Installation, Operation & Maintenance Manual

Magnetic Drive Coro-Flo® Pump
Models MDC10 and MDC12

Model MDC10

Warning: (1) Periodic inspection and maintenance of Corken products is essential. (2) Inspection, maintenance and installation of Corken products must be made only by experienced, trained and qualified personnel. (3) Maintenance, use and installation of Corken products must comply with Corken instructions, applicable laws and safety standards (such as NFPA Pamphlet 58 for LP-Gas and ANSI K61.1-1972 for Anhydrous Ammonia). (4) Transfer of toxic, dangerous, flammable or explosive substances using Corken products is at user's risk and equipment should be operated only by qualified personnel according to applicable laws and safety standards.

Solutions beyond products...

CORKEN®

IDEX

Warning

Install, use and maintain this equipment according to Corken, Inc. instructions and all applicable federal, state, local laws and codes, and NFPA Pamphlet 58 for LP-Gas or ANSI K61.1-1989 for Anhydrous Ammonia. Periodic inspection and maintenance is essential.

Corken One Year Limited Warranty

Corken, Inc. warrants that its products will be free from defects in material and workmanship for a period of one year from date of installation, provided that the warranty shall not extend beyond twenty-four (24) months from the date of shipment from Corken. Corken products which fail within the warranty period due to defects in material or workmanship will be repaired or replaced at Corken's option, when returned freight prepaid to: Corken, Inc., 3805 N.W. 36th Street, Oklahoma City, Oklahoma 73112.

Parts subject to wear or abuse are not covered by this limited warranty. Also, equipment, parts and accessories not manufactured by Corken but furnished with Corken products are not covered by this limited warranty and purchaser must look to the original manufacturer's warranty, if any. This limited warranty is void if the Corken product has been altered or repaired without the consent of Corken.

ALL IMPLIED WARRANTIES, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE EXPRESSLY NEGATED TO THE EXTENT PERMITTED BY LAW AND SHALL IN NO EVENT EXTEND BEYOND THE EXPRESSED WARRANTY PERIOD.

Corken disclaims any liability for consequential damages due to breach of any written or implied warranty on Corken products. Transfer of toxic, dangerous, flammable or explosive substances using Corken products is at the user's risk. Such substances should be handled by **experienced, trained personnel in compliance with governmental and industrial safety standards.**

Contacting the Factory

For your convenience, the model number and serial number are given on the compressor nameplate. Space is provided below for you to keep a written record of this information.

Always include the model number and serial number when ordering parts.

Model No. _____

Serial No. _____

Date Purchased _____

Date Installed _____

Purchased From _____

Installed By _____

Table of Contents

Features and Benefits

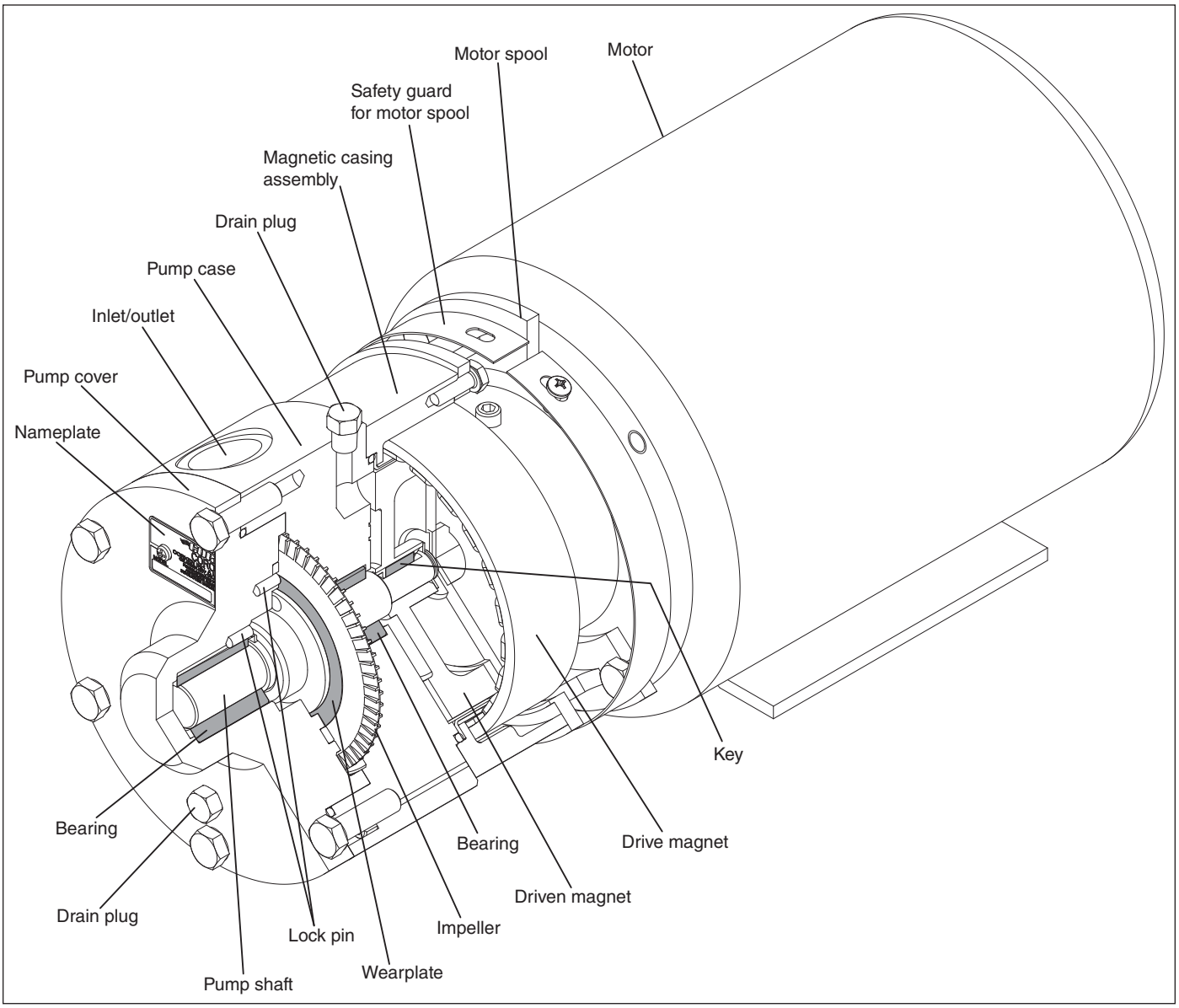


Figure 1

Exclusive Features of the Corken Coro-Flo® Pump

The pumping of volatile liquids is one of the most difficult pumping applications. Unlike other pumping operations, more attention must be given to the design, manufacture, installation and operation of the pump. The regenerative turbine, magnetic drive Coro-Flo pump is well suited for handling volatile liquids.

Listed below are a few of features that make it more easily operated and maintained.

- All parts under the pressure of the liquid are made of stainless steel, carbon, PTFE and other corrosion resistant allloys.
- The impeller floats on a shaft and may be replaced easily without disturbing the piping or driver by simply removing the cover. No special tools are needed.
- Magnetically coupled, sealless technology eliminates the need for a rotary mechanical seal and enables the pump to handle hazardous fluids safely with zero leakage to the atmosphere.
- Close-coupled design. A C-Face motor is directly mounted to the rear of the pump which provides greater assembled strength, enclosure of moving parts and a compact design.
- All pumps transmit rotation from the motor shaft to the impeller shaft by means of a magnetic drive coupling. An encapsulated driven magnet assembly is installed on the end of the impeller shaft. It is surrounded by a containment can, which constitutes the rear most part of the pump casing. A drive magnet installed on the motor shaft rotates

around the containment can. Drive torque is transferred through the containment can by magnetic attraction between the drive and driven magnet assemblies, causing the pump shaft to rotate. The containment can acts as a fluid barrier, eliminating the need for a dynamic seal.

- The magnetic coupling has an inherent characteristic that causes it to “decouple” if the coupling torque limit is exceeded. This could happen if a piece of foreign material were to jam the pump impeller or if unusually high torque was developed for any reason.
- The magnets can operate decoupled for short periods of time without losing their magnetic strength provided the temperature does not exceed specified limits (refer to Appendix B—Operating Specifications).
- Parts are available in several different materials, and care should be taken that all pump components (pump casing and cover, wear plates, bearings etc.) are compatible with the process liquid.
- The pump is functionally symmetrical so that the suction and discharge ports can be reversed (with direction of rotation) and the pump casing and cover can be rotated to suit the installation if required.
- Consult with the factory for applications involving a specific gravity or viscosity greater than that of water.

Principles of the Corken Coro-Flo® Pump

The magnetic drive Coro-Flo® Pump is a specialty design known as a regenerative turbine. The liquid flows into the inlet and into the passageway on each side of a rotating impeller and is re-circulated constantly between the vanes or teeth of the impeller and this passageway. The fluid makes a complete revolution through the pump case and is diverted to the outlet. This process results in a significantly higher buildup of pressure than occurs in the similar but simpler centrifugal pump (see Figure 2 for details).

The regenerative turbine pump is in many ways an intermediate between the centrifugal and positive displacement designs. As the discharge pressure increases, the flow decreases and the power required to drive the pump increases as well. Differential pressure is the difference between the inlet pressure and the outlet pressure (also known as discharge pressure) of the pump. Flow is directly controlled by discharge pressure: the greater the pressure, the lower the flow rate. This can be most readily achieved by throttling the discharge; however, care must be taken to not exceed the power level of the motor. Flow can be regulated using a variable bypass system that allows operation at reduced pressure and power draw and dumps excess flow usually back to a supply tank. The pumping characteristics of a regenerative turbine differ from other designs.

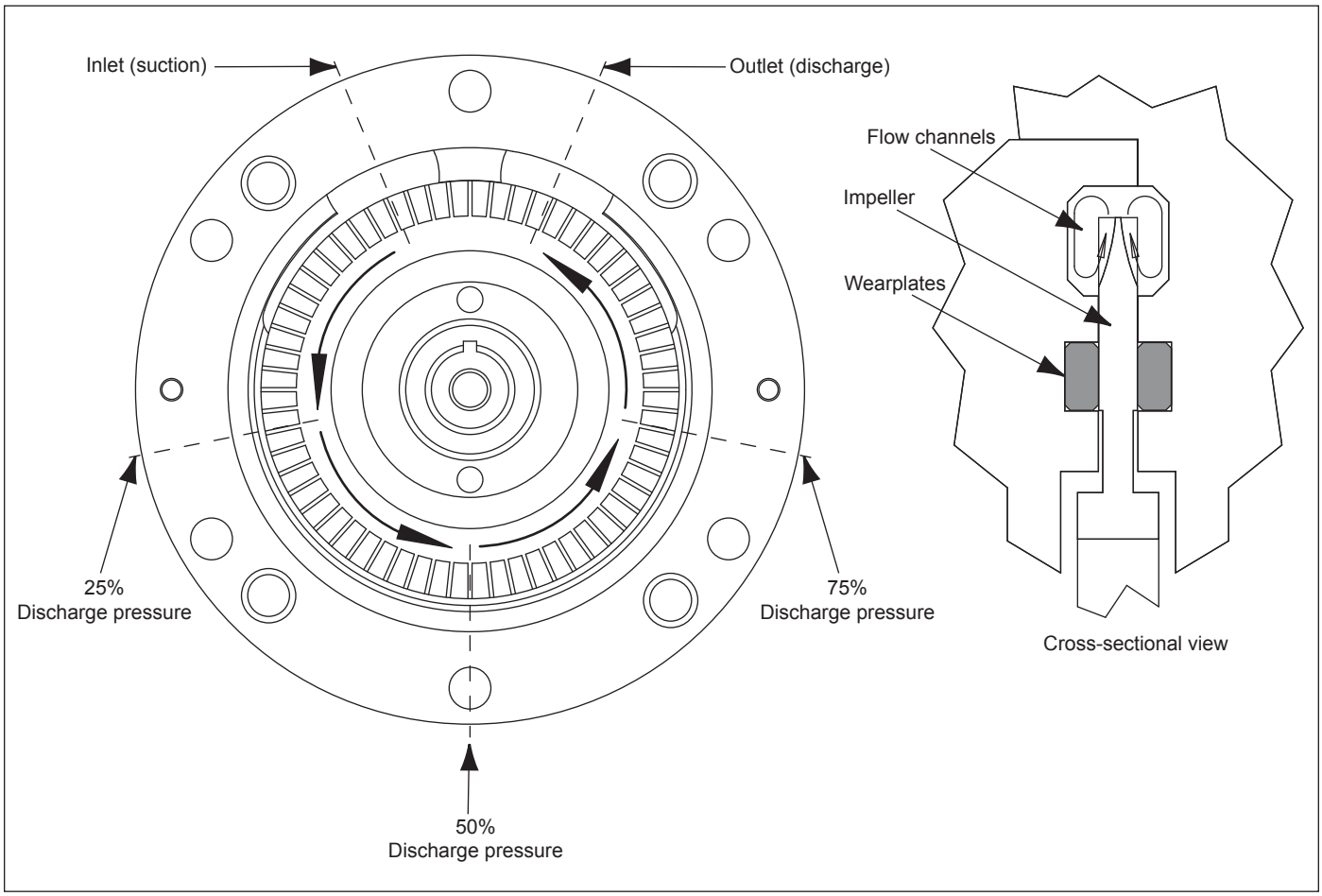


Figure 2

The Coro-Flo pump is a precision designed regenerative turbine pump. There is a very small clearance between the impeller, wear plates, pump cover and casing. The only moving part is the impeller. Since the impeller floats freely in the axial direction relative to the pump, a film of fluid is present on either side of the impeller so that there is no contact and negligible wear between impeller and wear plates. Even when pumping volatile liquids that have low lubrication qualities such as LP-gas or ammonia, very little to no wear occurs to the impeller. All of these unique features minimize maintenance requirements over the life of the pump.

Safety Considerations

- Read and understand all related instructions and documentation before attempting to install or maintain this equipment.
- Keep this and all documents (specification sheets, shipment records, maintenance records) in a safe place which is accessible to those who operate or maintain this equipment.
- Observe all special instructions, notes, and cautions.
- Act with care and exercise good common sense and judgment during all installation, adjustment, and maintenance procedures.
- Ensure that all safety rules, work procedures, and standards that are applicable to your company and facility are followed during the installation, maintenance, and operation of this equipment.
- Use for any application other than as described within this documentation is considered unsafe and voids all certification markings and warranties.
- Always ensure that all factory supplied guards and covers are in place before operating this equipment.
- A magnetically driven pump relies on strong magnets to transfer power from the drive to the pump system. Users are cautioned to keep magnetically sensitive items such as watches, credit cards and ID badges, and medical equipment away from the pump and drive mechanisms.
- See additional maintenance precautions listed in the maintenance section of this Installation, Operation & Maintenance (IOM) manual.

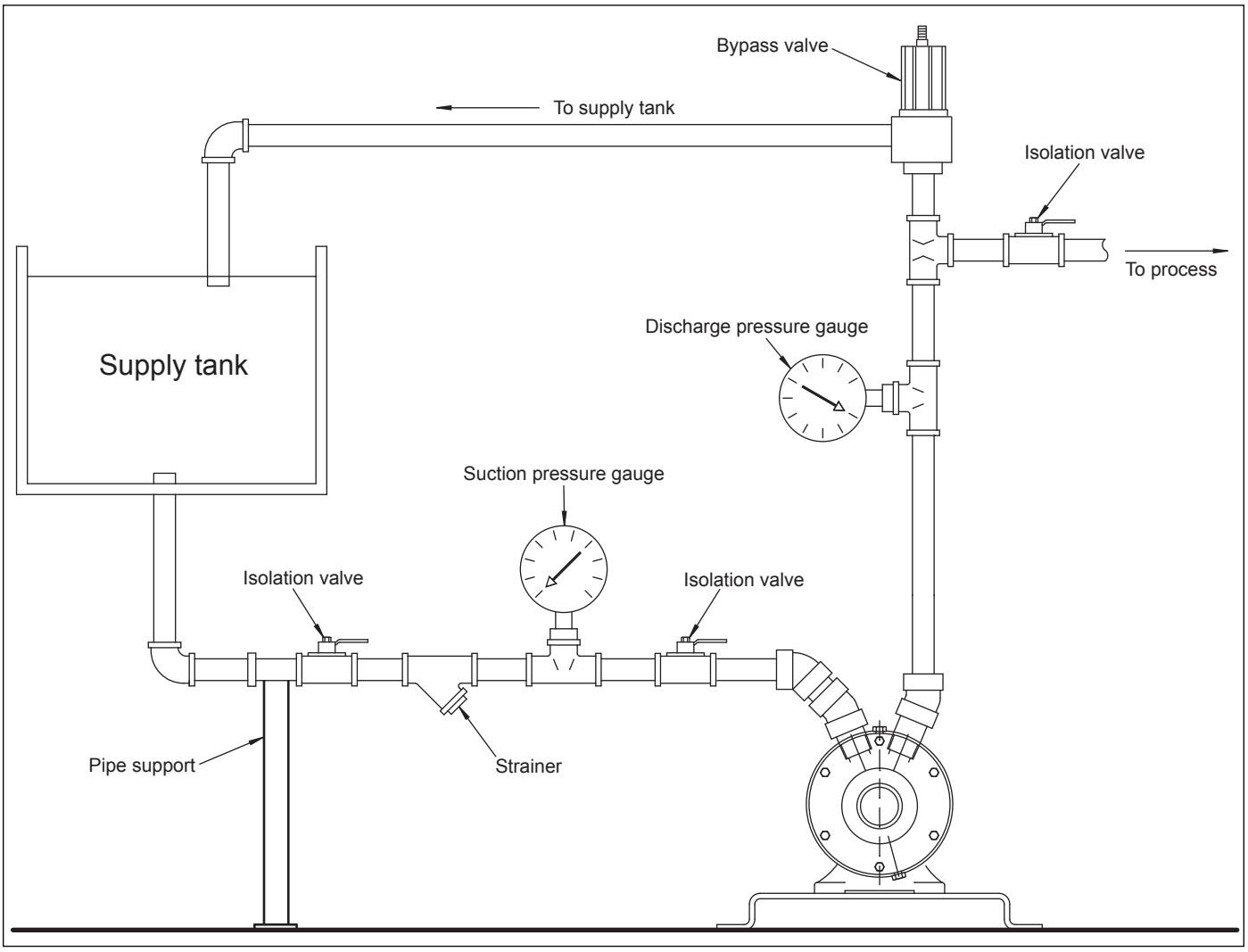


Figure 3: Typical pump installation

Equipment Inspection

Check all equipment for completeness against the order and for any evidence of shipping damage. Shortages or damage must be reported immediately to the carrier and to your Corken supplier.

If immediate installation is not scheduled, the following steps should be taken:

- Leave pump in the original shipping carton.
- Store indoors in a dry environment. Avoid temperature variations.
- Leave all shipping plugs in place.
- Contact the motor manufacturer for specific motor storage information.

Occasionally, during shipment, storage or installation, misalignment or other damage can occur. For this reason it is recommended that each unit be tested with water in some convenient area prior to piping into the actual process system.

Installing the Corken Coro-Flo® Pump

The installation of a Coro-Flo® pump is a simple matter. However, in order for the pump to deliver the performance you expect, the principles discussed in this book must be followed exactly. The piping details are furnished to illustrate methods proved by hundreds of installations. Your own needs may require some slight variations, but they must be slight, and no compromise made.

No pump can discharge more liquid than it receives, so the location and the inlet piping must be given careful attention. If the inlet piping is inadequate to supply the demand of the pump, you may expect trouble!

The pump must be located as near the storage tank as possible. The complete inlet line, including the vertical line from the tank must not exceed 12 feet in length.

The bottom of the tank must be at least two feet above the pump inlet nozzle, and four feet should be considered standard.

Installation Requirements

The pump installation site should provide easy access for routine maintenance and when possible to protect the pump from the elements and from leaks or drips from nearby process equipment.

WARNING

The provision of a VFD (recommended) or "soft-start" motor starter is required (20 – 30 second ramp up period) to reduce the possibility of magnetic de-coupling at startup with a fast-starting or oversized motor.

As the pump is supported by the motor mount, take care that the suction and discharge piping does not apply forces or moments (twisting) to the pump.

For optimum performance, a minimum 1-1/2" suction line size is recommended.

1. Bolt the pump down firmly to the mounting surface. Provide for air movement over the electric motor as required.

   The pump is functionally symmetrical so that the suction and discharge ports can be reversed (with direction of rotation) and the pump casing and cover

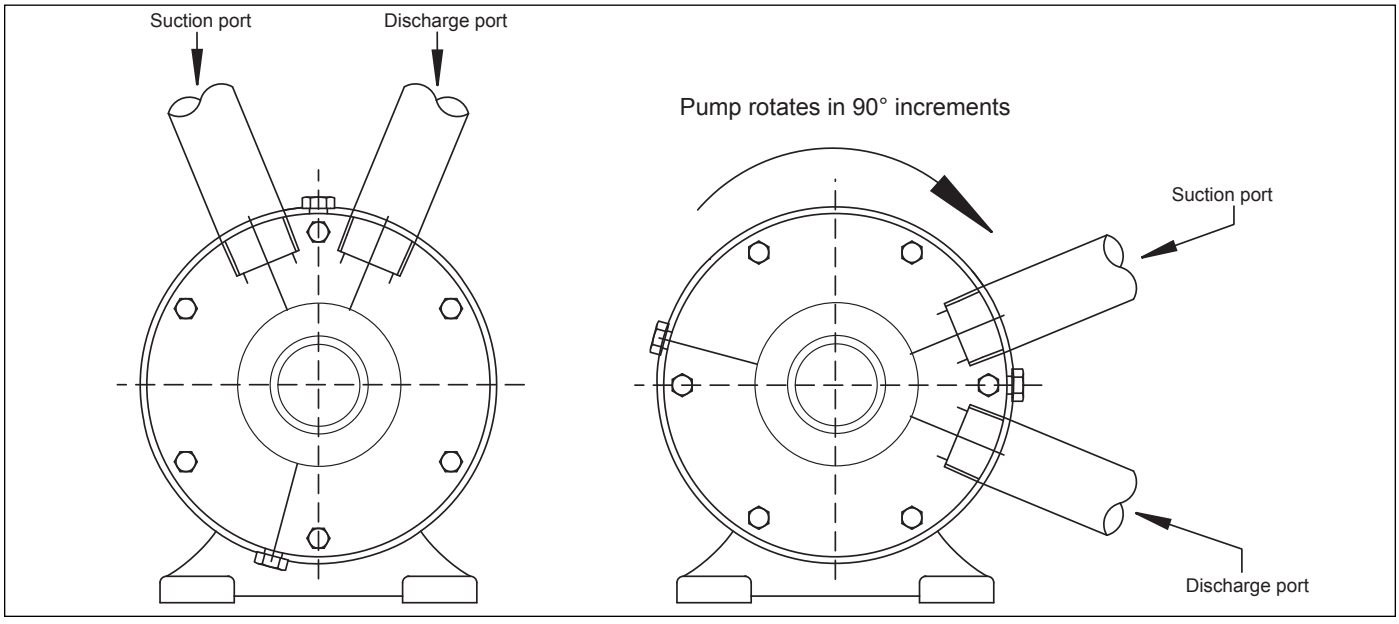


Figure 4: Typical pump port orientation facing pump cover

can be rotated to suit the installation if required. Refer to Figure 3, for typical installation and the required relation between rotation and direction of flow. If it is desirable to rotate the suction and discharge ports, remove the four socket head screws that hold the pump casing to the magnet casing assembly.

2. It is recommended to install vacuum/pressure gauges in the suction and discharge lines to monitor system operation.

3. Keep suction lines short and straight to minimize friction loss to the pump. Make sure that the pump will not starve or run dry. Flooded suction or gravity feed of fluid to the pump inlet is preferred and eliminates manual priming.

4. Use only full-bore ball valves or gate valves in the suction piping. If suction strainers are used, size them to minimize pressure drop and select a type that is easily cleaned. Strainers should be regularly inspected and cleared of debris as required during operation.

This pump should be used to pump clean, clear liquids only. This pump cannot handle solids or particulates in the process stream.

5. Arrange all suction piping and fittings to prevent formation of air pockets. Make sure all joints are air tight.

6. Flush all suction lines prior to mating up to the pump. Use unions or other appropriate fittings for ease of maintenance.

7. Do not spring piping, either suction or discharge, when mating up to the pump. Use supports or hangers at intervals as required. When necessary, provide for thermal expansion and contraction so that no strain is placed upon the pump.

8. Check all bolts and nuts for tightness. Correct any conditions that could cause destructive vibration or leakage.

9. When required, provide a proper system for containment can flush and/or drain.

10. If start-up screens are being used, be sure they do not clog and starve the suction system. Start-up screens should be removed prior to placing the system into regular operation.

11. If a flexible suction line is used, select the materials and install them so that they do not collapse (causing a starved condition).

12. When pumping from a tank or vessel, avoid entry of sludge, solids, etc. into the suction line by placing the suction line inlet above maximum level of solids.

13. When a bypass system is used to control flow from the pump, the bypassed fluid should be piped back to the supply tank. This will prevent the liquid from building heat due to recirculation. If it is absolutely necessary to pipe bypass back to the pump suction line, the point of entry should be at least 10 pipe diameters away from the suction inlet. Provision for cooling should be made in the event of excessive heat buildup caused by fluid recirculation.

14. Where pumped fluids may solidify, crystallize, precipitate etc., provision should be made to thoroughly flush the pump and associated piping prior to periods of shutdown. Pay particular attention to proper flushing and draining of the magnetic coupling area because it does not self drain. There is a drain plug in the rear housing for access to this area.

The inlet should include the following:

1. A pressure gauge.

2. The tank excess flow valve (EFV) should have a flow rate of 1-1/2 to 2 times the capacity of the pump. Do not use an EVF without knowing its flow capacity.

3. The tank shutoff valve should be an angle valve or a free flow type—not a standard globe valve.

4. A strainer of the “Y” type, with 1/16" mesh screen, must be on the inlet line of the pump. For simpler inlet lines use a Corken 1836-X1 right angle strainer to replace an elbow and “Y” strainer.

5. A flexible connection should be used on the pump inlet or outlet to care for piping strains.

6. Unions must be installed near the pump inlet and outlet nozzles.

7. An eccentric swage should be used at the pump inlet nozzle to change line size (flat side up, to avoid vapor formation.)

8. The inlet line must be level or slope downward to the pump.

9. The minimum inlet piping sizes should be 1-1/2".

The 1" outlet piping should include the following:

1. A pressure gauge should be installed in the opening provided on the outlet nozzle or in the outlet piping near the pump. This pressure gauge will tell you the complete story of the operation inside your pump. Be sure you have one installed.

2. A hydrostatic relief valve is required to be installed in the outlet piping.

Motor					Recommended wire size, AWG Length of run in feet		
Model	Hp	Motor Phase	Volts	Approx. Full Load Amperes	0–100	to 200	to 300
Pump must rotate in the direction shown on pump case. If not, switch any two of the three incoming 3 phase lines.							
MDC	1	3	230	3.6	12	12	12
				1.8	12	12	12
MDC	1-1/2	3	230	5.2	12	12	12
			460	2.6	12	12	12
MDC	2	3	230	6.8	12	12	12
			460	3.4	12	12	12
MDC	3	3	230	9.6	12	12	12
			460	4.8	12	12	12
MDC	5	3	230	15.2	12	12	10
			460	7.6	12	12	12
MDC	7-1/2	3	230	22.0	10	10	8
			460	11.0	12	12	12

3. If the outlet piping exceeds 50 feet in length, a check valve should be installed near the pump outlet.

4. The minimum outlet piping sizes should be 1".

The bypass system must include the following:

1. The pump bypass system must be installed. Without this system, the pump has little chance of performing.

2. A Corken B166 Bypass valve (a special valve to vent the pump of vapors and to act as a differential relief valve) makes the ideal installation.

3. The bypass line must rise uninterrupted to an opening in the vapor section of the storage tank. The tank fitting must be either an excess flow valve or a vapor return valve; it should never be a filler valve or a back check valve.

NOTE: For more piping tips, see Appendix G.

Level Base

After the concrete has set, check the pump base for level. Drive metal shims under the base near the anchor bolts as below. Tighten anchor bolts and recheck the base for level (see Figure 5).

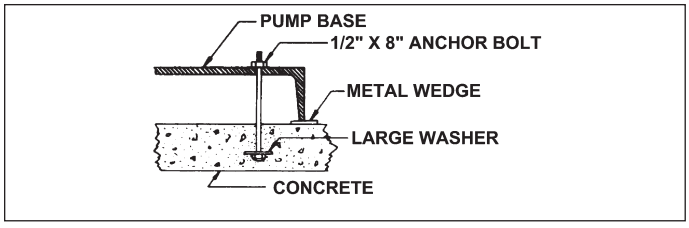


Figure 5

Driver Installation

The wiring of your electric motor is extremely important and must be done by a competent electrical contractor. The wire size chart on page 9 indicates the minimum standards for wire sizes.

Improper motor wiring will cause you to experience expensive motor difficulties from low voltage. If you suspect you have low voltage, call your power company. Connecting your motor for the voltage you have available is important too. Be sure your motor is connected to the proper voltage. Connecting to improper voltage will completely destroy your motor.

In explosion-proof motor applications in humid climates, the normal breathing and alternating temperatures of the motor (i.e. warm during operation and cold when stopped) will often cause moist air to be drawn into the motor housing. This moist air will condense and may eventually add enough free water to the inside of the motor to cause it to fail. To prevent this, make a practice of running the motor and pump at least once a week on a bright, dry day for an hour or so (pump through the bypass system). During this time, the motor will heat up and vaporize the condensed moisture. No motor manufacturer will guarantee their explosion-proof or totally enclosed motor against damage from moisture.

Startup and Operation of Your Coro-Flo® Pump

Do not dead-head

Do not run dry

Do not operate at flow rates below 2-3 gpm.

Prior to operation, recheck the suction system to be sure NPSH available to the pump is adequate. Reference Appendix D – Performance Curves for more information. Make sure all suction piping is air tight and clean.

Turn the pump over by hand. If any mechanical binding or other trouble is detected, determine the cause and correct.

Check that electrical service to the motor agrees with the name plate ratings. Jog to check rotation and reconnect the motor if necessary.

The pump should never be run dry. Damage to impeller, bearings and wear plates will result. Pumps should never be operated continuously at flow rates below 2 gpm (size 10) or 3 gpm (size 12). Localized heating will reduce operating clearances and can cause damage to the impeller, cover, and/or pump casing.

The pump must be primed before operation and any **air must be vented** from the casing. If foot valves are used, the valve should be of the flapper type and sized to minimize friction loss. Threaded and plugged vents in the pump casing can be provided as an option.

Do not operate the pump against a closed discharge, as this can cause the magnetic drive to decouple. Decoupled operation causes high temperatures that can boil the fluid or damage the magnet assemblies. Should de-coupling occur, stop the motor and restart after the stoppage has been cleared. As a safety precaution, a pressure relief valve bypass system is recommended. Ideally, the pressure relief valve can be set at a low-pressure trip point for startup, ensuring that fluid rapidly and fully floods the pump casing.

Start the pump with the discharge valve slightly open and check for proper operation. Excessive noise or vibration is an indication of harmful cavitation caused by insufficient NPSH. Stop the pump, and correct the issue as required.

The following steps should be performed for the initial pumping operation:

1. Close shutoff valve on the end of the delivery hose.
2. Open the storage tank bottom shutoff valve.
3. Open the storage tank shutoff valve of the bypass system.
4. Check the motor for the proper voltage. (See instructions under driver installation.)
5. Start the pump and circulate the liquid through the bypass system.
6. Adjust the B166 bypass valve by turning the adjusting screw out until the pump pressure gauge shows nearly the same pressure it did before you started the pump. Screw the adjusting screw in until the pressure gauge indicates the pump is starting to lose discharge pressure (you will know this by the rapid fluctuating of the pointer); then back the adjusting screw out a turn or two until the pressure gauge again indicates a steady pressure. Lock the lock nut, and permit the pump to circulate liquid for a half hour or more. If the motor overload protection device stops the motor during this period, this indicates the bypass system valve is set too high and should be readjusted by turning the adjusting screw out until the motor will run for this period.

Preventative Maintenance for Your Coro-Flo® Pump

The timing for maintenance of the pump is established primarily on past performance. Each installation is different. Therefore detailed maintenance records of past performance can be invaluable for determining future preventative maintenance intervals. During routine pump inspections pay particular attention to the bearings, wear plates, and impeller, as those areas will determine future maintenance intervals. For motor maintenance instructions consult the motor manufacturer.

Before performing any maintenance requiring pump disassembly, be sure to flush and drain pump and magnetic drive sections thoroughly with a neutralizing fluid. Wear protective clothing and handle equipment with proper care.

When changing a pump from one service to another, be sure to check that all wetted parts of the pump are compatible with the fluid to be handled and that the motor is sufficiently sized for the application. If in doubt contact your Corken supplier.

All magnetic drive couplings have a specific maximum torque limit. If this torque is exceeded the drive will decouple. Operation in the decoupled mode should be avoided as high temperatures could be generated.

Should the pump exhibit reduced flow rate or pressure capability, noise, or otherwise abnormal operation, first refer to the troubleshooting section. If the problem cannot be found, inspect the pump for wear or damage. It can be easily opened for partial wet end cleaning and inspection without disturbing piping connections by removing just the front cover.

Maintenance Precautions

- Drain and flush the pump and magnetic drive before disassembling the pump. Access to the magnetic drive area is provided by a drain plug located on the front of the pump cover. Use caution as this section of the pump will not fully self-drain.

- The exposed magnets on the drive magnet assembly are very fragile and will chip easily. Use extreme care while handling them. Keep wristwatches, credit cards, ID badges, and other sensitive items away from the magnetic fields.

- Take care to avoid particles or objects from attaching themselves to the drive magnets. It is difficult to remove small particles and larger objects could be attracted with enough force to break the magnets.

- Be careful during disassembly and re-assembly of the drive and driven magnet assemblies. The attraction forces are high and when the magnets come close together there is a strong tendency to snap together suddenly, possibly causing pinching or worse to fingers. Get help, often two people may be required to safely separate or re-attach the drive and driven sections of the pump.

Do not machine the magnets in the drive or driven magnet assemblies. The dust that would be produced is highly flammable.

- The model number stamped on the pump nameplate identifies the pump type and specifications. Refer to the model number identification code in Appendix A if you do not have the exact model number. Always refer to the full model and serial number in any correspondence with your Corken supplier.

Lubrication

Unlike the standard ductile iron Coro-Flo pump, the magnetic drive Coro-Flo pump has a carbon bearing and does not require lubrication. The carbon bearing is lubricated by the liquid moving through pump.

Servicing Your Coro-Flo® Pump

After a long service life, repairs are limited to replacing the impeller bearings, wear plates and lockpins.

The only wear part influencing the pumping action is the impeller, so we suggest the pump be given an “efficiency” test before any attempt is made to repair it. The trouble may lie in the piping system rather than in the pump. If the pump will still produce as much differential pressure when circulating through the bypass system as it did when new, you may be sure your problem is elsewhere. If the pump does not produce as much pressure as it did originally, remove the cover and inspect the impeller. If visual inspection indicates the impeller is in good condition, remove the thin shim gasket and replace the cover. Many times this procedure will adjust for slight impeller wear. If the impeller is badly damaged, it must be replaced.

Replacement is a matter of removing the cover and removing the old impeller from the shaft. If the old impeller is tight on the shaft, threaded bolt holes are provided in the impeller to use for pulling. The new impeller must be a good slip fit on the shaft; it should “float” on the shaft, so it may be necessary to sand the shaft lightly to get the proper fit.

Disassembling the magnetic drive Coro-Flo Pump

NOTE: The item numbers listed in parenthesis refer to the parts details found in Appendix E.

1. Disconnect the power source from the motor.

2. Close the suction and discharge valves.

3. Using the drain port (item 12) on the pump cover (item 21), flush and drain the pump and disconnect the piping.

4. Remove the six cover bolts (item 24). Remove the pump cover (item 21) and pump cover bearing (item 16) by carefully withdrawing it straight back to avoid damage to the bearing as it is withdrawn from the shaft.

5. Remove the thin plastic shims (item 20), if any, and the O-ring (item 11) between the pump cover and the pump casing. NOTE: The standard shim is plastic and the metal shims are used for higher temperatures (> 300°F).

6. Remove the four socket head screws (item 25) from the magnetic housing assembly (item 7) and separate the pump casing from the magnetic housing assembly. This will require physical force to overcome the magnetic attraction between the drive and driven magnet assemblies.

WARNING: Do not pry on one edge, but carefully withdraw it straight back to avoid damage. The magnets are fragile and easily damaged by rough handling. Two people may be required to separate the magnets safely.

7. After separating the pump casing from the magnetic housing assembly, use a small screwdriver to remove the retaining ring (item 9) from the end of the drive shaft (item 18) at the rear of the driven magnet assembly (item 10). After removing the retainer ring, withdraw the driven magnet assembly from the drive shaft. Make sure you retain the drive key (item 17) for the driven magnet assembly (item 10).

8. Lastly, carefully remove the wear plate (item 15), lock pin (item 14) and bearing (item 16) from the pump

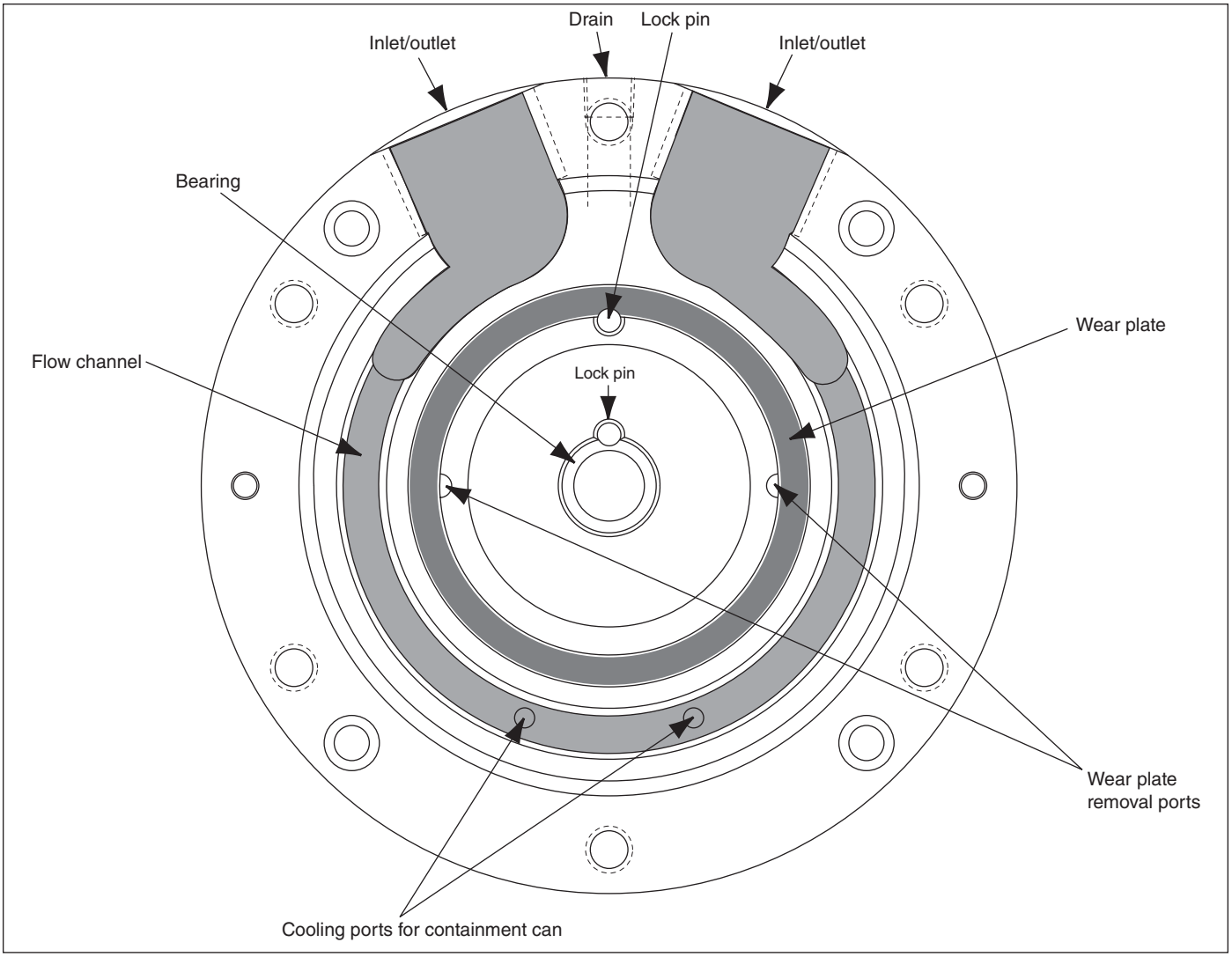


Figure 6

cover. Then remove the impeller (item 19), impeller drive key (item 17), drive shaft (item 18), bearing (item 16), wear plate (item 15) and lock pin (item 14) from the pump case.

WARNING: Do not remove the magnetic housing assembly (item 7) and drive magnet assembly (item 4) unless they or the electric motor need to be replaced.

If removal of the magnetic housing assembly (item 7) and drive magnet assembly (item 4) are required, perform the following steps:

9. Remove the safety guard (items 5 & 6).

10. Remove the containment can (item 8).

11. Remove the four hex head bolts (item 1) from the magnetic housing assembly (item 7) and gently pull the magnetic housing away from the electric motor spool (item 2).

12. The drive magnet assembly (item 4) can be removed by unscrewing the set screw (see Appendix E for location of set screw) that secures the drive magnet assembly to the electric motor shaft. Rotate the drive magnet assembly until the set screw is at the top (approximately the twelve o'clock position). With a 3/32 inch Allen wrench, reach through one of the slots of the electric motor spool and unscrew the set screw. A second hole has been added to the drive magnet assembly for balancing purposes. This "balance hole" is located 180° from the set screw.

13. Slide the drive magnet assembly (item 4) off the electric motor shaft. The spool (item 2) is removed by removing the hex head bolts (item 3) from the motor and withdrawing it from the electric motor.

14. Thoroughly clean all parts before reassembly.

Inspection

Flow Channel Inspection

The pump casing has two cooling ports located in the flow channel that divert essential cooling fluid to the magnetic drive chamber. Check and clear these ports if necessary

using a piece of wire or a drill bit of appropriate size (see figure 6 for location of cooling ports).

WARNING **The cooling port size in standard pumps is 5/32" (4 mm).**

Wear Plate Inspection

Inspect the two wear plates for damage or wear.

The carbon wear plates are identical and are recessed in the front cover and pump casing. They should protrude slightly above the surfaces in which they are mounted. You can verify this by dragging your fingernail across the mounting surface. Your fingernail should catch slightly as it passes over the wear plate. If the wear plate does not protrude above the surface of the mounting surface, replace it. Over time friction will cause a deterioration of the wear plates and a resultant reduction in pressure capability. If there are no other known causes for pressure reduction, replace the wear plates.

Use of wear plates that do not meet original specifications may result in contact between the impeller, cover and pump casing causing damage to all components.

Shaft Bearing Inspection

Inspect the cover bearing and the pump casing bearing for damage or wear. The maximum diametrical clearance (bearing ID minus shaft OD) is 0.006 inches (0.15 mm).

Choke Point Inspection

The “Choke Point” is the area between the two ports, and is the only place where the impeller and pump casing run closely together. A near-contact clearance is required in this area to maintain maximum pressure capability.

Perform an internal inspection as follows:

- Inspect the outer diameter of the impeller.
- Inspect inner surface of the cover at the choke point, paying special attention to the area between the inlet and the outlet ports.
- Inspect inner surface of the pump casing at the choke point, paying special attention to the area between the inlet and the outlet ports.
- Examine this area for evidence of scoring, corrosion, and any other physical damage or wear.

Wear Plates

- Two small opposed holes are provided in the pump casing adjacent to the outer surface of each wear plate (refer to Figure 6). To remove the wear plate, insert a small pick with a hook or 90° angle in each hole and pry evenly between the two to facilitate wear plate removal without breakage.
- Thoroughly clean all parts before reassembly.
- To replace the wear plates, first ensure that both plates and grooves are absolutely clean and free of debris since the plates must seat fully.
- Insert the replacement plate and press lightly all around to ensure uniform bottoming and to avoid breaking the carbon wear plates, which are relatively brittle. Ensure that the anti-rotation pin remains in place; replacement of this part is not normally required.

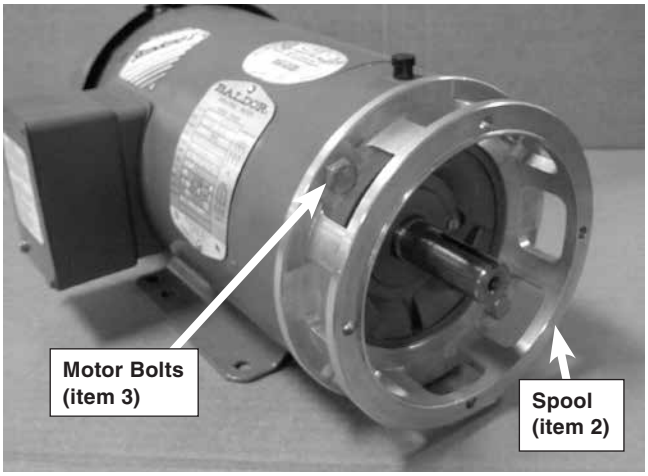
Bearings

When replacing bearings, ensure that the anti-rotation pin remains in place; replacement of this part is not normally required.

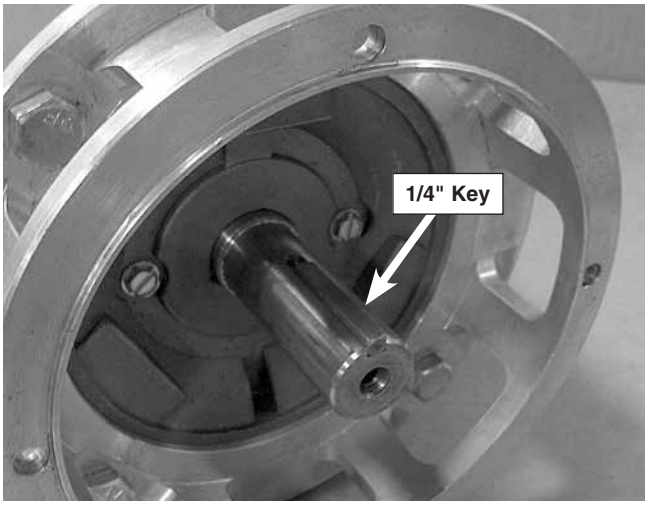
Reassembling the Magnetic Drive Coro-Flo Pump

NOTE: The item numbers listed in parenthesis refer to the exploded drawings found in Appendix E.

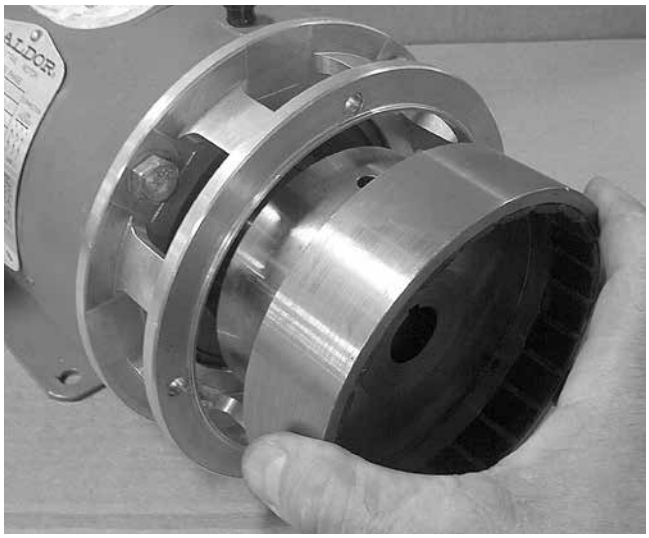
1. Position the spool (item 2) with the safety guard screw hole at the top (approximately the twelve o’clock position). Secure the spool to the motor by installing and tightening the four hex head bolts (item 3).



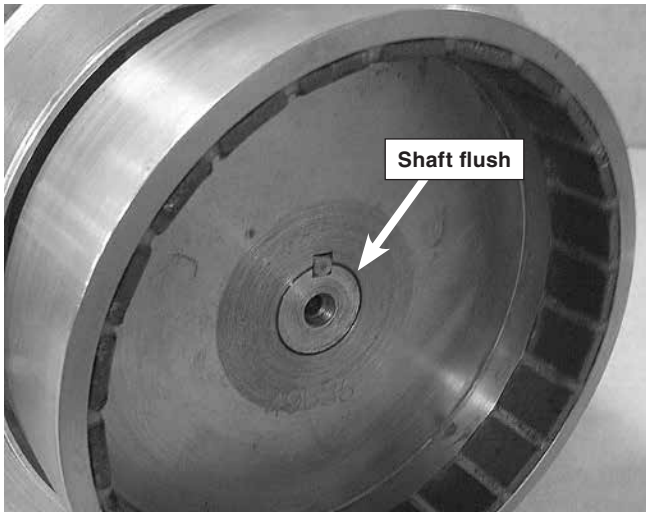
2. Coat the motor shaft with a small amount of anti-seize compound and insert 1/4" electric motor drive key.



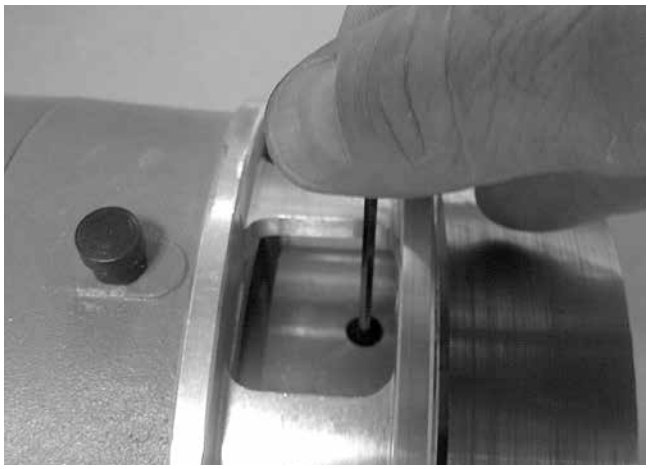
3. Slide the drive magnet (item 4) assembly onto the motor shaft.



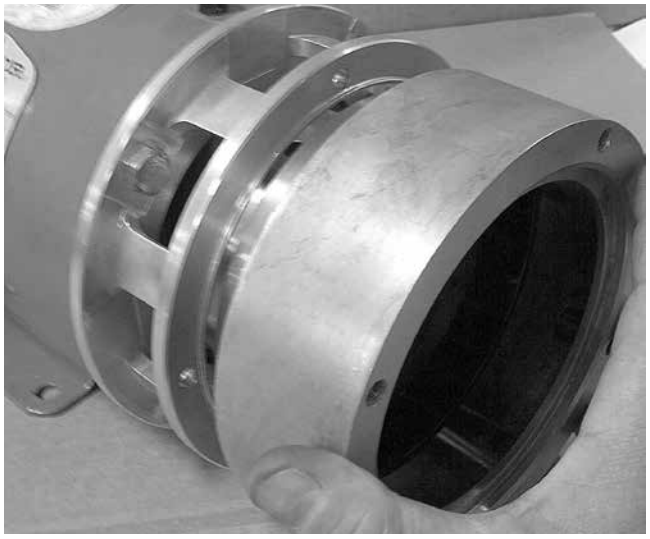
4. Position it axially so that the end of the motor shaft is exactly flush with the face of the drive magnet assembly.



5. Coat the set screw with removable thread locking compound (Loctite 727). Start the set screw in drive magnet assembly (item 4) and tighten through the spool (item 2) to 35 in-lb (400 N-cm). The screw socket fits a 3/32 Allen wrench.

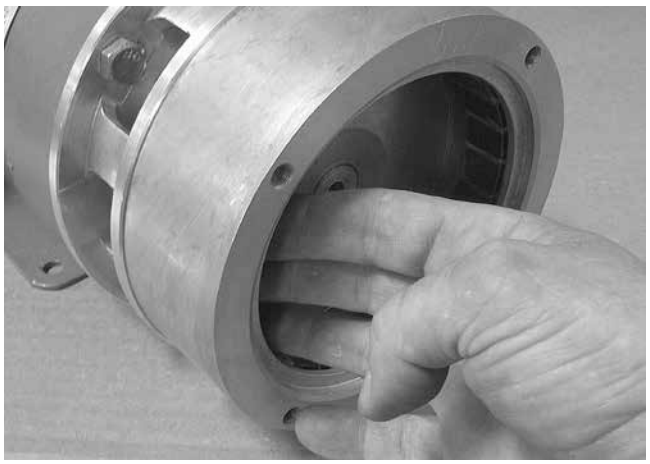


6. Slide the magnetic housing assembly (item 7) over the drive magnet assembly (item 4).

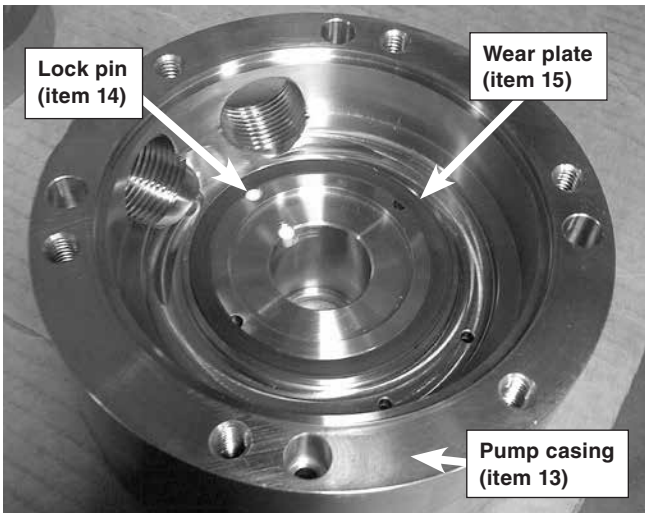


7. Secure the magnetic housing assembly (item 7) by installing and tightening the four hex head bolts (item 1) to 72 in-lb (810 N-cm).

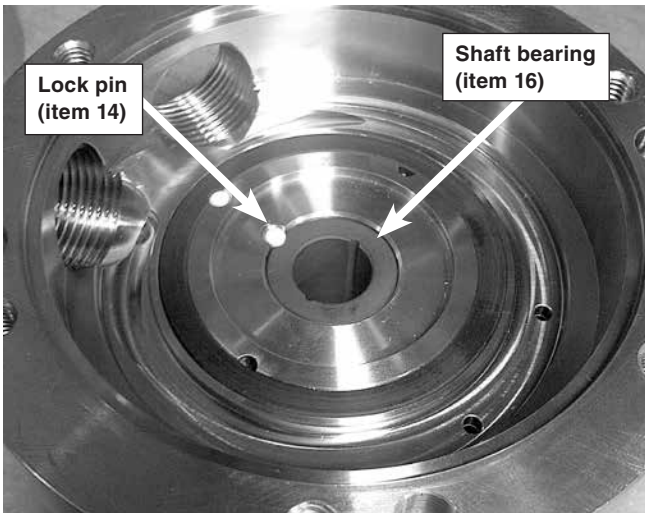
8. Move the drive magnet assembly (item 4) by hand and verify free movement throughout its travel. Make sure the drive magnet assembly is not rubbing against the magnetic housing assembly (item 7). If a clearance issue is noted, loosen the set screw and adjust the drive magnet assembly accordingly.



9. Position the wear plate (item 15) in the pump casing (item 13) and lock in place with the locking pin (item 14).

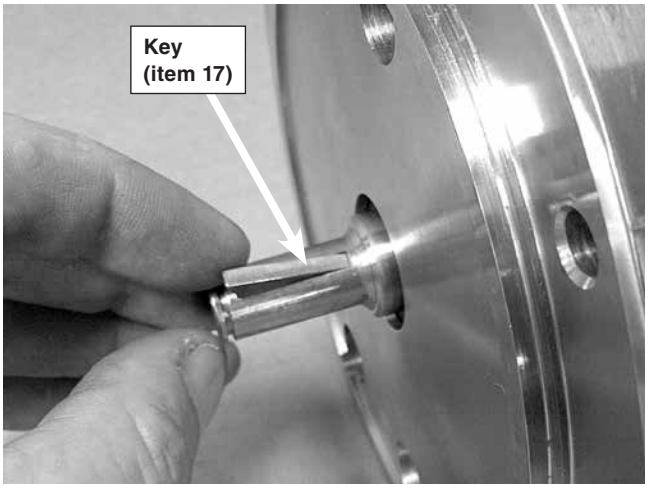


10. Position the shaft bearing (item 16) inside the pump casing (item 13) and lock in place with locking pin (item 14).

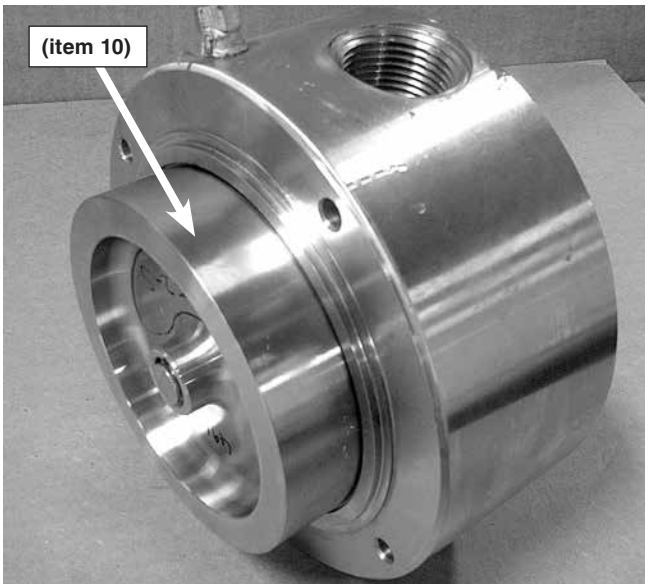


11. Insert keyway end of drive shaft (item 18) into front of the pump casing (item 13) taking care to avoid damage to the shaft bearing (item 16).

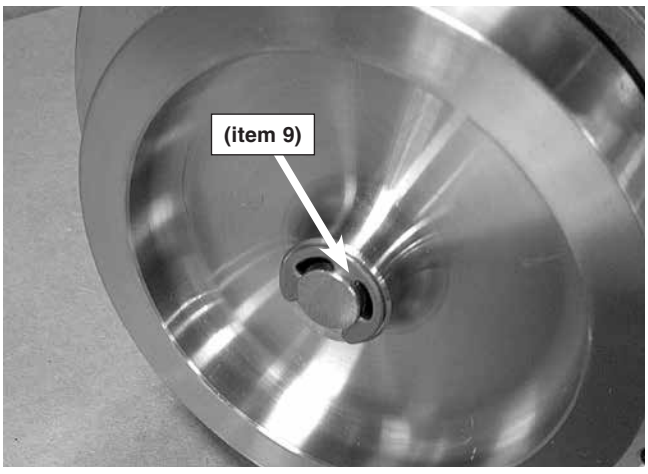
12. Position the drive key (item 17) for the driven magnet assembly into shaft keyway.



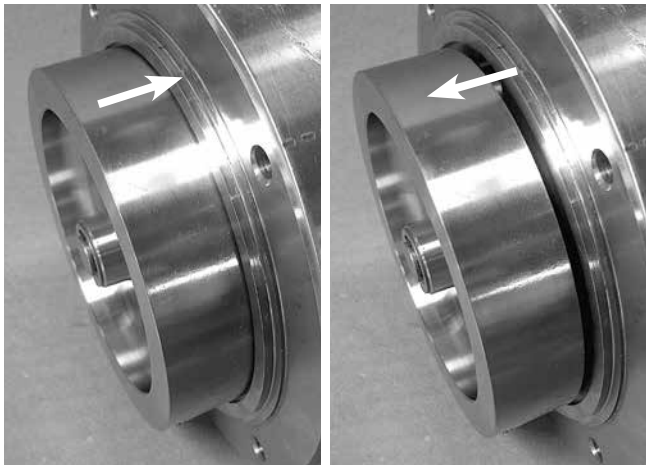
13. Slide the driven magnet assembly (item 10) over the drive shaft (item 18). NOTE: The flat side of the driven magnet assembly must face the pump casing.



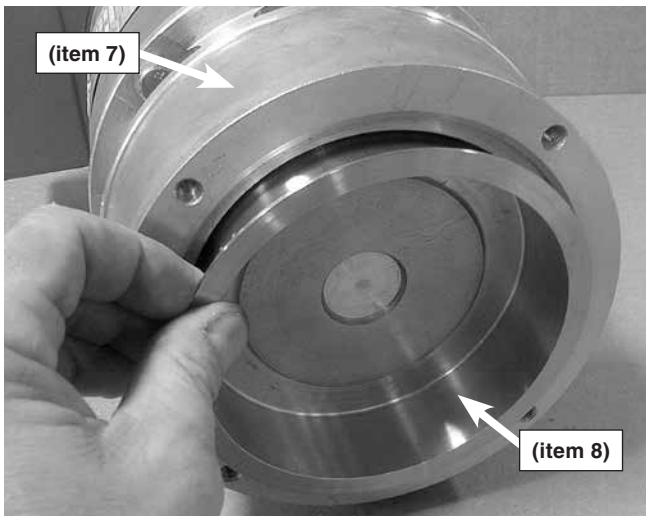
14. Secure the driven magnet by installing the outer retaining ring (item 9). Carefully expand the retainer ring over the end of the drive shaft (item 18) and snap it into groove.



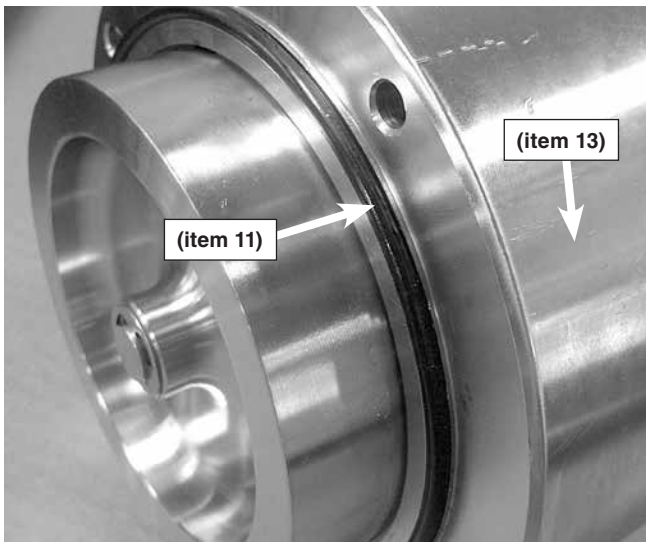
15. Make sure the driven magnet assembly floats freely as shown in the photos below.



16. Install the containment can (item 8) into the magnetic housing assembly (item 7).

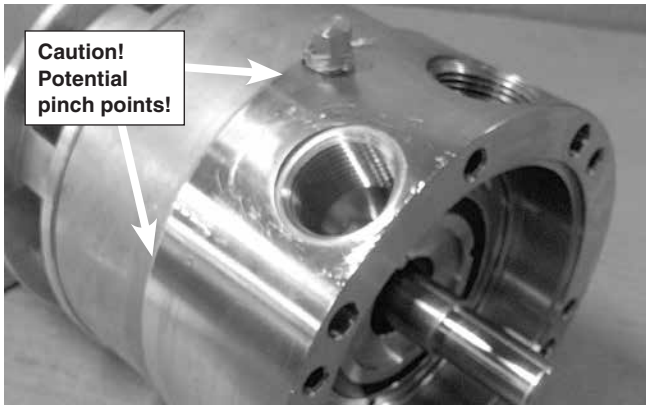


17. Install the containment can O-ring (item 11) on the back of the pump casing (item 13). NOTE: Placing the O-ring in warm water prior to installation will momentarily soften the material and make the installation easier.

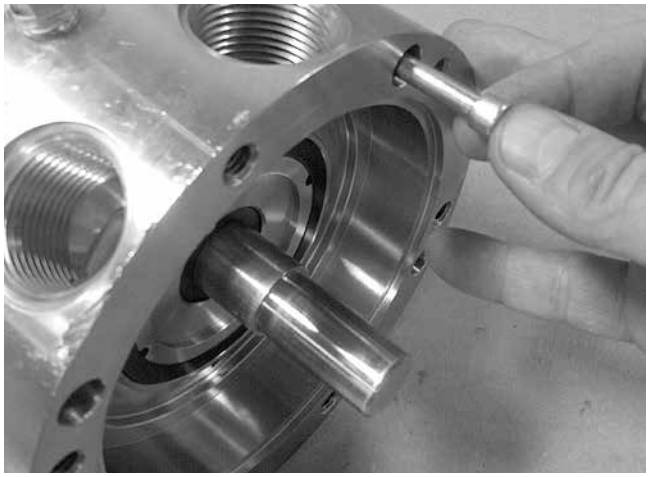


18. **WARNING CAUTION: IN THE NEXT STEP, THE MAGNETIC ATTRACTIVE FORCE IS CONSIDERABLE. TAKE CARE NOT TO CHIP THE MAGNETS AND AVOID PINCHING OF FINGERS WHEN THE MAGNETIC HOUSING ASSEMBLY AND PUMP CASING SNAP TOGETHER.**

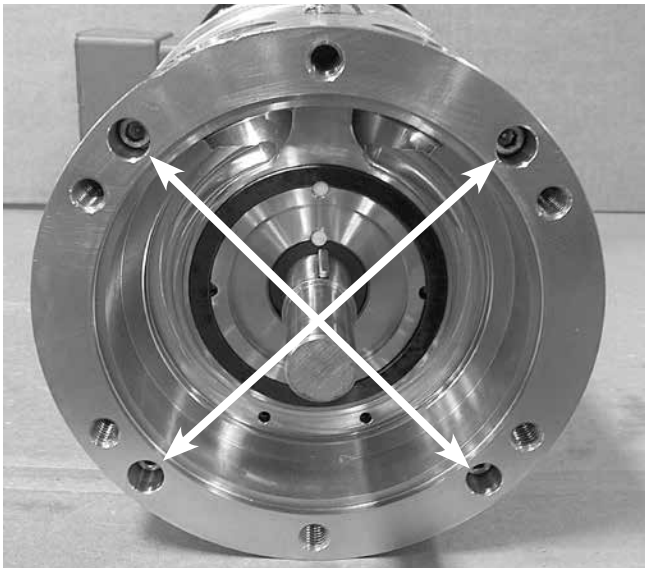
19. Carefully install the pump casing (item 13) into the magnetic housing assembly (item 7). CAUTION: A strong magnetic attraction will draw the magnetic housing assembly and pump casing together causing potential pinch points.



20. Secure the pump casing (item 13) to the magnetic housing assembly (item 7) by installing the four socket head screws (item 25).

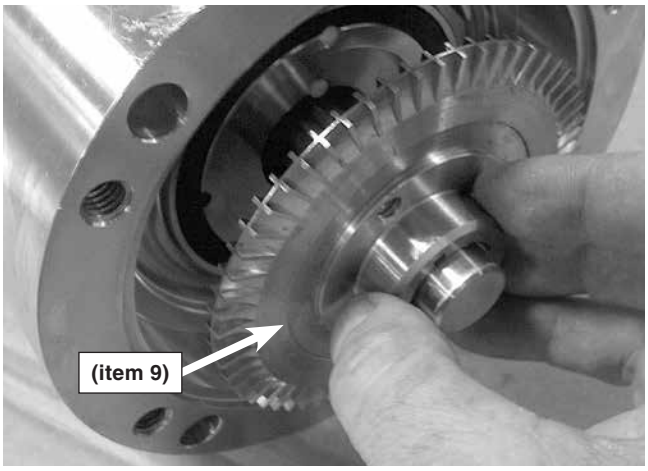


21. Using small intervals, evenly tighten all four socket head screws (item 25) to 72 in-lb (810 N-cm) in the “X” pattern shown above. NOTE: Tightening one side excessively before tightening the opposite side tends to crush the PTFE O-ring and cause a leak.

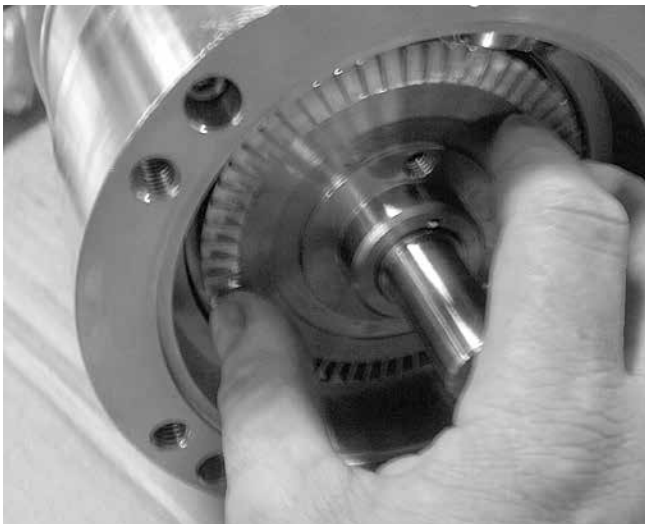


22. Position the drive key (item 17) for the impeller into its keyway as shown above.

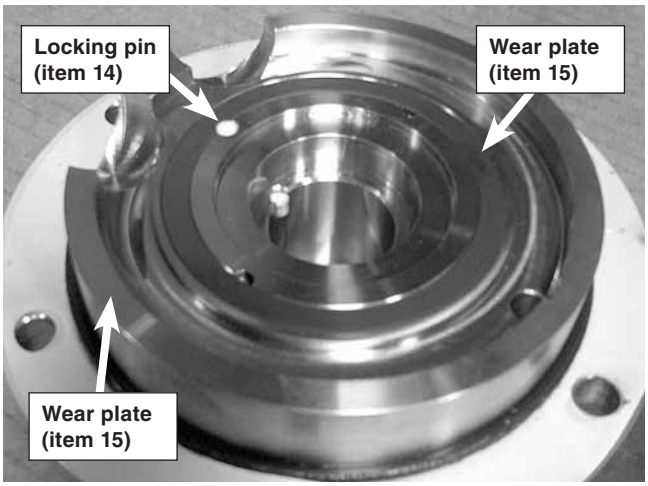
23. Slide the impeller (item 19) onto the drive shaft.



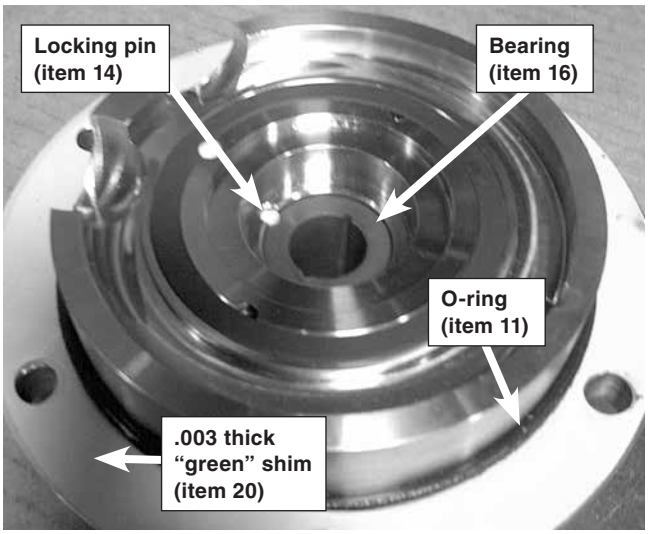
24. Verify that the impeller floats freely.



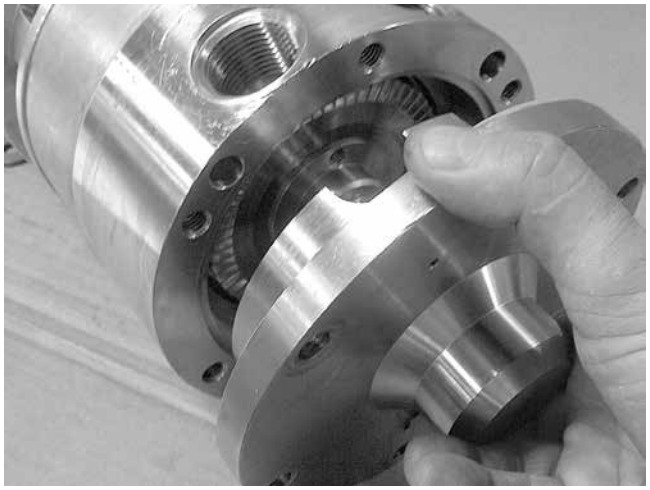
25. Position wear plate (item 15) in the pump cover (item 21) and lock in place with the locking pin (item 14).



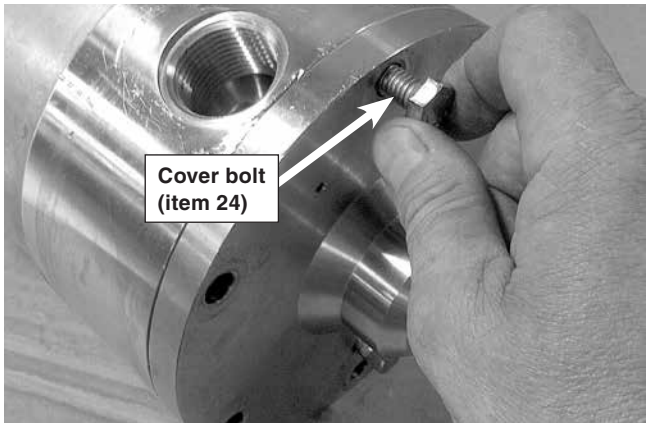
26. Position pump cover bearing (item 16) in front cover (item 21) and lock in place with the locking pin (Item 14). Install the thick (.003”) green shim (item 20) and pump cover O-ring (item 11).



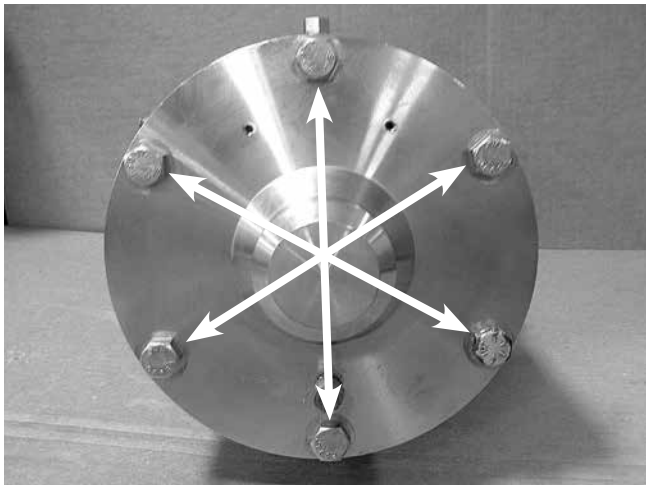
27. Carefully attach the pump cover (item 21) to the pump casing (item 13) and avoid damaging the pump cover bearing. Make sure the pump cover O-ring (item 11) is seated in the rabbet on the pump casing and is not pinched.



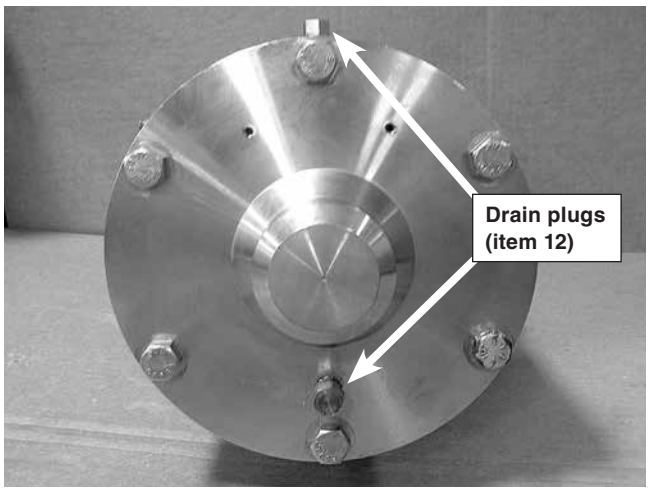
28. Secure the pump cover by installing the six hex head bolts (item 25) and tighten evenly using the pattern shown in step 30.



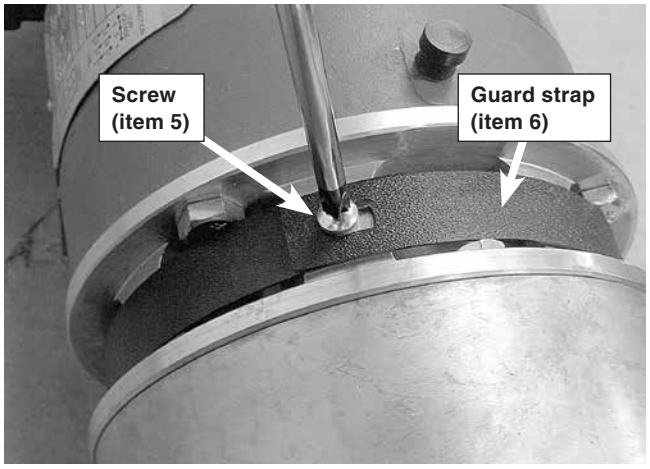
29. Using small intervals, evenly tighten all six hex head bolts to 220 in-lb (2,490 N-cm) in the "X" pattern shown above. **NOTE : If the impeller does not rotate freely after installing the pump cover, add red or green shims as necessary.**



30. Make sure the drain plugs (item 12) for the pump casing and pump cover are installed. Apply a pipe joint compound or tape to the plugs before installation.



31. Assemble the supplied plastic guard strap (item 6) around spool guard (item 2) using (1) 10-24 self-tapping screw (item 5). Tighten self-tapping screw as you pull the guard strap tight around spool.



Appendix A—Magnetic Drive Coro-Flo® Pump Model ID Code

BASE MODEL NUMBER	MDC10	MDC12
Inlet & outlet (standard)	1" NPT	1" NPT
Inlet & outlet (optional)	1" Slip weld	1" Slip weld
Ship weight, bare pump kg (lbs.)	CF	CF

BASE X X X X X X X X

SPECIFICATION FIELDS

Pump Housing	Stainless steel 316 with 1" NPT	Standard	A
Impeller & Shaft Material	Stainless steel 316	Standard	A
Bearing & Wear Plate Material	Carbon bearing & carbon wear plate	Standard	L
	Extended life carbon bearing & carbon wear plate	Optional	S
	PTFE bearing & PTFE wear plate	Optional	T
Magnet & Containment Can Material	Neodymium & stainless steel	Standard	1
	Samarium cobalt & stainless steel	Optional	2
	Samarium cobalt & hastelloy	Optional	3
O-ring Material	Buna-N	Standard	A
	Neoprene®[1]	Optional	B
	Viton®[1]	Optional	D
	PTFE	Optional	E
	Ethylene propylene	Optional	G
	Kalrez®[1]	Optional	K
Motor (IEEE841) (460V)	1 HP (143TC)	Optional	B
	1-1/2 HP (143TC)	Standard	C
	2 HP (145TC)	Optional	D
	3 HP (182TC)	Optional	E
	5 HP (184TC)	Optional	G
	7-1/2 HP (215TC)	Optional	H
Motor (EXP) (230/460V)	1 HP (56C)	Optional	K
	1-1/2 HP (143TC)	Optional	L
	2 HP (56C)	Optional	M
	3 HP (145TC)	Optional	N
	5 HP (184TC)	Optional	O
	7-1/2 HP (213TC)	Optional	P
Motor speed	3450 RPM - 60 Hz	Standard	1
	2880 RPM - 50 Hz	Optional	0
Magnetic Drive Mounting	Small (fits 56, 56H, 143T & 145T frames)	Standard	S
	Large (fits 182T, 184T, 213T & 215T frames)	Optional	B

ELECTRICAL OPTIONS

Description	Part Number 230 Volt
1.5 hp Variable Frequency Drive for use with 1 and 1.5 hp motors	4204-4
2 hp Variable Frequency Drive for use with 2 hp motor	4204-5
3 hp Variable Frequency Drive for use with 3 hp motor	4204-6
7.5 hp Variable Frequency Drive for use with 5 and 7.5 hp motors	4204-7

Description	Part Number 460 Volt
1.5 hp Variable Frequency Drive for use with 1 and 1.5 hp motors	4204-8
2 hp Variable Frequency Drive for use with 2 hp motor	4204-9
3 hp Variable Frequency Drive for use with 3 hp motor	4204-10
7.5 hp Variable Frequency Drive for use with 5 and 7.5 hp motors	4204-11

[1]Registered trademark of the DuPont company.
CF = Consult factory

Appendix B—Operating Specifications

Description	MDC10	MDC12
Inlet	1"	1"
Outlet	1"	1"
RPM	2880, 3450	2880, 3450
Rotation	CCW	CCW
Maximum working pressure	300 psig (20.7 bar)	300 psig (20.7 bar)
Maximum differential pressure	180 psig (12.4 bar)	250 psig (17.2 bar)
Temperature range	-150°F to 450°F (-101°C to 232°C)	-150°F to 450°F (-101°C to 232°C)
Flow range	2–14 gpm (7.6–53.0 L/min)	2–23 gpm (7.6–87.0 L/min)
Maximum viscosity	32 SSU[1]	32 SSU[1]

Material Specifications

Part	Standard Material	Optional Material
Bearing	Carbon	Extended life carbon, PTFE
Case	Stainless steel	None
Containment can	Stainless steel	Corrosion resistant alloys
Cover	Stainless steel	None
Drive magnet assembly	Neodymium	Samarium (>300°F)
Driven magnet assembly	Neodymium	Samarium (>300°F)
E-Clip	Stainless steel	None
Impeller	Stainless steel	None
Key	Stainless steel	None
Lock pin	PTFE	None
Magnetic casing	Stainless steel	None
O-ring	PTFE	Buna-N, Ethylene propylene, Viton[2], Neoprene[2], Kalrez[2]
Shaft	Stainless steel	None
Shim	Mylar	Aluminum (>300°F)
Spool	Aluminum	None
Wear plate	Carbon	PTFE

[1] Consult Corken for viscosities higher than 32 SSU.
[2] Registered trademarks of the DuPont company.

Appendix B—Mechanical Specifications

Bolt Pattern

1. Torque all six fasteners to 110 in-lbs (12.4 N-m) first, following the sequence in the Figure 7 below.

2. Then torque all fasteners to the final value of 220 in-lbs (24.8 N-m), again following the same sequence.

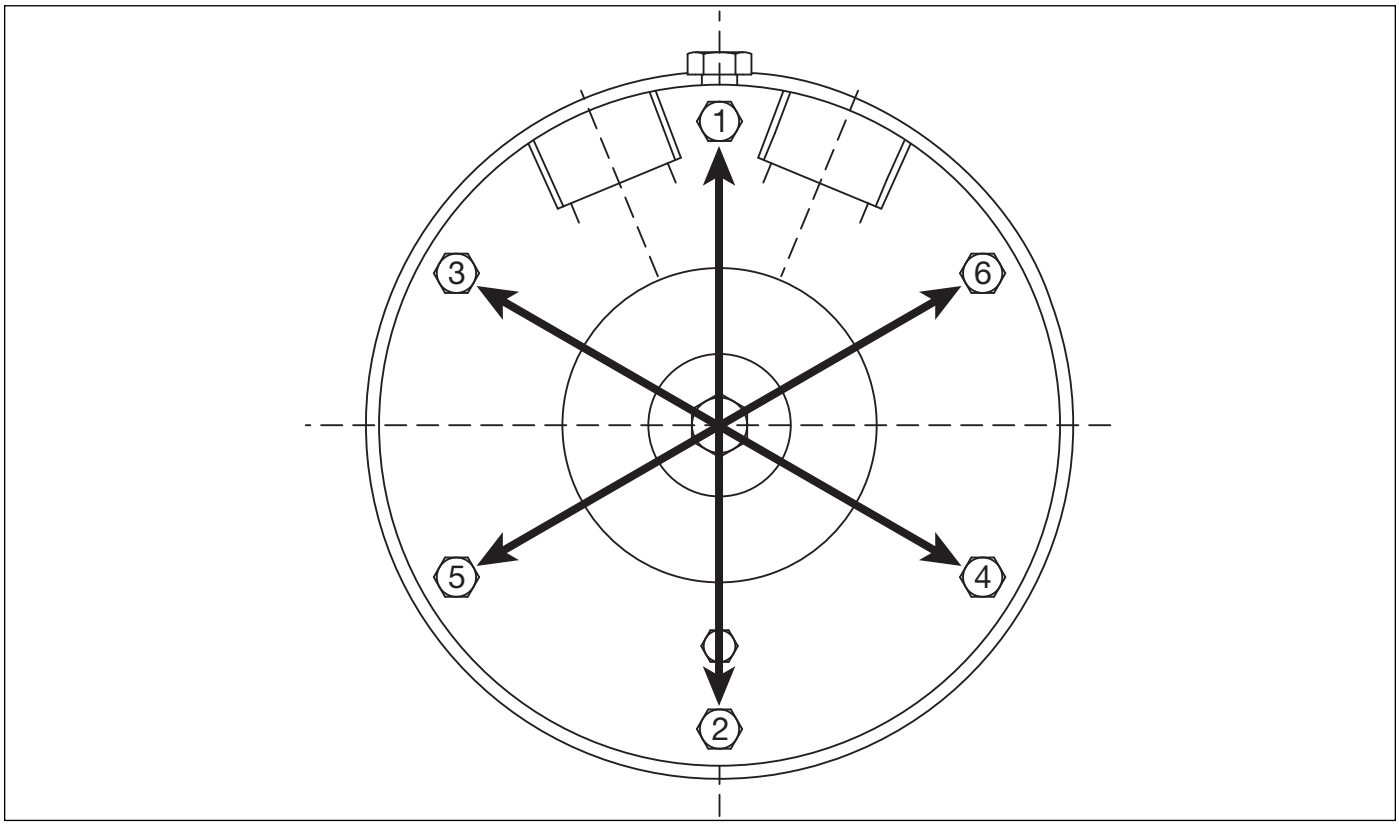
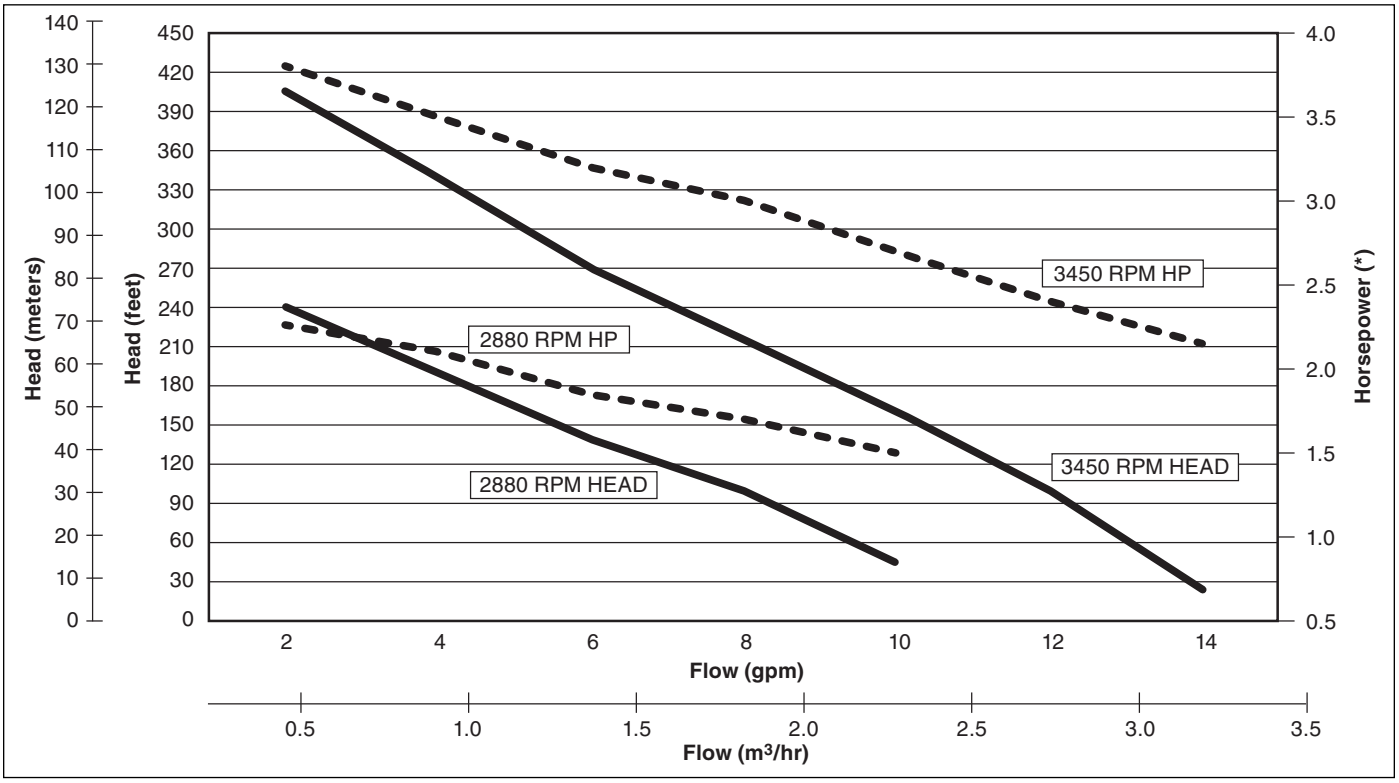
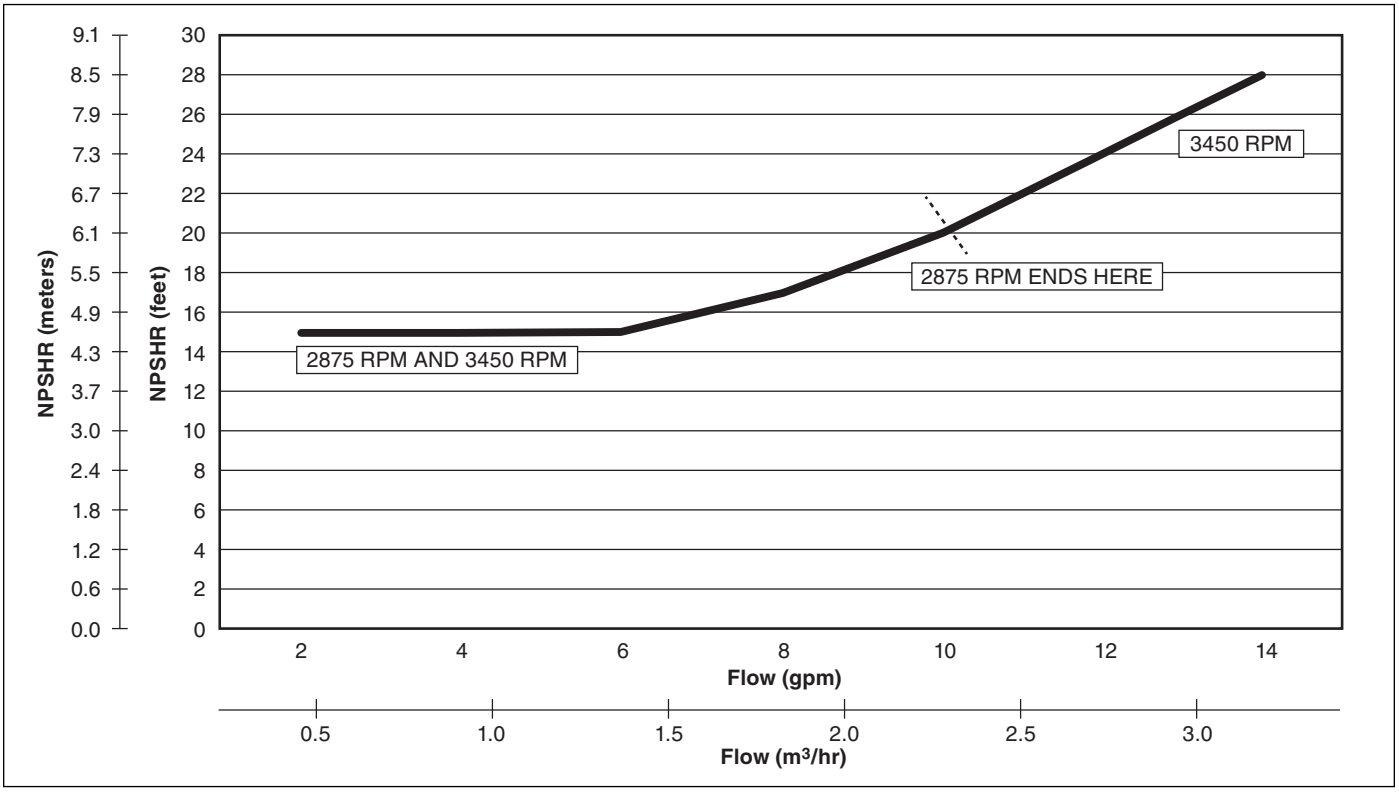


Figure 7

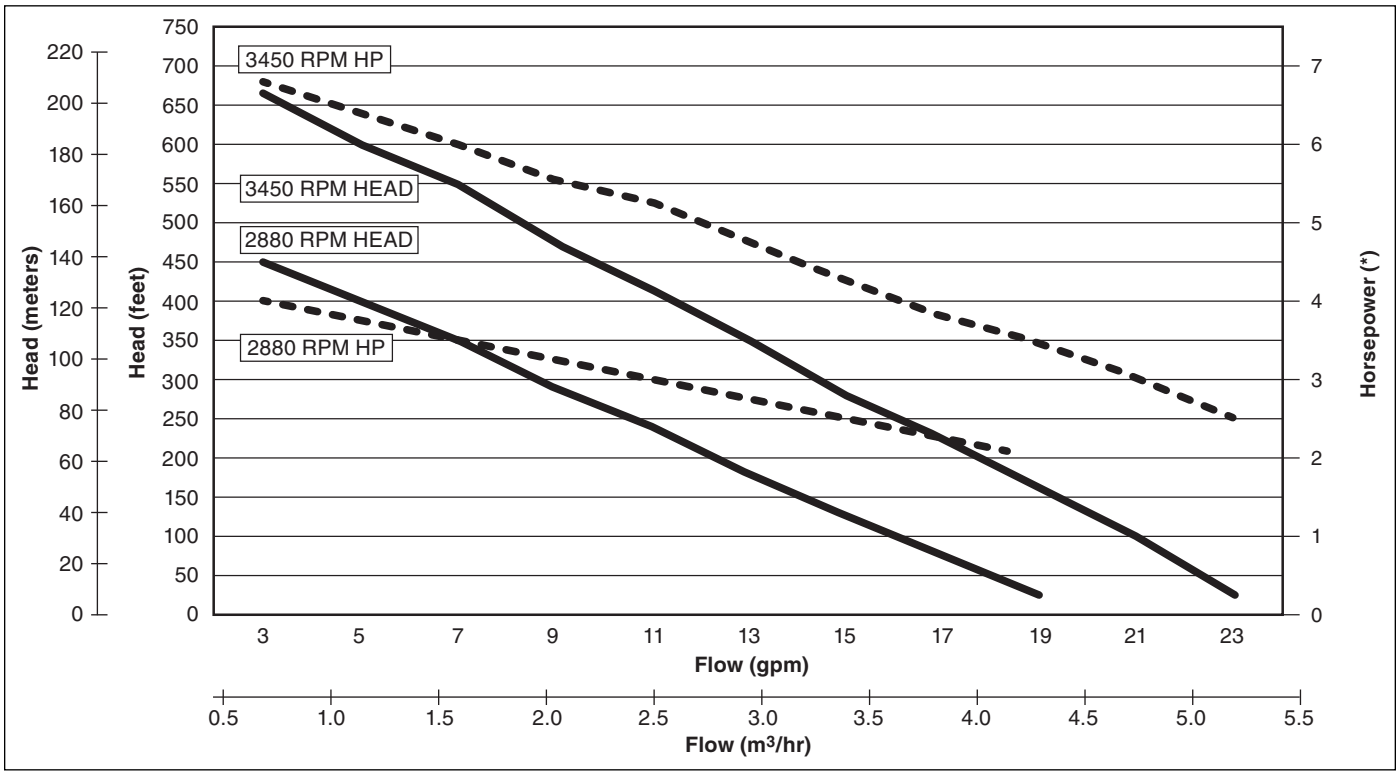
Appendix C—Performance Curves for Model MDC10



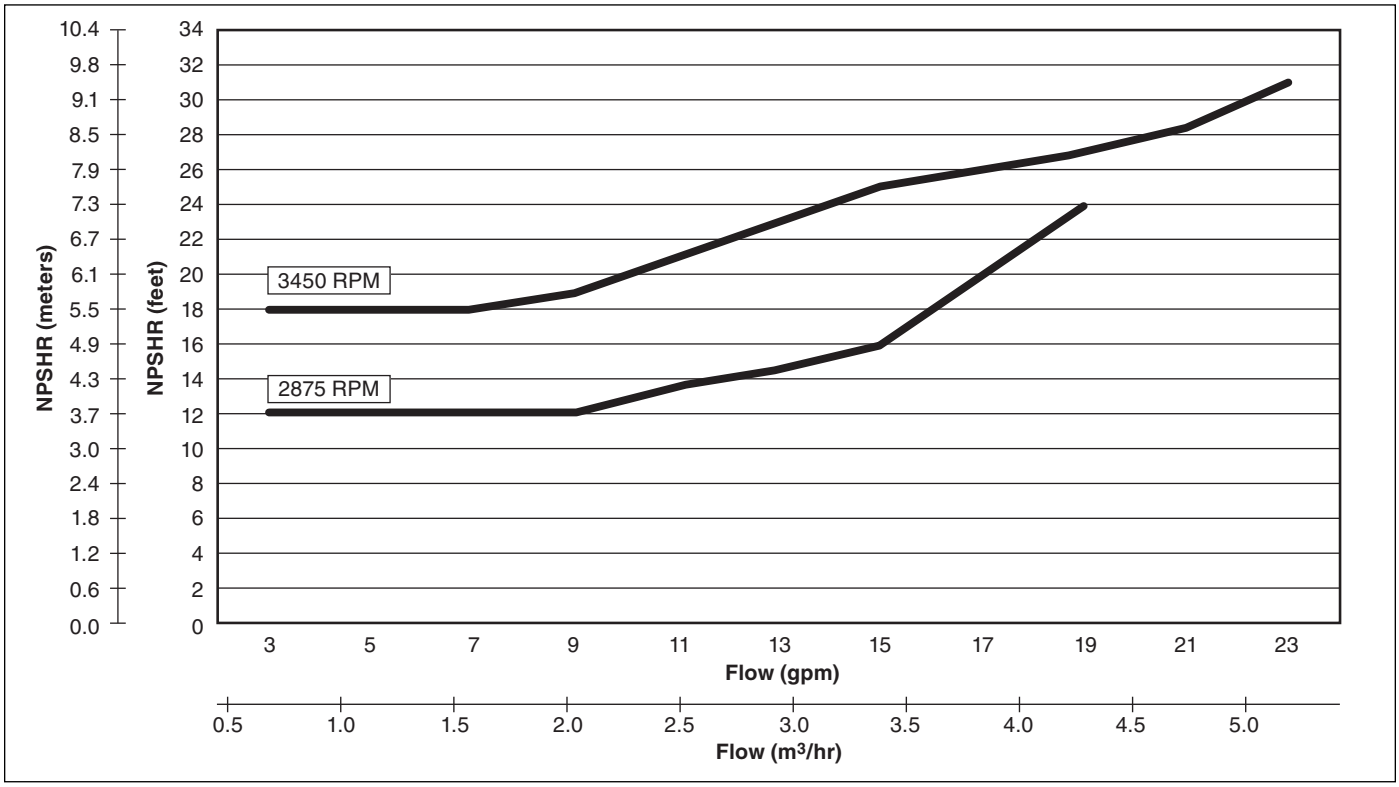
NPSHR Curves for Model MDC10



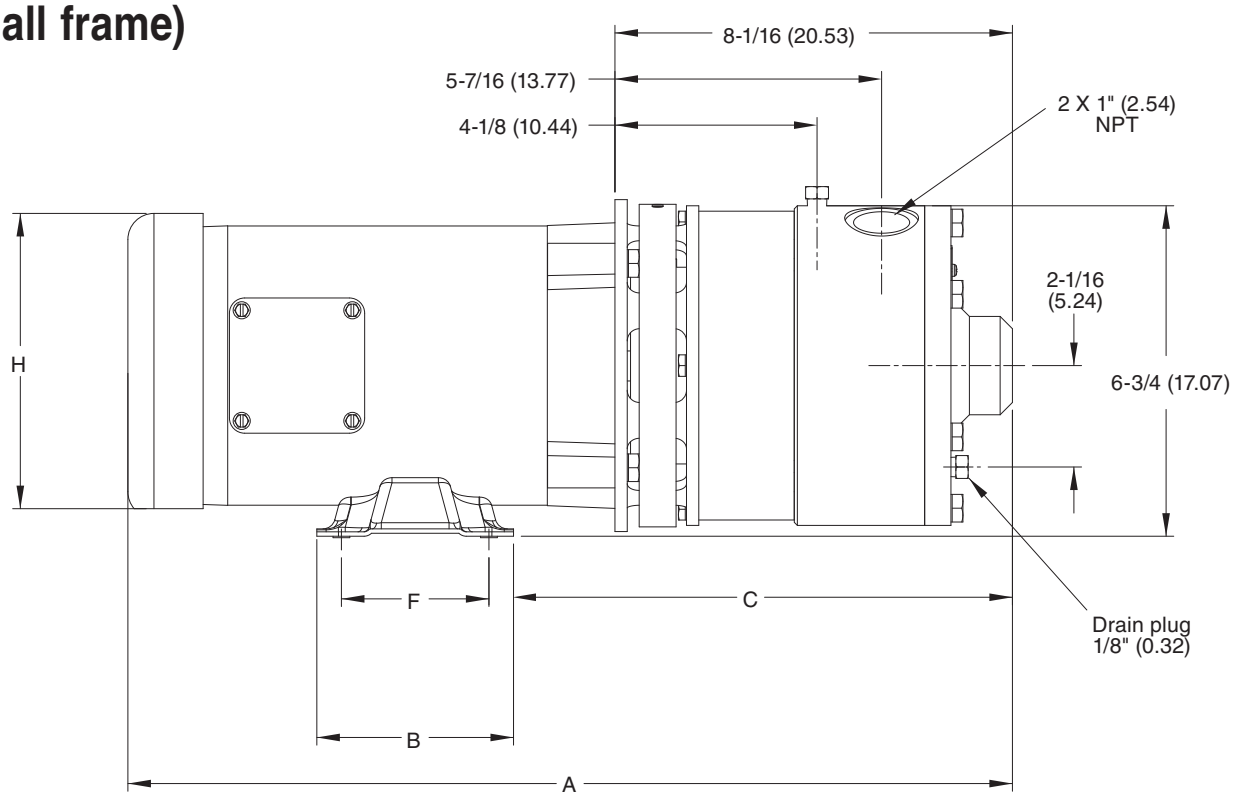
Appendix C—Performance Curves for Model MDC12

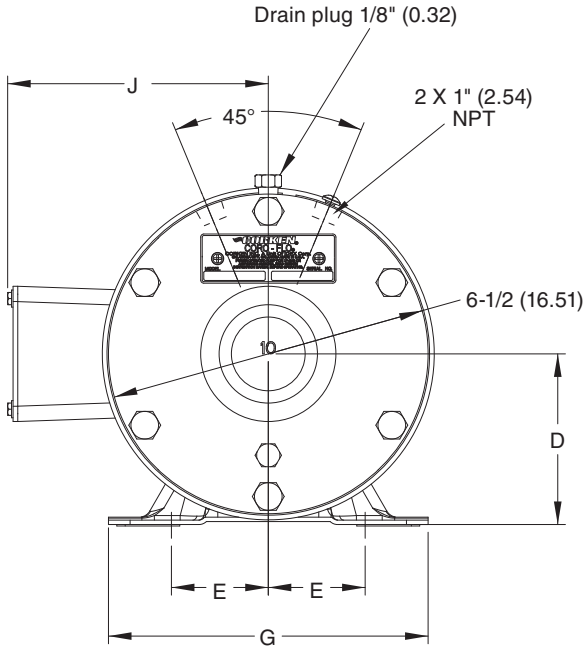


NPSHR Curves for Model MDC12



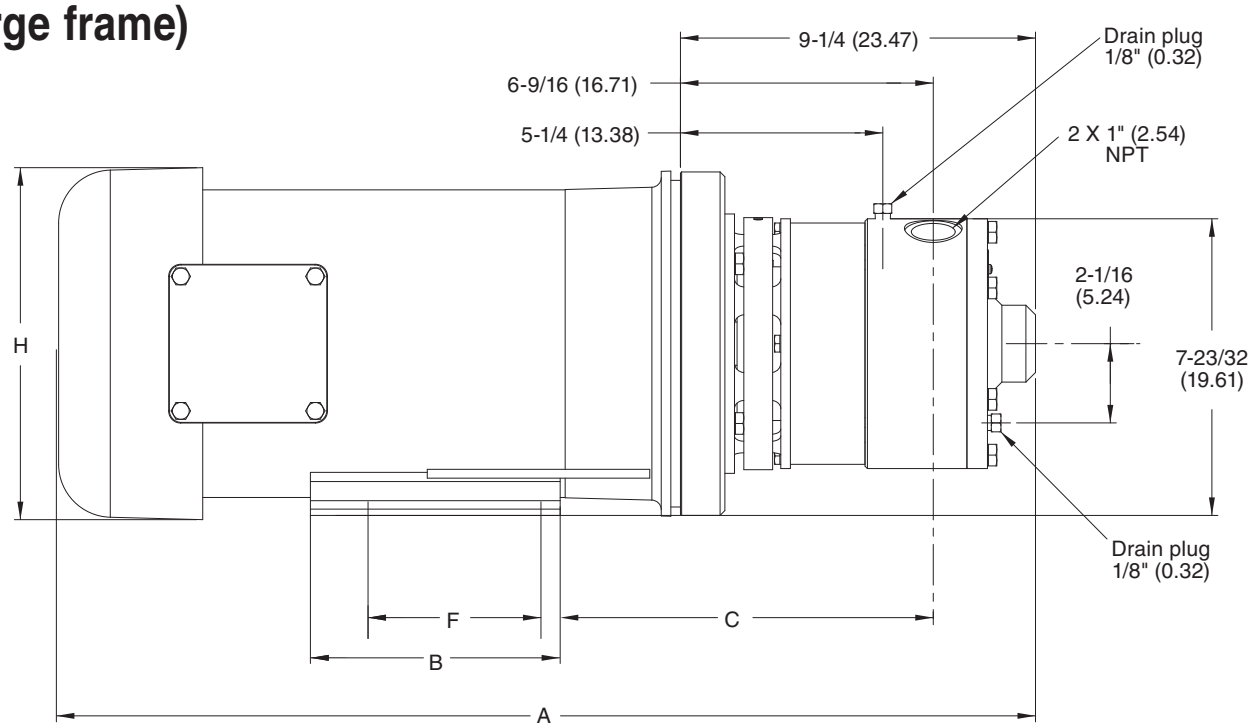
Appendix D—Outline Dimensions for Models MDC10 and MDC12 (small frame)

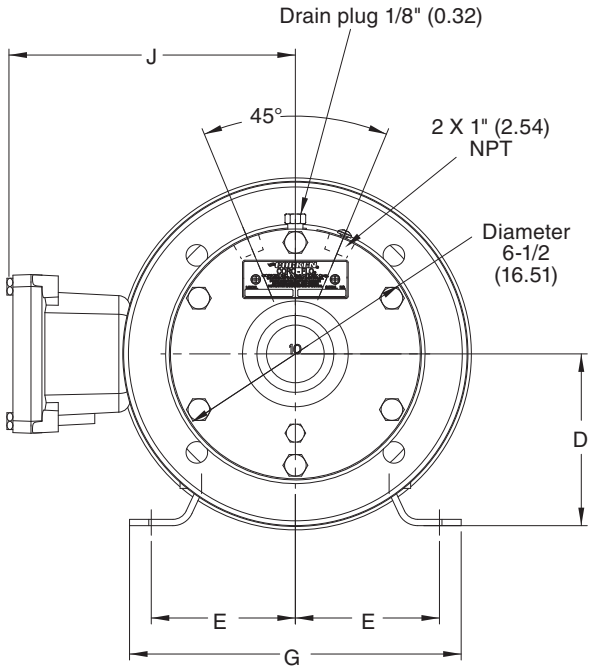




Outline Dimensions - Inches (Centimeters)										
Frame size	Motor	A	B	C	D	E	F	G	H	J
56C	1 hp 1-1/2 hp 1800 RPM explosion proof 2 hp 3600 RPM explosion proof	18-7/8 (47.94)	2-13/16 (7.18)	10-5/8 (27.04)	3-1/2 (8.81)	2-7/16 (6.20)	3 (7.62)	6-1/2 (16.51)	6-3/16 (15.72)	5-5/16 (13.46)
145TC	1-1/2 hp 1800 RPM TEFC 2 hp 1800/3600 RPM TEFC and 1800 RPM explosion proof 3 hp all 3600 RPM	22-1/16 (56.04)	5.940 (15.09)	10-5/8 (27.04)	3-1/2 (8.81)	2-3/4 (6.99)	5 (12.70)	6-5/8 (16.81)	7-3/16 (18.18)	6-15/16 (17.57)
143TC	1-1/2 hp all 3600 RPM	22-1/16 (56.04)	5.940 (15.09)	10-5/8 (27.04)	3-1/2 (8.81)	2-3/4 (6.99)	4 (10.16)	6-5/8 (16.81)	7-3/16 (18.18)	6-15/16 (17.57)

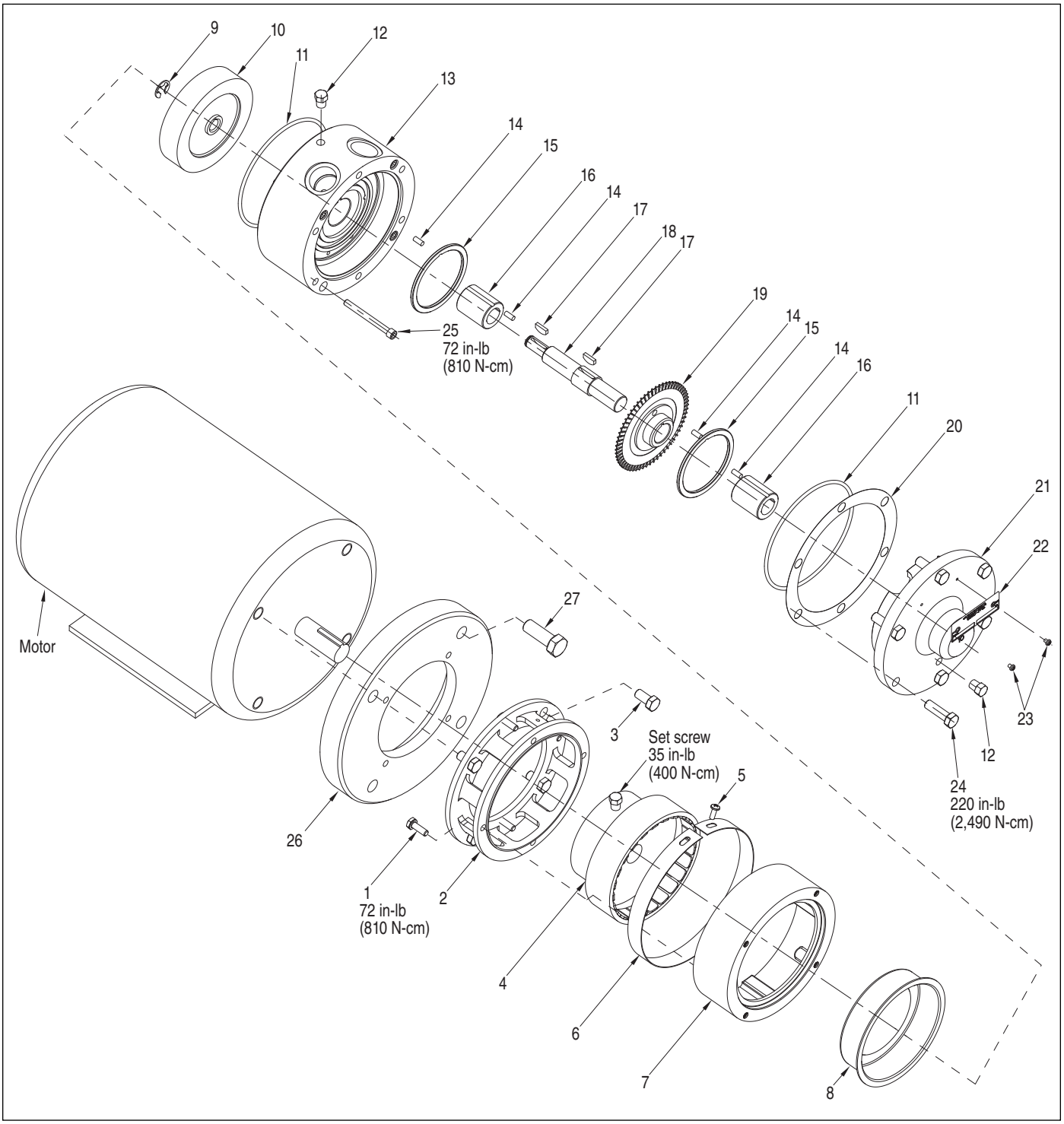
Appendix D—Outline Dimensions for Models MDC10 and MDC12 (large frame)





Outline Dimensions - Inches (Centimeters)										
Frame size	Motor	A	B	C	D	E	F	G	H	J
182TC	3 hp all 1800 RPM	26-11/16 (67.82)	6-1/2 (16.51)	10-3/16 (25.88)	4-1/2 (11.43)	3-3/4 (9.53)	4-1/2 (11.43)	8-5/8 (21.92)	9-3/16 (23.27)	7-1/2 (19.10)
184TC	All 5 hp	26-11/16 (67.82)	6-1/2 (16.51)	10-3/16 (25.88)	4-1/2 (11.43)	3-3/4 (9.53)	5-1/2 (13.97)	8-5/8 (21.92)	9-3/16 (23.27)	7-1/2 (19.10)
213TC	All 7.5 hp	27-3/8 (69.54)	5-7/16 (13.75)	11-1/16 (28.14)	5-1/4 (13.34)	4-1/4 (10.80)	5-1/2 (13.97)	9-1/2 (24.13)	10-1/4 (26.10)	8-1/16 (20.45)

Appendix E—Parts Details for Models MDC10 and MDC12



Appendix E—Parts Details for Models MDC10 and MDC12

Bill of Materials

Ref No.	Part No.	Description	Qty.
1	7001-025NF075E	1/4" - 28 x 3/4" hex head bolt	4
2	6653	Motor spool	1
	6653-1	Motor spool-used with motor adaptor	1
3	7001-037NC075E	3/8" - 16 x 3/4" hex head bolt	4
4	6651-N213T	Drive magnet - N213T frame (Neodymium)	1
	6651-N182	Drive magnet - N182 frame (Neodymium)	1
	6651-N140	Drive magnet - N140 frame (Neodymium)	1
	6651-N56	Drive magnet - N56 frame (Neodymium)	1
	6651-S213T	Drive magnet - S213T frame (Samarium cobalt)	1
	6651-S182	Drive magnet - S182 frame (Samarium cobalt)	1
	6651-S140	Drive magnet - S140 frame (Samarium cobalt)	1
	6651-S56	Drive magnet - S56 frame (Samarium cobalt)	1
5	7012-010SF050E	Pan head phillip 10 - 24 x 1/2" - type F plated	1
6	6701	Safety guard	1
7	6649-X	Magnetic housing assembly	1
8	6650	Containment can (stainless steel)	1
9	6656	Retaining ring	1
10	6652-N	Driven magnet (Neodymium)	1
	6652-S	Driven magnet (Samarium)	1
11	2-249_[a]	O-ring	2
12	6647	Pipe plug - 1/8" NPT (stainless steel)	2
13	6641-10	Pump case (MDC10)	1
	6641-12	Pump case (MDC12)	1
14	6655-12	Lock pin	4
15	6644-CRB	Wear plate (carbon)	2
	6644-TFL	Wear plate (PTFE)	2
16	6643-EXT	Bearing (extended life carbon)	2
	6643 STD	Bearing (standard carbon)	2
	6643-TFE	Bearing (PTFE)	2
17	6648	Drive key	2
18	6646	Drive shaft (stainless steel)	1
19	6645-10	Impeller (MDC10)	1
	6645-12	Impeller (MDC12)	1
20	6642-1	Shim - 0.002" (standard)	1
	6642-1A	Shim - 0.002" (aluminum optional)	1
	6642-2	Shim - 0.003" (standard)	1
	6642-2A	Shim - 0.003" (aluminum optional)	1
21	6640-10	Pump cover (MDC10)	1
	6640-12	Pump cover (MDC12)	1
22	1914-6	Nameplate	1
23	7012-006SF025E	Pan head screw	2
24	7001-037NC125C	3/8" - 16 x 1 1/4" hex head bolt	6
25	7002-025NF250E	Socket head screw	4
26	6657	Motor adaptor used with 182T frame size and larger	1
27	7001-050NC150E	Hex head bolt 1/2" - 13 x 1-1/2" - zinc plated	4

O-ring Code	
A	Buna-N
B	Neoprene®[b]
D	Viton®[b]
E	PTFE
K	Kalrez®[b]

[a] _ denotes O-ring code. See O-ring chart for details.

[b] Registered trademark of the DuPont company.

Appendix F—Troubleshooting Guide

Symptom	Probable Cause	Remedy
No Liquid Delivered	Pump not primed.	Prime pump.
	Motor Incorrectly wired.	Check wiring diagram.
	Air leak in suction.	Locate and repair.
	Rotation direction incorrect.	Reverse rotation.
	Suction and/or discharge valves closed.	Open valves.
	Suction lift too high.	Do not exceed vapor pressure of liquid.
	Magnetic coupling decoupled.	Stop motor, eliminate blockage or jamming and restart. If no blockage exists verify that operating conditions do not exceed capabilities of the pump. If de-coupling persists upon startup, a “soft-start” motor starter may be required to accommodate a fast-starting or oversized motor.
Low Liquid Delivery	Discharge head higher than calculated.	Reduce discharge restrictions e.g.: Open throttle valve.
	Air leak in suction.	Repair leak.
	Rotational speed incorrect.	Check speed and wiring.
	Rotation direction incorrect.	Reverse rotation.
	Suction lift too high.	Increase suction pressure.
	Impeller or housing worn.	Inspect and repair as required.
	Wear plates worn.	Inspect and repair as required.
Low Discharge Pressure	Rotational speed incorrect.	Check Speed.
	Air leak in suction.	Repair leak.
	Air or gas in liquid.	Eliminate air or gas.
	Impeller or Housing worn.	Inspect and repair as required.
	Wear plates worn.	Inspect and repair as required.
Pump Gradually Loses Prime	Air pocket in suction line.	Eliminate pocket.
	Air entering suction line.	Keep suction inlet submerged at all times.
Pump Noisy	Pump worn or damaged.	Inspect and repair as required.
	Air or gas in liquid.	Eliminate air or gas.
Motor runs hot or Overloads	It is normal for motors to feel hot even when not overloaded.	Check the actual temperature of the motor housing with suitable instrumentation. Verify the figures with the motor manufacturer.
	Motor wired incorrectly.	Check wiring diagram.
	Voltage or frequency low.	Correct condition.
	Motor not sized correctly for the flow.	Higher pressures may require more power than the motor is capable of.
	Heavy or viscous liquid being pumped.	Pumping fluids heavier or more viscous than water requires a larger motor.
	Binding internal pump parts.	Inspect and correct condition.

Appendix G—Extended Storage

If your Coro-Flo pump is to be removed from service for some time, the pump must be protected, as propane, butane and anhydrous ammonia all leave the metal “bare” and open to corrosion. Piping and tanks not in service should also be protected, as the rust that forms can destroy the pump’s seals almost immediately after startup.

1. Fill or thoroughly flush the pump with a light rust-inhibiting oil. (If the pump is flushed with oil, placing some desiccant packets inside the pump will provide added protection.)

2. Plug all pump openings.

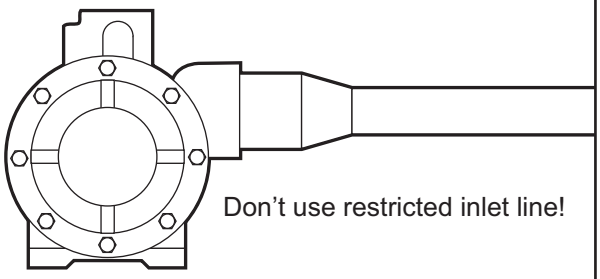
3. Store in a dry location.

4. Before placing the pump back into service, drain the oil and remove any desiccant packets.

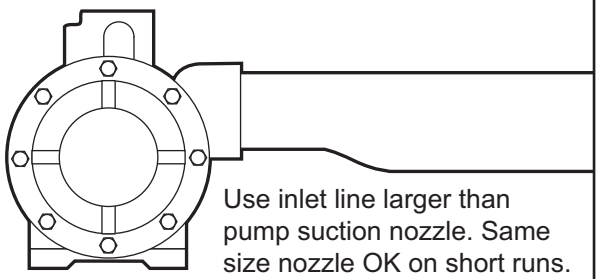
5. Refer to “Startup and Operation of Your Coro-Flo® Pump” on page 10.

Appendix H—Aboveground Installation/Piping Instructions

1 No!

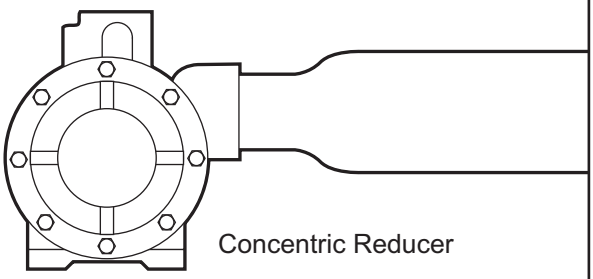


2 Yes!

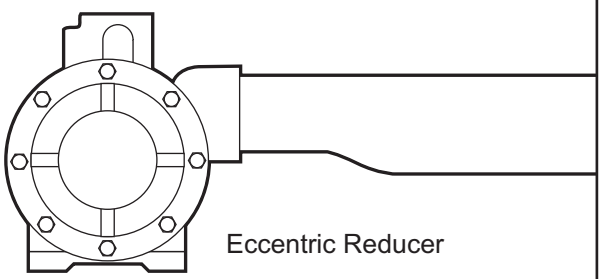


Pressure drop caused by restriction in suction line will cause vaporization and cavitation.

3 No!

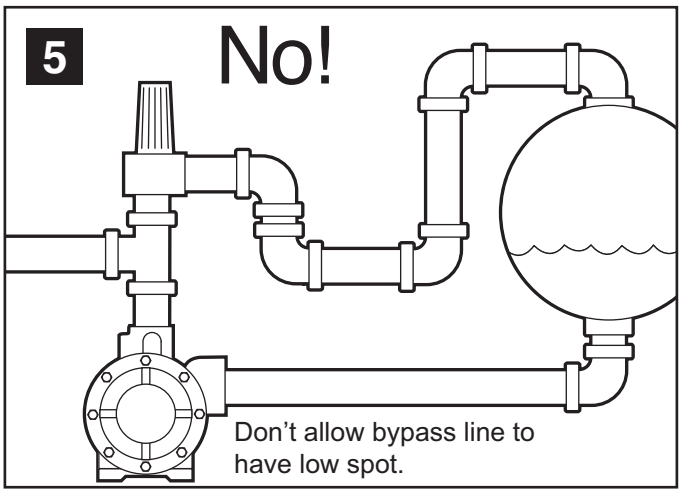


4 Yes!

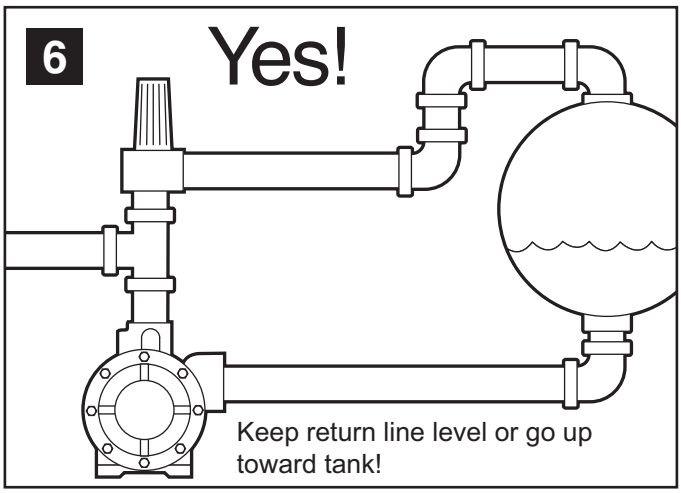


An eccentric reducer should always be used when reducing into any pump inlet where vapor might be encountered in the pumpage. The flat upper portion of the reducer prevents an accumulation of vapor that could interfere with pumping action.

5 No!



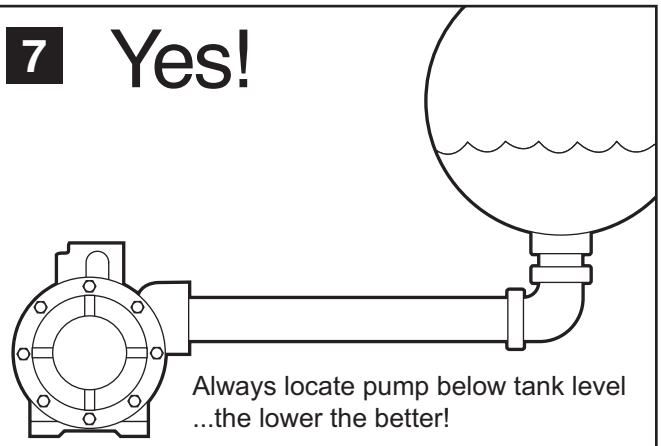
6 Yes!



Low spots in bypass line can collect liquid which prevents normal vapor passage for priming purposes just like the P trap in the drain of a kitchen sink. This is not a problem for bypass lines where vapor elimination is not required.

Appendix H—Aboveground Installation/Piping Instructions

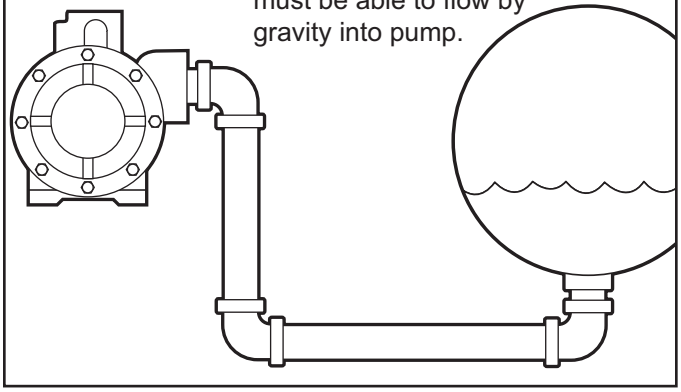
7 Yes!



Always locate pump below tank level ...the lower the better!

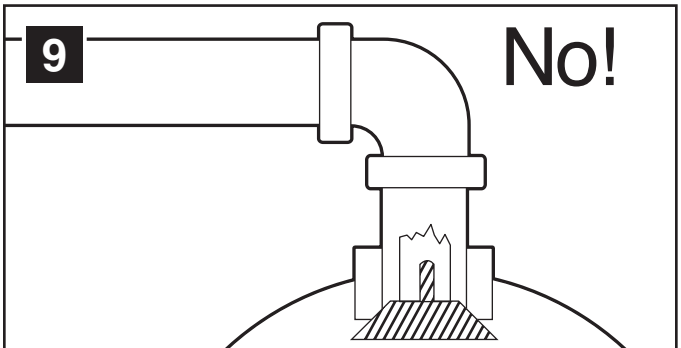
8 No!

Never locate pump above level of liquid feeding pump. Product must be able to flow by gravity into pump.



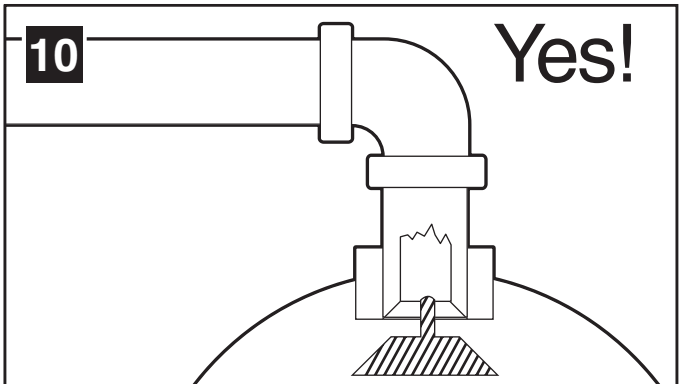
Since liquefied gases boil when drawn into a pump by its own suction, the pump must be fed by gravity flow to give stable, trouble-free operation.

9 No!



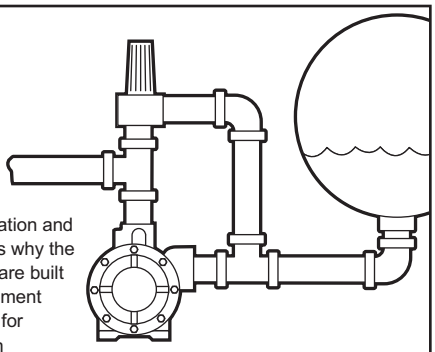
Back Check Valve
Positive closure of back check valve prevents proper vapor return for pump priming.

10 Yes!



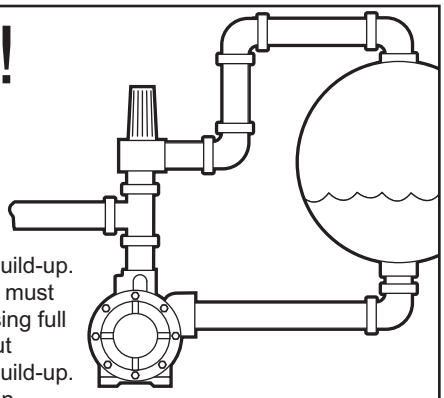
Excess Flow Check Valve
Necessary for proper vapor elimination when using priming type bypass valves.

11 No!



Don't pipe bypass line back into suction piping! Heat Building in recirculated products causes flashing of liquid to vapor with immediate cavitation and ultimate dry-running. This is why the bypass relief valves which are built into many positive displacement pumps should not be used for normal bypass action when handling liquefied gases. The internal valve should be considered to be a back-up safety relief in in addition to a back-up safety relief in addition to a back-to-tank bypass valve and should be set to relieve at pressure 10 to 20 psi higher than the working bypass. Some built-in bypass valves have the capability of being piped back-to-tank so check with the pump manufacturer.

12 Yes!



Always pipe bypass back to tank! Make sure bypass line is large enough to handle full pump flow without excessive pressure build-up. Note that bypass line must be capable of bypassing full pump capacity without excessive pressure build-up. High pressure rise can cause bypass valve to chatter and vibrate.

Solutions beyond products...

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