.



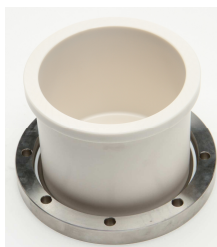
4.3.4 Containment Can Assembly

Step 1. Carefully turn over the assembly to gain access to the inner magnet side.

Step 2. Using a clean rag, wipe any dirt or small magnetic particles from the inner magnet.

Step 3. Install O-ring, containment can (71) into groove. Do not re-use O-rings

Step 4. Ceramic Can Only - Install O-ring, bumper (6a) into Flange (6b) and install flange over Containment Can, Ceramic (6c)



Step 5. Install Containment can (6) onto Bearing housing. Apply anti-seize to eight Bolts (49) and tighten. Use caution when tightening; inner magnet will attract metal tools.

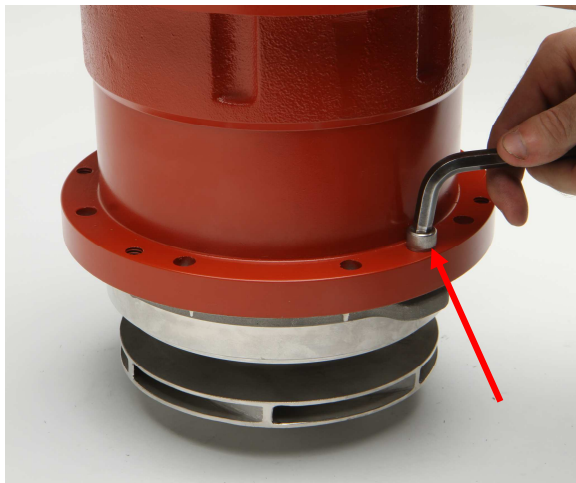


4.3.5 Mounting Bracket Assembly

Step 1. Install Mounting bracket (10) onto Bearing housing. Note the orientation. The drilled hole shown is a containment can drain hole. Orient this hole so that it is towards the bottom then assemble the bracket with the eye bolt hole facing to the top of the pump as show.



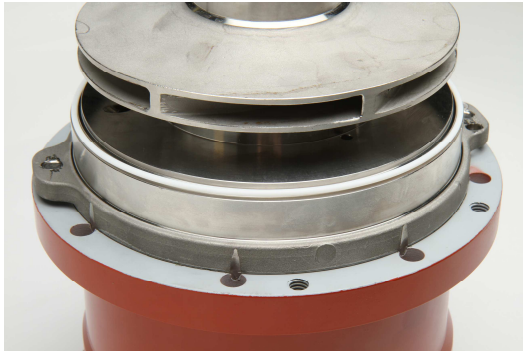
Step 2. Install two Bolts (60) through Mounting bracket (10) and into tabs on Bearing housing. Note the holes used in the bracket for this step are located "between" the hole pattern used for the Bearing housing.



4.3.5 6 inch Impeller Assembly

Step 1. Carefully turn over assembly and place casing O-ring (**70**) onto Bearing housing. Do not re-use O-ring.

Step 2. Carefully place Casing (**1**) onto pump assembly. Gently lower the Casing until the Impeller is aligned. Take care not to pinch the O-ring (**70**) between the Casing and Bearing housing. Make note of orientation of Casing to eye bolt hole in bracket as pictured at the bottom of the page.



Step 3. Apply anti-seize to threads and secure with eight 3/8-16 x 2 Bolts (**61**).



4.3.5 8 inch Impeller Assembly

Step 1. Carefully turn over assembly. Remove Nut, Impeller (**3**) and Impeller (**2**).

Step 2. Place adapter O-ring (**89**) onto Bearing housing. Do not re-use O-ring.



Step 3. Place Adapter (**46**) onto Bearing housing and secure with eight 3/8-24 x 1-3/4 Bolts (**60**).

Step 4. Re-install Impeller (**2**) and Nut, Impeller (**3**). Tighten nut to secure impeller.

Step 5. Install casing O-ring (**70**) onto Adapter.

Step 6. Install Casing (**1**) onto Adapter. Be careful not to pinch O-ring. Apply anti-seize to threads and secure with eight 1/2-13 Bolts (**90**). Make note of orientation of Casing to eye bolt hole in bracket as pictured below.



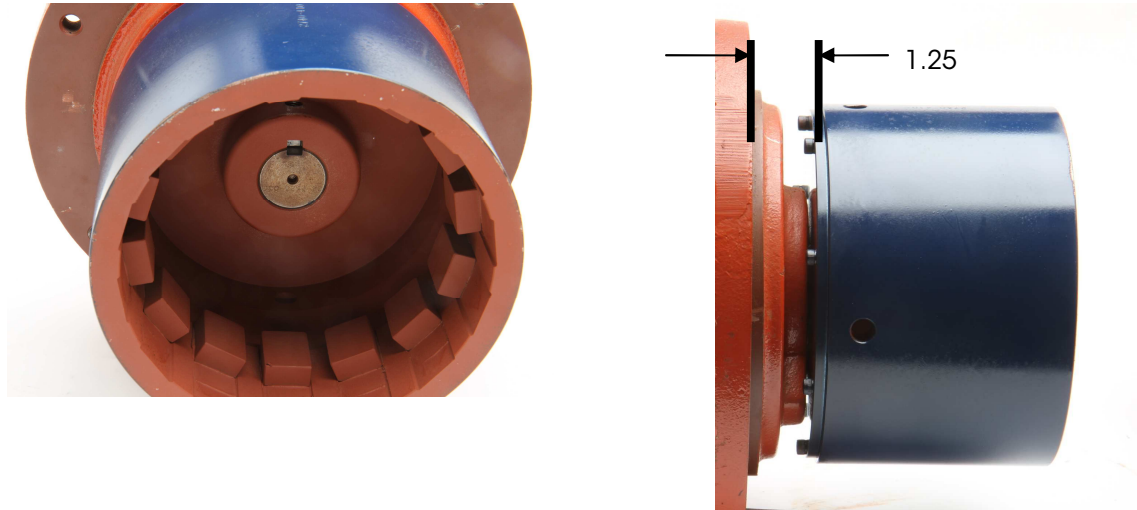
4.3.6 Final Assembly

Step 1. Install Eyebolt and Nut (**8 & 9**). Eyebolt is for lifting, ensure sufficient thread engagement.

Step 2. Wrap with Teflon tape or sealant and install Drain plug (**20**).

4.3.7 Outer Magnet Assembly

Step 1. Install Outer magnet assembly such that Hub (15) is flush with motor shaft. As a reference, the back side of the Outer magnet assembly should be 1.25 inches away from the face of the motor as shown. Magnet alignment is important to prevent excessive wear on the pump.



Step 2. Install motor key (provided with motor) and slide Outer magnet assembly onto shaft. Tighten two Set Screws (57) to secure assembly onto motor shaft.

Step 3. Install Adapter, motor (92) onto motor with (PN 2708-050) ½-13 x 1 Bolt (96).

Step 3a. If a second adapter plate is required (for larger motor frame sizes), install Adapter, motor (91 & 92) onto motor with (PN 2935-050) ½-13 x 1-¾ Bolt (96).

Step 4. Carefully install Bracket (10) onto Adapter (91) with Bolt (96). **Caution** – Magnets will attract each other.

Step 5. Double check all bolts and seals are tight. Prime pump with liquid; be sure to allow a few minutes to fill containment can.

Step 6. Monitor pump for 15 minutes to ensure proper operation. If excessive noise is heard or performance is not as expected, refer to Appendix 6 for troubleshooting.

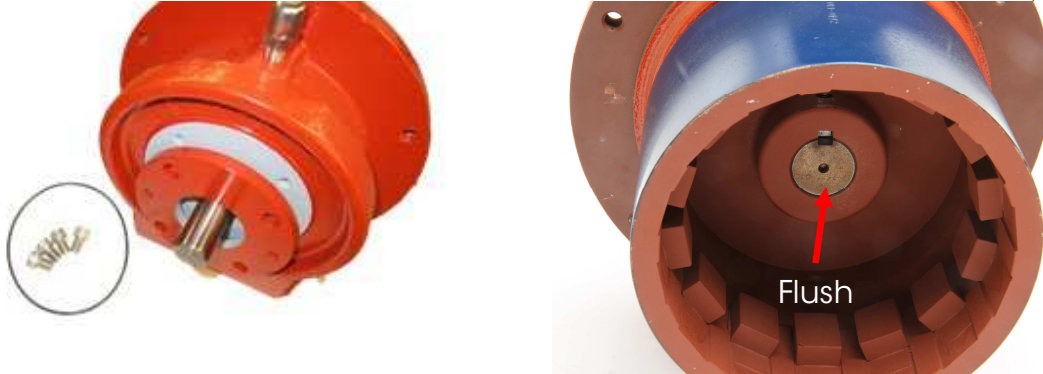
END OF ASSEMBLY PROCEDURE

Power Frame

If your pump is equipped with a power frame, below are the assembly/disassembly instructions. Refer to the drawing on the next page for drawing number references.

Step 1. Install/Remove outer magnet (7). Use a 5/32 Allen wrench.

Magnet hub on power frame models should be set flush with the end of shaft (11).



Step 2. Install / Remove bolts (4). Use a 3/16 Allen wrench.

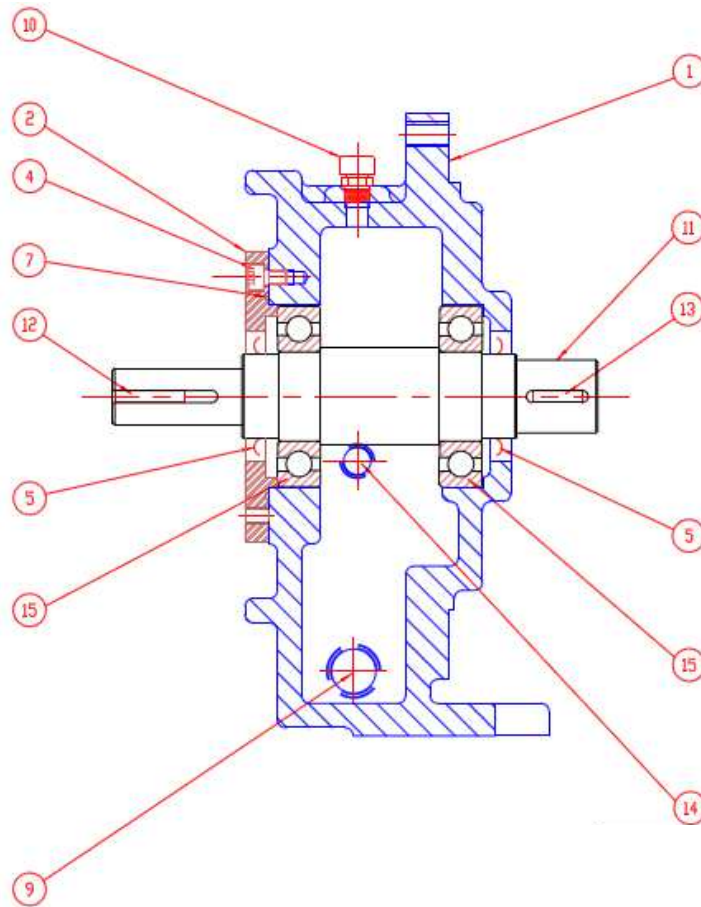
Step 3. Install / Remove end cap (2).



Step 4. Install / Remove bearings (15) and shaft (11). Bearings are pressed onto shaft (11) up to shoulder. Push on inner and outer races simultaneously to avoid damaging bearing.

General purpose 20 weight oil may be used. Consideration must be given to installation environment, temperature and usage conditions.

Reference Drawing: Power Frame



Parts List Power Frame (Part# 2629-190)			
Dwg #	Qty	Part Number	Description
1	1	2526-190	Case, Power Frame
2	1	2525-050	End Cap, Coupling End
3	-	-	-
4	4	2716-060	Bolts, End Cap
5	2	2671-180	Seal, Oil
6	-	-	-
7	1	2658-220	O-Ring (2-041), End Cap
8	-	-	-
9	1	2730-050	Plug, 1/2 NPT
10	1	2674-050	Breather, 1/8 NPT
11	1	2523-050	Shaft, Power Frame
12	1	2613-050	Key, Shaft, Coupling End
13	1	2614-050	Key, Shaft, Magnet End
14	1	3219-050	Sight Glass, 3/8-18
15	2	2673-050	Bearing, Ball

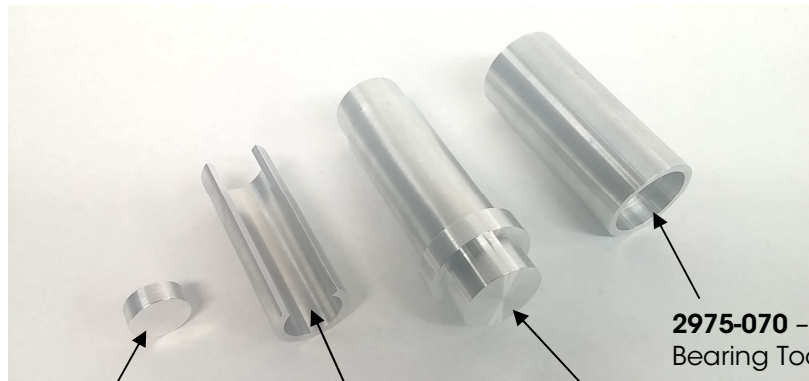
Appendix 1: Fastener Torque Specifications

Maximum Torque Values for 18-8 Stainless Steel Bolts

Bolt Size	Max Torque Specifications	
	(in-lbs)	(N-m)
1/4-20	79	9
3/8-24	236	27
1/2-13	517	58
5/8-11	1110	125

Appendix 2: Maintenance Tool List

The following tools (or equivalents) are required when performing maintenance on the pumps:



2977-070 – Shaft
Spacer Tool

2976-070 – Shaft Tool

2974-070 – Bearing
Housing Tool

2975-070 – Shaft
Bearing Tool

Allen Wrench Set, Inch
7/8" Socket & Ratchet
Punch
Hammer
Arbor Press

Appendix 3: Legacy Design Assembly

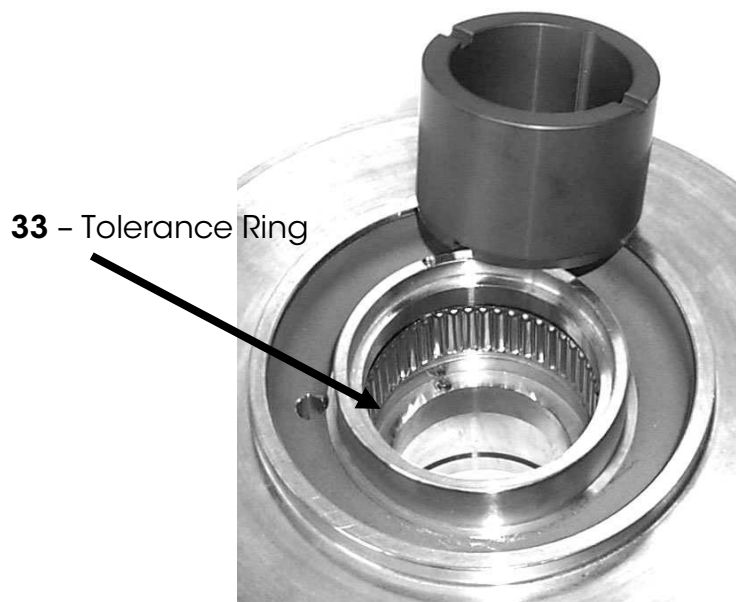
Pumps manufactured before July 2011 are assembled with Tolerance Rings (33) to retain the Bearings in the Bearing Housing. These tolerance rings are still available as spare parts. Removal is the same as the new design. Assembly is as followed.

Step 1. Place Bearing housing (5) on a bench with the large diameter (pump side) facing up, as shown above. Assembly **MUST** begin from this side to prevent damage to bearings.

Step 2. Install Pin (25) into Bearing housing (5) such that the step of the pin is flush with the casing cover. Tap lightly if necessary.

Step 3. Install Tolerance ring (33) into groove in Bearing housing. Do not re-use tolerance rings.

Step 4. Install second bearing in same manner. Continue with standard assembly procedure.



Appendix 4: Bill of Materials

Endura®				Bill of Materials – Group I, MC			
				Position 3 - Pump Size			
				1.5x1x6	3x1.5x6	1.5x1x8	
				A	B	C	
Code	Part Description	Ref #	Material	Part #			Qty
Position 1 - Pump Type							
MC	Magnetically Coupled						
	Eyebolt	8	CS/Epoxy	2620-050			1
	Nut, Eyebolt	9	18-8SS	2621-060			1
	Mounting Bracket, Standard	10	DI/Epoxy	2589-190			1
	Bolt, Bracket/Casing (3/8-16 x 2 SHCS)	61	18-8SS	2773-060	2773-060	X	8
	Bolt, Bracket/Casing Adapter (3/8-24 x 1-3/4 SHCS)	60	18-8SS	X	X	2848-060	8
	Bolt, Casing Adapter/Casing (1/2-13 x 1-1/2 SHCS)	90	18-8SS	X	X	2847-060	8
	Bolt, Bracket/Bearing Hsg (3/8-16 x 1-1/4 SHCS)	56	18-8SS	2709-060			2
	Bolt, Motor Adapter/Bracket (3/8-16 x 1-1/4 SHCS)	56	18-8SS	2709-060			4
	Bolt, Hub/Outer Magnet (8-32 x 1/2 SHCS)	55	Carbon Steel	2771-050			8
	Set Screw, Spacer/Shaft (1/4-28 x 1/4 SHSS-CP)	58	18-8SS	2718-060			1
	Bearing, Thrust	22	Silicon Carbide	2502-110			2
	Bearing, Radial (Stationary)	23	Silicon Carbide	2501-110			2
	Bearing, Sleeve (Rotating)	30	Silicon Carbide	2500-110			2
	Tolerance Ring, Shaft	32	Alloy-C	2532-020			2
	Name Plate	-	316SS	2723-010			1
Position 2 - Temperature							
N	Normal Temperature (+70 to +350°F)						
Position 3 - Size (See Columns)							
—	See Columns A, B, C						

Code	Part Description	Ref #	Material	1.5x1x6	3x1.5x6	1.5x1x8	Qty
Position 4 - Wet End, Material of Construction							
S	316 Stainless Steel						
	Impeller, Closed	2	316SS	2774-010	2776-010	2775-010	1
	Nut, Impeller, MC	3	316SS	2619-010			1
	Bearing Housing, Standard	5	316SS	2503-010			1
	Shaft	17	316SS	2504-010			1
	Key, Impeller	18	316SS	2612-010			1
	Key, Inner Magnet	19	316SS	2611-010			1
	Drain Plug, 1/2 NPT	20	316SS	2730-010			1
	Pin, Sleeve Bearing	25	316SS	2772-010			4
	Pin, Thrust Bearing	31	316SS	2615-010			2
	Spacer (Bearings)	34	316SS	2520-010			1
	Adapter, Casing	46	316SS	X	X	2810-010	1
Position 5 - Casing Flanges							
2	Casing, 150# RF ANSI	1	316SS	3368-010	3370-010	3369-010	1
3	Casing, 300# RF ANSI	1	316SS	3404-010	3405-010	3406-010	1
-	Casing, 300# RF ANSI CL Mount	1	316SS	3095-010	3078-010	3416-010	1
Position 6 - O-Rings							
T	Teflon						
	O-ring, Casing (2-166/2-175)	70	Teflon	2661-210	2661-210	2662-210	1
	O-ring, Containment Can (2-049)	71	Teflon	2660-210			1
	O-ring, Casing Adapter (2-166)	89	Teflon	X	X	2661-210	1
	O-ring, Bearing Retaining (2-034)	33	Teflon	2675-210			2
K	Kalrez 4079						
	O-ring, Casing (2-166/2-175)	70	Kalrez 4079	2661-240	2661-240	2662-240	1
	O-ring, Containment Can (2-049)	71	Kalrez 4079	2660-240			1
	O-ring, Casing Adapter (2-166)	89	Kalrez 4079	X	X	2661-240	1
	O-ring, Bearing Retaining (2-034)	33	Kalrez 4079	2675-240			2

Code	Part Description	Ref #	Material	1.5x1x6	3x1.5x6	1.5x1x8	Qty
Position 7 - Containment Can, Material of Construction							
S	316 Stainless Steel						
	Containment Can	6	316SS		2512-010		1
	Bolt, Metallic Can (5/16-24 x 3/4 SHCS)	49	18-8SS		2713-060		8
H	Hastelloy - C						
	Containment Can	6	Alloy-C		2512-020		1
	Bolt, Metallic Can (5/16-24 x 3/4 SHCS)	49	18-8SS		2713-060		8
Z	Zirconia (TTZ)						
	Containment Can	6c	Zirconia (TTZ)		2951-140		1
	Flange, Ceramic Containment Can	6b	316SS		2779-010		1
	O-ring, Flange Bumper, Ceramic Can (2-159)	6a	Teflon		2669-210		1
	Bolt, Ceramic Can (5/16-24 x 1 SHCS)	49	18-8SS		2714-060		8
Position 8 - Magnetic Coupling							
A	NdFeB 1.0" - Metal Can Only						
	Outer Magnet, Less Hub, Metallic Can, 1.0"	7	CS/NdFeB		2740-410		1
	Inner Magnet, 1.0"	16	316SS/NdFeB		2627-370		1
B	NdFeB 1.5" - Metal Can Only						
	Outer Magnet, Less Hub, Metallic Can, 1.5"	7	CS/NdFeB		2734-410		1
	Inner Magnet, 1.5"	16	316SS/NdFeB		2625-370		1
C	NdFeB 2.0" - Metal Can Only						
	Outer Magnet, Less Hub, Metallic Can, 2.0"	7	CS/NdFeB		3138-410		1
	Inner Magnet, 2.0"	16	316SS/NdFeB		2939-370		1
E	SmCo 1.0" - Metal Can Only						
	Outer Magnet, Less Hub, Metallic Can, 1.0"	7	CS/SmCo		2740-420		1
	Inner Magnet, 1.0"	16	316SS/SmCo		2627-380		1
F	SmCo 1.5" - Metal Can Only						
	Outer Magnet, Less Hub, Metallic Can, 1.5"	7	CS/SmCo		2734-420		1
	Inner Magnet, 1.5"	16	316SS/SmCo		2625-380		1

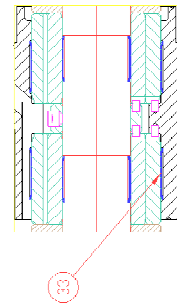
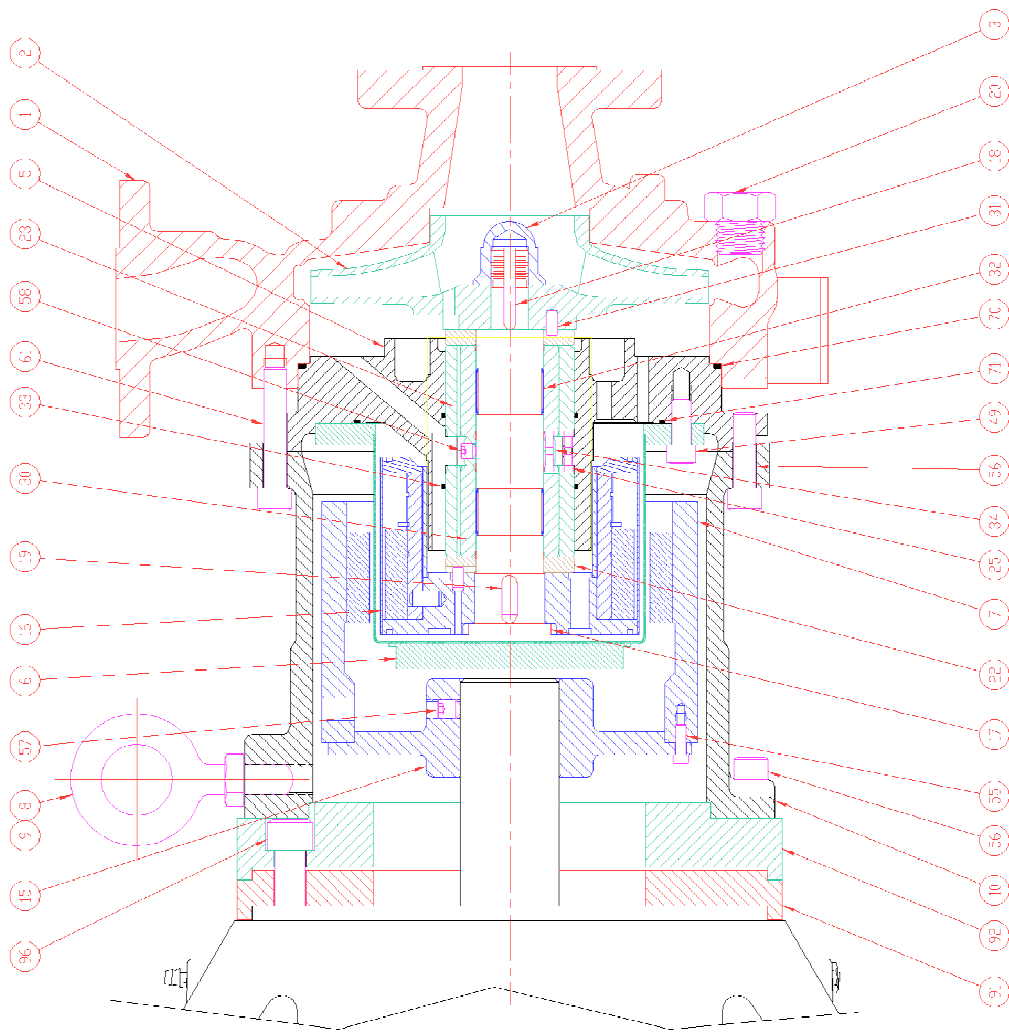
Code	Part Description	Ref #	Material	1.5x1x6	3x1.5x6	1.5x1x8	Qty
Position 8 Continued - Magnetic Coupling							
G	SmCo 2.0" - Metal Can Only						
	Outer Magnet, Less Hub, Metallic Can, 2.0"	7	CS/SmCo		3138-420		1
	Inner Magnet, 2.0"	16	316SS/SmCo		2939-380		1
L	NdFeB 1.5" - Ceramic Can Only						
	Outer Magnet, Less Hub, Ceramic Can, 1.5"	7	CS/NdFeB		2752-410		1
	Inner Magnet, 1.5"	16	316SS/NdFeB		2625-370		1
M	NdFeB 2.0" - Ceramic Can Only						
	Outer Magnet, Less Hub, Ceramic Can, 2.0"	7	CS/NdFeB		2913-410		1
	Inner Magnet, 2.0"	16	316SS/NdFeB		2939-370		1
Q	SmCo 1.5" - Ceramic Can Only						
	Outer Magnet, Less Hub, Ceramic Can, 1.5"	7	CS/SmCo		2752-420		1
	Inner Magnet, 1.5"	16	316SS/SmCo		2625-380		1
R	SmCo 2.0" - Ceramic Can Only						
	Outer Magnet, Less Hub, Ceramic Can, 2.0"	7	CS/SmCo		2913-420		1
	Inner Magnet, 2.0"	16	316SS/SmCo		2939-380		1
Position 9 - Mounting							
0	Close Coupled (Select Code in Position 10)						
1	Power Frame (Leave Position 10 blank)						
	Power Frame Assembly - Group I	99	DI/Epoxy		2629-190		1
	Hub, Outer Magnet, Power Frame	15	Carbon Steel		2524-050		1
	Bolt, Power Frame/Bracket(3/8-16 x 1-1/4 SHCS)	56	18-8SS		2709-060		4

Code	Part Description	Ref	Material	1.5x1x6	3x1.5x6	1.5x1x8	Qty
Position 10 - Motor Frame Size (If Close Coupled Mounted)							
A	56C Motor						
	Hub, Outer Magnet, 56C	15	Carbon Steel		2607-050		1
	Set Screw, Hub/Shaft (1/4-28 x 1/4 SHSS)	57	18-8SS		2718-060		2
B	143/145TC Motor						
	Hub, Outer Magnet, 143/145TC	15	Carbon Steel		2554-050		1
	Set Screw, Hub/Shaft (1/4-28 x 1/4 SHSS)	57	18-8SS		2718-060		2
	Adapter, 143-215TC, G1	92	CS/Epoxy		2555-050		1
	Bolt, 143-215TC Adapter (3/8-16 x 1-1/2)	96	18-8SS		781117		4
C	182/184TC Motor						
	Hub, Outer Magnet, 182/184TC	15	Carbon Steel		2553-050		1
	Set Screw, Hub/Shaft (5/16-24 x 3/8 SHSS-CP)	57	18-8SS		2719-060		2
	Adapter, 143-215TC, G1	92	CS/Epoxy		2555-050		1
	Bolt, 143-215TC Adapter (1/2-13 x 1 SHCS)	96	Carbon Steel		2708-050		4
D	213/215TC Motor						
	Hub, Outer Magnet, 213/215TC	15	Carbon Steel		2514-050		1
	Set Screw, Hub/Shaft (5/16-24 x 3/8 SHSS-CP)	57	18-8SS		2719-060		2
	Adapter, 143-215TC, G1	92	CS/Epoxy		2555-050		1
	Bolt, 143-215TC Adapter (1/2-13 x 1 SHCS)	96	Carbon Steel		2708-050		4
E	254/256TC Motor						
	Hub, Outer Magnet, 254/256TC & 284/286TSC	15	Carbon Steel		2891-050		1
	Bolt, Bracket/Adapter Plate (3/8-16 x 1-1/4 HSCS)	56	18-8SS		2709-060		4
	Set Screw, Hub/Shaft (5/16-24 x 3/8 SHSS-CP)	57	18-8SS		2719-060		2
	Adapter, 143-215TC, G1	92	CS/Epoxy		2555-050		1
	Adapter, 254-256TC, G1	91	CS/Epoxy		2890-050		1
	Bolt, 254/256TC Adapter (1/2-13 x 1-3/4 SHCS)	96	18-8SS		2935-060		4
F	284/286TC Motor						
	Hub, Outer Magnet, 284/286TC	15	Carbon Steel		2515-050		1
	Bolt, Bracket/Adapter Plate (3/8-16 x 1-1/4 HSCS)	56	18-8SS		2709-060		4
	Set Screw, Hub/Shaft (5/16-24 x 3/8 SHSS-CP)	57	18-8SS		2719-060		2
	Adapter, 284/286TC	91	CS/Epoxy		2896-050		1
	Adapter, 143-215TC, G1	92	CS/Epoxy		2555-050		1
	Bolt, Adapter/Adapter (1/2-13 x 1-1/4 SHCS)	96	18-8SS		3153-060		4
	Bolt, Motor/Adapter (1/2-13 x 1-3/4 SHCS)	97	18-8SS		2935-060		4

Code	Part Description	Ref #	Material	1.5x1x6	3x1.5x6	1.5x1x8	Qty
Position 10 Continued - Motor Frame Size (If Close Coupled Mounted)							
J	284/286TSC Motor						
	Hub, Outer Magnet, 254/256TC & 284/286TSC	15	Carbon Steel		2891-050		1
	Set Screw, Hub/Shaff (5/16-24 x 3/8 SHSS-CP)	57	18-8SS		2719-060		2
	Adapter, 284/286TSC	91	CS/Epoxy		2897-050		1
	Bolt, Bracket/Adapter (3/8-16 x 1-1/4 SCHS)	56	18-8SS		2709-060		4
	Bolt, Motor/Adapter (1/2-13 x 1 SHCS)	96	Carbon Steel		2708-050		4
Q	71 IEC Motor						
	Hub, Outer Magnet, 71 IEC	15	Carbon Steel		CF		1
	Set Screw, Hub/Shaff (1/4-28 x 1/2 SHSS)	57	18-8SS		2718-060		2
	Adapter, 71 IEC, B5, G1	92	CS/Epoxy		CF		1
	Bolt, Adapter to Motor	96	18-8SS		CF		4
	Nut, Adapter to Motor	102	18-8SS		CF		4
	Lock Washer, Adapter to Motor	103	18-8SS		CF		4
R	80 IEC Motor						
	Hub, Outer Magnet, 80 IEC	15	Carbon Steel		CF		1
	Set Screw, Hub/Shaff (1/4-28 x 1/2 SHSS)	57	18-8SS		2718-060		2
	Adapter, 80 IEC, B5, G1	92	CS/Epoxy		CF		1
	Bolt, Adapter to Motor	96	18-8SS		CF		4
	Nut, Adapter to Motor	102	18-8SS		CF		4
	Lock Washer, Adapter to Motor	103	18-8SS		CF		4
S	90 IEC Motor						
	Hub, Outer Magnet, 90 IEC	15	Carbon Steel		3296-050		1
	Set Screw, Hub/Shaff (1/4-28 x 1/2 SHSS)	57	18-8SS		2718-060		2
	Adapter, 90 IEC, B5, G1	92	CS/Epoxy		2590-050		1
	Bolt, Adapter to Motor (7/16-14 x 1 SHCS)	96	18-8SS		2535-060		4
	Nut, Adapter to Motor (7/16-14 Hex)	102	18-8SS		CF		4
	Lock Washer, Adapter to Motor (7/16)	103	18-8SS		CF		4
T	100/112 IEC Motor						
	Hub, Outer Magnet, 100/112 IEC	15	Carbon Steel		2552-050		1
	Set Screw, Hub/Shaff (1/4-28 x 1/2 SHSS)	57	18-8SS		2718-060		2
	Adapter, 100/112 IEC, B5, G1	92	CS/Epoxy		2591-050		1
	Bolt, Adapter to Motor (1/2-13 x 1-1/4 SHCS)	96	18-8SS		3153-060		4
	Nut, Adapter to Motor (1/2-13 Hex)	102	18-8SS		2621-060		4
	Lock Washer, Adapter to Motor (1/2)	103	18-8SS		641107		4

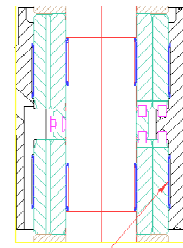
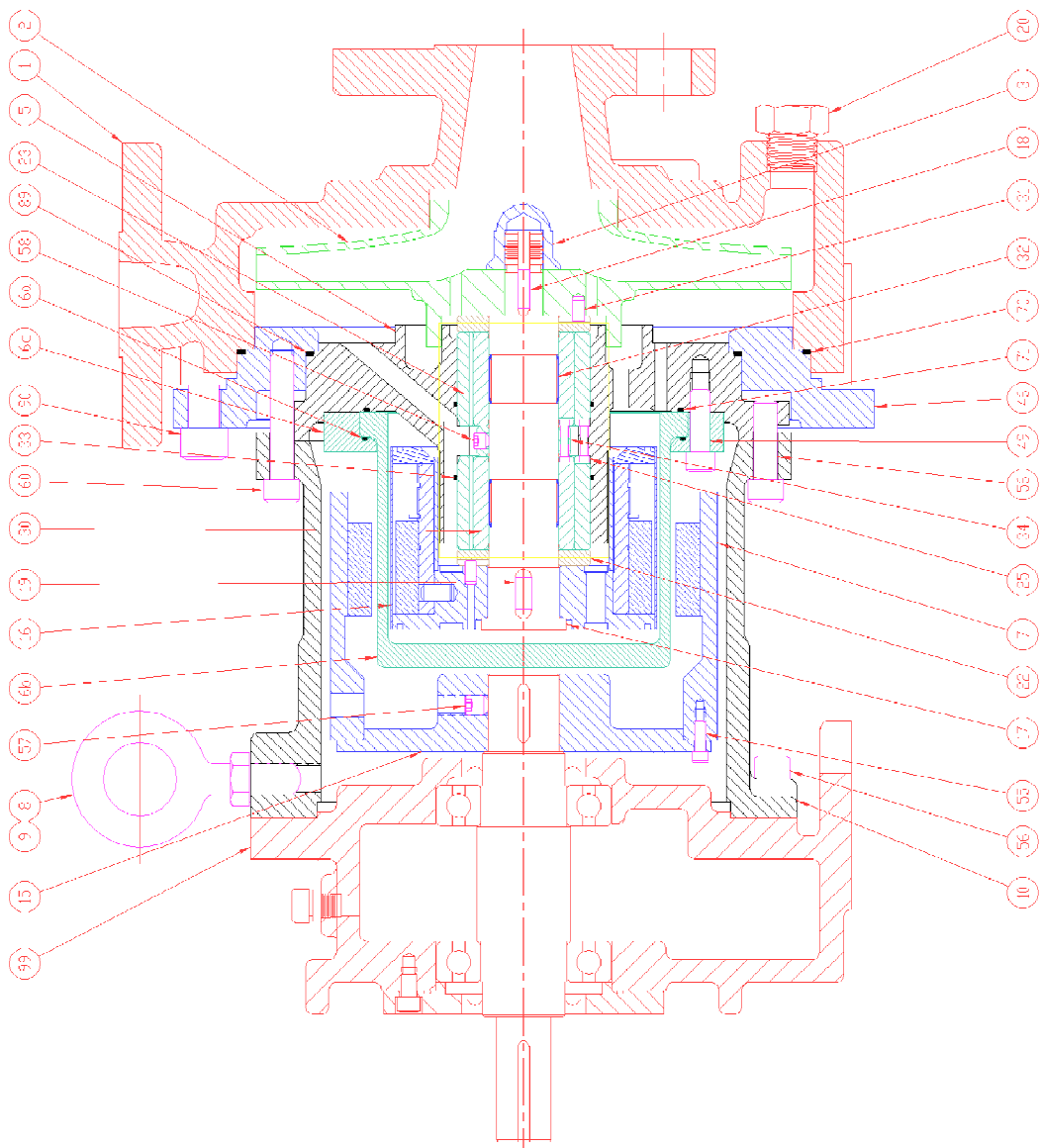
Code	Part Description	Ref Item #	Material	1.5x1x6	3x1.5x6	1.5x1x8	Qty
Position 10 Continued - Motor Frame Size (If Close Coupled Mounted)							
U	132 IEC Motor						
	Hub, Outer Magnet, 132 IEC	15	Carbon Steel	3589-050			1
	Set Screw, Hub/Shaft (5/16-24 x 3/8 SHSS-CP)	57	18-8SS	2719-060			2
	Adapter, 132 IEC, B5, G1	92	CS/Epoxy	3588-050			1
	Bolt, Adapter to Motor (1/2-13 x 1-1/2 SHCS)	96	18-8SS	2847-060			4
	Nut, Adapter to Motor (1/2-13 Hex)	102	18-8SS	2621-060			4
	Lock Washer, Adapter to Motor (1/2)	103	18-8SS	641107			4
V	160 IEC Motor						
	Hub, Outer Magnet 160 IEC	15	Carbon Steel	3149-050			1
	Set Screw, Hub/Shaft (5/16-24 x 3/8 SHSS-CP)	57	18-8SS	2719-060			2
	Adapter, 160 IEC, B5, G1	92	CS/Epoxy	2893-050			1
	Bolt, Adapter to Motor	96	18-8SS	CF			4
	Nut, Adapter to Motor	102	18-8SS	CF			4
	Lock Washer, Adapter to Motor	103	18-8SS	CF			4
W	180 IEC Motor						
	Hub, Outer Magnet 180 IEC	15	Carbon Steel	3151-050			1
	Set Screw, Hub/Shaft (5/16-24 x 3/8 SHSS-CP)	57	18-8SS	2719-060			2
	Adapter, 180 IEC, B5, G1	92	CS/Epoxy	CF			1
	Bolt, Adapter to Motor	96	18-8SS	CF			4
	Nut, Adapter to Motor	102	18-8SS	CF			4
	Lock Washer, Adapter to Motor	103	18-8SS	CF			4
Add-Ons							
-	Guard, Coupling (Motor/Power Frame)	-	303SS	3070-015			1
-	Base Plate #138E (38" x 15" x 3.4" Channel)	-	CS/Epoxy	3519-050			1
-	Base Plate #148 (48" x 15" x 3.4" Channel)	-	CS/Epoxy	3520-050			1
-	Motor Riser	-	CS/Epoxy	CF			2
-	Pump Riser	-	CS/Epoxy	CF			1
-	Power Frame Riser	-	CS/Epoxy	CF			1
-	EARS Power Sensor	-	Misc	3239-000			1

Appendix 5: Reference Drawings
1.5x1x6 & 3x1.5x6 w/ Metal Containment Can



Legacy Design Pictured
Above
Change as of July 2011
Serial #: 52122

Appendix 5: Reference Drawings (Continued)
1.5x1x8 w/ Ceramic Containment Can



Legacy Design Pictured
Above
Change as of July 2011
Serial #: 52122

Appendix 6: Troubleshooting Guide

Troubleshooting Guide - Part 1

Problem	Possible Cause	Corrective Action
No discharge	Pump not primed	Verify suction pipe is submerged. Increase suction pressure. Open suction valve.
	Wrong direction of rotation	Reverse motor leads.
	Valves closed	Open all suction and discharge valves.
	Bypass valve open	Close bypass valve.
	Air leak in suction line	Tighten connections. Apply sealant to all threads. Verify suction pipe is submerged.
	Clogged strainer	Clean strainer.
	Clogged impeller	Disassemble and remove blockage.
	Impeller greatly worn or damaged	Disassemble and replace impeller.
Insufficient discharge	Suction pressure too low	Increase suction pressure. Verify suction piping is not too long. Fully open any suction valves.
	Bypass valve open	Close bypass valve.
	Partly clogged strainer	Clean strainer.
	Partly clogged impeller	Disassemble and remove blockage.
	Speed too low	Increase driver speed, if possible. Use larger size pump, if required.
	Impeller worn or damaged	Disassemble and replace impeller.
Loss of suction after satisfactory operation	Pump not properly primed	Reprime pump.
	Air leaks in suction line	Tighten connections. Apply sealant to all threads. Verify suction pipe is submerged.
	Air or vapor pockets in suction line	Rearrange piping as necessary.
	Increase in fluid viscosity	Heat fluid to reduce viscosity. Reduce pump speed.
Excessive power consumption	Fluid viscosity higher than specified	Heat fluid to reduce viscosity. Reduce pump speed. Increase driver horsepower.
	Liquid specific gravity higher than expected	Reduce pump speed. Increase driver horsepower.
	Total head greater than specified	Increase pipe diameter. Decrease pipe run.
	Total head lower than specified, pumping higher flow than expected	Install throttle valve.
	Total head higher than rating with flow at rating	Install impeller with correct diameter.
	Rotating parts binding or severely worn	Disassemble and replace worn parts.

Appendix 6: Troubleshooting Guide (Continued)

Troubleshooting Guide - Part 2

Problem	Possible Cause	Corrective Action
Rapid pump wear	Abrasives in fluid	Install suction strainer. Limit solids concentration. Reduce pump speed or use larger pump running at lower speed.
	Corrosion wear	Use materials of construction that are acceptable for fluid being pumped.
	Extended dry running	Install power sensor to stop pump.
	Discharge pressure too high	Increase pipe diameter. Decrease pipe run.
Excessive noise and vibration	Partly clogged impeller causing imbalance	Disassemble and remove blockage.
	Damaged impeller and/or shaft	Disassemble and replace damaged parts.
	Suction and/or discharge piping not anchored or properly supported	Anchor per Hydraulic Institute Standards.
	Base not rigid enough	Tighten hold-down bolts on pump and motor or adjust stilts. Inspect grout and regROUT if necessary.
	Worn motor bearings	Replace bearings or motor.
	Pump cavitation	Increase NPSH available.
Excessive product leakage	Static seal failure caused by chemical incompatibility or thermal breakdown	Use O-rings or gaskets made of material compatible with fluid and temperature of the application.
	Static seal failure caused by improper installation	Install O-rings or gaskets without twisting or bending. Use star-pattern torque sequence on housing bolts during assembly. Allow Teflon O-rings to cold flow and seat during tightening. Torque bolts to specification.
	Mechanical seal worn or damaged	Disassemble and replace mechanical seal. Prime pump and avoid dry running.
	Pump port connections not properly sealed	Use Teflon tape or other suitable sealant. Use gaskets compatible with fluid and temperature of the application.
	Crevice corrosion of pump housing material	Only pump chemicals that are compatible with the pump housing material. Decrease temperature to reduce corrosion rate to acceptable value. Flush idle pumps that are used to pump corrosive chemicals. Eliminate contaminants in the fluid that can accelerate corrosion wear.