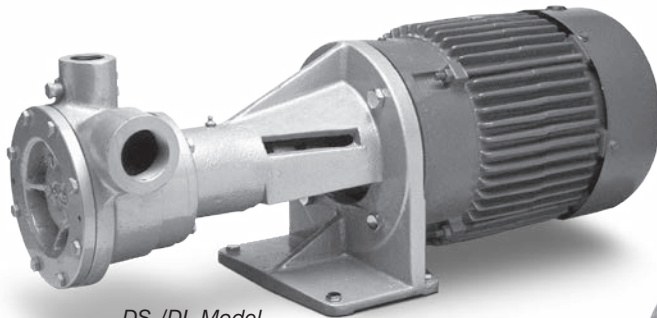
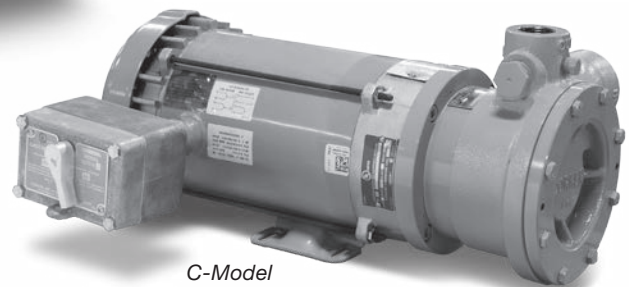


# Installation, Operation & Maintenance Manual

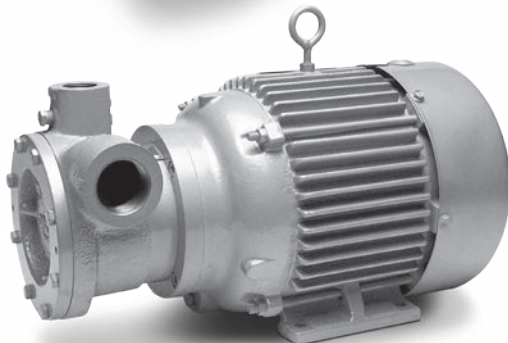
## Regenerative Turbine Coro-Flo® Pumps Models C, CF, DL, DLF, DS, DSF, F, and FF Pump Sizes 9, 10, 12, 13, 14, and 15



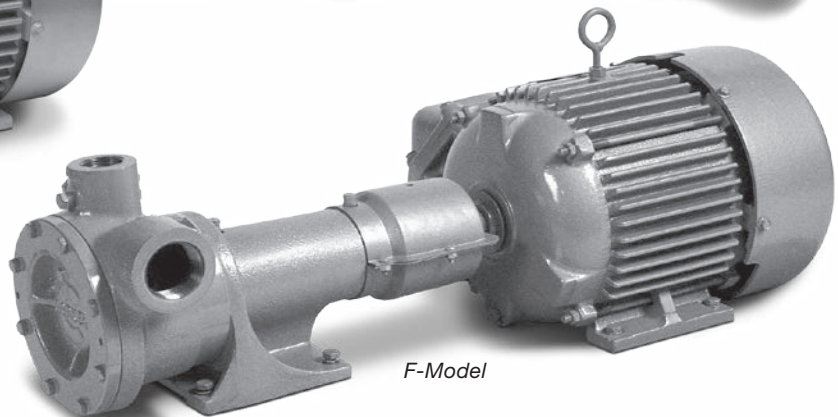
*DS-/DL-Model*



*C-Model*



*C-Model*



*F-Model*

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**

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## 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 \_\_\_\_\_

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## Principles of a Regenerative Turbine Coro-Flo® Pump

The Corken Coro-Flo® Pump is a special type of pump known as a turbine or regenerative pump. The liquid flows into the inlet nozzle and into the passageway on each side of an impeller (the rotating element) and is recirculated constantly between the vanes or teeth of the impeller and this passageway as the impeller rotates. The fluid makes a complete revolution in the pump case and is diverted out the outlet nozzle. The horsepower required to drive the pump increases as the differential pressure increases, but the capacity decreases at the same time. Differential pressure is the difference between the pressure at the inlet of the pump and at the outlet of the pump.

The impeller is the only moving part and has no contact with the casing. Consequently, practically no wear occurs to the impeller, even when pumping volatile liquids such as LP-gas or ammonia which have little lubricating qualities.

## Exclusive Features of Your Coro-Flo® Pump

The pumping of volatile liquids is one of the most difficult of all pumping jobs. Unlike other pumping operations, more attention must be given to the design, manufacture installation, and operation of the pump.

In addition to being a pump type especially suited for handling volatile liquids, your Coro-Flo® pump has a number of features which help to make it more easily operated and maintained.

- Available with three mounting options: close-coupled (C-model), frame-mounted (F-model), and direct-mounted (D-model).
- Underwriters' Laboratories, Inc. have tested and inspected the C-model pumps and have listed them for use in the handling of LP-gas and ammonia fluids. The nameplate on the pump shows the UL label.
- Ductile iron, the metal with the strength of steel, has been used in the manufacture of this pump for parts under pressure of the liquid.
- 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.
- The mechanical seal assembly may be replaced easily by removing the cover and the impeller and without disturbing the piping or driver. No special tools are needed.

- The pump nozzles may be rotated into four different positions, 90 degrees apart, if desired.
- A bypass connection, 3/4" pipe thread, has been located on the outlet nozzle to make the piping of the pump more simple.
- Pressure gauge connections, 1/4" pipe thread, have been located on the outlet nozzle.
- Motors on models C10, C12, C13 and C14 are explosion-proof, Class I, Group D - UL and CSA listed. The C10, C12 and C13 motors are all single phase. 60 Hertz (50/60 Hertz on C13 only), 3450 RPM, 115/230 volt. The C14 motor is three-phase, 60 Hertz, 3450 RPM, 230/460 volts. Corken provides two manual motor starters for models C10, C12 and C13. One is motor-mounted and the other is wall-mounted. These motors (after pump serial number TS185540) are provided with a conduit seal in the 3/4" NPT rigid galvanized steel nipple, fulfilling the 1996 requirement of NFPA 70-NEC, paragraphs 501.5.a.1 & 3. Separate motor starters with overload protection must be provided for the model C14 and all F series pumps.

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# Chapter 1—Installation of Your Corken Coro-Flo® Pump

## 1.1 Location

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 instructions in Appendix H illustrate methods proved by hundreds of installations. Your own needs may require some slight variations, but they must be slight, and no compromise made.

If it is desirable to rotate the nozzles of the pump to a new position, remove the four cap screws connecting the pump case to the motor or the frame. Be careful to do this without moving the case away from the motor or frame; otherwise, the mechanical seal may be damaged.

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.

### Pump Weights

Model No.	Weight
C10	76
C12	86
C13	126
C14	150
DL9-DL15	62
DS9-DS15	52
F9-F15	48
Add 6 lbs for 300# ANSI flanges	

## 1.2 The Inlet Should Include the Following

1. The tank excess flow valve should have a flow rate of 1-1/2 to 2 times the capacity of the pump. Do not use an Excess Flow Valve (EFV) without knowing its flow capacity.
2. The tank shutoff valve should be an angle valve or a free flow type – not a standard globe valve.
3. A strainer of the “Y” type, with 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.

4. A flexible connection should be used on the pump inlet or outlet to care for piping strains.
5. Unions must be installed near the pump inlet and outlet nozzles.
6. An eccentric swage should be used at the pump inlet nozzle to change line size (flat side up, to avoid vapor formation.)
7. The inlet line must be level or slope downward to the pump.

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

## 1.4 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.

For more piping tips, see Appendix H. For a discussion of pumping from underground tanks see the operation section and Appendix I.

## 1.5 Pump Foundation—F-Models

Every pump deserves a firm, neat concrete foundation (see figure 1.5). There are many ways to construct a foundation, and the example in figure 1.5 is only a suggestion. The important features are to make the foundation level, and deep enough to get below the frost line for your locality. See Appendix D for outline dimensions.

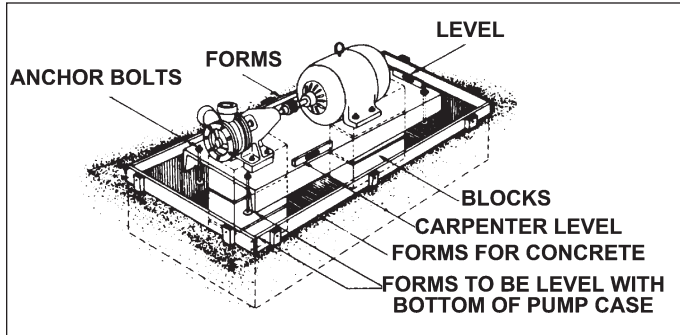


Figure 1.5

## 1.6 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 1.6.

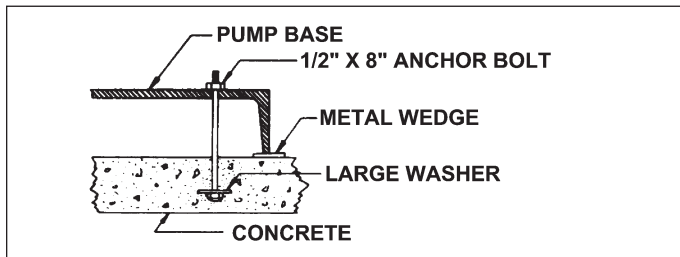


Figure 1.6

## 1.7 Coupling Alignment—F-Models

The coupling alignment must be near perfect to give quiet, long life service to the pump and driver. **The pump and driver shafts are carefully aligned at the factory but should always be checked after the pump is installed and before the initial operation.**

Lay a straight edge across coupling halves, top, and side; both positions must line up to be correct (figure 1.7).

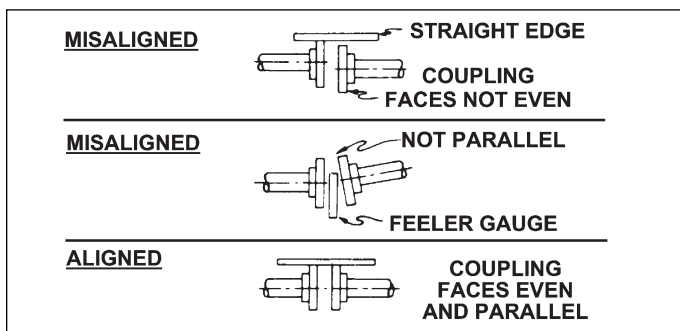


Figure 1.7

If misalignment exists, adjust the shims between the pump base and the foundation until exact alignment is accomplished.

## 1.8 Back-up Wrench

To keep from breaking the pump nozzle or springing the pump out of alignment, always use a back-up wrench as shown in figure 1.8.

Use the proper wrench size, and be sure the pipe threads are clean and evenly doped with the proper thread seal for the service. Avoid using excessive pipe dope because it may enter the pump and damage the mechanical seal.

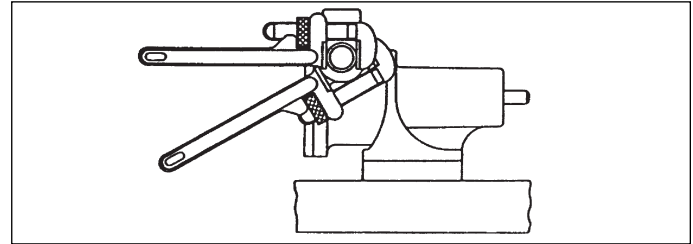


Figure 1.8

## 1.9 Driver Installation

The wiring of your electric motor is extremely important and must be done by a competent electrical contractor. The wire size charts on pages 7 and 8 indicate 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.

With explosion-proof motor applications in humid climates, the normal breathing and alternating temperatures of the motor (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.

Engine drivers pose a special consideration. The manufacturer's instructions must be followed. When the Coro-Flo® Pump is equipped with an engine from the factory, the engine speed should normally not exceed 3600 rpm. Excessive engine speed will overload the engine and cause early failure. The engine loses 3% of its power for every 1000 feet above sea level, so if your installation is at a higher altitude than normal, consult the factory.

# 1.10 Wire Sizing Chart—C-Models

Model	Switch Types	Motor Part No.	Hp	Phase	Voltage	Approximate Full Load Amperage	Minimum Wire Size, AWG Length of Run in Feet			Heater Element Part No.	Wiring Connections	
							0-100	to 200	to 300			
C9 C10	S-10 SM-10	2555 (Obs.)	3/4	1	115 230	10 5	12 12	8 12	6 12	2574 (P28)	<p>115V 2277-X1 or 2277-X2 Switch Assy</p>	<p>208-230V 2277-X1 or 2277-X2 Switch Assy</p>
C10 C12	S-20 SM-20	2556 (Obs.)	1	1	115 230	18 9	8 12	6 12	4 10	2610 (P32)	<p>115V 2277-X1 or 2277-X2 Switch Assy</p>	<p>208-230V 2277-X1 or 2277-X2 Switch Assy</p>
C10 C12 C13	—	3760 (Rep. by 4261)	2	1	115 230	24 12	8 12	4 10	2 8	4250 (P36)	<p>115V 2277-X1 or 2277-X2 Switch Assy</p>	<p>208-230V 2277-X1 or 2277-X2 Switch Assy</p>
C10 C12 C13	S-30 SM-30	4261	2	1	115 230	20 10	8 12	4 10	2 8	No overload	<p>115V 2277-X3 or 2277-X4 Switch Assy</p>	<p>230V 2277-X3 or 2277-X4 Switch Assy</p>
C14	—	2557 <sup>a</sup>	3	3	230 460	10 5	12 12	12 12	12 12	—	<p>208-230V</p>	<p>460V</p>

<sup>a</sup> Pump must rotate in the direction shown on pump case. If not, switch any two of the three incoming 3 phase lines.

**Notes:**

1. Green wire, if present, should be grounded.
2. For Coro-Flo units with oversized motors, follow the wiring information for the appropriate motor and operating voltage.
3. Any differences on the motor nameplate should take precedence over the data presented on this sheet.
4. All electrical work should be done by a qualified electrician familiar with local codes.

## 1.11 Wire Sizing Chart—DL-, DLF-, DS-, DSF-, F-, and FF-Models

Motor				Recommended wire size, AWG <sup>1</sup>		
Hp	Motor Phase	Volts	Approximate Full Load Amperes	Length of Run (ft)		
				0–100	to 200	to 300
3	1	115	34.0	6	4	2
		230	17.0	12	8	8
	3	230	9.6	12	12	12
		460	4.8	12	12	12
5	1	115	56.0	4	1	1/0
		230	28.0	10	6	4
	3	230	15.2	12	12	10
		460	7.6	12	12	12
7-1/2	1	230	40.0	8	6	4
	3	230	22.0	10	10	8
		450	11.0	12	12	12
10	3	230	28.0	8	8	8
		460	14.0	12	12	12
15	3	230	42.0	6	6	6
		460	21.0	10	10	10
20	3	230	54.0	4	4	4
		460	27.0	8	8	8
25	3	230	68.0	2	2	2
		460	34.0	6	6	6
30	3	230	80.0	1	1	1
		460	40.0	6	6	6
40	3	230	100.0	2/0	2/0	2/0
		460	52.0	4	4	4
50	3	230	130.0	3/0	3/0	3/0
		460	65.0	2	2	2

<sup>1</sup> Based upon 3% voltage loss copper wire type TW. Single phase motor calculations are based on two times distance.

## Chapter 2—Operation of Your Coro-Flo® Pump

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 in section 1.9 Driver Installation.)
5. Start the pump and circulate 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.

### 2.1 Filling New Cylinders and Tanks

All new containers are full of air and since air will not liquefy under reasonable filling pressures, it must be purged. To assure relatively easy filling and the proper gas supply to burners and carburetors, purging air from new containers is essential.

Some cylinders are difficult to fill because they are equipped with a fill tube that extends down into the liquid portion of the container. If possible, these cylinders should be refitted, so the incoming liquid enters the vapor section of the cylinder. If refitting is impossible or impractical, rock the cylinder as it is being filled so that liquid will splash up into the vapor section – this will help keep the cylinder filling pressure down to a reasonable limit. Don't blame your pump for not filling a small container! A properly fitted cylinder and filling manifold or connection will permit filling with not more than 50 to 60 psi differential pressure.

### 2.2 Pumping From Underground Tanks

The pumping of boiling liquids, like LPG and other liquefied gases, offers a unique set of challenges for underground tank installations. The Coro-Flo pumps give superior performance in these applications if the system is well designed to function with the pump in mind. Liquefied gases are stored at exactly their boiling points. Any increase in temperature, as well as any decrease in pressure, will cause the product to boil and form vapor. To minimize the amount of vapor formation at the pump's suction, the design of the suction piping system is an important aspect. For boiling liquids, the net positive suction head available (NPSHA) of an installation is reduced to the height of the liquid level above the pump minus the frictional losses. For an underground tank where the pump is located above the liquid level, the net static suction head becomes the net suction lift, which is negative not positive. This means that for aboveground pumps pumping from underground tanks, the installation NPSHA will always be negative, and the pump will always handle vapor in the liquid stream.

The Coro-Flo regenerative turbine pumps are designed to handle some vapor without the damaging effects of cavitation. They are designed with a floating impeller which minimizes wear and noise in these types of applications. Properly installed, Coro-Flo pumps will provide excellent service in underground tank applications.



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## 2.3 Installation Design Criteria For Underground Tank Applications

Minimize frictional losses:

- Pump should be as close as possible to the tank's liquid outlet connection
- Use a minimal number of fittings and elbows
- No strainer is necessary since the tank itself acts as a gravity collector
- Use full-port ball valves, or low restriction valves
- Use at least the minimum piping sizes shown in Appendix I
- Minimize the net static suction lift to approximately 14 feet (4.3 M)
- Use vapor eliminator valves (Corken B166 by-pass valves have this feature)
- Use back-pressure check valves downstream of the pump
- Vent the vapor eliminator on the liquid meter back to the tank, not to the by-pass line
- Limit the capacity of the pump to a maximum of 1.5% of the tank's capacity or a 1000 Gal (3,785 L) tank, limit the capacity of the pump to 15 gpm (56.8 L/min)

See Appendix I for piping diagram.

## Chapter 3—Preventative Maintenance for Your Coro-Flo® Pump

The only maintenance necessary on this pump is to lubricate the bearings about once every six months. The bearings have been lubricated at the factory for the initial operation.

### Lubrication for models C10, C12, C13 and C14:

These models are equipped with lifetime lubricated bearings.

### Lubrication for models DL, DLF, DS, DSF, F, and FF in pump sizes 9, 10, 12, 13, 14, and 15:

There are two bearings on the pump frame of these models that require lubrication. In addition, if the pump is driven by a motor there may be two bearings on the motor to lubricate at the same time you lubricate the pump bearings. If the driver is an engine, follow the engine manufacturer's instructions.

Lubricating the ball bearing is simple. Use ball bearing grease only to lubricate the pump shaft bearing – nothing else will do.

**Older models without a grease zerk:** Remove the plug over the bearings, add a small amount of grease. With the plug removed, run the pump and driver for several minutes. The bearings will pump out the excess grease. Replace the plug.

**Newer pump models with a grease zerk:** Remove the lubricap covering the grease zerk and attach a grease gun to the grease zerk. Add a small amount of grease and cover the grease zerk with the lubricap.

## Chapter 4—Repair Service on Your Coro-Flo® Pump

After a long service life, repairs are limited to replacing the impeller or mechanical seal.

The only wearing 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 one 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 (see step 32 in the seal replacement instructions).

This 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.

# Chapter 5—Coro-Flo® Seal Replacement Instruction

## 1. Please note these important Safety Tips

Periodic inspection and maintenance of the pump is essential.

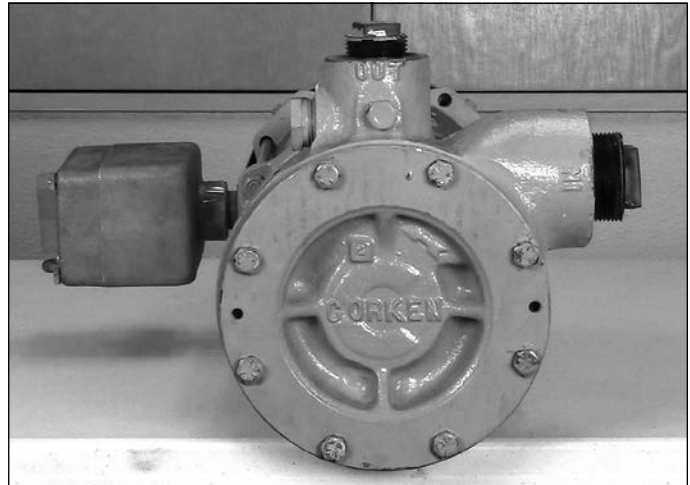
Inspection, maintenance, and installation of the pump must be performed by trained personnel.

All procedures must comply with the Corken Installation, Operation & Maintenance manual, applicable local codes and safety standards.

The transfer of toxic, flammable, or explosive substances is always at the user's risk.

Equipment should only be operated by qualified personnel according to applicable codes and safety standards.

Listed below are some written instructions for replacing the seal assembly on all C-, DL-, DLF-, DS-, DSF-, F-, and FF-model regenerative turbine pumps. A video presentation is available on Corken's website (see Resources/Training Videos) and YouTube channel.



3. Note the direction of the rotation arrow on the front of the pump cover. This is important to know when installing a three phase motor such as the one used on model C14 and all DL-, DLF-, DS-, DSF-, F-, and FF-models. The motor can be wired to turn in a clockwise or counterclockwise direction, so make sure it is wired to match the direction of the rotation arrow when installing a new motor. This wiring instruction does not apply to the small C model motors of 2 horsepower or less since they are wired to run one direction only.



2. The model number of the pump is located on a name plate on top of the pump casing.

If there is not a nameplate on the unit, there is a stamped number on the cover and on the back of the casing that indicates the model number.



This pump is a model C12. 9 would be a model 9, 0 is a model 10, 2 a 12, 3 a 13, 4 a 14, and 5 is a model 15.



5. The boxed seal replacement kit includes:

- Important Instructions
- The stationary metal seat
- The rotating carbon with the seal sleeve assembly and spring

- The case cover O-ring
- The rear housing O-ring
- The follower and follower O-ring that seals to the shaft
- The impeller woodruff key
- The seal locking pin
- The seal clamp ring and 3 screws
- And, a .002 red and .003 green cover shim for adjusting impeller clearance



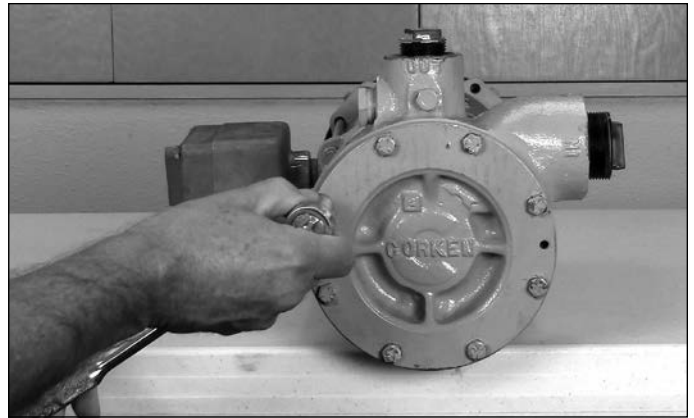
6. The tools required for this procedure are:

- #2 phillips screwdriver
- #2 flat screwdriver
- 1/2" box wrench or 1/2" socket and ratchet
- Flat metal file
- 12" adjustable wrench
- O-ring pick
- Diagonal or side cutting pliers
- 300 to 400 grit emery cloth and scotch-brite
- You will also need a can of spray lubricant or light oil and plenty of clean shop towels

7. Before you begin servicing the pump, make sure the pump and system have been depressurized!

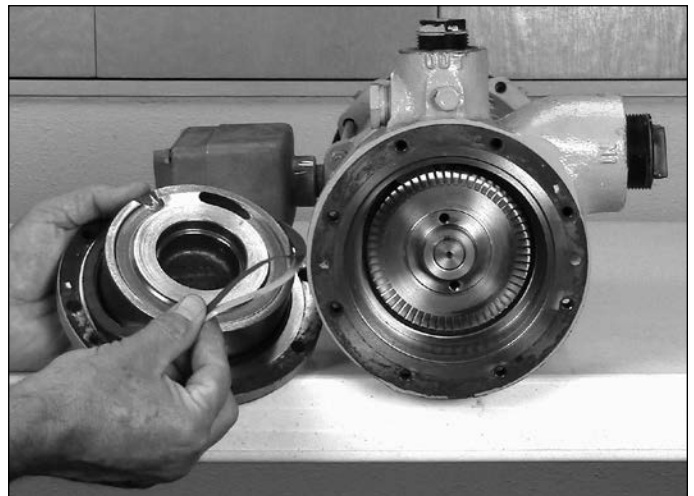
The seal replacement is an easy procedure so it's not necessary to remove the pump from the piping.

Keep the work area, tools and parts clean.

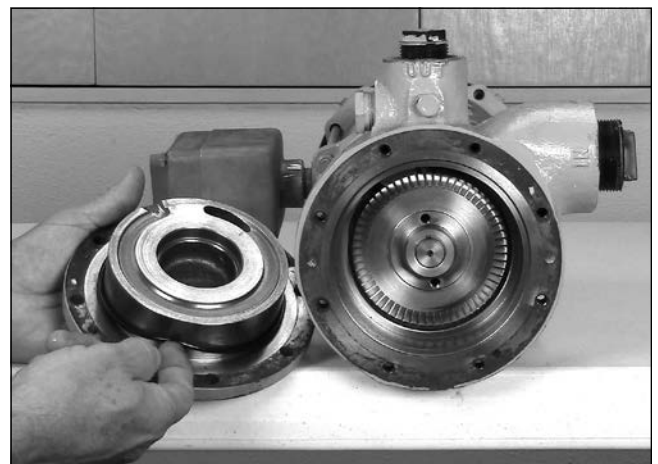


8. Begin by removing the bolts from the pump cover with a 1/2" wrench or socket.

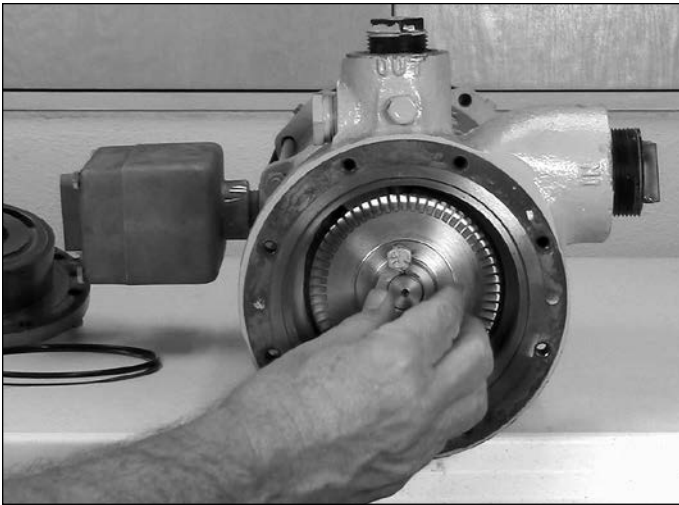
If you can't remove the pump cover by hand, use the cover bolts in the bolt holes located at the three and nine o'clock position as pull or jacking bolts to help remove the cover.



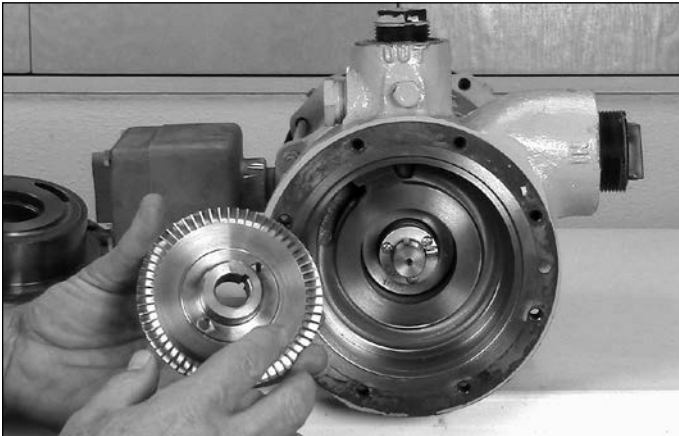
9. With the cover removed, note the number and color of shims used for impeller clearance.



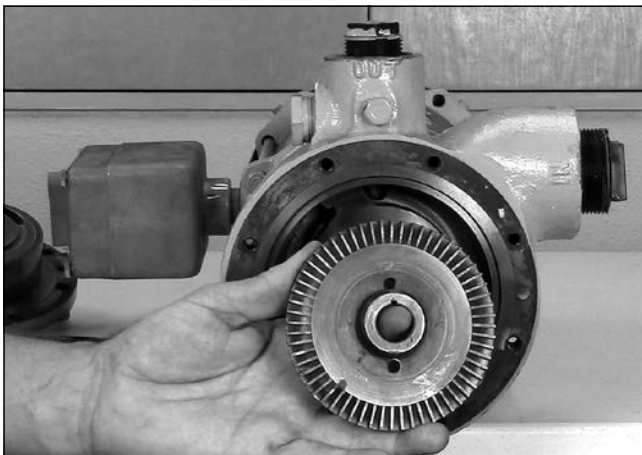
This is the O-ring that seals the cover to the casing.



10. Next, remove the impeller by pulling it off the shaft. If it is stuck, insert an existing bolt from the pump cover into one of the threaded pulling holes located on the impeller. Remove the impeller by pulling on the bolt.

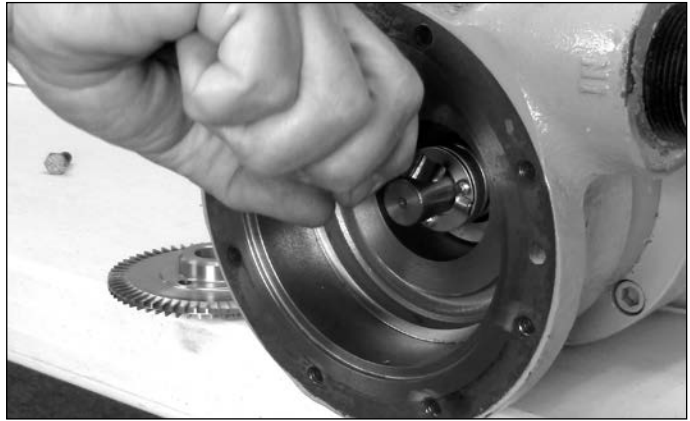


11. It's okay if there is some light scoring or scratches on the face of the impeller. As long as it can be shimmed for proper clearance, the impeller may be re-used. However, if any fins are damaged or broken, it will need to be replaced. The matching model number is stamped on the back of the impeller as well.



This is an example of an impeller that has discolored as a result of heat caused by dry-running. This is the usual

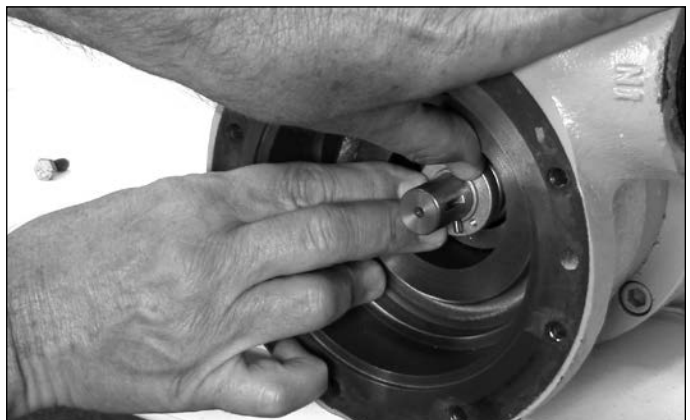
cause of seal failure and excessive impeller wear. This impeller is not damaged. As long as it can be shimmed for proper clearance, the impeller may be re-used.



12. Next remove the woodruff key. With a pair of diagonal cutting pliers, grab the key firmly and slowly roll up. DO NOT drive the key out from the top with a screwdriver. You may bend the shaft which will cause repetitive seal failure.



13. Before you remove the seal clamp ring, prevent the pump shaft from rotating by inserting a screwdriver between the fan blades and through the fan guard at the rear of the motor. Remove the sleeve screws and clamp ring using the Phillips screwdriver. A magnetic screwdriver can make this a bit easier.



14. Remove the screwdriver from the fan guard at the rear of the motor. To remove the locking pin, rotate

the shaft so the locking pin is in the 6 o'clock position. Compress the seal assembly with your thumbs and the pin should drop out. A light press with a screwdriver may help if the seal assembly does not move back.



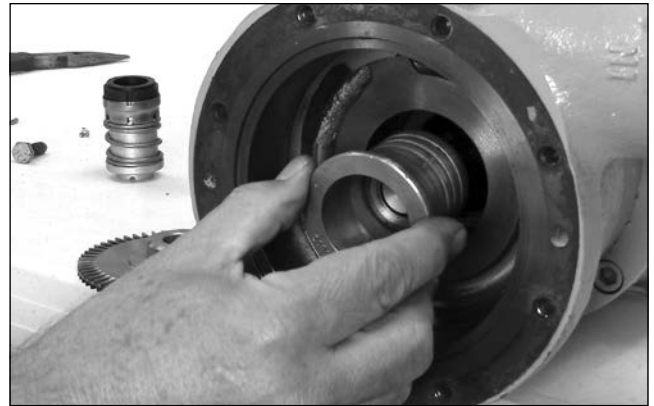
15. Reach in with your fingers and remove the sleeve, follower, and follower O-ring. If there are any nicks or burrs on the shaft, removal may be difficult. Push the assembly back in and use emery cloth to smooth and polish the shaft. Repeat until the sleeve assembly slides out easily.



16. After you remove the assembly note the follower and follower O-ring. The O-ring is compressed by the follower when you tighten the seal clamp ring with the 3 screws. It is critical that the shaft is smooth and clean for a positive seal.



17. To access the seal housing, remove the nameplate located at the top of the pump casing and insert a flat blade screwdriver in the opening.



Pry the seal housing forward with the screwdriver and remove the housing from the pump.



18. After the seal housing has been removed, locate and remove the shims behind the flange of the seal housing. Make sure no shims have stuck to the inside of the casing. Note the number of shims and set aside. These shims will be re-used during reassembly and are critical for proper seal compression.



19. Remove the metal stationary seat inside the seal housing by placing the seal housing face down on a flat work surface. Lightly tap the seat with a flat blade screwdriver until it drops out. Or, using a small flat blade screwdriver, gently pry the seat, rotating the housing, until the seal drops out.



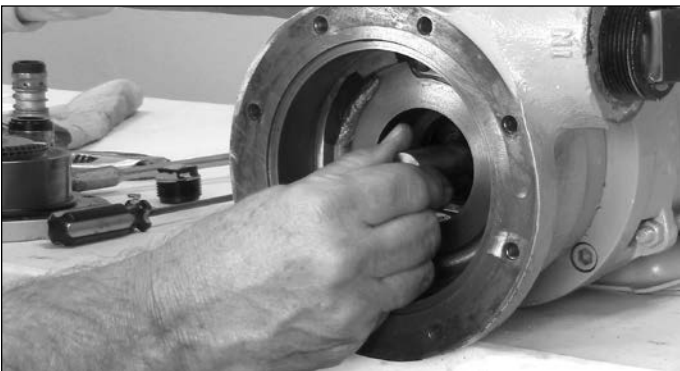
20. Clean the inside and outside of the seal housing with a spray lubricant or light oil and set aside. Polish with emery paper if needed.



21. Next remove the rear casing O-ring with an O-ring pick.



22. Clean the groove in the casing by rinsing with a spray lubricant.



23. At this time, rotate the shaft with your fingers. If there is any roughness in the bearings or it slides in and out, the motor or frame bearing may need to be replaced.



24. Before you reassemble the pump, now is a good time to clean the front of the casing and the back of the cover mating surfaces. Gently file or use emery cloth to remove paint, rust and dirt from the surfaces. Then, make sure you have cleaned all parts and surfaces with a spray lubricant or light oil.



25. The first step of reassembly is to install the new O-ring in the back of the pump casing. Begin by feeding the O-ring into the groove and work it around with your fingers or a flat head screwdriver until it is fully seated. Spray with a light lubricant and wipe clean. Lubricating the O-ring will help with the installation of the seal housing.



26. Next, install the new seal seat inside the seal housing.



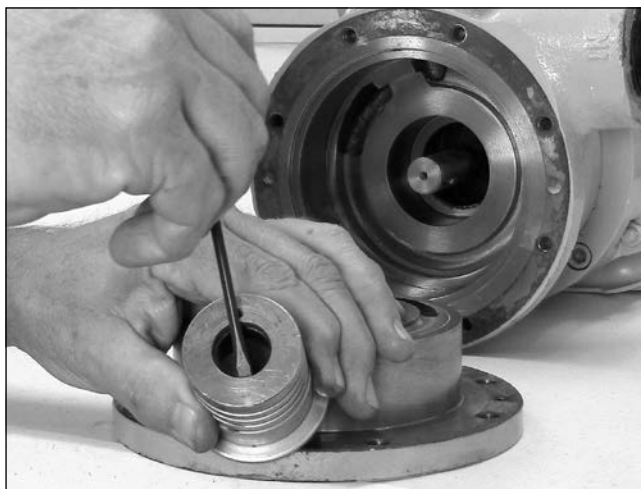


There is a locating pin in the back of the seal housing that must align with the notch in the back of the seal seat.

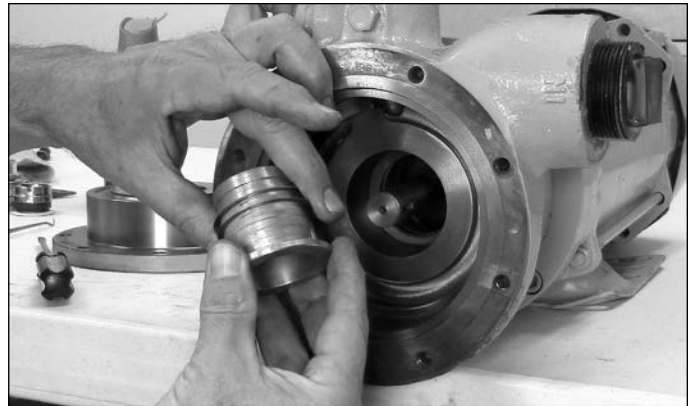
To aid the installation process and prevent damage to the seal seat, we recommend using a plastic handle screwdriver. With the notch facing up, lubricate the seal seat with light oil or spray lubricant and place on top of the plastic handle screwdriver. Place the seal housing over the seal seat and visually align the locating pin with the notch in the seal seat.



Tap the housing down with the palm of your hand to secure the seat in the housing.



If the pin is misaligned during the process, you may use a small screw driver to align the notch of the seal seat with the pin. Again, tap the seal housing down with the palm of your hand to make sure the seal seat is secure.



27. Reinstall all the metal shims, that were removed during disassembly, behind the flange of the seal housing.



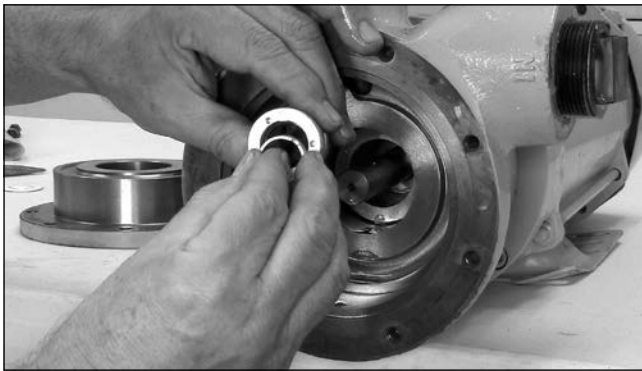
Slide the seal housing over the shaft and press into the pump casing. Make sure the seal housing slides through the O-ring and is seated to the back of the pump casing. To confirm the seal housing is seated completely, you may lightly tap the outer flange surface on the front of the seal housing with a screwdriver. Do not tap on the seal seat located inside the housing.



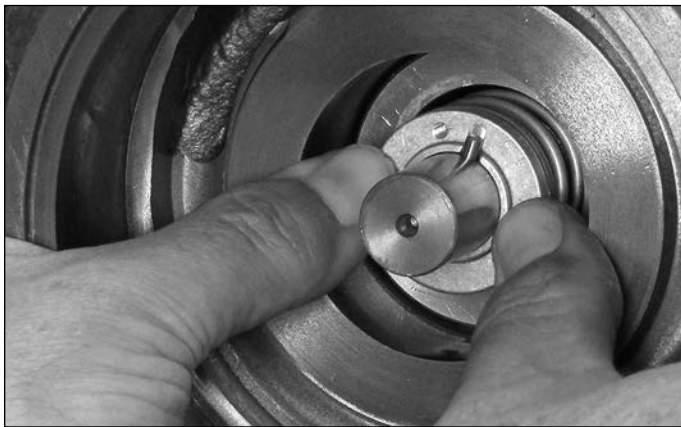
28. The seal assembly will need to be assembled before it can be installed in the seal housing. Remove the carbon from the retainer and apply lubricant to the inner O-ring. Place carbon back on the retainer. Align notches on the retainer with locators on the spring seal assembly and press into place.



Next, insert the follower O-ring and the follower into the seal sleeve.



Make sure the follower notch aligns with the notch on the seal assembly. Before installing, clean and lubricate the shaft and surfaces again.



29. Rotate the pump shaft until the locking pin location is at 12 o'clock. Insert a screwdriver into the fan guard to lock the shaft in place. Slide the seal assembly over the shaft and align the seal locking pin notch with the pin location on the shaft. Compress the seal assembly spring with both thumbs to expose the locking pin hole on the shaft. Install the locking pin into the hole on the pump shaft. Make sure it is seated in the locking pin notch on the seal assembly. There should be some clearance behind the pin when you compress the seal assembly. And, enough spring pressure to hold the pin in the notch on the seal assembly.



30. Next, install the seal clamp ring with three screws using the Phillips screwdriver. A magnetic screwdriver is helpful if available. Install all three screws before tightening. Then tighten the screws evenly. Do not over tighten or break the screws.

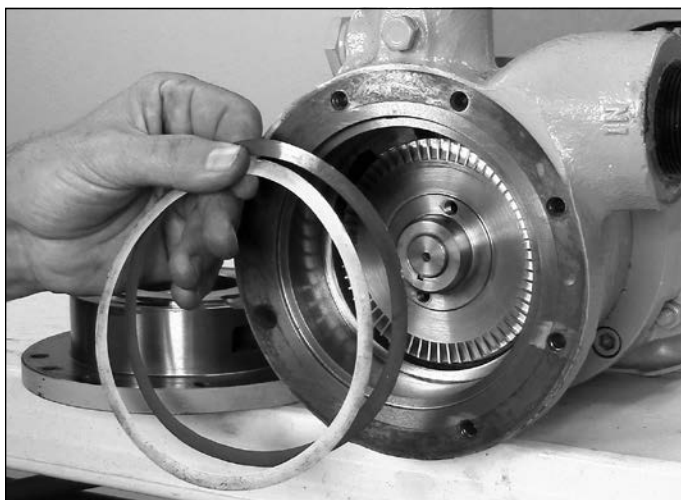


31. Remove the screwdriver from the fan guard and rotate the shaft until the shaft key-way is at the 12 o'clock position. Reinsert the screwdriver into the fan guard to secure the shaft. Align the woodruff or impeller key into the center of the shaft key-way. Using an adjustable wrench, apply pressure to the key by gently rocking the wrench up and down on the shaft while tightening the wrench. Continue until the key is firmly seated and flat in the key-way. Be careful to not damage or score the shaft.





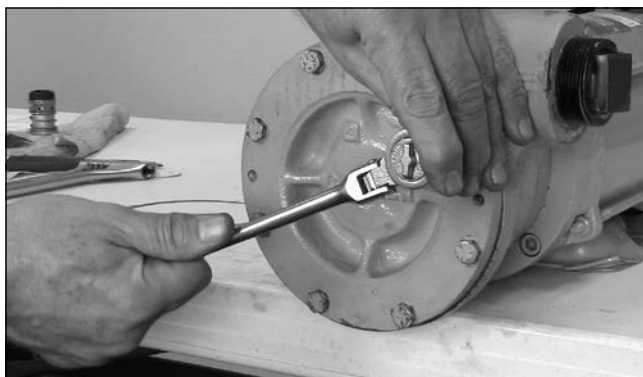
Now, install the impeller. If the key has been properly installed, the impeller should slide smoothly on the shaft and go all the way to the back of the casing.



32. Impeller side clearance or float is set with the .002 red and .003 green cover shims.

Caution: Use the minimum amount of shims to achieve impeller clearance for maximum pump performance.

As the impeller wears, it may be necessary to remove one of the shims to obtain the proper clearance. If your pump has been in the field for a while, start the shimming process by installing the cover O-ring with the green shim only. Make sure the mating surfaces of the pump casing and the cover are perfectly clean. Adding a little lubricant will hold the shim in place.



Attach the pump cover making sure the Corken name is level with the casing and cross-tighten with four of the cover bolts. Rotate the shaft by inserting a screwdriver in the fan guard and rotating the fan blade. If the shaft does not spin freely with one green shim, add the red shim for additional clearance.

Install and tighten the pump cover bolts evenly in a crisscross pattern.

Rotate the pump several times to ensure there is no rubbing or binding and to align and seat the seal assembly.



33. Now, close and secure the name plate on top of the pump casing.

This completes the seal replacement procedure for all C-, DL-, DLF-, DS-, DSF-, F-, and FF-model Coro-Flo regenerative turbine pumps. If the pump is going back into service, slowly pressurize with vapor. This can be accomplished by slowly opening the bypass return line on most systems.

If the pump is placed into short or long term storage, close all openings and partially fill the pump with some light oil to protect against rust and corrosion.

For intermittent duty, the frame bearings generally require lubrication every three months.

However, continuous duty operations may require monthly lubrication.

Corken recommends only using a MIL-G-10924C ball bearing grease, with a temperature rating of -50°F.

# Appendix A—Model Number Identification Code and Available Options

## C-Model (Close-Coupled) Regenerative Turbine Coro-Flo® Pumps

All Coro-Flo® close-coupled pumps are listed by Underwriters' Laboratories for LP Gas.

BASE MODEL #	C10	C12	C13	C14	CF10	CF12	CF13	CF14	MODEL NUMBER BASE X X X X
Inlet	1¼" NPT	1½" NPT	1½" NPT	1½" NPT	1½" ANSI 300 lb.	1½" ANSI 300 lb.	1½" ANSI 300 lb.	1½" ANSI 300 lb.	
Outlet	1" NPT	1" NPT	1" NPT	1" NPT	1" ANSI 300 lb.	1" ANSI 300 lb.	1" ANSI 300 lb.	1" ANSI 300 lb.	
Weight bare pump (lbs.)*	76	86	126	150	82	92	132	156	

\* Weight corresponds to standard motor.

### SPECIFICATION FIELDS

Motor Selection:	2 hp, single phase, 115/208/230 volt, 50/60 Hz**	Standard	Standard	Standard	NA	Standard	Standard	Standard	NA	F
	3 hp, three phase, 230/460 volt, 50/60 Hz**	Charge Option	Charge Option	Charge Option	Standard	Charge Option	Charge Option	Charge Option	Standard	G

\*\* These motors are listed by Underwriters' Laboratories, Inc. and CSA for Class 1, Group D, explosion proof service. These motors do not have internal overload protection.

Impeller, Seal Sleeve, Follower and Shaft Material	Bronze impeller	Standard	D
	Aluminum sleeve and follower		
	Steel shaft		

Seal Seat Material	Cast iron	Standard	2
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O-ring Material	Buna-N	Standard	A
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### MOUNTING OPTIONS (with pump only)

Part Number	Description
SM-30	Motor mounted starter for 2 hp motor.
S-30	Separate remote wall mounted starter for 2 hp motor.

### ELECTRIC OPTIONS

Part Number	Description
2277-X3	Motor mounted manual starter for 2 hp motor.
2277-X4	Wall mounted manual starter for 2 hp motor.
3784	Switch only (used with the 2277-X3 and 2277-X4 manual starters)

NA = Not available

# Appendix A—Model Number Identification Code and Available Options

## D-Model (Direct-Mount) Regenerative Turbine Coro-Flo® Pumps

DS models connect to motor frame size 56C through 145TC. DL models connect to motor frame size 182TC through 215TC. All standard ANSI port sizes are 300 lb.

BASE MODEL NUMBER (NPT)	DS9	DS10	DS12	DS13	DS14	DS15	MODEL NUMBER BASE X X X X
Inlet	1¼" NPT	1¼" NPT	1½" NPT	1½" NPT	1½" NPT	1½" NPT	
Outlet	1" NPT	1" NPT	1" NPT	1" NPT	1" NPT	1" NPT	
Ship weight, bare pump (lbs.)	52	52	52	52	52	52	

BASE MODEL NUMBER (Flanged)	DSF9	DSF10	DSF12	DSF13	DSF14	DSF15	MODEL NUMBER BASE X X X X
Inlet	1½" ANSI	1½" ANSI	1½" ANSI	1½" ANSI	1½" ANSI	1½" ANSI	
Outlet	1" ANSI	1" ANSI	1" ANSI	1" ANSI	1" ANSI	1" ANSI	
Ship weight, bare pump (lbs.)	58	58	58	58	58	58	

BASE MODEL NUMBER (NPT)	DL9	DL10	DL12	DL13	DL14	DL15	MODEL NUMBER BASE X X X X
Inlet	1¼" NPT	1¼" NPT	1½" NPT	1½" NPT	1½" NPT	1½" NPT	
Outlet	1" NPT	1" NPT	1" NPT	1" NPT	1" NPT	1" NPT	
Ship weight, bare pump (lbs.)	62	62	62	62	62	62	

BASE MODEL NUMBER (Flanged)	DLF9	DLF10	DLF12	DLF13	DLF14	DLF15	MODEL NUMBER BASE X X X X
Inlet	1½" ANSI	1½" ANSI	1½" ANSI	1½" ANSI	1½" ANSI	1½" ANSI	
Outlet	1" ANSI	1" ANSI	1" ANSI	1" ANSI	1" ANSI	1" ANSI	
Ship weight, bare pump (lbs.)	68	68	68	68	68	68	

### SPECIFICATION FIELDS

<b>Motor</b>	No integral motor	Standard	C	
<b>Impeller, Seal Sleeve, Follower and Shaft Material</b>	Bronze impeller Aluminum sleeve/follower Steel shaft	Standard	D	
	Ductile iron impeller Aluminum sleeve/follower Steel shaft	No charge option	F	
	<b>Seal Seat Material</b>	Cast iron	Standard	2
	<b>O-ring Material</b>	Buna-N	Standard	A
Neoprene®		No charge option	B	

### PART OPTIONS

Description	Part Number
Coupling for DS model pumps (specify motor shaft size)	1344
Coupling for DL model pumps (specify motor shaft size)	1345

Neoprene® is a registered trademark of DuPont.

# Appendix A—Model Number Identification Code and Available Options

## F-Model (Frame-Mount) Regenerative Turbine Coro-Flo® Pumps

BASE MODEL NUMBER (NPT)	F9	F10	F12	F13	F14	F15
Inlet	1½" NPT	1½" NPT	1½" NPT	1½" NPT	1½" NPT	1½" NPT
Outlet	1" NPT	1" NPT	1" NPT	1" NPT	1" NPT	1" NPT
Ship weight, bare pump (lbs.)	48	48	48	48	48	48

BASE MODEL NUMBER (Flanged)	FF9	FF10	FF12	FF13	FF14	FF15
Inlet	1½" ANSI	1½" ANSI	1½" ANSI	1½" ANSI	1½" ANSI	1½" ANSI
Outlet	1" ANSI	1" ANSI	1" ANSI	1" ANSI	1" ANSI	1" ANSI
Ship weight, bare pump (lbs.)	52	52	52	52	52	52

All standard ANSI port sizes are 300 lb.

### MODEL NUMBER

BASE X X X X

### SPECIFICATION FIELDS

<b>Motor</b>	No integral motor	Standard	C
<b>Impeller, Seal Sleeve, Follower and Shaft Material</b>	Bronze impeller	Standard	D
	Aluminum sleeve/follower Steel shaft		
	Ductile iron impeller	No charge option	F
	Aluminum sleeve/follower Steel shaft		
<b>Seal Seat Material</b>	Cast iron	Standard	2
<b>O-ring Material</b>	Buna-N	Standard	A
	Neoprene®	No charge option	B

### MOUNTING OPTIONS

Description	Part Number	Maximum Motor Frame Size
Mounting Set-Up for <b>Direct Drive</b> . Includes steel baseplate, flexible coupling, and coupling guard. PUMP AND MOTOR NOT INCLUDED (b)(d)	101-8 (a)	145T
		184T
		215T
		256T
Mounting Set-Up for <b>V-Belt Drive</b> . Includes steel baseplate, adjustable driver slide base, V-belt drive and enclosed belt guard. PUMP AND MOTOR NOT INCLUDED (b)(c)(d)	103-12 (a)	184T
		215T
		256T

(a) Specify motor frame when ordering.

(b) Pricing based upon motor of current frame size, 3450 RPM, 60 cycle as shown on page A190, latest issue. Drivers of non-standard sizes may require additional mounting charges.

(c) Pricing based upon motor of current frame size, 1750 RPM, 60 cycle as shown on page A190, latest issue. Drivers of non-standard sizes may require additional mounting charges.

(d) There is an additional charge for mounting customer supplied motor. See page A180 for details.

Neoprene® is a registered trademark of DuPont.

## Appendix B—Specifications for All C-Model (Close-Coupled) Pumps

### Operating Specifications for C10, C12, C13, C14, CF10, CF12, CF13, and CF14 Model Pumps

Inlet:	C10: 1-1/4" NPT, C12 through C14: 1-1/2" NPT, 300# ANSI optional
Outlet:	1" NPT, 300# ANSI optional
RPM:	3450 @ 60 Hz, limited use in 50 Hz @ 2880 RPM
Maximum working pressure:	400 psig (27.6 bar)
Maximum differential pressure:	C10: 75 psig (5.2 bar)
	C12: 100 psig (6.9 bar)
	C13,C14: 125 psig (8.6 bar)
Driver range:	2 to 3 hp (0.37–2.2 kW)
Temperature range:	-25° to 225°F (-32° to 107°C)
Flow range:	2–36 gpm (7.6–136.3 L/min)

### Material Specifications for C10, C12, C13, C14, CF10, CF12, CF13, and CF14 Model Pumps

Part	Standard Material
Case, cover	Ductile iron ASTM A536
Impeller	Bronze
Impeller key	Steel
Seal seat	Cast iron
Seal rotor	Carbon
Seal metal parts	Steel
Seal sleeve	Aluminum
Seal follower	Aluminum
Seal housing	Steel, cadmium plated
O-rings	Buna-N
Bearings	Ball

## Appendix B—Specifications for All D-Model (Direct-Mount) and F-Model (Frame-Mount) Pumps

### Operating Specifications for DL-, DLF-, DS-, DSF-, F-, and FF-Model Pumps

Inlet: F/DS/DL 9 through 10, 1-1/4" NPT	Maximum working pressure: 400 psig (27.6 bar)
F/DS/DL 12 through 14, 1-1/2" NPT	Maximum differential pressure: 125 psig (8.6 bar)
Optional: 1" NPT, 1" or 1-1/2" 300# ANSI	Optional driver range: 1 to 15 hp (0.75 to 11.2 kW)
Outlet: 1" NPT, 300# ANSI optional	Temperature range: -25° to 225°F (-32° to 107°C)
RPM: 3450 @ 60 Hz, 2880 @ 50 Hz	Flow range: 2–36 gpm (7.6–136.3 L/min)
Rotation: Clockwise only	Maximum viscosity: 400 SSU (88 cSt)

### Material Specifications for DL-, DLF-, DS-, DSF-, F-, and FF-Model Pumps

Part	Model	Standard Material	Optional Material
Case, cover	All	Ductile iron ASTM A536	None
Impeller	All	Bronze	Ductile iron, 416 SS
Impeller key	All	Steel	Stainless steel
Seal seat	All	Cast iron	304 SS, N-Resist, ceramic, tungsten carbide
Seal rotor	All	Carbon	None
Seal metal parts	All	Steel	None
Seal sleeve	All	Aluminum	416 Stainless steel
Seal follower	All	Aluminum	416 Stainless steel
Seal housing	All	Steel, cadmium plated	416 Stainless steel
Shaft	F-Models	Stressproof steel	416 Stainless steel
Frame	F-Models	Gray iron ASTM A48 Class 30	None
Bearing cap	F-Models	Aluminum	None
O-rings	All	Buna-N	PTFE, Viton <sup>®</sup> , Neoprene <sup>®1</sup> Ethylene-propylene
Retainer rings	F-Models	Steel	None
Bearings	All	Ball	None

<sup>1</sup> Registered trademark of the DuPont company.

## Appendix C—Performance for C-Model (Close-Coupled) Pumps

### C10 (60 Hz only)

Service: Fill 20# cylinders in 30 seconds to 1 minute, 100# cylinders in 2-1/2 to 3-1/2 minutes, motor fueling through a meter at 7 gpm (26.5 L/min) <sup>1</sup>	
Differential Pressure	gpm (L/min)
Capacity at 20 psid (1.4 bar d)	12 (45.4)
Capacity at 50 psid (3.4 bar d)	7 (26.5)
Capacity at 70 psid (5.2 bar d)	3 (11.4)

### C12 (60 Hz only)

Service: Fill 20# cylinders in 15 to 30 seconds, 100# I.C.C. cylinders in 2 to 3 minutes, motor fueling through a meter at 15 gpm (56.8 L/min) <sup>1</sup>	
Differential Pressure	gpm (L/min)
Capacity at 20 psid (1.4 bar d)	19 (71.9)
Capacity at 70 psid (4.8 bar d)	12.5 (47.3)
Capacity at 85 psid (5.9 bar d)	10 (37.9)

### C13

Service: Fill 20# cylinders in 10 to 20 seconds, 100# cylinders in 1-1/2 minutes, motor fueling through a meter at 23 gpm (87.1 L/min) <sup>1</sup>	
Differential Pressure	gpm (L/min)
Capacity at 20 psid (1.4 bar d)	28 (106.0)
Capacity at 75 psid (5.2 bar d)	16 (60.6)
Capacity at 100 psid (6.9 bar d)	11.5 (43.5)

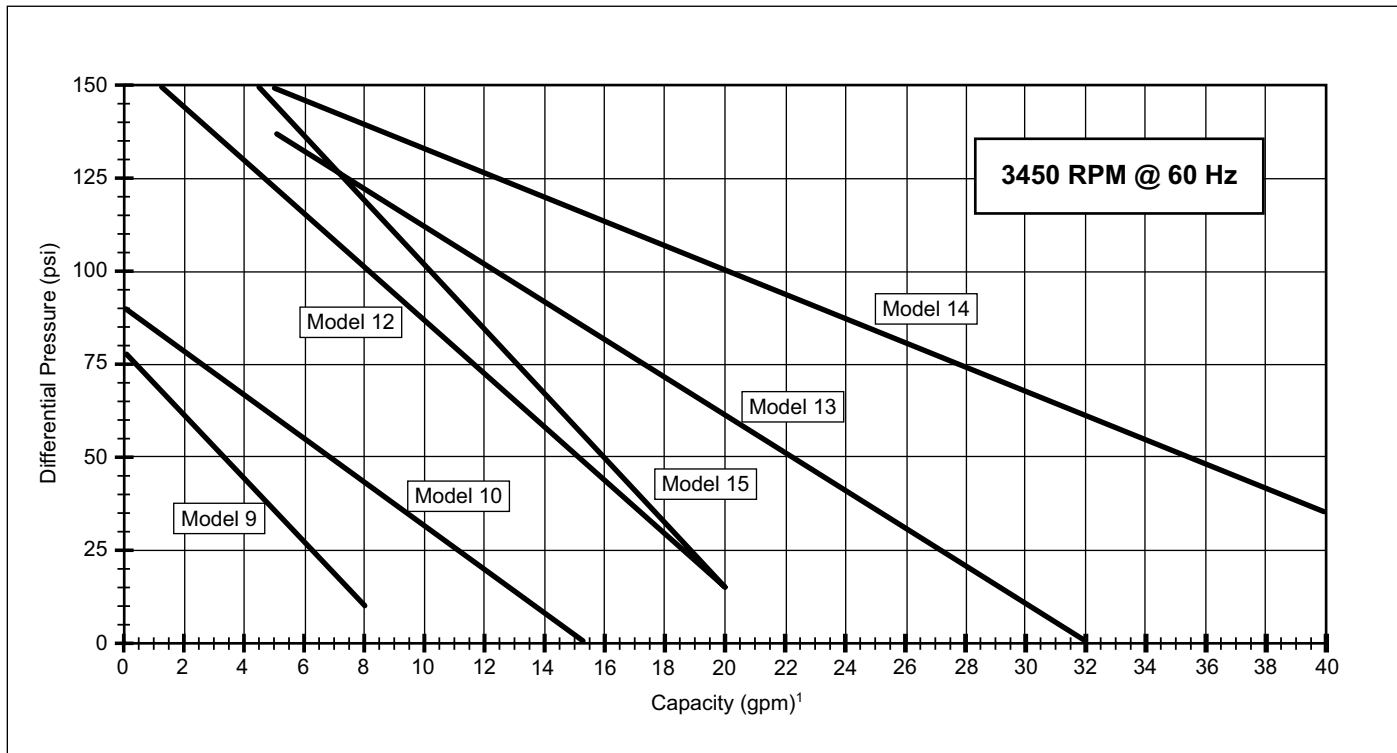
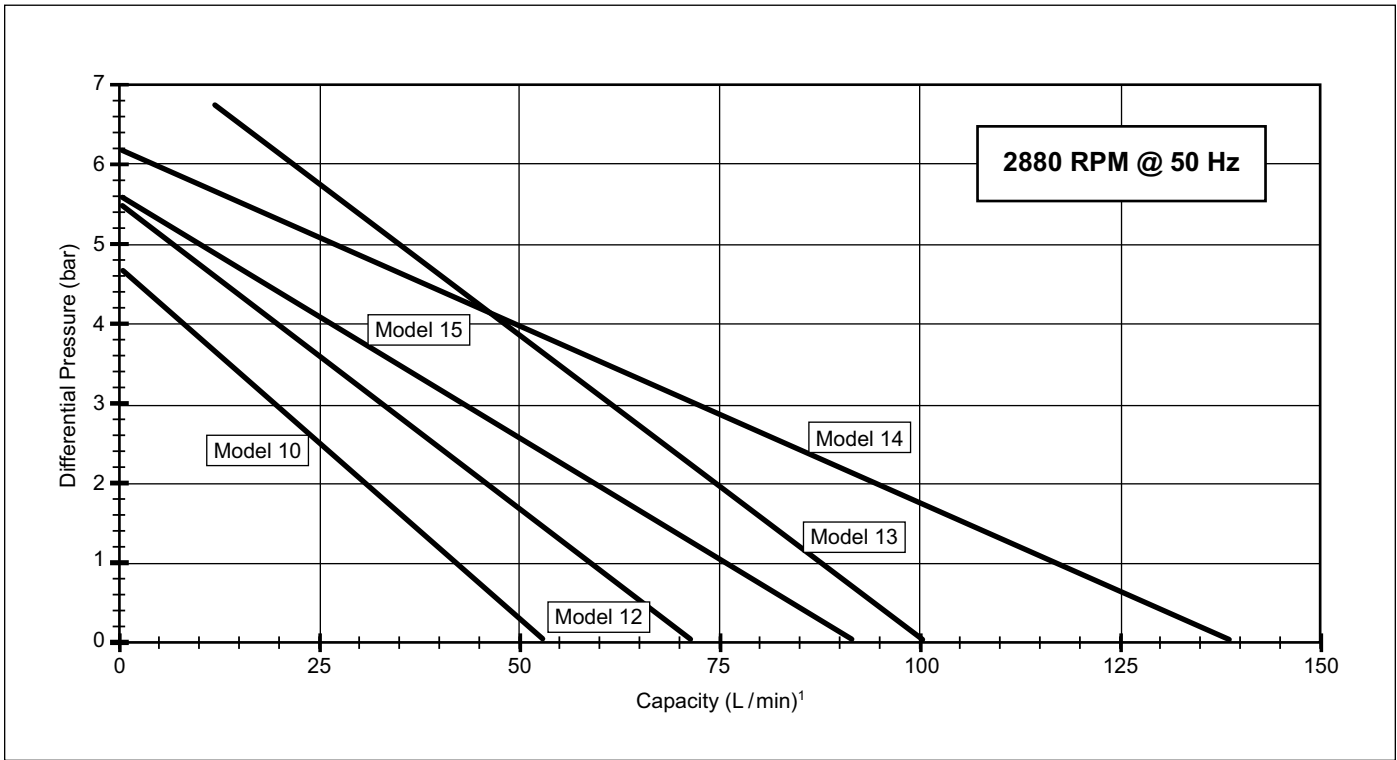
### C14

Service: Fill 100# cylinders in less than one minute, motor fueling through a meter at 30 gpm (113.6 L/min) <sup>1</sup>	
Differential Pressure	gpm (L/min)
Capacity at 20 psid (1.4 bar d)	38 (143.8)
Capacity at 70 psid (4.8 bar d)	26 (98.4)
Capacity at 100 psid (6.9 bar d)	20 (75.7)

<sup>1</sup> Times are estimates and will be affected by conditions at the site, cylinder and OPD design. PSID is pounds per square inch differential or "differential pressure."

# Appendix C—Performance (Differential Pressure vs. Capacity) D-Model (Direct-Mount) and F-Model (Frame-Mount) Pumps

All DL-, DLF-, DS-, DSF-, F-, and FF-Model Pumps

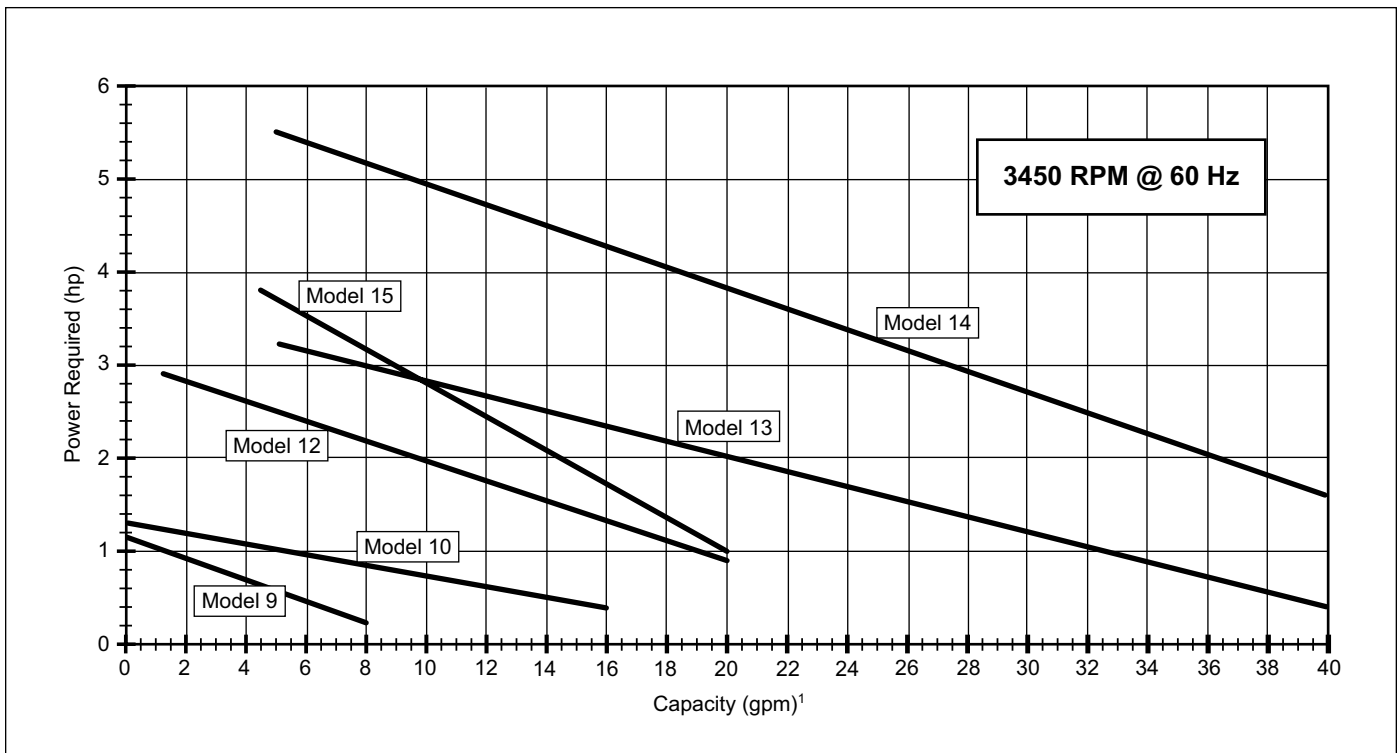
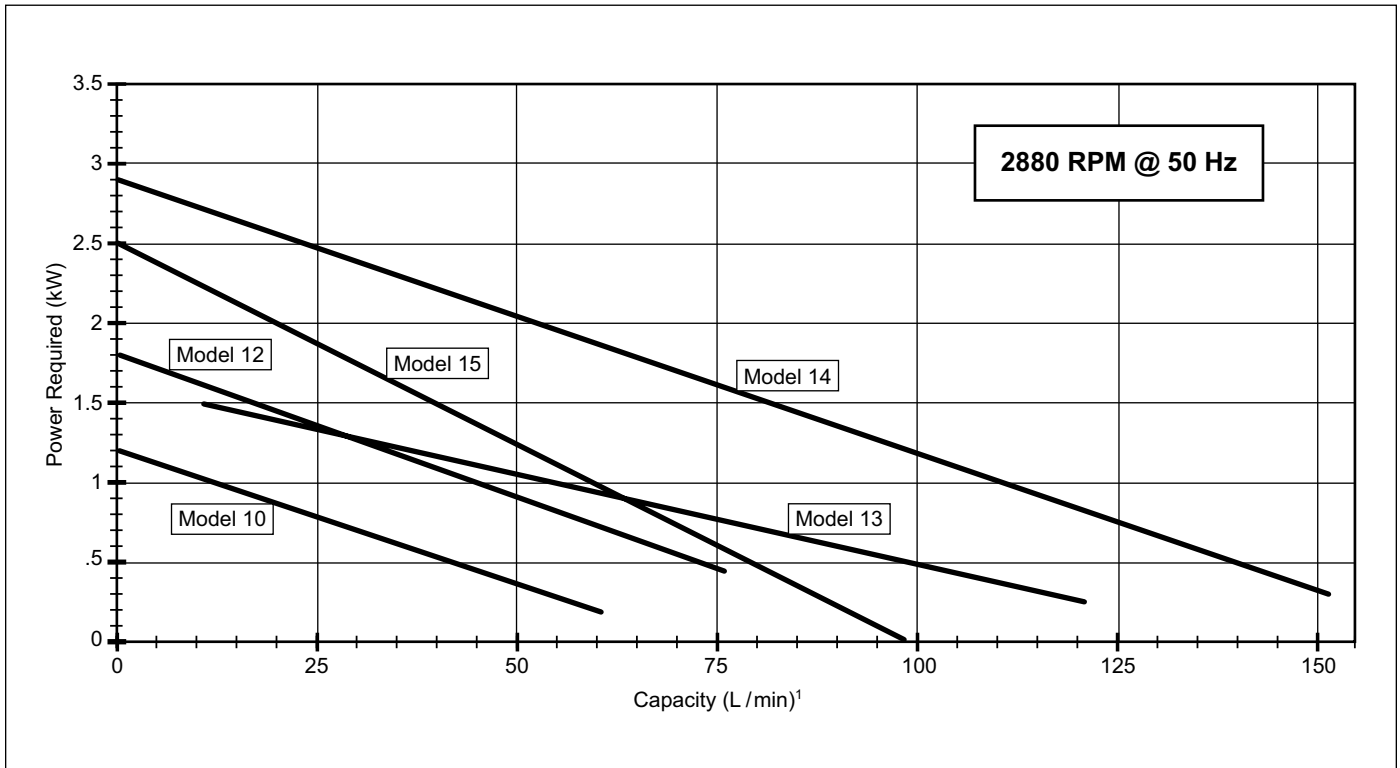


<sup>1</sup> The performance curves are based on aboveground LPG installations. Performance curves for underground LPG tanks will vary based on the specific installation. Consult factory.



# Appendix C—Performance (Power Required vs. Capacity) D-Model (Direct-Mount) and F-Model (Frame-Mount) Pumps

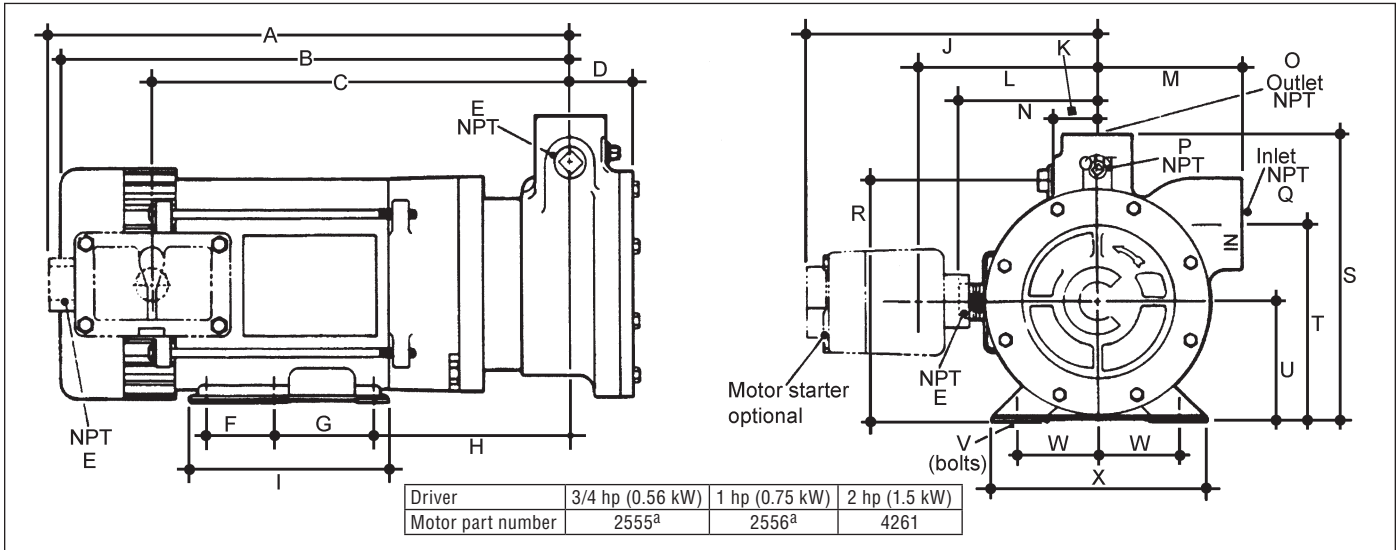
All DL-, DLF-, DS-, DSF-, F-, and FF-Model Pumps



<sup>1</sup> The performance curves are based on aboveground LPG installations. Performance curves for underground LPG tanks will vary based on the specific installation. Consult factory.

# Appendix D—Outline Dimensions for C-Model (Close-Coupled) Pumps C10, C12, C13, and C14

## 1 to 2 Hp Motors



Outline Dimensions for Pumps with Obsolete Bluffton Motors—Inches (Centimeters)

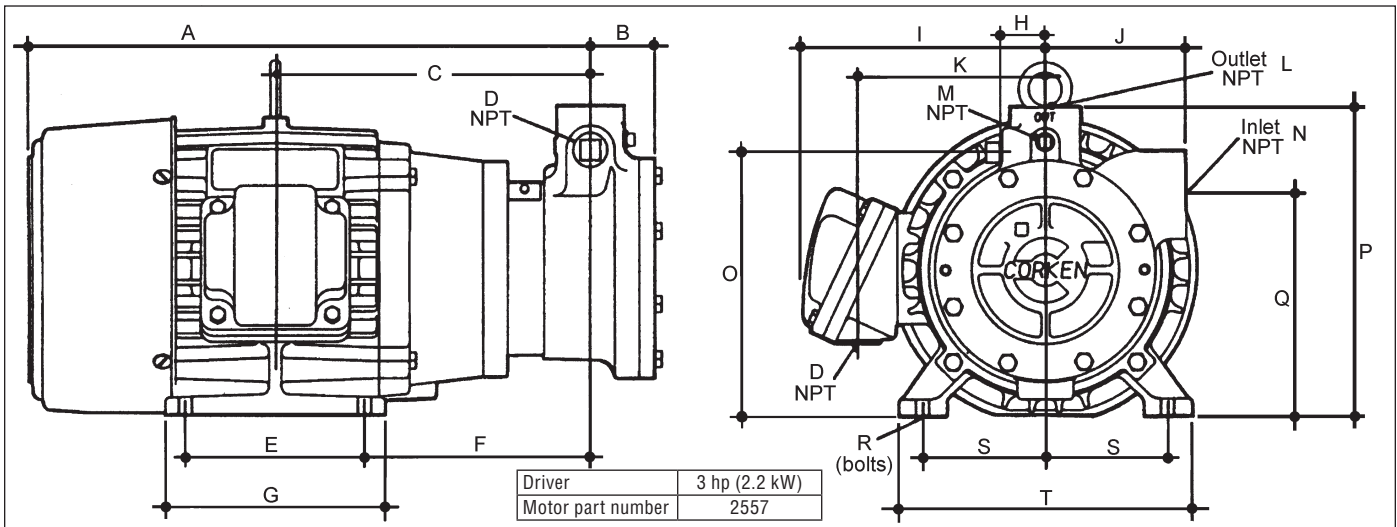
Model	hp	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
C10, C12	1	17-1/8 (43.50)	16-3/4 (42.55)	14 (35.58)	2 (5.08)	3/4 (1.91)	1 (2.54)	4 (10.16)	5-7/8 (14.90)	5-7/8 (14.90)	8-11/16 (22.06)	1-5/16 (3.33)	5-3/8 (13.65)	4-5/16 (10.95)	4-3/16 (10.63)	1 (2.54)	1/4 (0.64)	1-1/2 (3.81)	6-1/8 (15.56)	8-1/2 (21.59)	5-3/4 (14.61)	3-1/2 (8.89)	1/4 bolt (0.64)	2-7/16 (6.19)	6-1/2 (16.51)
C12, C13	2	18-17/32 (47.07)	8-1/16 (45.88)	14-15/16 (39.94)	2 (5.08)	3/4 (1.91)	1 (2.54)	4 (10.16)	5-7/8 (14.90)	6-1/2 (16.51)	9-5/16 (23.65)	1-5/16 (3.33)	6 (15.24)	4-5/16 (10.95)	4-13/16 (12.22)	1 (2.54)	1/4 (0.64)	1-1/2 (3.81)	7-1/8 (18.10)	9-1/2 (24.13)	6-13/16 (17.30)	3-1/2 (8.89)	3/8 bolt (0.95)	2-7/16 (6.19)	6-1/2 (16.51)

Outline Dimensions for Pumps with Marathon Motors—Inches (Centimeters)

C10, C12, C13	2	15-13/16 (40.16)	15-3/4 (40.00)	12-1/8 (30.80)	2 (5.08)	3/4 (1.91)	N/A	3 (7.62)	5-7/8 (14.90)	4 (10.16)	10-3/16 (25.88)	1-5/16 (3.33)	6-7/8 (17.46)	4-5/16 (10.95)	5-5/8 (14.28)	1 (2.54)	1/4 (0.64)	1-1/2 (3.81)	7-1/8 (18.10)	9-1/2 (24.13)	6-13/16 (17.30)	3-1/2 (8.89)	3/8 bolt (0.95)	2-7/16 (6.19)	6-1/2 (16.51)
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<sup>a</sup> These part numbers are obsolete and have been replaced by part #4261 (2 hp).

## 3 Hp Motors

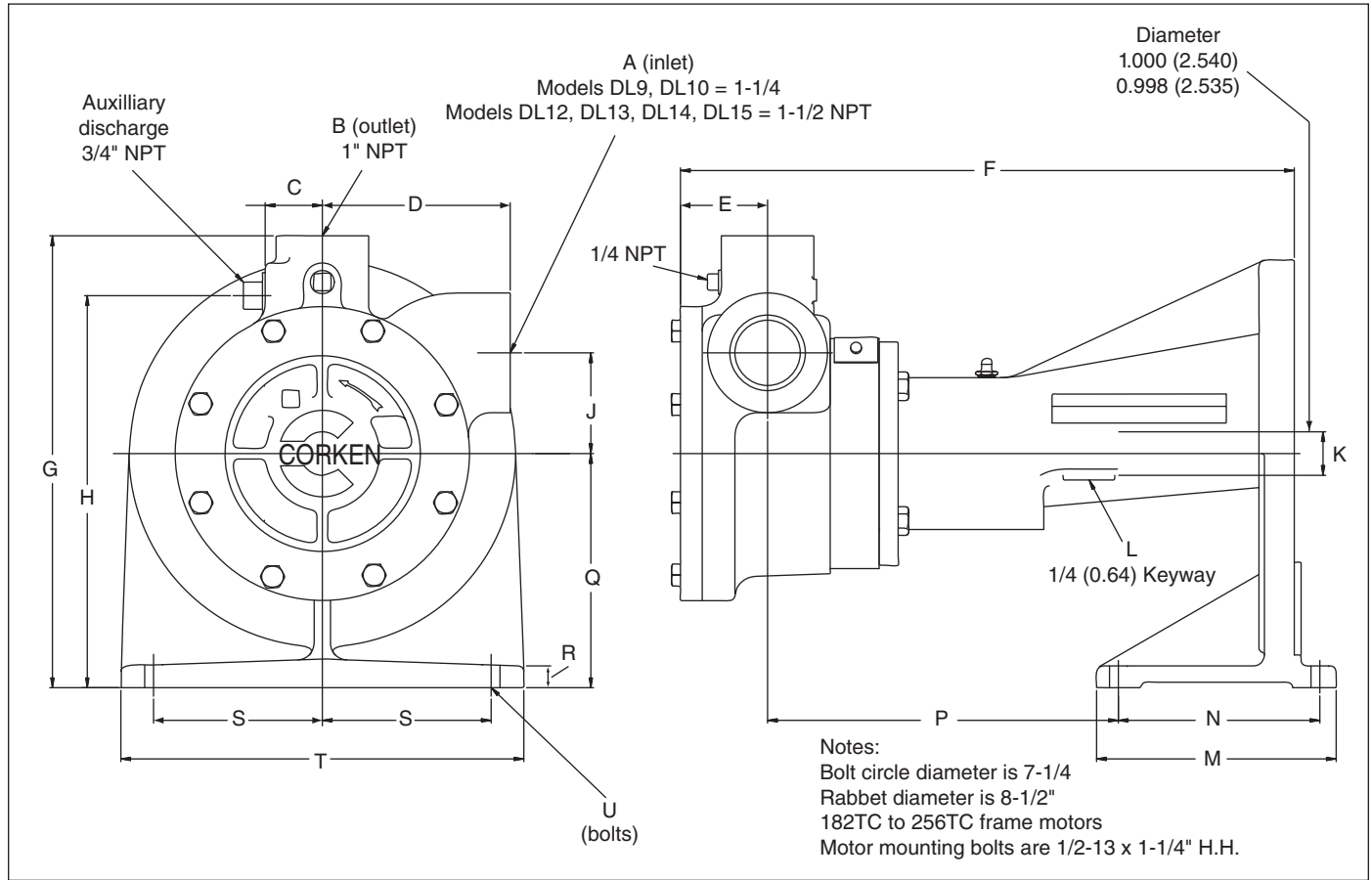


Outline Dimensions - Inches (Centimeters)

Model	hp	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
C13, C14	3	17-1/4 (43.80)	2 (5.08)	9-11/16 (24.60)	3/4 (1.91)	4-1/2 (11.43)	6-15/16 (17.62)	5-1/2 (13.97)	1-5/16 (3.33)	7-5/8 (24.60)	4-5/16 (10.95)	5-3/4 (14.60)	1 (2.54)	1/4 (0.64)	1-1/2 (3.81)	8-1/8 (20.64)	9-1/2 (24.13)	6-13/16 (17.30)	5/16 bolt (0.79)	3-3/4 (9.52)	8-3/4 (22.23)

# Appendix D—Outline Dimensions for D-Model (Direct-Mount) Pumps

## All DL9, DL10, DL12, DL13, DL14, and DL15 Model Pumps



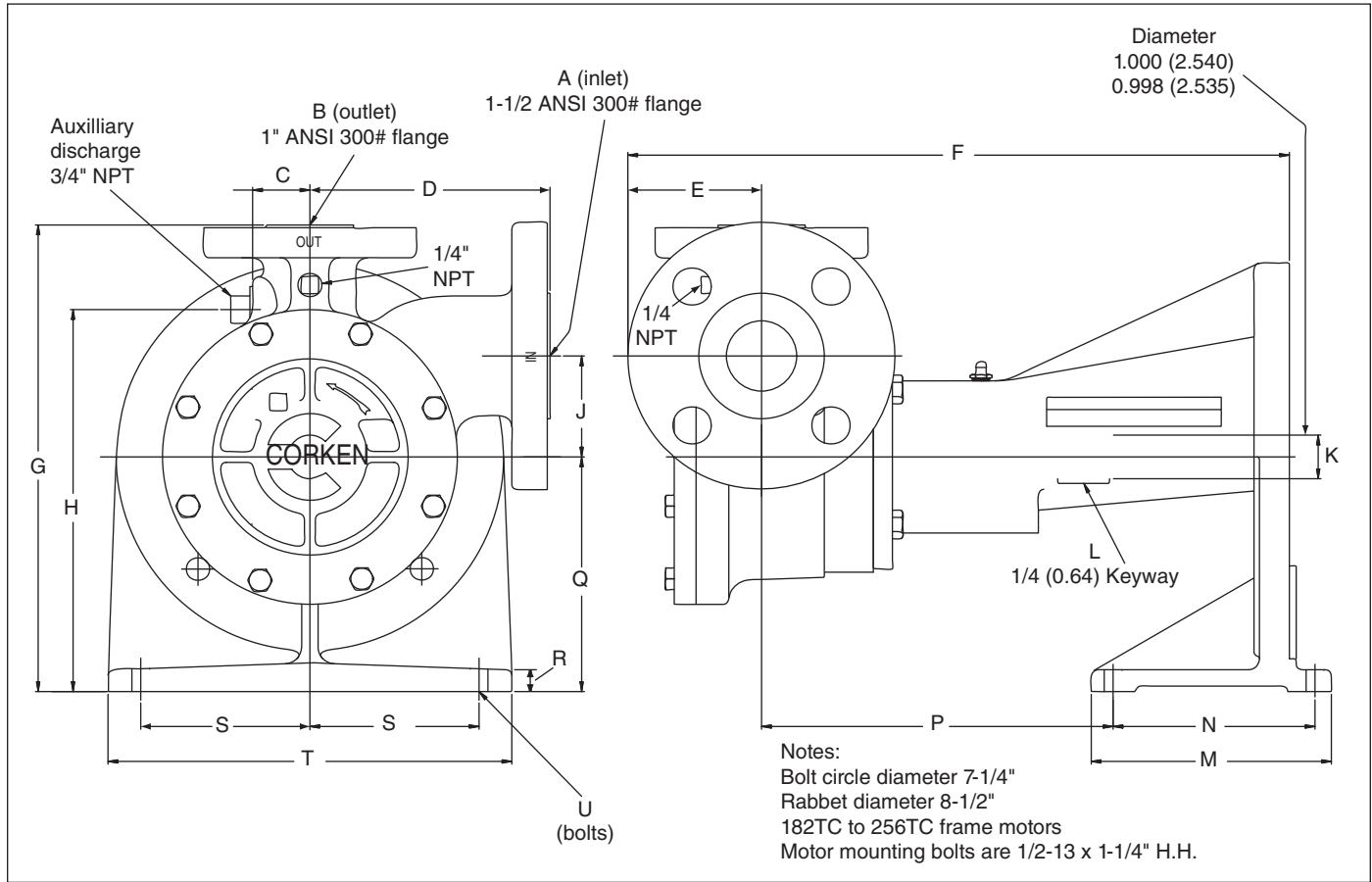
Flange Dimensions		
Model	A (inlet)	B (outlet)
DL9–DL10	1-1/4" NPT	1" NPT
DL12–DL15	1-1/2" NPT	1" NPT

DL9–DL15 NPT Outline Dimensions—Inches (Centimeters)								
C	D	E	F	G	H	J	K	L
1-5/16 (3.33)	4-5/16 (10.95)	2 (5.08)	14-3/32 (35.79)	10-3/8 (26.35)	9 (22.86)	2-5/16 (5.87)	1 diameter (2.54)	1/4 (0.64)

DL9–DL15 NPT Outline Dimensions—Inches (Centimeters)							
M	N	P	Q	R	S	T	U
5-1/2 (13.97)	4-5/8 (11.75)	8-3/64 (20.45)	5-3/8 (13.65)	1/2 (1.27)	3-7/8 (9.84)	9-1/4 (23.49)	5/16 bolt (0.79)

# Appendix D—Outline Dimensions for D-Model (Direct-Mount) Pumps

## All DLF9, DLF10, DLF12, DLF13, DLF14, and DLF15 Model Pumps



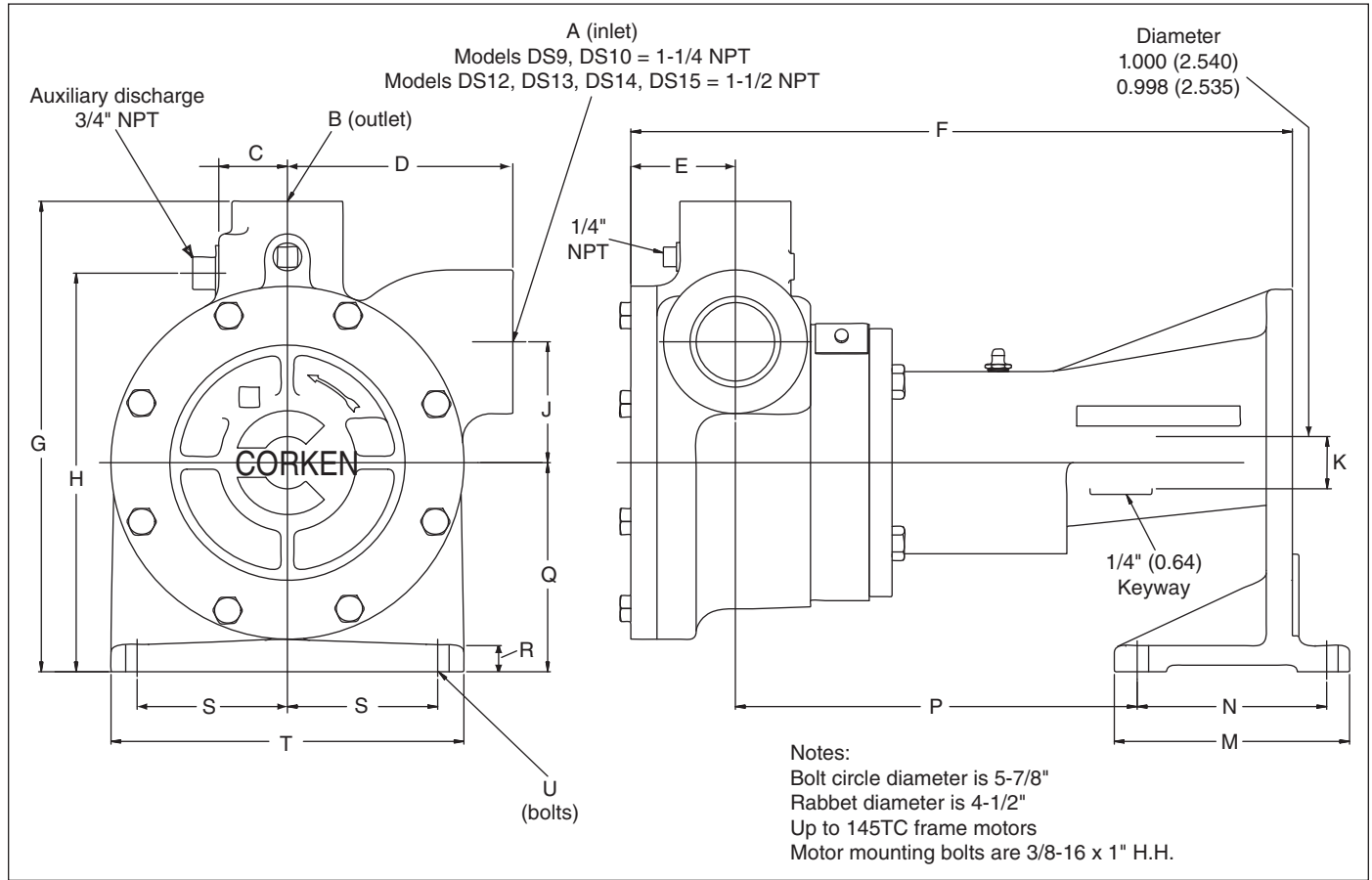
Flange Dimensions		
Model	A (inlet)	B (outlet)
DLF9-DLF15	1-1/2" 300# ANSI	1" 300# ANSI

DLF9-DLF15 300# ANSI Outline Dimensions—Inches (Centimeters)								
C	D	E	F	G	H	J	K	L
1-5/16 (3.33)	5-1/2 (13.97)	3-1/16 (7.78)	15-5/32 (38.49)	10-11/16 (27.15)	8-3/4 (22.23)	2-5/16 (5.87)	1 diameter (2.54)	1/4 (0.64)

DLF9-DLF15 300# ANSI Outline Dimensions—Inches (Centimeters)								
M	N	P	Q	R	S	T	U	
5-1/2 (13.97)	4-5/8 (11.75)	8-3/64 (20.45)	5-3/8 (13.65)	1/2 (1.27)	3-7/8 (9.84)	9-1/4 (23.49)	5/16 bolt (0.79)	

# Appendix D—Outline Dimensions for D-Model (Direct-Mount) Pumps

## All DS9, DS10, DS12, DS13, DS14, and DS15 Model Pumps



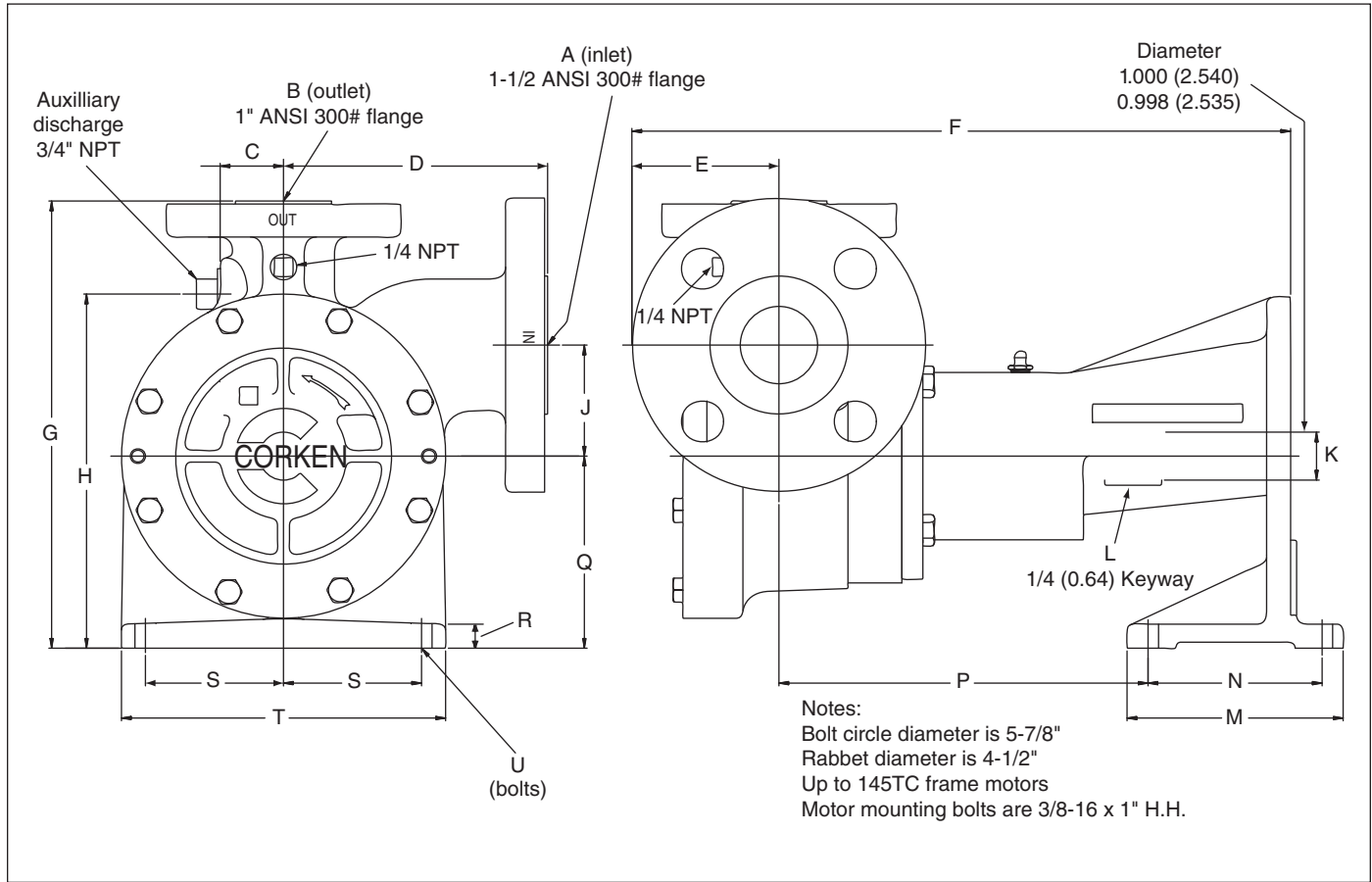
Flange Dimensions		
Model	A (inlet)	B (outlet)
DS9-DS10	1-1/4" NPT	1" NPT
DS12-DS15	1-1/2" NPT	1" NPT

DS9-DS15 NPT Outline Dimensions—Inches (Centimeters)							
C	D	E	F	G	H	J	K
1-5/16 (3.33)	4-5/16 (10.95)	2 (5.08)	12-21/32 (32.15)	9 (22.86)	7-5/8 (19.37)	2-5/16 (5.87)	1 diameter (2.54)

DS9-DS15 NPT Outline Dimensions—Inches (Centimeters)								
L	M	N	P	Q	R	S	T	U
1/4 (0.64)	4-1/2 (11.43)	3-5/8 (9.21)	7-11/16 (19.52)	4 (10.16)	1/2 (1.27)	2-7/8 (7.30)	6-3/4 (17.15)	5/16 bolt (0.79)

# Appendix D—Outline Dimensions for D-Model (Direct-Mount) Pumps

## All DSF9, DSF10, DSF12, DSF13, DSF14, and DSF15 Model Pumps



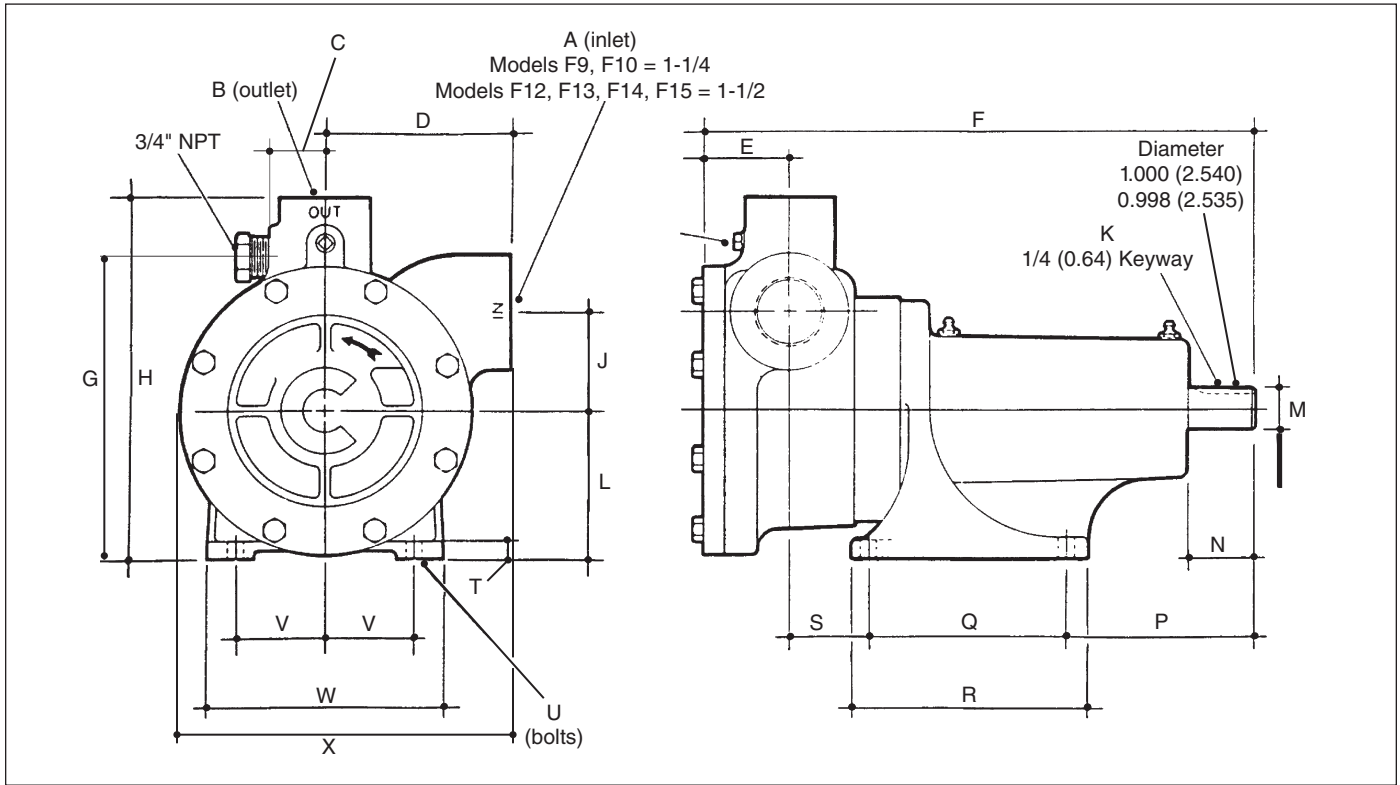
Flange Dimensions		
Model	A (inlet)	B (outlet)
DSF9–DSF15	1-1/2" 300# ANSI	1" 300# ANSI

DSF9–DSF15 300# ANSI Outline Dimensions—Inches (Centimeters)							
C	D	E	F	G	H	J	K
1-5/16 (3.33)	5-1/2 (13.97)	3-1/16 (7.78)	13-23/32 (34.84)	9-5/16 (23.65)	7-3/8 (18.73)	2-5/16 (5.87)	1 diameter (2.54)

DSF9–DSF15 300# ANSI Outline Dimensions—Inches (Centimeters)								
L	M	N	P	Q	R	S	T	U
1/4 (0.64)	4-1/2 (11.43)	3-5/8 (9.21)	7-11/16 (19.52)	4 (10.16)	1/2 (1.27)	2-7/8 (7.30)	6-3/4 (17.15)	5/16 bolt (0.79)

# Appendix D—Outline Dimensions for F-Model (Frame-Mount) Pumps

## All F9, F10, F12, F13, F14, and F15 Model Pumps



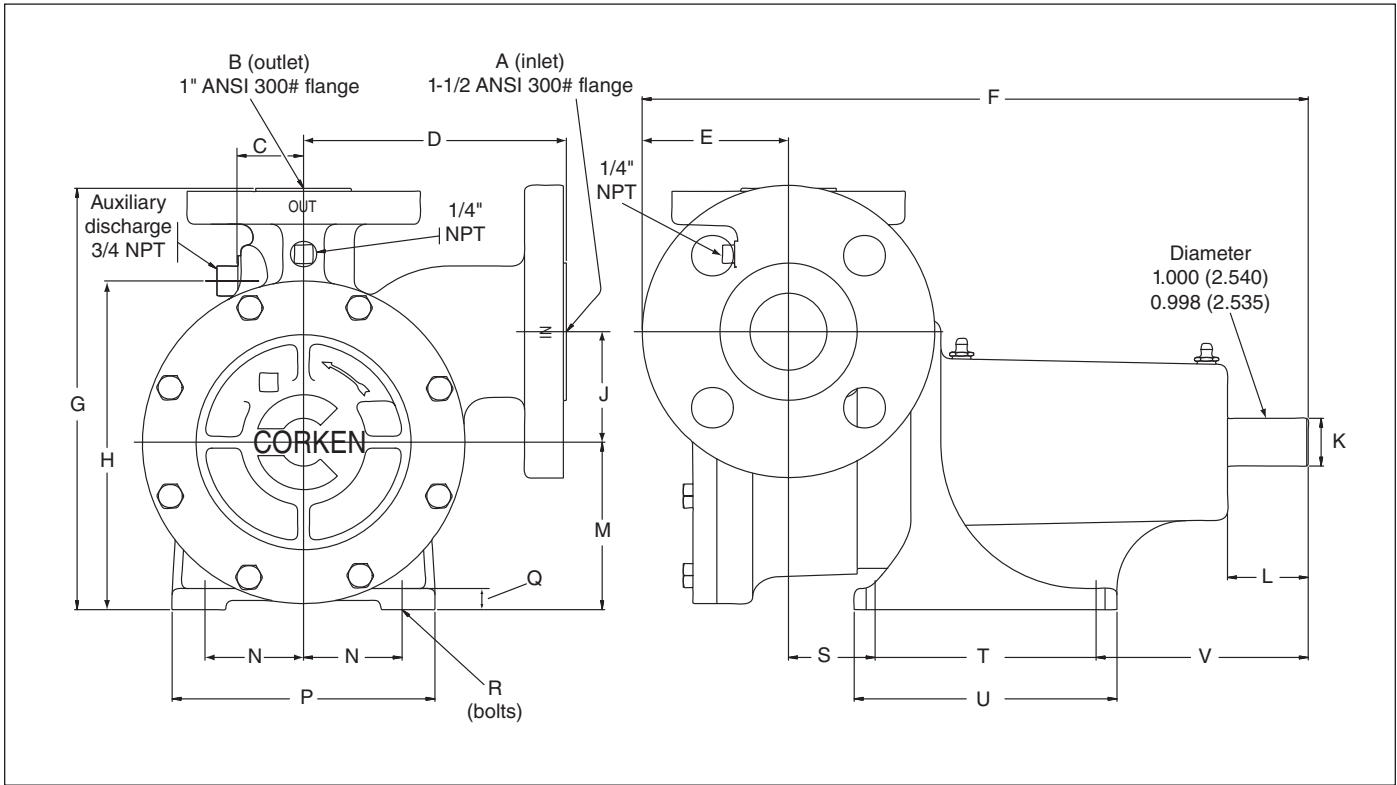
Flange Dimensions		
Model	A (inlet)	B (outlet)
F9–F10	1-1/4" NPT	1" NPT
F12–F15	1-1/2" NPT	1" NPT

F9–F15 NPT Outline Dimensions—Inches (Centimeters)									
C	D	E	F	G	H	J	K	L	M
1-5/16 (3.33)	4-5/16 (10.95)	2 (5.08)	12-13/16 (32.54)	7-1/8 (18.10)	8-1/2 (21.59)	2-5/16 (5.87)	1/4 (0.64)	3-1/2 (8.90)	1 diameter (2.54)

F9–F15 NPT Outline Dimensions—Inches (Centimeters)									
N	P	Q	R	S	T	U	V	W	X
1-11/16 (4.29)	4-7/16 (11.27)	4-5/8 (11.75)	5-1/2 (13.97)	1-3/4 (4.45)	1/2 (1.27)	5/16 bolt (0.79)	2-1/16 (5.24)	5-1/2 (13.97)	7-3/4 (19.69)

# Appendix D—Outline Dimensions for F-Model (Frame-Mount) Pumps

## All FF9, FF10, FF12, FF13, FF14, and FF15 Model Pumps



Flange Dimensions		
Model	A (inlet)	B (outlet)
FF9–FF15	1-1/2" 300# ANSI	1" 300# ANSI

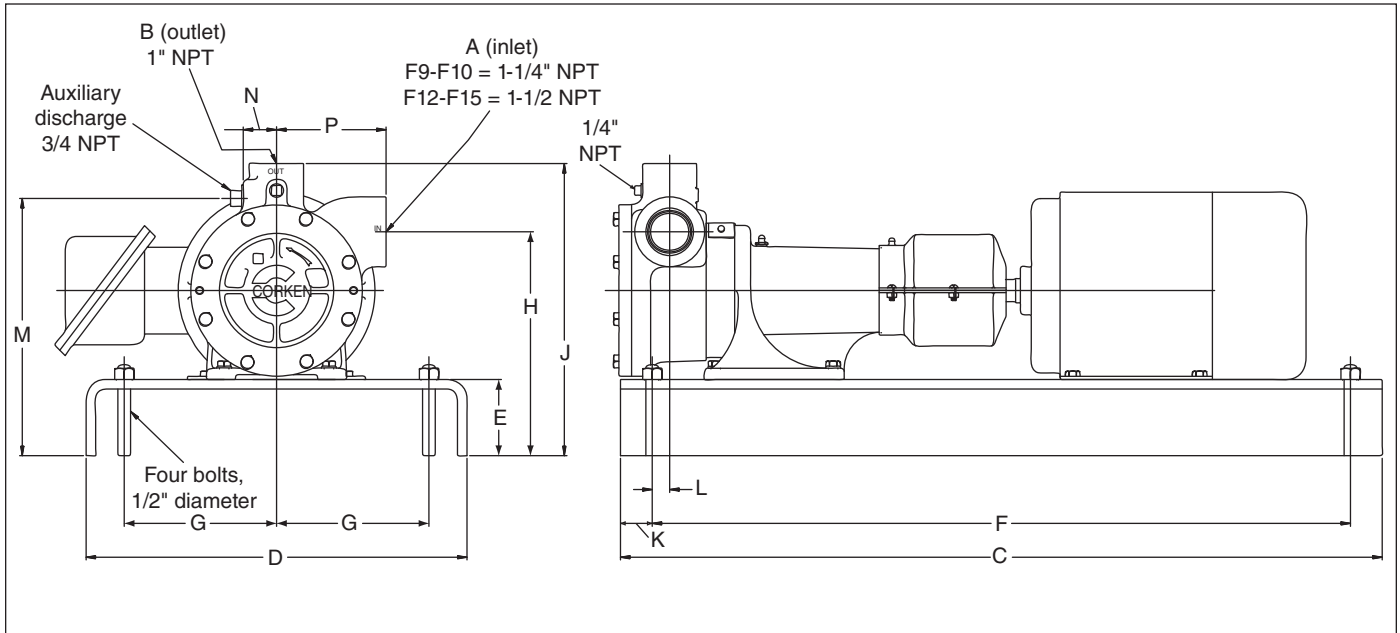
FF9–FF15 300# ANSI Outline Dimensions—Inches (Centimeters)								
C	D	E	F	G	H	J	K	L
1-5/16 (3.33)	5-1/2 (13.97)	3-1/16 (7.78)	13-15/16 (35.41)	8-13/16 (22.40)	6-7/8 (17.48)	2-5/16 (5.87)	1 diameter (2.54)	1-11/16 (4.29)

FF9–FF15 300# ANSI Outline Dimensions—Inches (Centimeters)									
M	N	P	Q	R	S	T	U	V	W
3-1/2 (8.90)	2-1/16 (5.24)	5-1/2 (13.97)	1/2 (1.27)	5/16 bolt (0.79)	1-13/16 (4.61)	4-5/8 (11.75)	5-1/2 (13.97)	4-7/16 (11.27)	8-7/8 (22.54)



# Appendix D—Outline Dimensions for F-Model (Frame-Mount) Pumps with -101 Mounting

All F9-101, F10-101, F12-101, F13-101, F14-101, and F15-101 Model Pumps

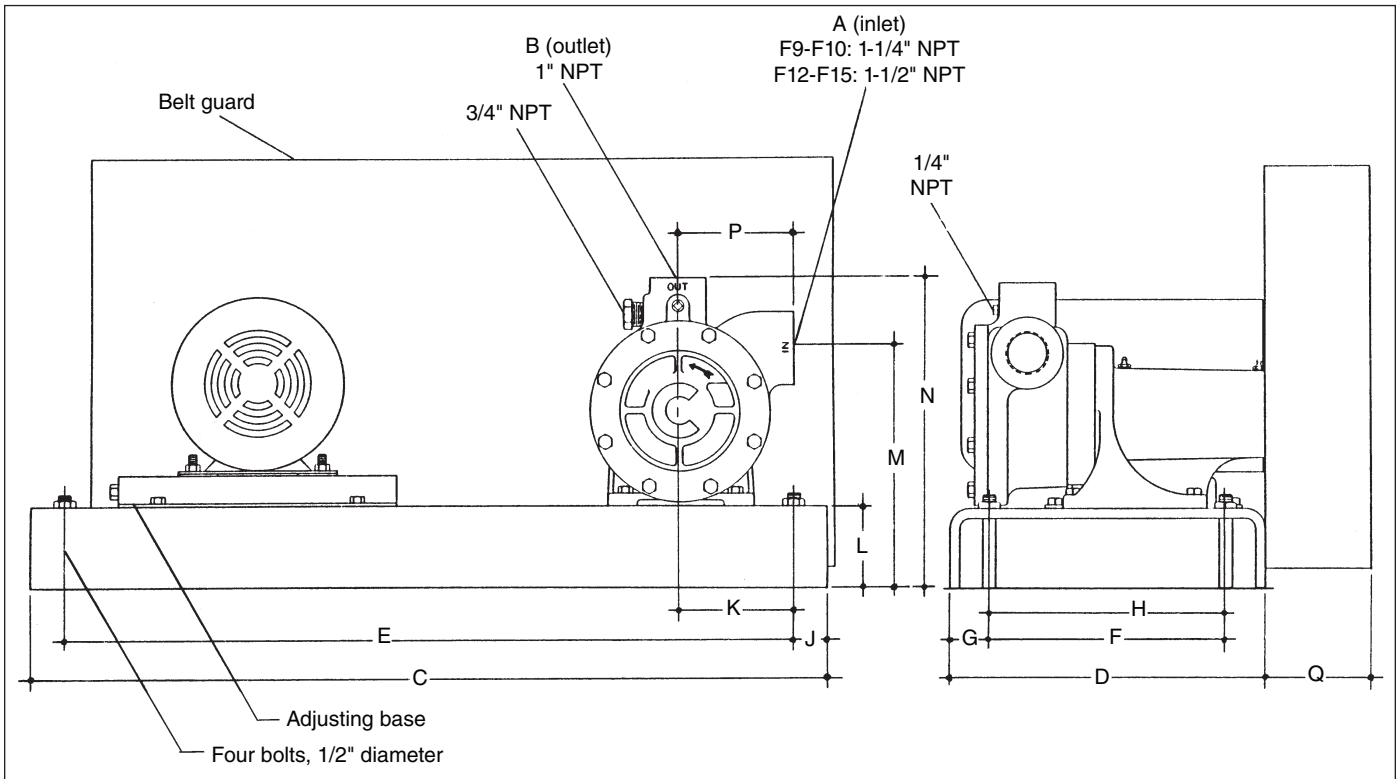


Flange Dimensions		
Model	A (inlet)	B (outlet)
F9–F10	1-1/4" NPT	1" NPT
F12–F15	1-1/2" NPT	1" NPT

F9–101 through F15–101 Mounting Dimensions—Inches (Centimeters)												
Mtr. Frame	C	D	E	F	G	H	J	K	L	M	N	P
56	22 (56.0)	10 (25.0)	2-1/2 (6.3)	20 (51.0)	4 (10.2)	8-1/4 (21.0)	11 (28.0)	1 (2.50)	11/16 (1.7)	10-1/8 (25.7)	1-5/16 (3.33)	4-5/16 (10.95)
66	30 (76.2)	15 (38.1)	3 (7.6)	27-1/2 (69.8)	6 (15.2)	9-3/8 (23.8)	12-1/8 (30.8)	1-1/4 (3.2)				
143T, 145T						8-13/16 (22.4)	11-1/2 (29.2)					
182T, 184T						9-3/4 (24.8)	12-1/2 (31.7)					
213T, 215T	34 (86.4)			31-1/2 (80.0)		10-1/2 (26.7)	13-1/4 (33.7)					
254U						11-1/2 (29.2)	14-1/4 (36.2)					

# Appendix D—Outline Dimensions for F-Models (Frame-Mount) Pumps with -103 Mounting

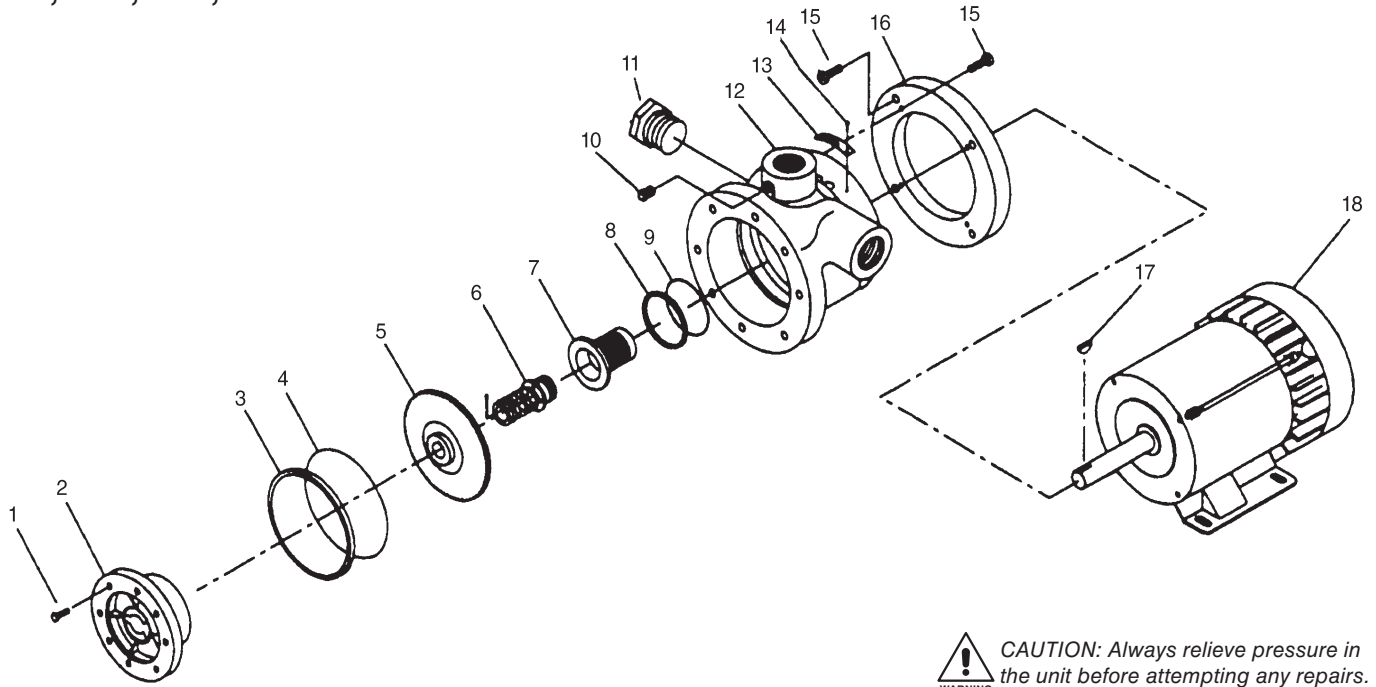
All F9-103, F10-103, F12-103, F13-103, F14-103, and F15-103 Model Pumps



Flange Dimensions		
Model	A (inlet)	B (outlet)
F9–F10	1-1/4" NPT	1" NPT
F12–F15	1-1/2" NPT	1" NPT

F9–103 through F15–103 Mounting Dimensions—Inches (Centimeters)													
Motor Frame	C	D	E	F	G	H	J	K	L	M	N	P	Q
56, 66, 143T, 145T, 182T, 184T, 213T, 215T	30 (76.2)	12 (30.5)	27-1/2 (69.8)	9 (22.9)	1-1/2 (3.8)	7-9/16 (19.2)	1-1/4 (3.2)	4-1/4 (10.8)	3 (7.6)	8-3/4 (22.2)	11-1/2 (29.2)	4-5/16 (10.9)	5 (12.7)
254U													
256U	34 (86.4)	15 (38.1)	31-1/2 (80.0)	12 (30.5)									

# Appendix E—Parts Details for All C-Model (Close-Coupled) Pumps C10, C12, C13, and C14



**CAUTION:** Always relieve pressure in the unit before attempting any repairs.

## Bill of Materials

Ref No.	Part No.	Description	Qty.
1	7001-031NC100A	Hex head cap screw	8
2	1001-0	Cover - model 10	1
	1001-2	Cover - model 12	1
	1001-3	Cover - model 13	1
	1001-4	Cover - model 14	1
3	1014 <sup>c</sup>	Case clearance shim (.002" red)	As req.
	1014-1 <sup>c</sup>	Case clearance shim (.003" green)	As req.
4	2-246 <sup>a,c</sup>	Case O-ring	1
5	1003-0 <sup>d</sup>	Impeller, brass - model 10	1
	1003-2 <sup>d</sup>	Impeller, brass - model 12	1
	1003-3 <sup>d</sup>	Impeller, brass - model 13	1
	1003-4 <sup>d</sup>	Impeller, brass - model 14	1
6	113-CX <sup>a</sup>	Seal assembly	1
7	1004-1X	Seal housing, steel (non-PTFE O-rings)	1
	1004-11X	Seal housing, SS (non-PTFE O-rings)	1
	1004-2X	Seal housing, steel (PTFE O-rings)	1
	1004-21X	Seal housing, SS (PTFE O-rings)	1
8	1013	Housing adjustment shim (.010")	As req.
	1013-1	Housing adjustment shim (.020")	As req.
9	2-224 <sup>a,c</sup>	Housing O-ring	1
10	3442	Pipe plug, 1/4" NPT	1
11	3444	Pipe plug, 3/4" NPT	1
12	1002-0	Case - model 10	1
	1002-2	Case - model 12	1
	1002-3	Case - model 13	1
	1002-4	Case - model 14	1
	4206-0	Case - ANSI flanged model 10	1
	4206-2	Case - ANSI flanged model 12	1
	4206-3	Case - ANSI flanged model 13	1
	4206-4	Case - ANSI flanged model 14	1

Ref No.	Part No.	Description	Qty.
13	1914-1	Nameplate	1
14	7012-006SF019E	Phillips head screw 6-32 x 1/4"	2
15	7002-037NC087A	Socket head cap screw	8
16	1015	Adapter ring	1
17	2497 <sup>c</sup>	Woodruff key, steel	1
	2497-1 <sup>c</sup>	Woodruff key, SS	1
18	2555 (obsolete) <sup>e</sup>	Motor 3/4 hp - models 9 & 10	1
	2556 (obsolete) <sup>e</sup>	Motor 1 hp - models 10 & 12	1
	2557	Motor 3 hp - model 14	1
	4261	Motor 2 hp - models 10, 12, & 13	1

O-ring Code	
A	Buna-N
B	Neoprene <sup>®b</sup>
D	Viton <sup>®b</sup>
E	PTFE
K	Kalrez <sup>®b</sup>

<sup>a</sup> \_ denotes O-ring code. See O-ring chart for details.

<sup>b</sup> Registered trademark of the DuPont company.

<sup>c</sup> Included with seal assembly/repair kit 113-CX<sub>1</sub>.

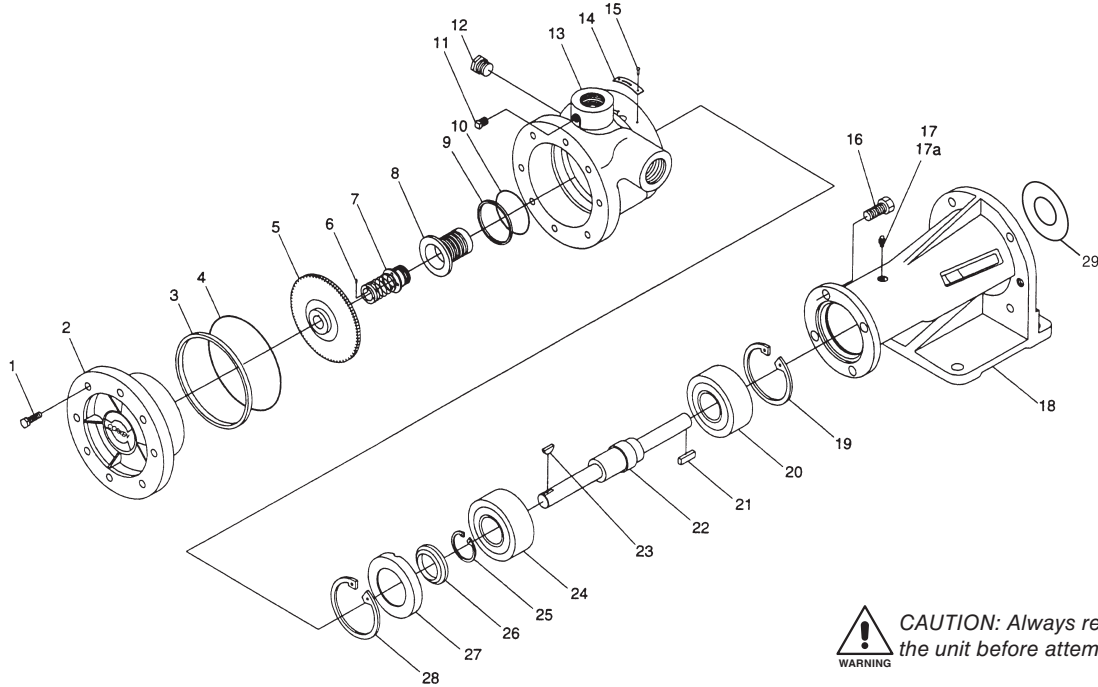
<sup>d</sup> Add a 1 to # for Iron or a 2 for stainless steel.

(ex. - model 10 w/iron is 1003-01)

<sup>e</sup> Replaced by 4261.

# Appendix E—Parts Details for All D-Model (Direct-Mounted) Pumps

This includes DL-, DLF-, DS-, DSF-models in sizes 9, 10, 12, 13, 14, & 15



**CAUTION:** Always relieve pressure in the unit before attempting any repairs.

Ref No.	Part No.	Description	Qty.
1	7001-031NC100A	Hex Head Cap Screw	8
2	1001-09	Cover - model 9	1
	1001-0	Cover - model 10	1
	1001-2	Cover - model 12	1
	1001-3	Cover - model 13	1
	1001-4	Cover - model 14	1
	1001-5	Cover - model 15	1
	3	1014 <sup>c</sup>	Case clearance shim (0.002 - red)
1014-1 <sup>c</sup>		Case clearance shim (0.003 - green)	As req.
4	2-246 <sup>a,c</sup>	Case O-ring (non-PTFE)	1
	2-247E <sup>c</sup>	Case O-ring PTFE	1
5	1003-09 <sup>d</sup>	Impeller - model 9	1
	1003-0 <sup>d</sup>	Impeller - model 10	1
	1003-2 <sup>d</sup>	Impeller - model 12	1
	1003-3 <sup>d</sup>	Impeller - model 13	1
	1003-4 <sup>d</sup>	Impeller - model 14	1
	1003-5 <sup>d</sup>	Impeller - model 15	1
6	1009	Seal pin	1
7	113-CX <sup>a</sup>	Seal assembly	1
8	1004-1X	Seal housing, steel (for non PTFE O-rings)	1
	1004-11X	Seal housing, stainless steel (for non PTFE O-rings)	1
	1004-2X	Seal housing, steel (for PTFE O-rings)	1
	1004-21X	Seal housing, stainless steel (for PTFE O-rings)	1
9	1013	Housing adjustment shim (0.010)	As req.
	1013-1	Housing adjustment shim (0.020)	As req.
10	2-224 <sup>a,c</sup>	O-ring (housing)	1
11	3442	Pipe plug 1/4"	1
12	3444	Pipe plug 3/4"	1
13	1002-09	Case - model 9	1
	1002-0	Case - model 10	1
	1002-2	Case - model 12	1
	1002-3	Case - model 13	1

Ref No.	Part No.	Description	Qty.
13	1002-4	Case - model 14	1
	1002-5	Case - model 15	1
	4206-09	Case - ANSI flanged model 9	1
	4206-0	Case - ANSI flanged model 10	1
	4206-2	Case - ANSI flanged model 12	1
	4206-3	Case - ANSI flanged model 13	1
	4206-4	Case - ANSI flanged model 14	1
	4206-5	Case - ANSI flanged model 15	1
14	1914-1	Name plate	1
15	7012-0065F019E	Phillips head screw 6-32 x 1/4"	2
16	7001-037NC100A	Hex head mounting bolts	4
17	2158	Grease zerk	2
17A	2159	Lubricap	2
18	4298	Mounting frame - DL	1
	4308	Mounting frame - DS	1
19	5002-281	Bearing retainer ring	1
20	4378	Bearing	1
21	3226	Key	1
22	4303	Shaft	1
	2497 <sup>c</sup>	#5 Woodruff key, steel	1
23	2497-1 <sup>c</sup>	#5 Woodruff key, stainless steel	1
	2758	Bearing	1
24	2758	Bearing	1
25	5102-118	Bearing retainer ring	1
26	1006	Grease seal	1
27	1238	Bearing cap	1
28	5000-281	Bearing retainer ring	1
29	4377	Bearing plate	1

O-ring Code	
A	Buna-N
B	Neoprene <sup>®b</sup>
D	Viton <sup>®b</sup>
E	PTFE
G	Ethylene Propylene
K	Kalrez <sup>®b</sup>

<sup>a</sup> \_ denotes O-ring code. See O-ring chart for details.

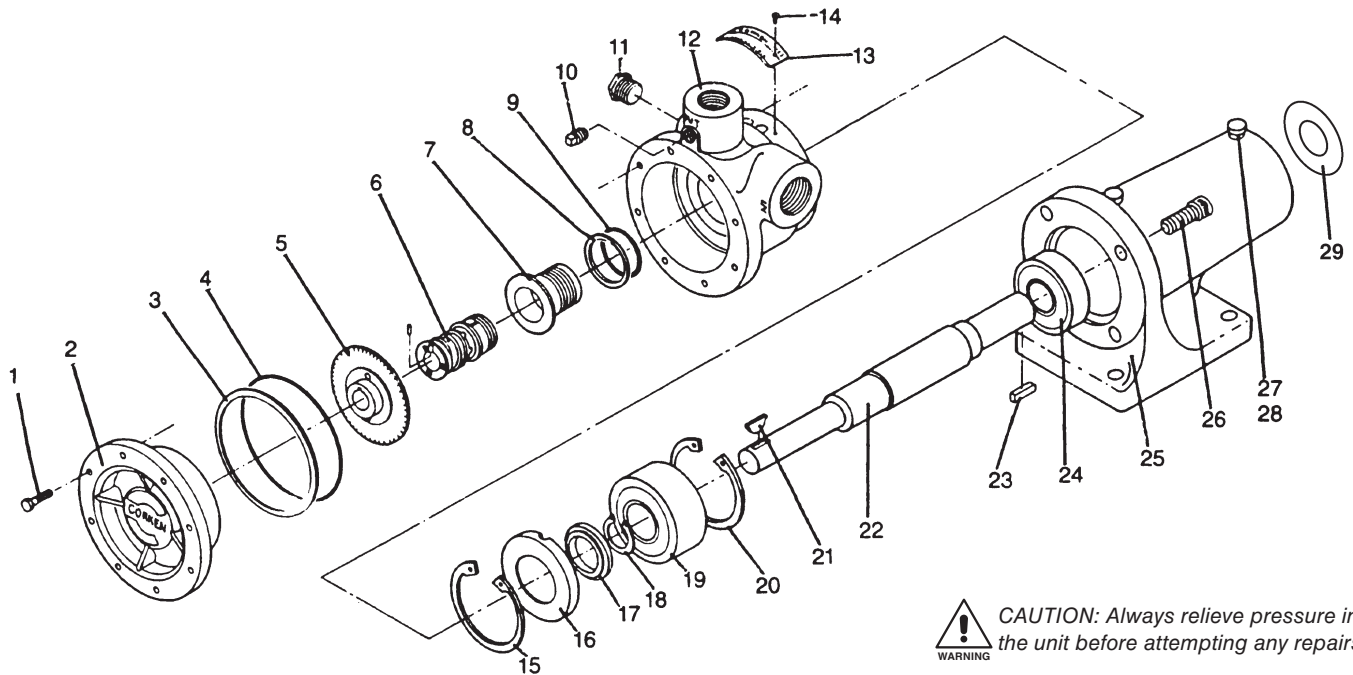
<sup>b</sup> Registered trademark of the DuPont company.

<sup>c</sup> Included with seal assembly/repair kit.

<sup>d</sup> Add a 1 to # for iron or a 2 for stainless steel. (ex. - model 10 w/iron is 1003-01)

# Appendix E—Parts Details for All F-Model (Frame-Mounted) Pumps

This includes F- and FF-models in sizes 9, 10, 12, 13, 14, & 15



**CAUTION:** Always relieve pressure in the unit before attempting any repairs.

Ref No.	Part No.	Description	Qty.
1	7001-031NC100A	Hex head cap screw	8
2	1001-09	Cover - model 9	1
	1001-0	Cover - model 10	1
	1001-2	Cover - model 12	1
	1001-3	Cover - model 13	1
	1001-4	Cover - model 14	1
	1001-5	Cover - model 15	1
	3	1014 <sup>c</sup>	Case clearance shim (0.002 - red)
1014-1 <sup>c</sup>		Case clearance shim (0.003 - green)	As req.
4	2-246 <sup>a,c</sup>	Case O-ring (non-PTFE)	1
	2-247E <sup>c</sup>	Case O-ring PTFE	1
5	1003-09 <sup>d</sup>	Impeller - model 9	1
	1003-0 <sup>d</sup>	Impeller - model 10	1
	1003-2 <sup>d</sup>	Impeller - model 12	1
	1003-3 <sup>d</sup>	Impeller - model 13	1
	1003-4 <sup>d</sup>	Impeller - model 14	1
	1003-5 <sup>d</sup>	Impeller - model 15	1
6	113-CX <sup>a</sup>	Seal assembly	1
7	1004-1X	Seal housing, steel (for non PTFE O-rings)	1
	1004-11X	Seal housing, stainless steel (for non PTFE O-rings)	1
	1004-2X	Seal housing, steel (for PTFE O-rings)	1
	1004-21X	Seal housing, stainless steel (for PTFE O-rings)	1
8	1013	Housing adjustment shim (0.010)	As req.
	1013-1	Housing adjustment shim (0.020)	As req.
9	2-224 <sup>a,c</sup>	O-ring (housing)	1
10	3442	Pipe plug 1/4"	1
11	3444	Pipe plug 3/4"	1
12	1002-9	Case - model 9	1
	1002-0	Case - model 10	1
	1002-2	Case - model 12	1
	1002-3	Case - model 13	1

Ref No.	Part No.	Description	Qty.
12	1002-4	Case - model 14	1
	1002-5	Case - model 15	1
	4206-09	Case - ANSI flanged model 9	1
	4206-0	Case - ANSI flanged model 10	1
	4206-2	Case - ANSI flanged model 12	1
	4206-3	Case - ANSI flanged model 13	1
	4206-4	Case - ANSI flanged model 14	1
	4206-5	Case - ANSI flanged model 15	1
13	1914-1	Name plate	1
14	7012-006SF019E	Phillips head screw 6-32 x 1/4"	2
15	5002-281	Bearing retainer ring	1
16	1238	Bearing cap	1
17	1006	Grease seal	1
18	5102-118	Bearing retainer ring	1
19	2758	Ball bearing	1
20	5000-281	Bearing retainer ring	1
	2497 <sup>c</sup>	#5 woodruff key, steel	1
21	2497-1 <sup>c</sup>	#5 woodruff key, stainless steel	1
	1234	Shaft	1
22	1234-1	Shaft, stainless steel	1
	3226 <sup>c</sup>	Key	1
23	2759	Ball bearing	1
24	1010-2	Frame	1
25	7002-037NC087A	Socket head screw	4
26	2158	Grease zerk	2
27	2159	Lubricap	2
28	3227	Bearing plate	1

O-ring Code	
A	Buna-N
B	Neoprene <sup>b</sup>
D	Viton <sup>b</sup>
E	PTFE
G	Ethylene Propylene
K	Kalrez <sup>b</sup>

<sup>a</sup> \_ denotes O-ring code. See O-ring chart for details.

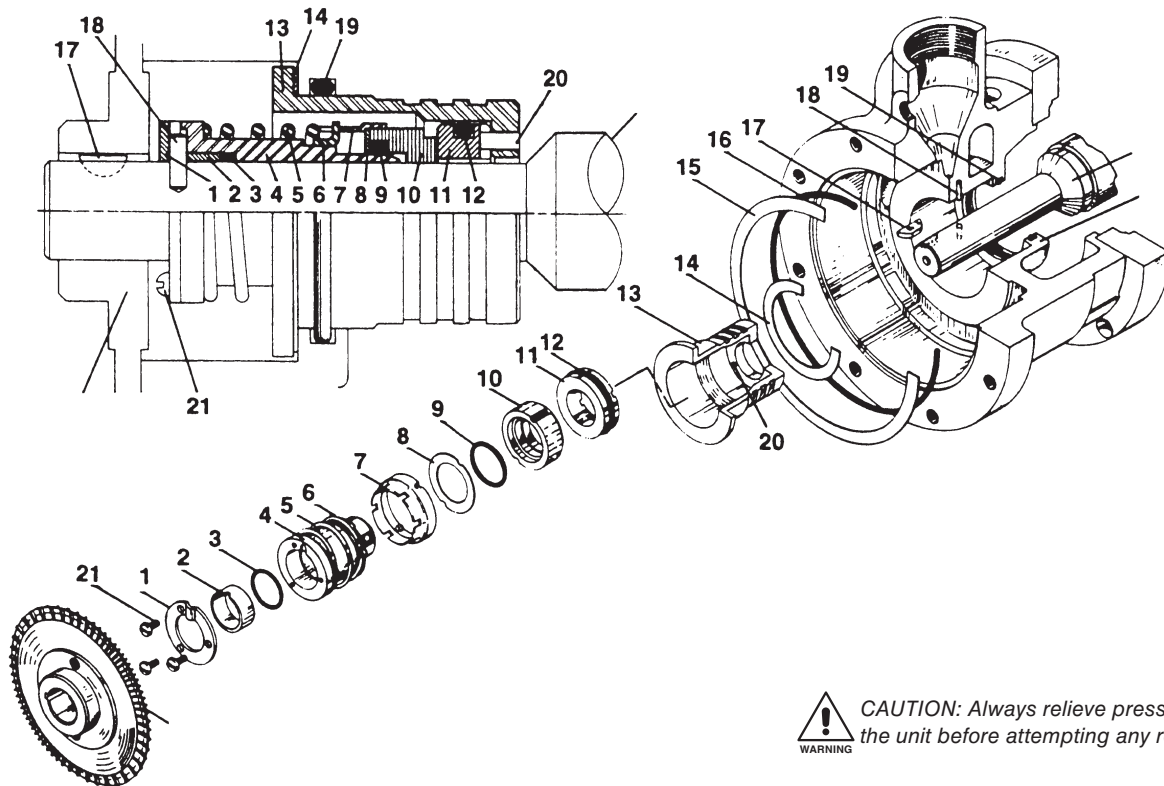
<sup>b</sup> Registered trademark of the DuPont company.

<sup>c</sup> Included with seal assembly/repair kit 113-CX\_.

<sup>d</sup> Add a 1 to # for iron or a 2 for stainless steel. (ex. - model 10 w/iron is 1003-01)

# Appendix E—Parts Details for the Balanced Seal Assembly (113-CX\_)

All C-, DS-, DSF-, DL-, DLF-, F-, FF-Models (Sizes 9, 10, 12, 13, 14, & 15)



**CAUTION:** Always relieve pressure in the unit before attempting any repairs.

Ref No.	Part No.	Description	Qty.
1	1008	Seal clamp ring	1
2	1080	Follower, aluminum	1
	1080-1	Follower, stainless steel	1
3	2-018 <sup>a</sup>	Follower O-ring	1
4	1007 <sup>c</sup>	Seal sleeve, aluminum	1
	1007-2	Seal sleeve, stainless steel	1
5	2734 <sup>c</sup>	Spring	1
6	2735 <sup>c</sup>	Drive band	1
7	2736 <sup>c</sup>	Retainer	1
8	2737 <sup>c</sup>	Disc	1
9	2-118 <sup>a,f</sup>	Rotor O-ring	1
	2343-X <sup>d,g</sup>	Coro-seal (not shown)	1
10	2738 <sup>c,f</sup>	Rotor	1
	2738-1 <sup>d,g</sup>	Rotor for Coro-Seal	1
11	2739 <sup>c</sup>	Seat, cast iron	1
	2739-1 <sup>c</sup>	Seat, ceramic	1
	2739-2 <sup>c</sup>	Seat, ni-resist	1
	2739-3 <sup>c</sup>	Seat, stainless steel	1
	2739-4 <sup>c</sup>	Seat, tungsten carbide	1
12	2-123 <sup>a</sup>	Seat O-ring	1
13	1004-1X <sup>e,f</sup>	Seal housing, steel (with pin)	1
	1004-11X <sup>e,f</sup>	Seal housing, stainless steel (with pin)	1
	1004-2X <sup>e,g</sup>	Seal housing, steel	1
	1004-21X <sup>e,g</sup>	Seal housing, stainless steel	1
14	1013 <sup>e</sup>	Housing adjustment shim (.010")	As req.
	1013-1 <sup>e</sup>	Housing adjustment shim (.020)	As req.
15	1014	Case clearance shim (.002)	As req.
	1014-1	Case clearance shim (.003)	As req.

Ref No.	Part No.	Description	Qty.
16	2-246 <sup>a</sup>	Case O-ring (non-PTFE)	1
	2-247E	Case O-ring, PTFE	1
17	2497	#5 Woodruff key, steel	1
	2497-1	#5 Woodruff key, stainless steel	1
18	1009	Seal drive pin	1
19	2-224 <sup>a</sup>	Seal housing O-ring	1
20	3520	Roll pin (included with seal housing)	1
21	7012-006NC025B	Screw, 6-32 x 1/4" phillip pan head	3

Assembly No.	Assembly Name
113-CX <sup>a,d</sup>	Seal assembly with 1007-X, 1008, 1009, 1014, 1014-1, 1080, 2497, 2736, 2737, 2739-X, 2-018, 2-224, 2-246
1007-X	Seal sleeve assembly with 1007, 2734, 2735
1007-2X	Seal sleeve assembly, stainless steel, with 1007-2, 2734, 2735

O-ring Code	
A	Buna-N
B	Neoprene <sup>®b</sup>
D	Viton <sup>®b</sup>
E	PTFE
G	Ethylene Propylene
K	Kalrez <sup>®b</sup>

<sup>a</sup> \_ denotes O-ring code. See O-ring chart for details.

<sup>b</sup> Registered trademark of the DuPont company.

<sup>c</sup> These parts are not available separately.

<sup>d</sup> For PTFE fitted seals, O-ring 2-118 is replaced by Coro-Seal 2343-X and rotor 2738 is replaced by 2738-1.

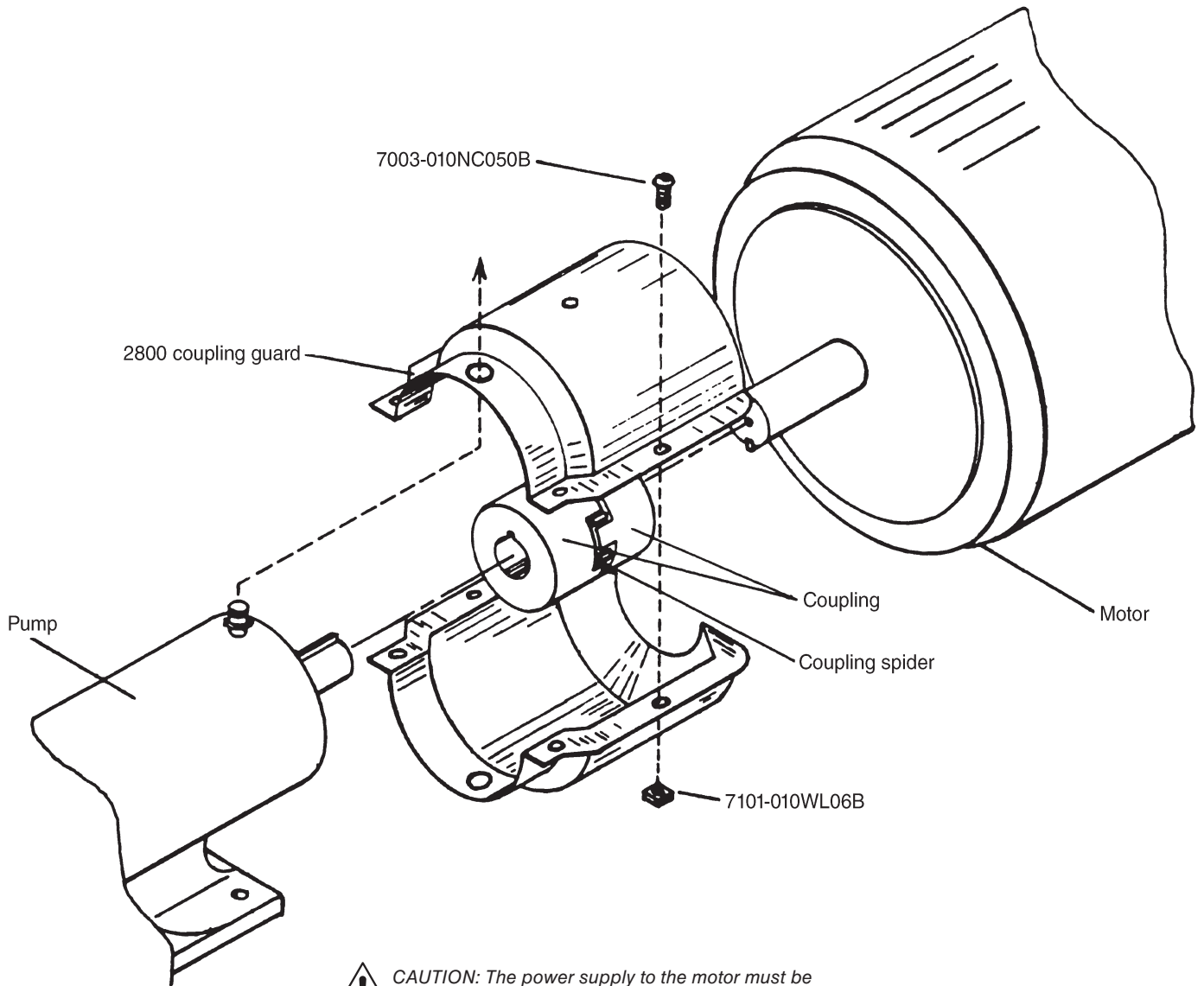
<sup>e</sup> Not included in 113-CX.

<sup>f</sup> Except PTFE O-rings.

<sup>g</sup> For PTFE O-rings only.

# Appendix E—Parts Details for the F-Model Pump Coupling Guard

All F- and FF-Models (Pump Sizes 9, 10, 12, 13, 14, and 15)

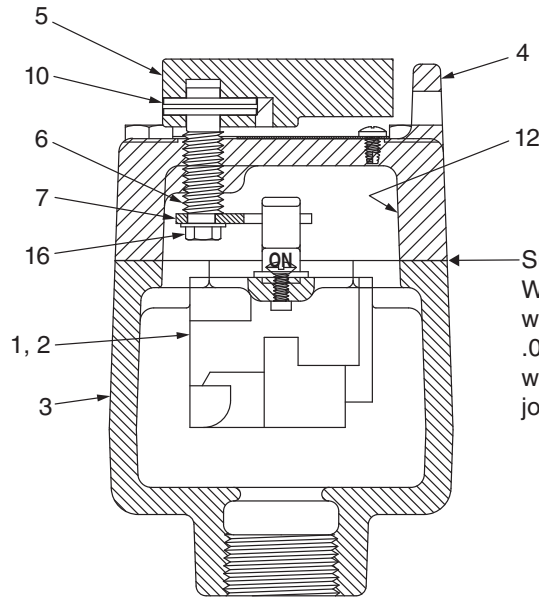
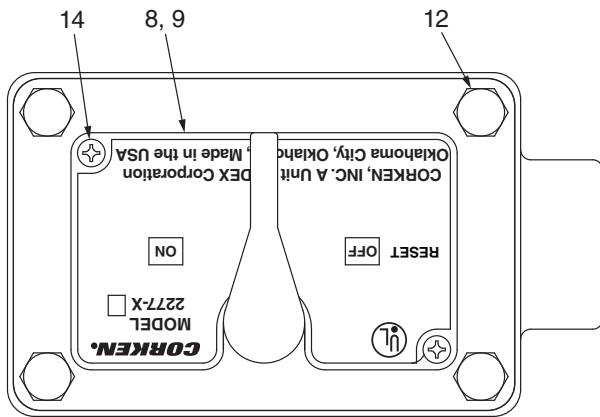


**CAUTION:** The power supply to the motor must be disconnected before working on the pump drive system.

Part No.	Description
1344	Coupling AL/L-095, special bore
1344-1	Coupling AL/L-095, 1 x 5/8
1344-2	Coupling AL/L-095, 1 x 3/4
1344-3	Coupling AL/L-095, 1 x 7/8
1344-4	Coupling AL/L-095, 1 x 1-1/8
1345	Coupling AL/L-100, special bore
1345-1	Coupling AL/L-095, 1 x 1-3/8
1346	Coupling AL/L-110, special bore-hytrel
1351	Coupling spider AL/L-095
1352	Coupling spider AL/L-100
1353	Coupling spider AL/L-110/hytrel
2800-X	Coupling guard assembly - Coro-Flo® (includes (2)2800, (4)7003-010NC050B, and (4)7101-010WL06B)

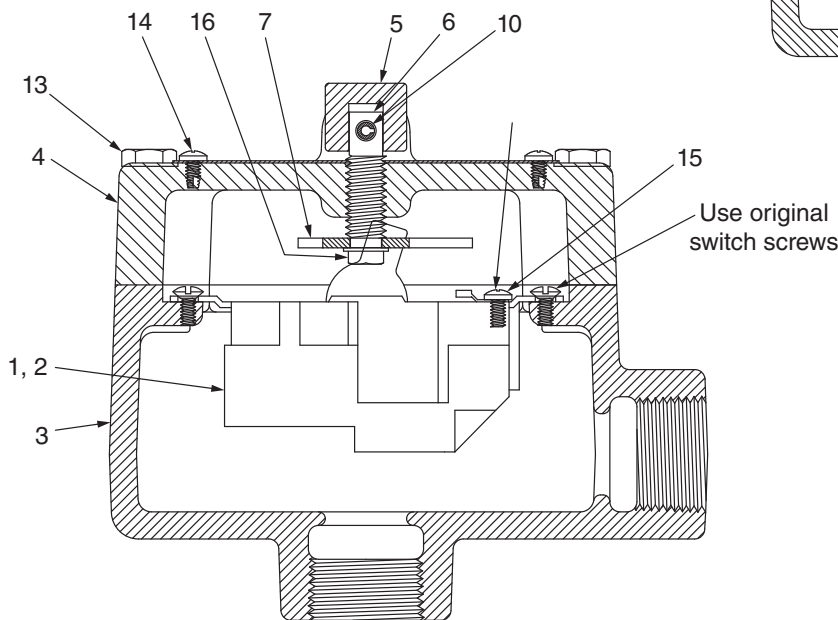
# Appendix E—Parts Details for the C-Model Pump Starter Box

## Motor Mounted Model (2277-X1)



Surface flatness:  
When assembled  
with cover 2277 a  
.0015 feeler gauge  
will not enter the  
joint more than 1/8".

Section B



Use original  
switch screws

Section A

*NOTE: Original instructions that come with switch is placed inside box.*



**CAUTION:** To prevent ignition of hazardous atmospheres, disconnect the device from the supply circuit before opening. Keep assembly tightly closed when in operation.

Specify maximum motor amperage for proper heating selection.

Ref No.	Part No.	Description	Qty.
1	2275	Switch: 3/4 hp – 1 hp	1
2	3784 <sup>a</sup>	Switch: 2 hp	1
3	2276	Box	1
4	2277	Cover	1
5	2278	Switch handle	1
6	2279	Switch stem	1
7	2280	Switch actuator	1
8	2281	Nameplate: 2277-X1	1
9	3782	Nameplate: 2277-X3	1
10	3802	Roll pin: 5/32" x 7/8"	1
11	2867	Plastic nozzle plug: 3/4" NPT (not shown)	2
12	3813	Decal	1
13	7001-025NC150A	Hex head 1/4-20 x 1-1/2"	4
14	7012-006SF025E	Pan head phillip 6-32 1/4"	2
15	7012-006NC025B	Pan head phillip 6-32 x 1/4"	1
16	7001-010WL037B	Hex head 10-24 x 3/8"	1

For current Corken Coro-Flo C-Model motors the following heaters are standard.

Motor No.	Horsepower	Heater No.
2555 (Obsolete) <sup>c</sup>	3/4	2574
2556 (Obsolete) <sup>c</sup>	1	2610
4261 <sup>d</sup>	2	—

<sup>a</sup> Motor number 4261 uses switch 3784 which does not use a heater element.

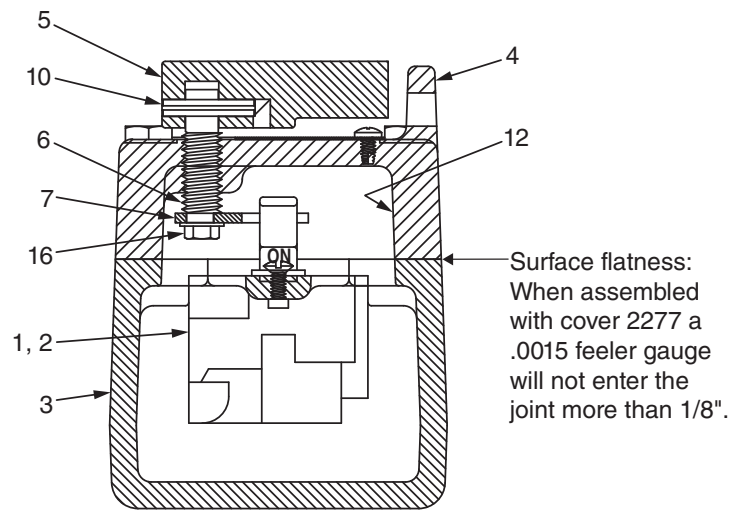
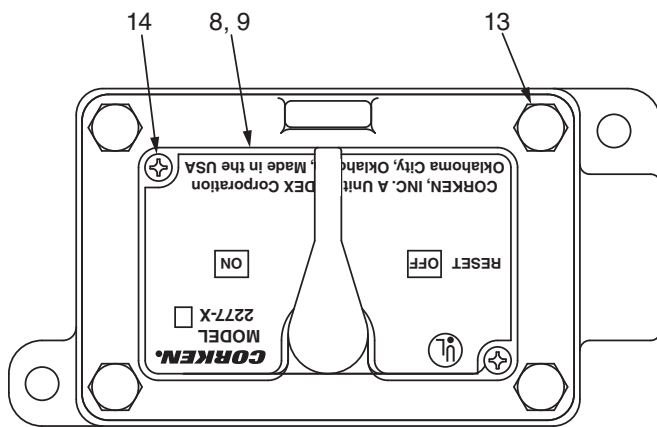
<sup>b</sup> Motor number 4261 uses switch assembly 2277-X3.

<sup>c</sup> Replaced by 4261 (2 hp).

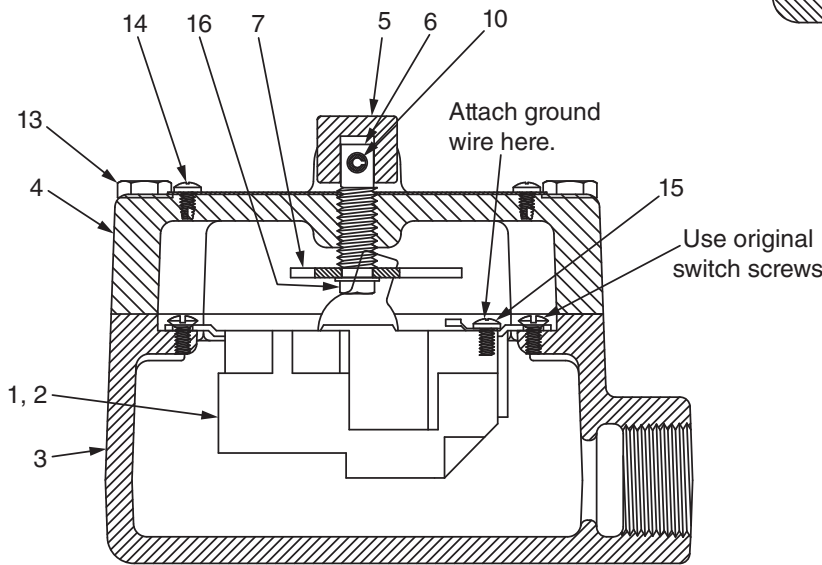


# Appendix E—Parts Details for the C-Model Pumps Starter Box

## Wall Mounted Model (2277-X2)



Section B



Section A

NOTE: Original instructions that come with switch is placed inside box.

**CAUTION:** To prevent ignition of hazardous atmospheres, disconnect the device from the supply circuit before opening. Keep assembly tightly closed when in operation.

Specify maximum motor amperage for proper heating selection.

Ref No.	Part No.	Description	Qty.
1	2275	Switch: 3/4 hp – 1 hp	1
2	3784 <sup>a</sup>	Switch: 2 hp	1
3	2339	Box	1
4	2277	Cover	1
5	2278	Switch handle	1
6	2279	Switch stem	1
7	2280	Switch actuator	1
8	2281	Nameplate: 2277-X2	1
9	3782	Nameplate: 2277-X4	1
10	3802	Roll pin: 5/32" x 7/8"	1
11	2867	Plastic nozzle plug: 3/4" NPT (not shown)	2
12	3813	Decal	1
13	7001-025NC150A	Hex head 1/4-20 x 1-1/2"	4
14	7012-006SF025E	Pan head phillip 6-32 1/4"	2
15	7012-006NC025B	Pan head phillip 6-32 x 1/4"	1
16	7001-010WL037B	Hex head 10-24 x 3/8"	1

For current Corken Coro-Flo C-Model motors the following heaters are standard.

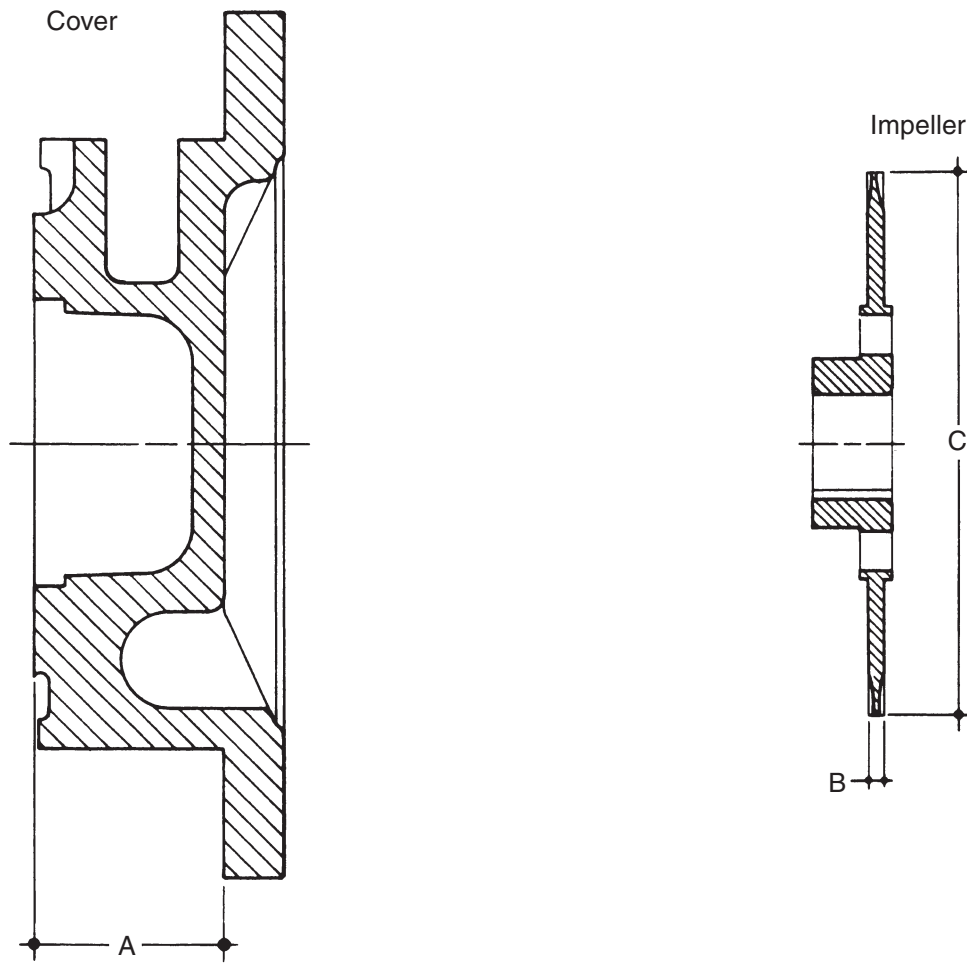
Motor No.	Horsepower	Heater No.
2555 (Obsolete) <sup>c</sup>	3/4	2574
2556 (Obsolete) <sup>c</sup>	1	2610
4261 <sup>b</sup>	2	4250

<sup>a</sup> Motor number 4261 uses switch 3784 which does not use a heater element.

<sup>b</sup> Motor number 4261 uses switch assembly 2277-X4.

<sup>c</sup> Replaced by 4261 (2 hp).

# Appendix E—Parts Details for New Part Interference Dimensions for Coro-Flo® Pumps All Models



Model	A (maximum)	B (maximum)	C (maximum)
9	1.489	0.142	4.126 D
10	1.489	0.142	4.126 D
12	1.398	0.208	4.062 D
13	1.388	0.227	4.374 D
14	1.351	0.301	4.374 D
15	1.398	0.208	4.374 D
150	1.098	0.372	5.870 D

# Appendix F—Troubleshooting Guide

In diagnosing pump and “system” troubles, the following information is essential:

1. Pump model and serial number
2. Electric motor; hp and RPM
3. Product specific gravity
4. Product temperature
5. Pressure at pump’s suction port
6. Pressure at pump’s discharge port
7. Pressure in the storage tank
8. Pressure in the tank being filled
9. Size and length of the discharge pipe and hose

Symptom	Probable Cause	Remedy
Low Capacity	Pump speed too low Wrong electric motor	Check the RPM of the electric motor.
	High differential pressure	Remove the restrictions in the discharge piping/hose, or increase their sizes.
	Vapor lock	Regenerative turbine pumps “vapor- lock” when reaching their maximum differential pressure capability. See above for high differential pressure.
	By-Pass valve stuck open or set too low	Readjust, repair or replace the by-pass valve
	Clogged strainer	Clean strainer screen.
	Worn impeller	Replace the impeller.
	Suction pipe too small or restricted	Indicated by pump’s inlet pressure dropping when the pump is started. Remove restrictions and/or increase pipe size.
Pump runs but no flow	Valve closed	Check valves and make sure they are in the open position.
	Excess flow valve slugged or closed	Stop pump until the excess flow valve opens. If the problem continues, install a new or larger capacity excess flow valve.
	Wrong rotation	Check the rotation of the electric motor and change the rotation.
	Suction pipe too small or restricted	Indicated by pump’s inlet pressure dropping when the pump is started. Remove restrictions and/or increase pipe size.
Pump will not turn — locked	Foreign matter in the pump	Clean out the pump—inspect the strainer screen.
	Bearing seized	Replace the pump’s bearings—grease bearing every three months, using a ball bearing grease.
	Moisture in the pump	Thaw and break loose carefully. Check with the product supplier if the product contains water. Properly remove the moisture from the product.
Pump will not build pressure	Poor suction conditions	Check the storage tank excess flow valve—clean filter screen. The suction pipe might be too small or restricted. Remove restrictions and/or increase pipe size.
	By-pass valve set too low	Set the valve for higher pressure (see valve’s instructions).
	Too much impeller clearance	Do a performance test on the pump (see preventive maintenance program).
Noise or vibration in the pump	Cavitation from poor suction conditions	Make sure all valves are open, look for restrictions on the suction piping and clean the strainer screen.
	Coupling misaligned	Align the coupling.
	Coupling or coupling guard loose	Tighten the coupling and its guard.
	Coupling rubber insert worn or damaged	Replace the rubber insert and check coupling alignment.
	Worn bearings	Replace if necessary—Lubricate every three months.

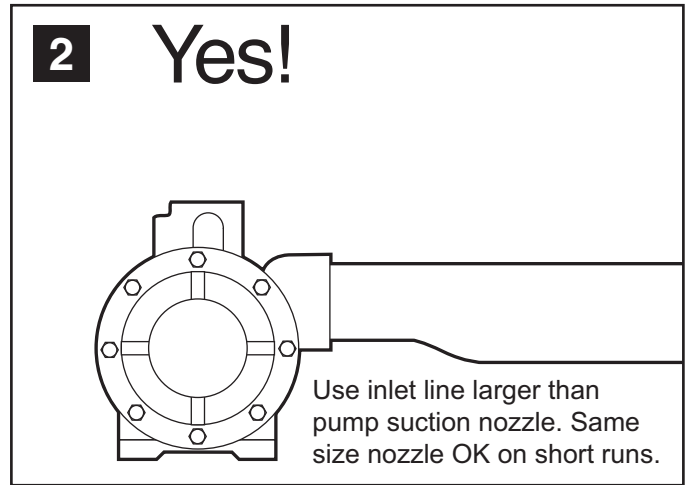
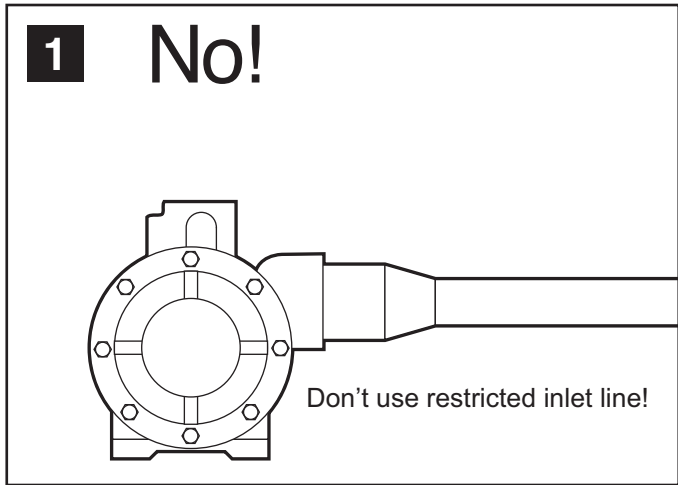
Symptom	Probable Cause	Remedy
Noise or vibration in the pump (continued)	Defective or wrong size By-pass valve	Confirm the size of the by-pass valve required for your application. Inspect, repair or replace the valve.
	Loose anchor bolts	Tighten all pump's anchor bolts.
Electric motor gets hot or overload protection kicks out	High differential pressure	Check the motor's full load amperage. Adjust the by-pass valve setting to a lower setting. See recommendations for low capacity due to high differential pressure.
	Low line voltage	Check line voltage when in operation. Be sure motor is wired for the proper voltage. Check the electric motor's nameplate.
	Starter overload Heaters too small	Check the motor load with an ammeter and confirm the heater size with the starter's manufacturer.
	Motor shorted	Totally Enclosed Fan-Cooled electric motors (TEFC) and explosion proof electric motors are subject to moisture condensation inside when used intermittently. To eliminate moisture you might allow the motor to operate at least once a week until it get sufficiently hot to evaporate the moisture.
Leaks	Failed O-rings or mechanical seal assembly	Inspect and replace the seals and O-rings, if needed.

## Appendix G—Extended Storage Procedures

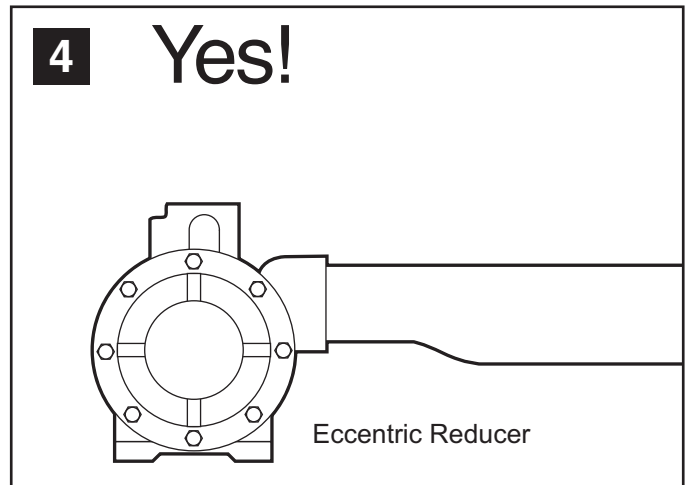
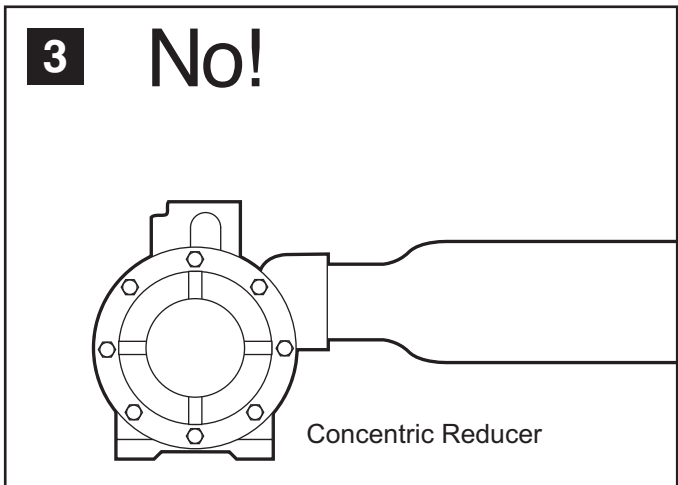
If your Coro-Flo pump is to be removed from service for some time, the pump must be protected, as propane, butane and anhydrous ammonia all leave the metal "bare" and open to corrosion. Piping and tanks not in service should also be protected, as the rust that forms can destroy the pump's seals almost 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 "Operation of Your Coro-Flo® pump" on page 8.

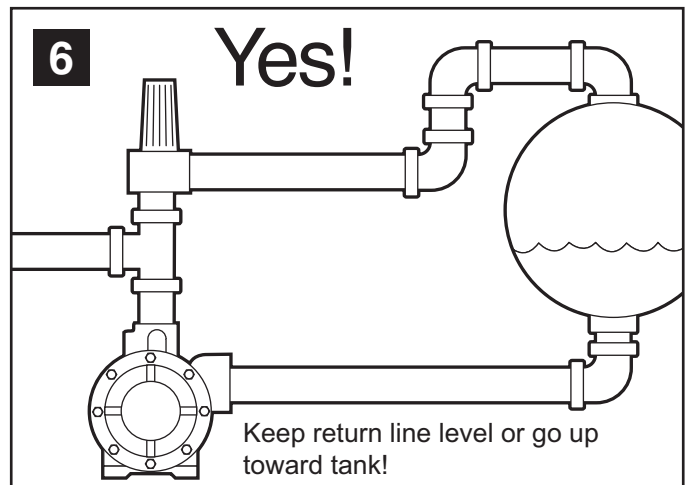
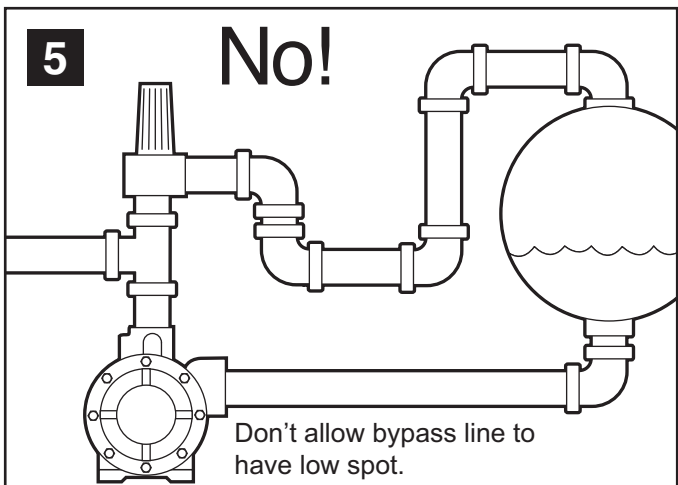
## Appendix H—Aboveground Installation/Piping Instructions



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

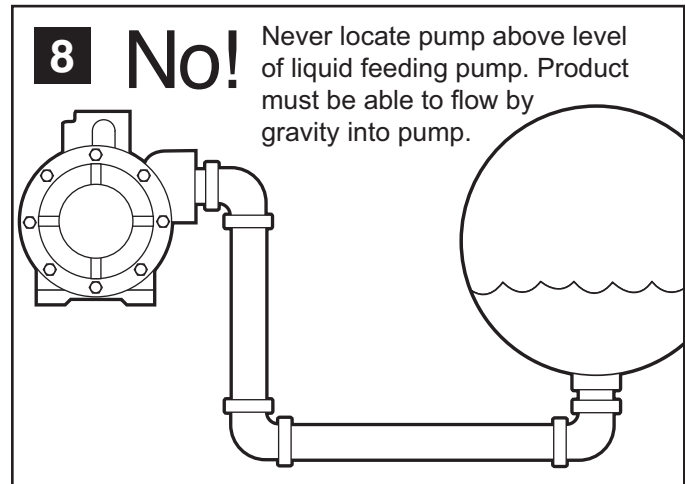
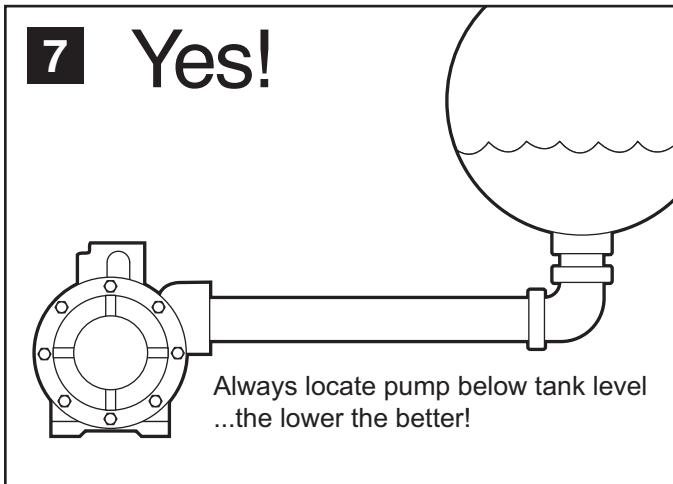


An eccentric reducer should always be used when reducing into any pump inlet where vapor might be encountered in the pumpage. The flat upper portion of the reducer prevents an accumulation of vapor that could interfere with pumping action.

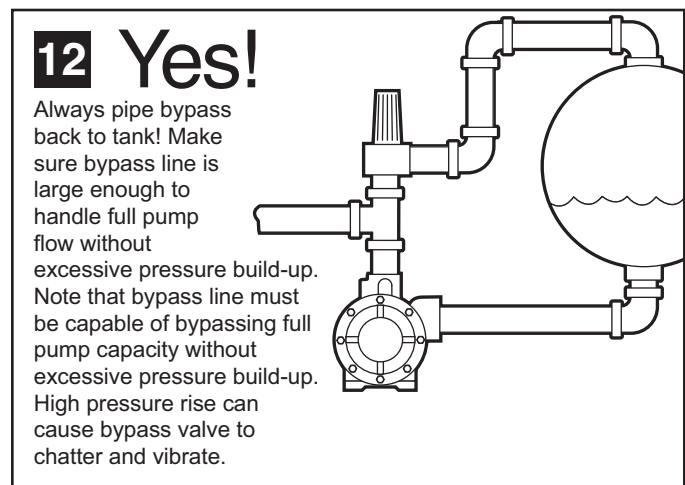
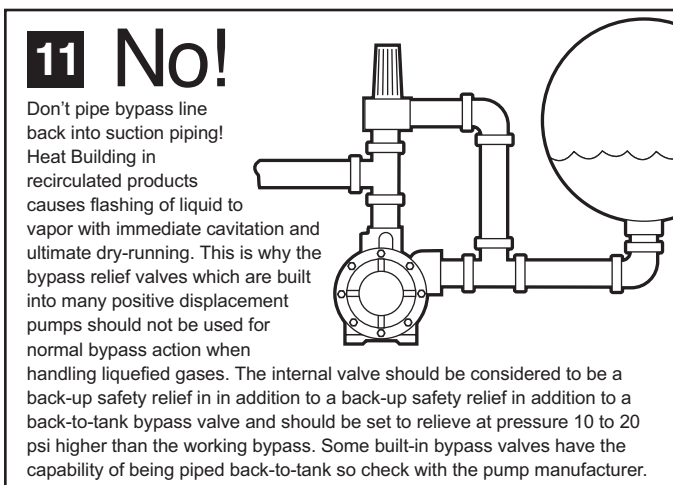
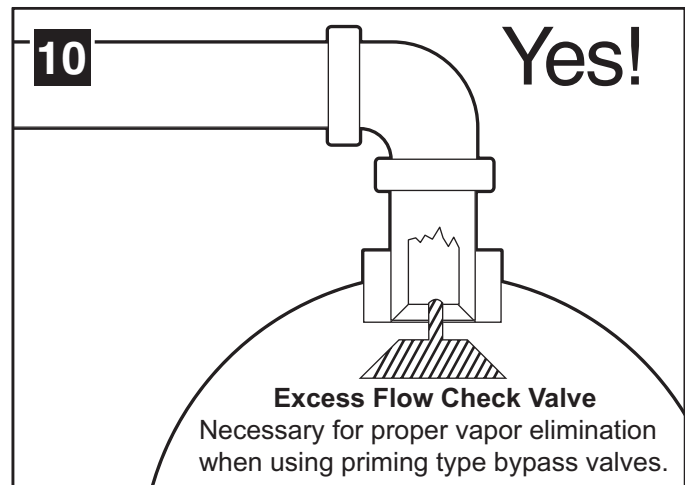
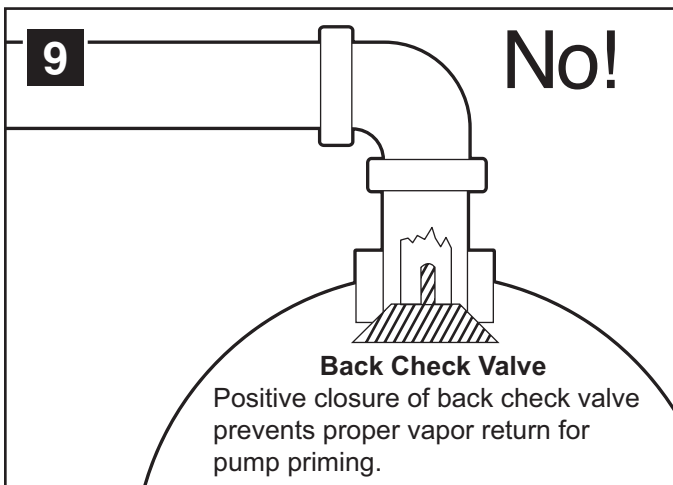


Low spots in bypass line can collect liquid which prevents normal vapor passage for priming purposes just like the P trap in the drain of a kitchen sink. This is not a problem for bypass lines where vapor elimination is not required.

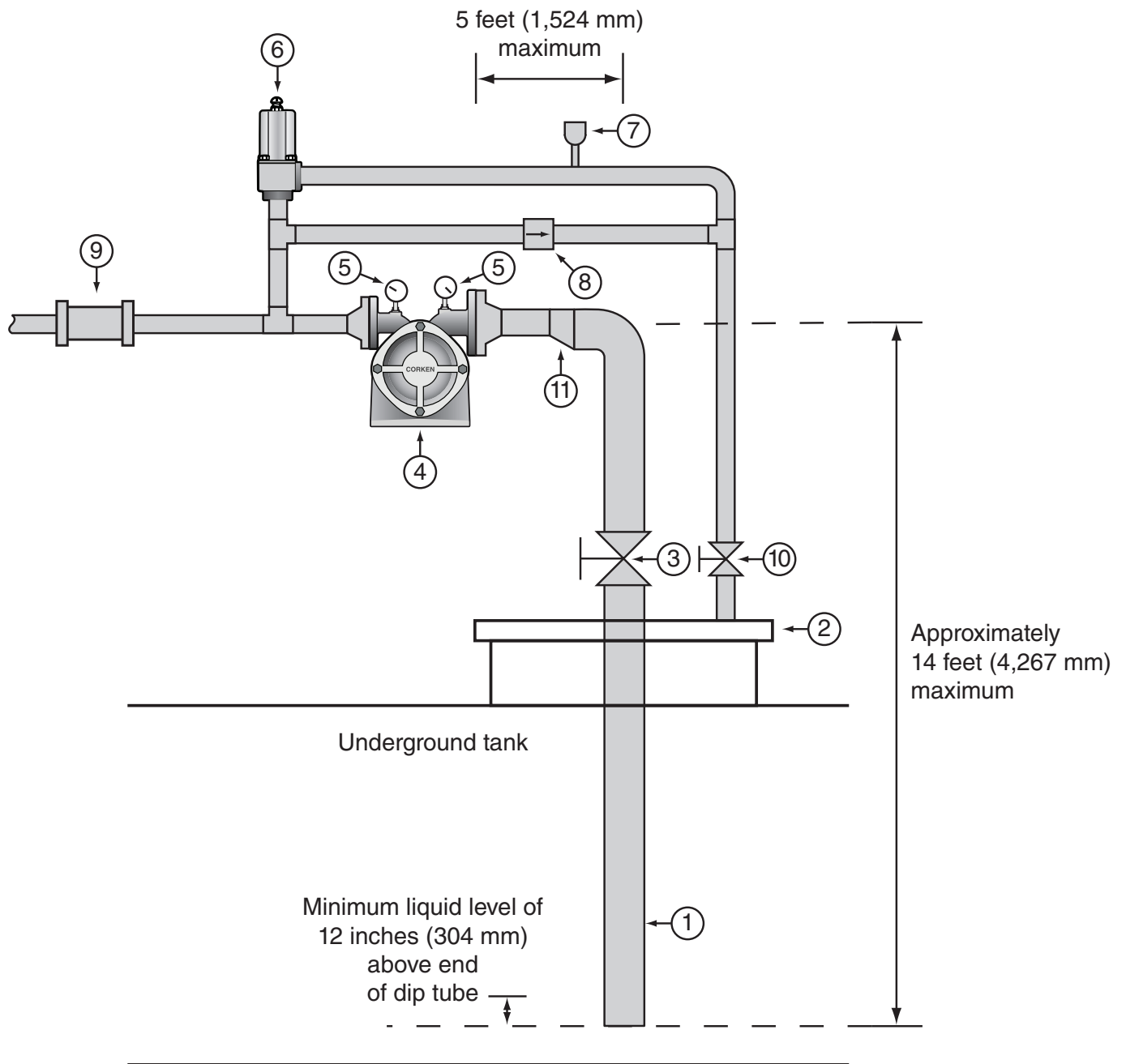
## Appendix H—Aboveground Installation/Piping Instructions



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.



# Appendix I—Underground Piping Diagram



# Appendix I—Bill of Materials for Underground Installations

Ref. No.	Description	Size		Remarks
		Model 12, 15	Model 13, 14	
1	Schedule 80 pipe	1"	1-1/4"	
2	Man way cover			Existing
3	Ball valve, full port	1"	1-1/4"	Manual or remote control
4	Corken Coro-Flo pump	12	13 or 14	With appropriate motor
5	1/4" NPT pressure gauge			0-400 psig (0-28 bar g)
6	Corken B166 by-pass valve	1"	1"	With spring code C
7	1/4" NPT hydrostatic relief valve			Set at 450 psig (31 bar g)
8	In-line excess flow valve			Closing flow of 10-15 gpm (37-57 L/min)
9	Back pressure check valve			Corken Flo-Chek valve
10	By-pass return line valve			Existing
11	Eccentric reducer if required			

## Warning:

- 1.0 No excess flow valves on the tank's liquid outlet connections are shown in these schematics. If local regulations require the use of excess flow valves, its closing flow should be approximately 1.5 times higher than the pump's rated capacity for the operational conditions.
- 2.0 Periodic inspection and maintenance of Corken products is essential.
- 3.0 Only experienced, trained and qualified personnel must make inspection, maintenance and installation of Corken products.
- 4.0 Maintenance, use and installation of Corken products must comply with Corken instructions, applicable laws and safety standards such as NFPA 58 for LP-Gas and ANSI K6.1-1972 for Anhydrous Ammonia.
- 5.0 Transfer of toxic, dangerous, flammable or explosive substances using Corken equipment is at the user's risk. Only qualified personnel should operate Corken equipment according to the applicable laws and safety standards.

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