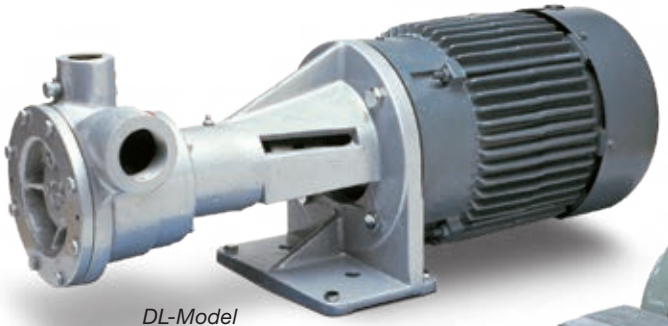
Installation, Operation & Maintenance Manual

Regenerative Turbine Pumps

for LPG, NH_3, and Many Other Liquefied Gases and Thin Liquids

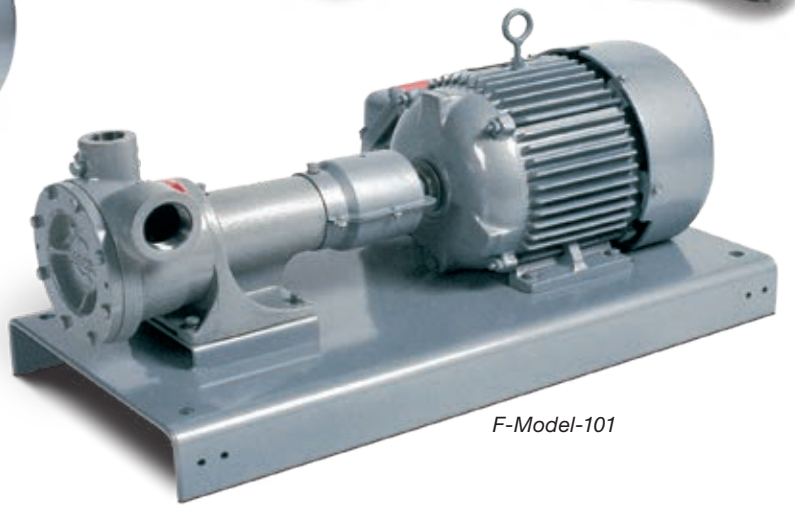
All Models 10, 12, 13, 14, 16, 17, 18, and 19



DL-Model

C-Model

C-Model



F-Model-101

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. (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.

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Solutions beyond products...

CORKEN®

Warning

Install, use and maintain this equipment according to Corken's instructions and all applicable federal, state, local laws and codes. Periodic inspection and maintenance is essential.

Corken One Year 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. If a warranty dispute occurs, the DISTRIBUTOR may be required to provide CORKEN with proof of date of sale. The minimum requirement would be a copy of the DISTRIBUTOR'S invoice to the customer.

CORKEN products which fail within the warrant period due to defects in material or workmanship will be repaired or replaced at CORKEN's option, when returned, freight prepaid to CORKEN, INC., 9201 North I-35 Service Road, Oklahoma City, OK. 73131.

Parts subject to wear or abuse, such as mechanical seals, blades, piston rings, valves and packing, and other parts showing signs of abuse, neglect or failure to be properly maintained 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 the 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 warrantee 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. Experienced, trained personnel in compliance with governmental and industrial safety standards should handle such substances.

Important notes relating to the European Union (EU) Machinery Directive

Pumps delivered without electric motors are not considered as machines in the EU Machinery Directive. These pumps will be delivered with a Declaration of Incorporation. The fabricator of the machinery must assure and declare full compliance with this Directive before the machine in which the pump will be incorporated, or of which it is a part, is put into service.

Contacting the Factory

Before contacting the factory, note the model and serial numbers. The serial number directs Corken personnel to a file containing all information on material specifications and test data applying to the product. When ordering parts, the Corken service manual or Installation, Operations, and Maintenance (IOM) manual should be consulted for the proper part numbers. ALWAYS INCLUDE THE MODEL NUMBER AND SERIAL NUMBER WHEN ORDERING PARTS.

The model and serial numbers are shown on the nameplate of the unit. Record this information for future reference.

Model No. _____

Serial No. _____

Date Purchased _____

Date Installed _____

Purchased From _____

Installed By _____

Table of Contents

Principles of a Regenerative Turbine Pump

The Corken Coro-Flo® is a special type of pump known as a regenerative turbine. The liquid flows through the inlet nozzle and passageways on each side of the impeller (the rotating element) and is recirculated constantly between the vanes or teeth of the impeller and passageways as the impeller rotates. The fluid makes a complete revolution inside the pump case before it is diverted through the outlet nozzle. As the differential pressure increases, the horsepower required to drive the pump increases but the capacity decreases. Differential pressure is the difference between the pressure at the inlet and outlet of the pump.

The impeller is the only moving part and does not contact the pump casing. Consequently, there is very little impeller wear when pumping volatile liquids with little to no lubricating qualities such as LP-Gas and ammonia.

Exclusive Features of a Coro-Flo® Pump

Pumping 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.

In addition to being well suited for handling volatile liquids, the Coro-Flo® pump has several features making it easier to operate and maintain.

- Three mounting options: Close-coupled (C-model), Frame-mounted (F-model), and Direct-mounted (D-model).
- Underwriters' Laboratories, Inc. has tested and inspected the pumps listed in this manual. All are approved for use in LP-Gas and ammonia applications. The nameplate on the pump shows the UL label.
- Ductile iron, a metal with the strength of steel, is used for all parts under pressure of the liquid.
- The impeller floats on a shaft and can be easily replaced without disturbing the piping or driver. No special tools are needed.
- The mechanical seal assembly can be replaced without disturbing the piping or driver and no special tools are required.
- The pump nozzles rotate into four different positions, 90 degrees apart.
- A bypass connection with 3/4" pipe thread is located on the outlet nozzle simplifying the piping process.
- Pressure gauge connections with 1/4" pipe thread are located on the inlet and outlet nozzles.
- The motors on models C10, C12, C13, C14, and C16 are explosion proof, Class I, Group D - UL and CSA listed.

  The model C10, C12, and C13 motors are designed for single phase, 50 Hz (2,880 RPM) or 60 Hertz (3,450 RPM), 115 and/or 230 volt applications.

  The C14 and C16 motors are designed for single-phase (115/230V) or three-phase (230/460V), 50 Hz (2,880 RPM) or 60 Hz (3,450 RPM) applications.
- Corken provides two manual motor starters for models C10, C12, and C13. One is motor mounted and the other is wall-mounted. To fulfill the 1996 requirement from NFPA 70-NEC, paragraphs 501.5.a.1 and 3, all motors after pump serial number TS185540 are equipped with a conduit seal in the 3/4" NPT rigid galvanized steel nipple.

  NOTE: Separate motor starters with overload protection are required for models C14 and C16 and all D- and F-model pumps.

Chapter 1—Installation

1.1 Location

Installing of a Coro-Flo® pump is a simple matter; however, the principles discussed in this manual must be followed to ensure maximum performance. The piping instructions in Appendix H illustrate methods proven by hundreds of installations. Slight variations are acceptable but they must be minor.

If it is necessary to rotate the nozzles of the pump, remove the four cap screws connecting the pump case to the motor or the frame.

CAUTION: Do not pull the case away from the motor or frame. Doing so may damage the mechanical seal.

No pump can discharge more liquid than it receives, so the location and the inlet piping must be given careful consideration. If the inlet piping does not meet the demand of the pump, there will be flow issues!

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 should be a minimum of two feet above the pump inlet nozzle. NOTE: Four feet above the pump nozzle is standard.

Pump Weights

The following table shows the weight of the bare pump for each model. For handling a bare pump, lifting slings

should be placed around the inlet and outlet flange neck of the pump. To minimize damage to the paint, web slings are preferred over metal slings.

Model No.	Weight
C10	76
C12	86
C13	126
C14, C16	150
DL10, DL12, DL13, DL14, DL16, DL17, DL18, and DL19	62
F10, F12, F13, F14, F16, F17, F18, and F19	48

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. A pressure gauge at pump suction nozzle.

3. The tank shutoff valve should be a full port ball or internal valve.

4. A “Y” type strainer with a 20 mesh screen should be placed on the inlet line of the pump.

5. A flexible connection should be used on the pump inlet and outlet to accommodate piping strains.

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

7. To change line size, an eccentric swage at the pump inlet nozzle is recommended (Note: flat side up, to avoid vapor formation.)

8. 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 shows how the pump is performing on the inside so be sure to have one installed.

2. A hydrostatic relief valve must be installed within 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. A bypass system for the pump must be installed. Without it, the pump has little chance of performing.

2. A Corken B166 bypass valve allows the pump to vent vapors from the pump and act as a differential relief valve making it ideal for the bypass system.

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. A filler or back check valve should never be used.

For more detailed piping tips, see Appendix H in the back of this manual.

1.5 Pump Foundation—F-Models

For optimal performance, every pump mounting needs a firm concrete foundation. There are many ways to construct a foundation so the example in figure 1.5 is only a suggestion. Two important requirements are to make the foundation level and deep enough to get below the frost line for the region. See Appendix D for outline dimensions related to the baseplate.

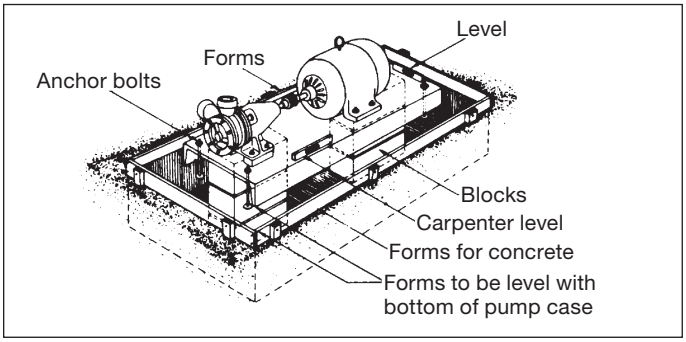


Figure 1.5

1.6 Level Base

After the concrete has set, confirm the pump base is level. If necessary drive metal shims under the base near the anchor bolts as shown in figure 1.6. Tighten the anchor bolts once again and confirm the base is level.

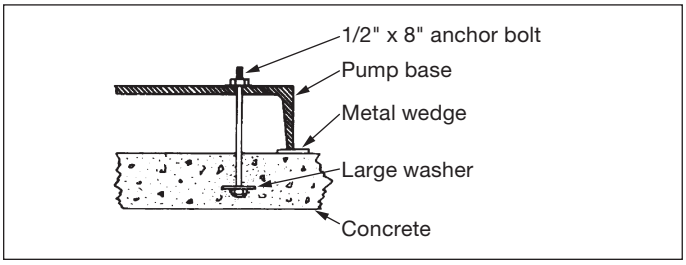


Figure 1.6

1.7 Coupling Alignment—F-Models

For a long service life, the coupling alignment must be near perfect. **The shafts of the pump and driver 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 both coupling halves on the top and side. For proper alignment, both coupling faces must be parallel and concentric (figure 1.7).

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

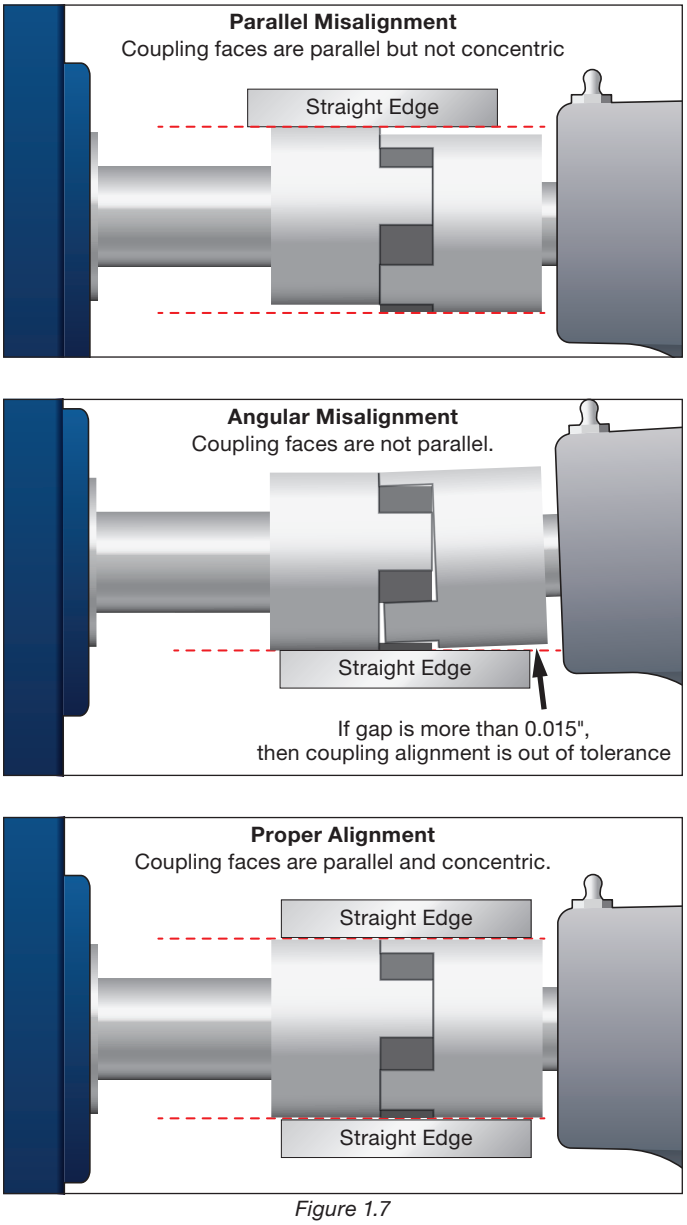


Figure 1.7

Scan QR Code and refer to the maintenance video titled "How to Align the Coupling Between the Motor and Pump".

1.8 Backup Wrench

To help prevent breaking the pump nozzle or springing the pump out of alignment, always use a backup wrench as shown in figure 1.8.

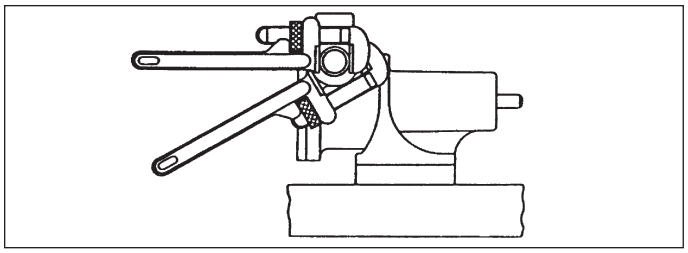


Figure 1.8

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

1.9 Driver Installation

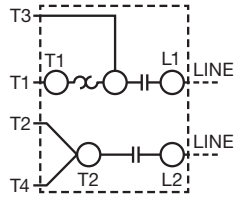
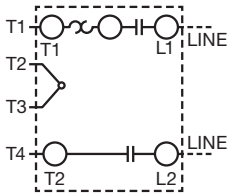
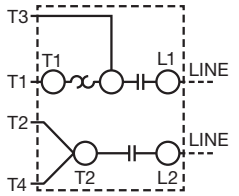
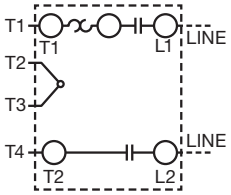
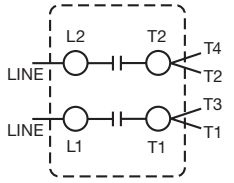
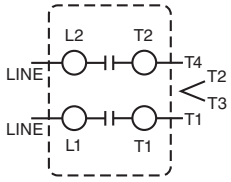
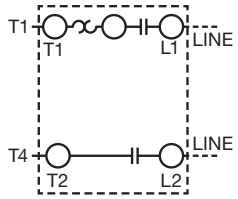
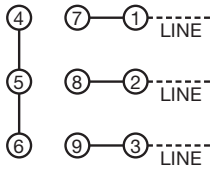
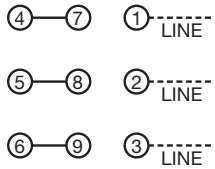
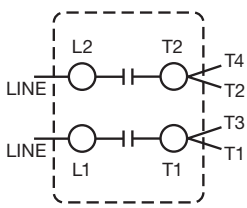
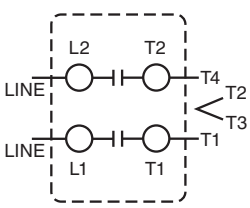
Wiring the electric motor correctly is extremely important. An improperly wired motor causes expensive motor difficulties so a competent electrical contractor is recommended. The wire size charts on pages 7 and 8 indicate the minimum specifications for wire sizes.

Wiring the motor for the proper voltage is critical as well. If low voltage is suspected, call the local power company and confirm the voltage provided and wire accordingly. Connecting to improper voltage will completely destroy the motor.

With 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) draw moist air into the motor housing. The moist air condenses and may eventually add enough free water to the inside of the motor causing 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 approximately one hour using the pump's bypass system. During this time, the motor heats up and vaporizes the condensed moisture. No motor manufacturer guarantees an explosion-proof or totally enclosed motor against damage from moisture.

Engine drivers require special consideration so the manufacturer's instructions must be followed. When the Coro-Flo® Pump is equipped with an engine from the factory, normally the engine speed should not exceed 3600 rpm. Excessive engine speed overloads the engine causing early failure. The engine loses 3% of its power for every 1,000 feet above sea level. If the installation is located 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			
C10 C12	S-20 SM-20	2556 (Obs.)	1	1	115	18	8	6	4	2610 (P32)	115V 2277-X1 or 2277-X2 Switch Assy (uses switch 2275) 	208–230V 2277-X1 or 2277-X2 Switch Assy (uses switch 2275) 
					230	9	12	12	10			
C10 C12 C13	—	3760 (Rep. by 4261)	2	1	115	24	8	4	2	4250 (P36)	115V (uses switch 2275) 	208–230V (uses switch 2275) 
					230	12	12	10	8			
C10 C12 C13	S-30 SM-30	4261	2	1	115 230	20 10	8 12	4 10	2 8	No overload	115V 2277-X3 or 2277-X4 Switch Assy (uses switch 3784) 	230V 2277-X3 or 2277-X4 Switch Assy (uses switch 3784) 
					230	10	12	10	8			
C10 C12	S-25 SM-25	4261-1	1	1	208	10	12	10	8	4250 (P36)	208-230V (uses switch 2275) 	
					230							
C14 C16	—	2557[a]	3	3	230	10	12	12	12	—	208–230V 	460V 
					460	5	12	12	12			
C14 C16	—	4885	3	1	115	29	6	4	2	—	115V 	230V 
					230	14.5	12	8	8			

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.

[a] *Pump must rotate in the direction shown on pump case. If not, switch any two of the three incoming 3 phase lines.*

1.11 Wire Sizing Chart—DL- and F-Models

Motor				Recommended wire size, AWG[1]		
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
		460	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

[1] Based upon 3% voltage loss copper wire type TW. Single phase motor calculations are based on two times distance.

Chapter 2—Operation

The following steps should be performed during the initial operation:

1. Close the 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 prior to starting the pump. Screw the adjusting screw in until the pressure gauge indicates the pump is starting to lose discharge pressure and the pointer is rapidly fluctuating. Then back the adjusting screw out a turn or two until the pressure gauge again indicates a steady pressure. Tighten the lock nut and allow 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 valve is set too high and should be readjusted by turning the adjusting screw out until the motor can run constantly for this period of time.

2.1 Filling New Cylinders and Tanks

All new containers are full of air and since air does not liquefy under reasonable filling pressures, it must be purged. To ensure containers are filled easily and the proper amount of gas is supplied to burners and carburetors, purging the air is essential.

Some cylinders are difficult to fill because they are equipped with a fill tube extending down into the liquid portion of the container. If possible, retrofit the cylinders so the incoming liquid enters the vapor section of the cylinder. If refitting is not possible, rock the cylinder while it is being filled so that liquid splashes up into the vapor section. This helps keep the cylinder filling pressure down to a reasonable limit. Don't blame the pump for not filling a small container! A properly fitted cylinder and filling manifold or connection permit filling with 50 to 60 psi differential pressure.

2.2 Pumping From Underground Tanks

Pumping boiling liquids, like LPG and other liquefied gases, offers a unique set of challenges for underground tank installations. When the piping system is designed to function with a pump, Coro-Flo pumps offer superior performance in these applications. Liquefied gases are stored at exactly their boiling points. Any increase in temperature, as well as any decrease in pressure, cause the product to boil and form vapor. To minimize the amount of vapor formation at the pump's suction, properly designed suction piping is critical. 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. With 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 the installation NPSHA is always negative so the pump will always have vapor in the liquid stream.

Coro-Flo regenerative turbine pumps are designed to handle some vapor without the damaging effects of cavitation. They are designed with a free floating impeller that helps minimize wear and noise in this type of application. When properly installed, Coro-Flo pumps provide excellent service in underground tank applications.

Design Criteria for Underground 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 or low restriction valves.

— Use adequate piping sizes and do not go below the inlet and outlet size of the pump.

- Limit the net static suction lift to approximately 14 feet (4.3 meters) maximum.
- Use vapor eliminator valves and return to the vapor space of the tank. A Corken B166 bypass valve has this feature.
- An excess flow valve should be used in parallel for additional vapor elimination.
- Always use back-pressure check valves downstream of the pump.
- Limit the capacity of the pump to a maximum of 1.5% of the tank's capacity. For example, with a 1,000 Gal (3,785 L) tank, limit the capacity of the pump to 15 gpm (56.8 L/min).

For more details on underground piping systems, see Appendix H.

Chapter 3—Preventative Maintenance

The only routine maintenance required is lubricating bearings once every six months. For the initial operation, the bearings are lubricated at the factory.

C-Models 10, 12, 13, 14, and 16:

Lubrication is not necessary on C-model pumps. These models are equipped with lifetime lubricated bearings.

DL- and F-Models 10, 12, 13, 14, 16, 17, 18, and 19:

These models have two bearings on the pump frame that require lubrication once every six months. NOTE: If the pump is motor driven, there may be two bearings on the motor that require lubrication as well. If it is engine driven, follow the engine manufacturer's instructions.

NOTE: For DL- and F-Model pumps, a low temperature ball bearing grease with a rating of at least -25°F to 250°F is recommended. The lubricant used by the factory is Mystik JT-6 Low Temperature Extreme Grease. This instruction does not apply to C-Model pumps.

For 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 so the bearings can pump out the excess grease. Replace the plug.

For 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

CAUTION: RELIEVE SYSTEM PRESSURE BEFORE PERFORMING ANY MAINTENANCE TO THE PUMP.

ALL MAINTENANCE MUST BE PERFORMED IN A SAFE MANNER BY QUALIFIED PERSONNEL. MAINTENANCE PERSONNEL SHOULD UTILIZE TOOLS AND/OR EQUIPMENT FREE OF HAZARDS AND FOLLOW THE APPLICABLE SAFETY CODES OF PRACTICE SET BY THE LOCAL AUTHORITIES HAVING JURISDICTION.

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

Since the only wear part influencing the pumping action is the impeller, a pumping efficiency test is recommended prior to performing any maintenance. The problem may be within the piping system rather than the pump. If the pump produces as much differential pressure when circulating through the bypass system as it did when it was new, the problem is not with the pump. If the pump does not produce as much pressure as it did originally, remove the cover and inspect the impeller. If it appears to be in good condition, remove the thinnest shim and replace the cover. Generally, this procedure compensates for impeller wear by tightening the tolerance between the pump case, impeller, and cover.

NOTE: If the impeller is badly damaged or heavily scored, it must be replaced (see step 11 in the seal replacement instructions listed in the manual).

Chapter 5—Seal Replacement Instructions

Scan QR code to view maintenance video.

1. Please note the following important **safety tips:**

   Periodic inspection and maintenance of the pump are essential.

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

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

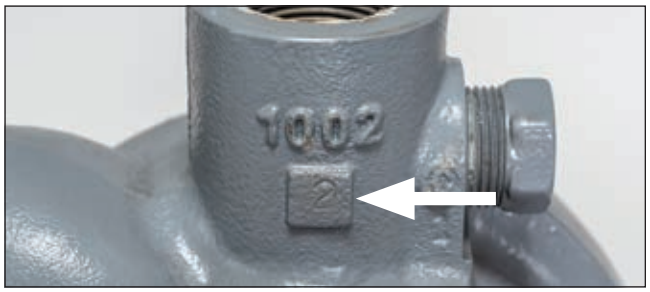
   The transfer of toxic, flammable, or explosive substances is always at the user's risk.

   In according to applicable codes and safety standards , only qualified personnel should operate the equipment.

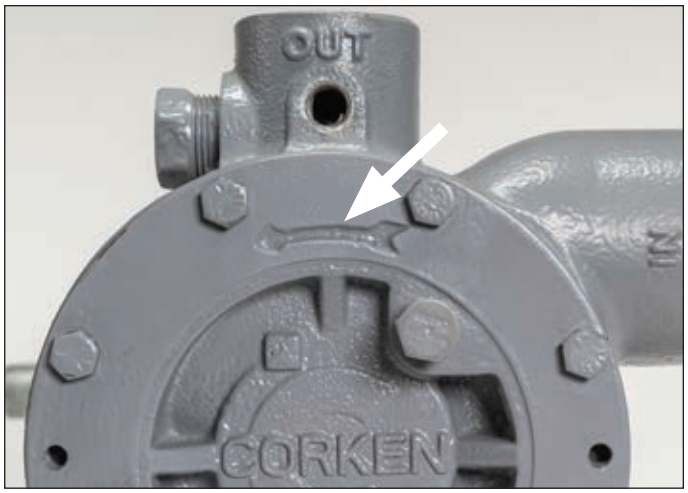
   Listed below are some written instructions for replacing the seal assembly on all models 10, 12, 13, 14, 16, 17, 18, and 19 regenerative turbine pumps. A video presentation is available on Corken's YouTube channel.

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

   If the nameplate is missing, there is a stamped number on the pump cover and on the back of the pump casing indicating the model number.



   The number 2 on the raised face indicates a model 12. Number 0 is a model 10, number 3 is a model 13, number 4 is a model 14 etc.



3. Note the arrow on the front of the pump cover showing the direction of rotation. This is important to know when installing a three phase motor such as the one used on all C-models 10, 12, 13, 14, and 16. An electric 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. NOTE: 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.

4. All standard Coro-Flo regenerative turbine pumps use the seal replacement kit 113-CXA6. The letter after the "X" at the end of the part number indicates the O-ring material. A is the standard configuration and indicates Buna-N. Optional O-ring material is available and indicated with a B for Neoprene, D for Viton, E for PTFE, G for Ethylene propylene, and K for Kalrez.

5. The boxed seal replacement kit includes:

   - Important Instructions
   - The stationary silicon carbide seat
   - The rotating carbon with the seal sleeve assembly and spring
   - The case cover O-ring

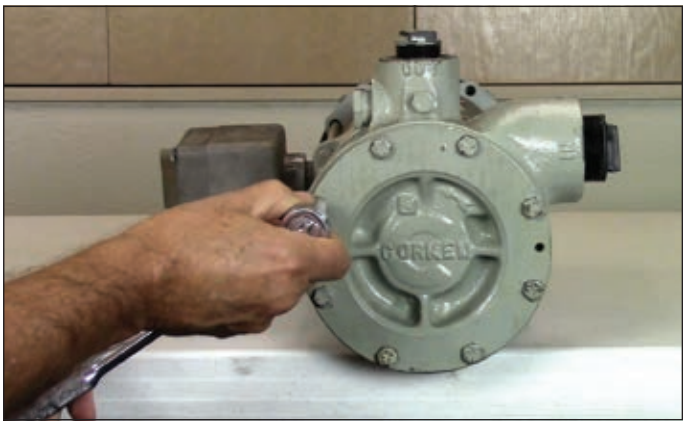
- The rear housing O-ring
- The follower and follower O-ring that seals to the shaft
- The impeller woodruff key
- The seal locking pin
- The seal clamp ring and 3 screws
- One .002 red and one .003 green cover shim for adjusting impeller clearance

6. The tools required for this procedure are:
   - #2 phillips screwdriver
   - #2 flat screwdriver
   - Diagonal or side cutting pliers
   - 3/4" PVC collar
   - 1/2" PVC pipe
   - 3/8" drive ratchet with 1/2" socket
   - 300 to 400 grit emery cloth and Scotch-Brite®[a]
   - Flat metal file
   - 12" adjustable wrench
   - 1/2" box wrench
   - O-ring pick
   - A can of spray lubricant or light oil and plenty of clean shop towels
7. CAUTION: Before servicing the pump, make sure the pump and system are depressurized!

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

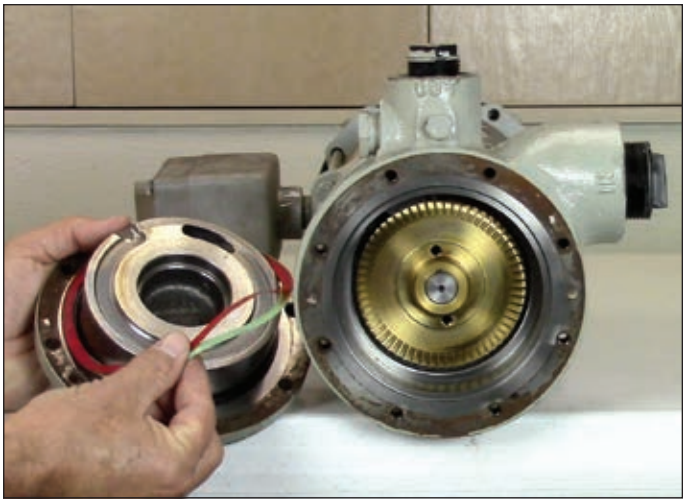
   Keep the work area, tools, and parts clean.

[a] *Registered trademark of 3M.*

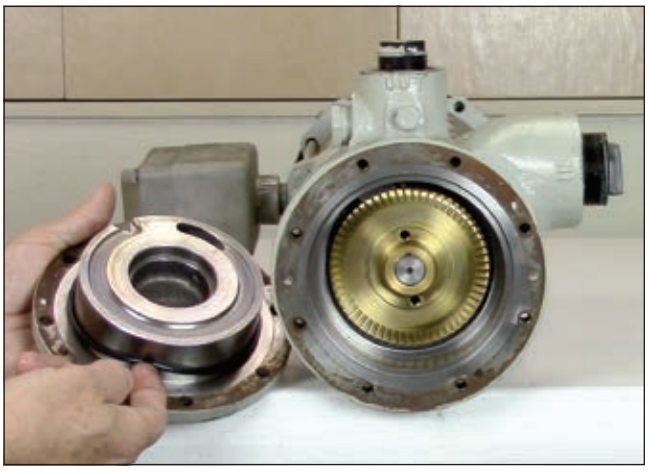


8. Begin by removing the bolts from the pump cover with a ½" wrench or socket.

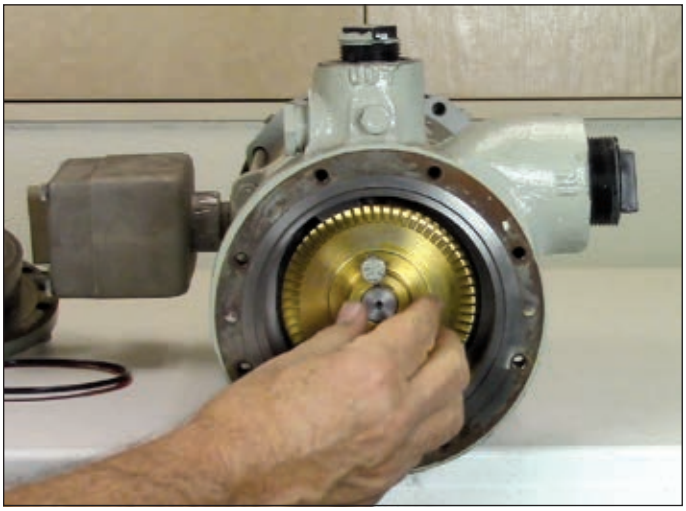
   If the pump cover cannot be removed by hand, use the cover bolts in the bolt holes located at the three and nine o'clock positions as pull or jacking bolts to remove the cover.



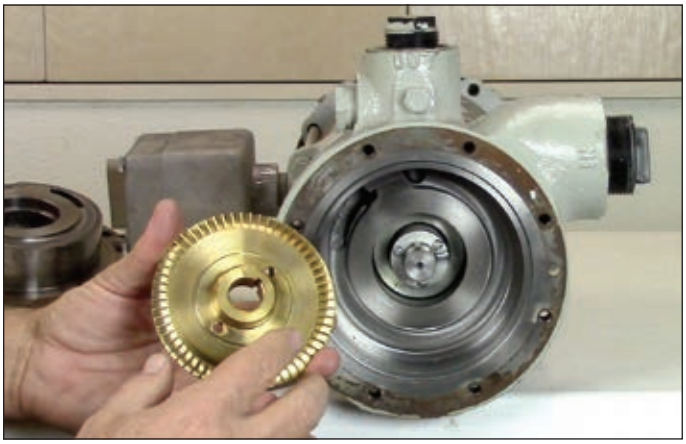
9. With the cover removed, note the quantity and color of shims used for shimming the impeller. The significance of this is discussed later during re-assembly.



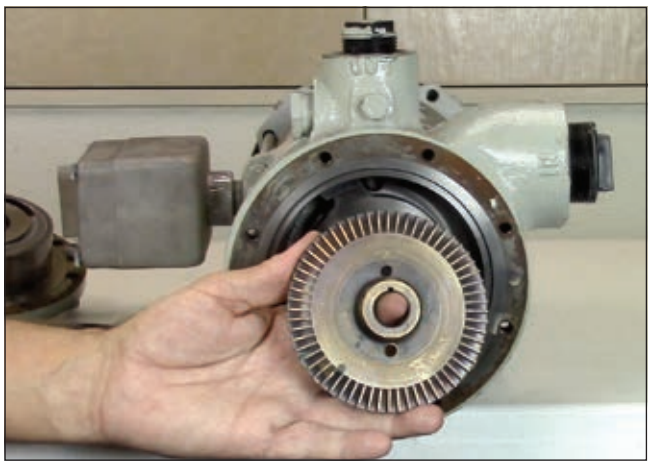
This O-ring seals the cover to the casing.



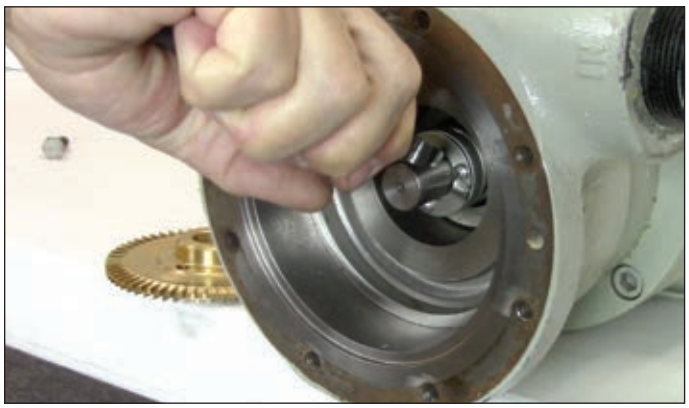
10. Next, remove the impeller by pulling it off the shaft. If it does not slide off, insert one of the bolts used with the pump cover into one of the threaded pulling holes located on the impeller. Remove the impeller by pulling on the bolt.



11. Light scoring or scratches on the face of the impeller is acceptable. As long as it can be shimmed for proper clearance, the impeller can be re-used. However, if any fins are damaged or broken, it should 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 over heating due to dry-running. This usually causes seal failure and excessive wear on the impeller. Since this impeller is not damaged and can be shimmed for proper clearance, it 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. Doing so may bend the shaft and cause seal failure.

13. Before removing the seal clamp ring, prevent the pump shaft from rotating by inserting a screwdriver between the fan blades 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 until the locking pin is at the 6 o'clock position. Compress the seal assembly inwards until the pin should drops out. A light press with a screwdriver may help if the seal assembly does not move back.

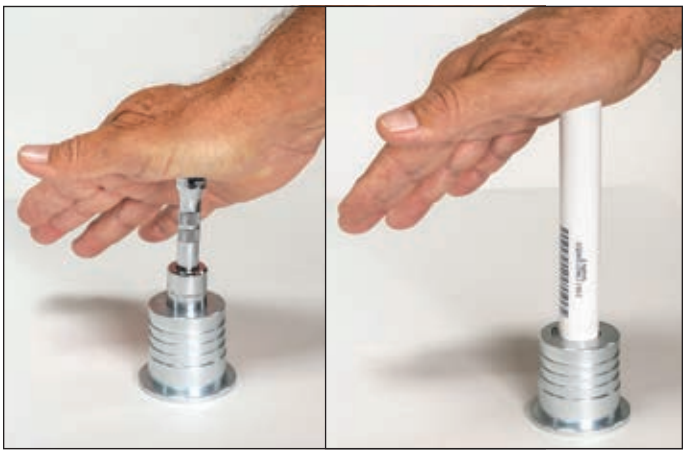
15. Remove the sleeve, follower, and follower O-ring. If there are any nicks or burrs on the shaft, removal may be difficult. Push the assembly back in and use emery cloth to smooth out and polish the shaft. Repeat until the sleeve assembly slides off easily.

16. After removing the assembly, note the follower and follower O-ring. The O-ring is compressed by the follower when the three screws on the seal clamp ring are tightened. It is critical for the shaft to be 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.

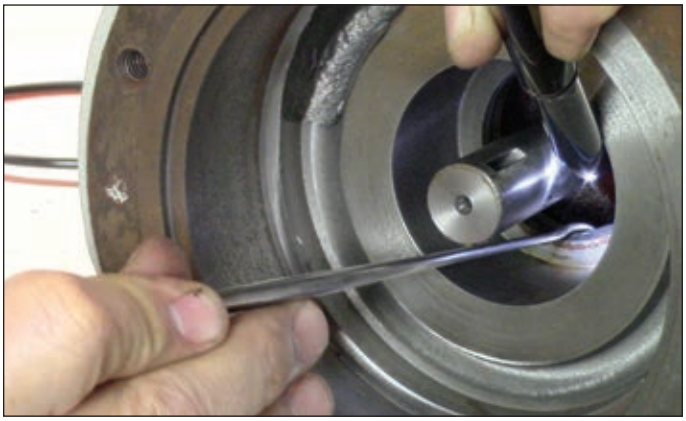
Pry the seal housing forward with the screwdriver and remove the housing from the pump.

18. After the seal housing is removed, locate and remove the shims behind the flange of the seal housing. Make sure none of the shims are left inside the pump casing. Note the quantity of shims and set aside. Using the correct number of shims is critical to proper seal compression.



19. Remove the silicon carbide seal seat inside the seal housing by placing the seal housing face down on a flat work surface. Insert a ½" PVC pipe or 3/8" drive socket through the opening on the back side of the seal housing and press until the seal seat presses out.

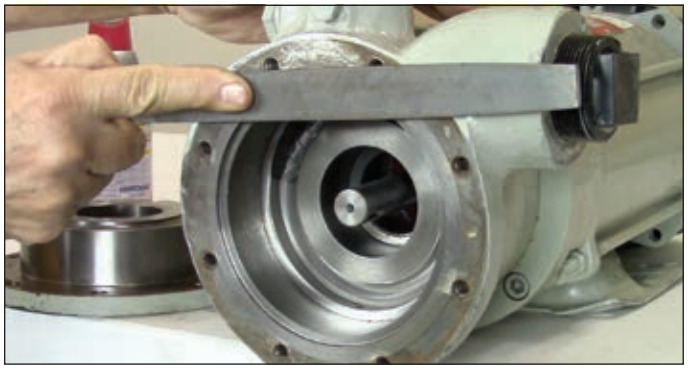
20. Clean the inside and outside of the seal housing with a spray lubricant or light oil and set aside. Polish with emery paper if needed.



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 and wipe dry with a clean cloth.

23. Rotate the shaft and examine for any roughness in the bearings as it turns. If the shaft slides in and out, the motor or frame bearings may need to be replaced.



24. Before reassembling the pump, clean the mating surfaces on the front of the casing and the back of the cover. Gently file or use emery cloth to remove paint, rust, and dirt from the surfaces. Next, clean all parts and surfaces with a spray lubricant or light oil.

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

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

CAUTION: Mechanical seals are precision devices. To prevent chipping or cracking the silicon carbide seal seat, use extreme care during installation.

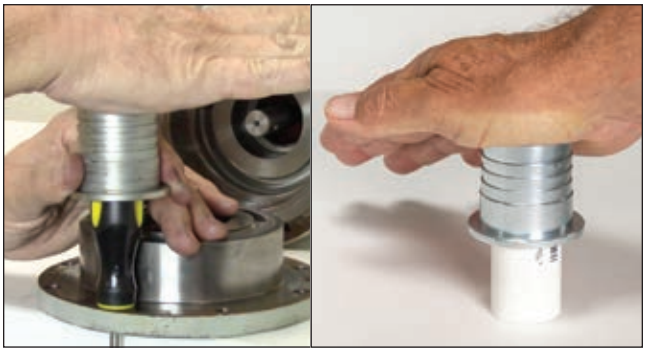
NOTE: There are two methods for installing a new seal seat.

Method 1 (For PTFE and Kalrez® O-rings): This method uses a seal locating pin. When equipped with PTFE or Kalrez® O-rings, the locating pin in the back of the seal housing must be used. Due to the textures of these materials, the pin prevents the seal seat from rotating in the seal housing. Please follow steps 26a, 26b, and 26c shown below.

Method 2 (For Buna-N, Neoprene®, and Viton® O-rings): This method does not require a seal locating pin. When equipped with Buna-N, Neoprene®, and Viton® O-rings, the locating pin can be removed or pressed flush with the back of the seal housing. Please refer to step 26b only and skip steps 26a and 26c.

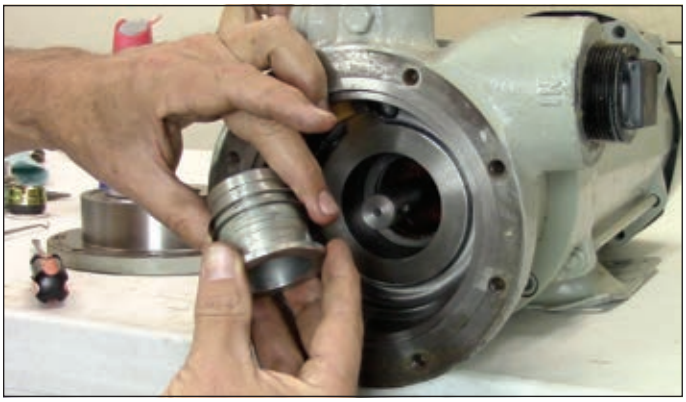
To keep from damaging the silicon carbide seal seat, use a plastic handle screwdriver or ¾" PVC collar to install the new seal seat. Lubricate the seal seat with a light oil or spray lubricant and place it on top of the plastic handle screwdriver or ¾" PVC collar with the notched side up as shown.

26a. Slide the seal housing over the seal seat and visually align the locating pin with the notch on the back of the seal seat. NOTE: This step applies to method 1 only.



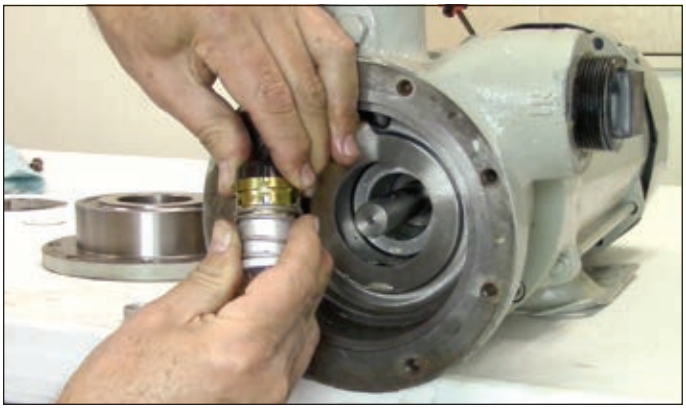
26b. PRESS the seal housing down with the palm of the hand to secure the seal seat inside the housing. The seal seat should gently slide into place.

26c. If the pin is misaligned during the process, remove the seat seal with the ½" PVC pipe or 3/8" socket as shown in step 19 and reinstall using a plastic handle screw driver or a ¾" PVC collar as shown. NOTE: This step applies to method 1 only.



27. Reinstall all of the existing metal shims behind the flange of the seal housing as shown.

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 case. To confirm the seal housing is seated completely, 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. Reassemble the seal assembly before inserting inside the seal housing. Remove the rotating carbon from the retainer and apply some lubricant to the inner O-ring. Place the rotating carbon back on the retainer. Align notches on the retainer with locators on the spring seal assembly and press into place.

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

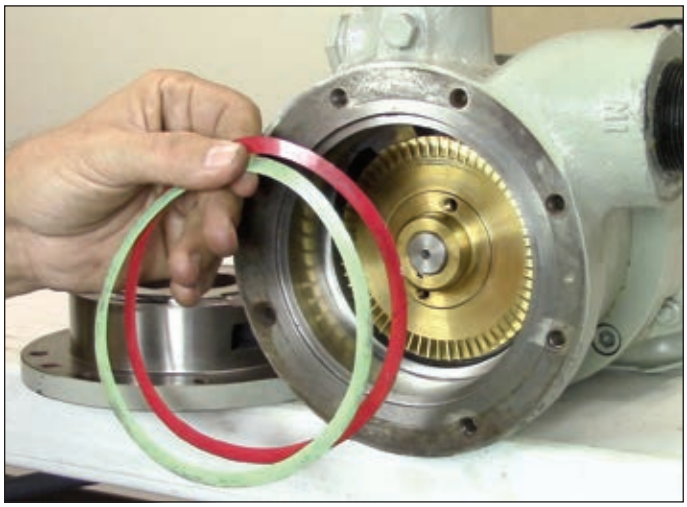
Make sure the notch on the follower aligns with the notch on the seal assembly. Clean and lubricate the shaft and surfaces again before installing.

29. Rotate the pump shaft until the locking pin location is in the 12 o'clock position. Insert a screwdriver into the fan guard to lock the shaft in place. Slide the seal assembly over the shaft and align the locking pin notch with the pin location on the shaft. Compress the seal assembly spring with both thumbs and expose the hole on the shaft and install the locking pin. Make sure it is seated in the locking pin notch on the seal assembly. There should be some clearance behind the pin when the seal assembly is compressed but retain 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 with this step. 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 in 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 and do not damage or score the shaft with the adjustable wrench.

Reinstall the impeller. If properly installed the impeller should slide over the shaft freely and back to the pump casing.



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

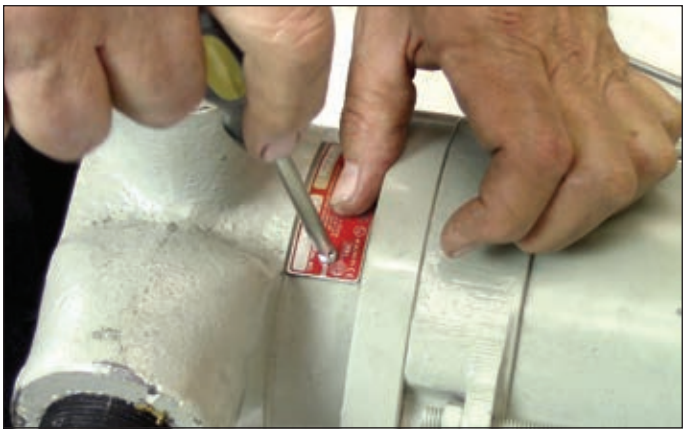
    TIP: For maximum performance, use a minimum number of shims to achieve impeller clearance.

    As the impeller wears (thins out), it may be necessary to remove one of the shims to maintain the proper clearance. If the 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 clean and smooth. Adding a little lubricant to the shim will help hold it in place.

    Attach the pump cover and make sure the Corken name is level. Start with just four cover bolts and cross-tighten. 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, remove the cover and add the red shim for additional clearance.

    After proper clearance is achieved, install all of the pump cover bolts and tighten in a crisscross pattern.

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



33. Close and secure the name plate on top of the pump casing.

This completes the seal replacement procedure for all models 10, 12, 13, 14, 16, ,17, 18, and 19.

Back Into Service: If the pump is placed back into service, slowly pressurize with vapor. On most systems this is accomplished by slowly opening the bypass return line.

Short or Long Term Storage: 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.

Intermittent Duty Applications: Lubricate once every three months.

Continuous Duty Applications: Lubricate monthly.

NOTE: For DL- and F-Model pumps, a low temperature ball bearing grease with a minimum rating of at least -25°F to 250°F is recommended. The lubricant used by the factory is Mystik JT-6 Low Temperature Extreme Grease. This instruction does not apply to C-Model pumps.

Scan QR code to view maintenance video.

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	C16
Inlet	1¼" NPT	1½" NPT	1½" NPT	1½" NPT	1¼" NPT
Outlet	1" NPT	1" NPT	1" NPT	1" NPT	1" NPT
Weight bare pump (lbs.) [a]	85	85	85	150	150

Model Number
Base X X X X

Specification Fields

Motor Selection	1 hp, single phase, 208/230 volt, 50/60 Hz	No charge option	No charge option	Not available	Not available	Not available	K
	2 hp, single phase, 115/208/230 volt, 50/60 Hz	Standard	Standard	Standard	Not available	Not available	F
	3 hp, three phase, 230/460 volt, 50/60 Hz	Charge option	Charge option	Charge option	Standard	Standard	G
	3 hp, single phase, 115/208-230 volt, 60 Hz	NA	Charge option	Charge option	Charge option	Charge option	M

Impeller, Seal Sleeve, Follower, and Shaft Material	Bronze impeller Aluminum sleeve and follower Steel shaft	Standard	Not available	D
	Ductile impeller Aluminum sleeve and follower Steel shaft	Not available	Standard (with M motor specification)	F

Seal Seat Material	Silicon carbide	Standard	6

O-ring Material	Buna-N	Standard	A

Mounting Options (with pump only)

Part Number	Description
SM-25	Motor mounted starter for 1 hp motor.
S-25	Separate remote wall mounted starter for 1 hp motor.
SM-30	Motor mounted starter for 2 hp motor.
S-30	Separate remote wall mounted starter for 2 hp motor.

Parts Options

113-CXA6	Mechanical seal (Buna-N)
4261-1	1 hp (208/230 volt only) 50/60 Hz Coro-Flo® motor
4261	2 hp, 50/60 Hz Coro-Flo® motor
2557	3 hp, 50/60 Hz Coro-Flo® motor (three phase)
4885	3 hp, 60 Hz Coro-Flo® motor (single phase)

Accessory Options

Part Number	Description
2277-X1 [b]	Motor mounted manual starter
2277-X2 [b]	Wall mounted manual starter
2277-X3	Motor mounted manual starter - 2 hp
2277-X4	Wall mounted manual starter
2275-X1	Switch assembly with heater - ¾ hp
2275-X2	Switch assembly with heater - 1 hp
3784	Switch only - 2 hp

Accessory Options

Part Number	Description
B166B-.75BAU	¾" bypass valve with 50–150 psi
B166B-1BAU	1" bypass valve with 50–150 psi
B166B-1CAU	1" bypass valve with 100–225 psi

[a] *Weight corresponds to standard motor.*
[b] *Must specify heater element: 1 hp motor (p.n. 2556) requires heater no. 2610 (P32)*
1 hp motor (p.n. 4261-1) requires heater no. 4250 (P36)

Appendix A—Model Number Identification Code and Available Options

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

Base Model #	DL10	DL12	DL13	DL14	DL16	DL17	DL18	DL19
Inlet	1¼" NPT	1½" NPT	1½" NPT	1½" NPT	1¼" NPT	1¼" NPT	1½" NPT	1½" NPT
Outlet	1" NPT	1" NPT	1" NPT	1" NPT	1" NPT	1" NPT	1" NPT	1" NPT
Weight bare pump (lbs.)	62	62	62	62	62	62	62	62

Model Number
Base X X X X

Specification Fields

Motor	No integral motor	Standard	C

Impeller, Seal Sleeve, Follower, and Shaft Material	Bronze impeller	Standard	Standard	Standard	Standard	Standard	Standard	Not available	Not available	D
	Aluminum sleeve/follower									
	Steel shaft									
	Stainless steel impeller	Charge option	Charge option	Charge option	Charge option	Not available	Not available	Not available	Not available	E
	Stainless steel sleeve/follower									
	Stainless steel shaft									
	Ductile iron impeller	No charge option	No charge option	No charge option	No charge option	No charge option	No charge option	Standard	Standard	F
	Aluminum sleeve/follower									
	Steel shaft									

Seal Seat Material	Silicon carbide	Standard	6

O-ring Material	Buna-N	Standard	A
	Neoprene®[a]	No charge option	B
	Viton®[a]	Charge option	D
	PTFE	Charge option	E
	Ethylene propylene	Charge option	G
	Kalrez®[a]	Charge option	K

Part Options

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

[a] *Registered trademark of the DuPont company.*

Appendix A—Model Number Identification Code and Available Options

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

Base Model #	F10	F12	F13	F14	F16	F17	F18	F19
Inlet	1¼" NPT	1½" NPT	1½" NPT	1½" NPT	1¼" NPT	1¼" NPT	1½" NPT	1½" NPT
Outlet	1" NPT	1" NPT	1" NPT	1" NPT	1" NPT	1" NPT	1" NPT	1" NPT
Weight bare pump (lbs.)	48	48	48	48	48	48	48	48

Model Number
Base X X X X

Specification Fields

Motor	No integral motor	Standard	C

Impeller, Seal Sleeve, Follower, and Shaft Material	Bronze impeller Aluminum sleeve/follower Steel shaft	Standard	Standard	Standard	Standard	Standard	Standard	Not available	Not available	D
	Stainless steel impeller Stainless steel sleeve/follower Stainless steel shaft	Charge option	Charge option	Charge option	Charge option	Not available	Not available	Not available	Not available	E
	Ductile iron impeller Aluminum sleeve/follower Steel shaft	No charge option	No charge option	No charge option	No charge option	No charge option	No charge option	Standard	Standard	F

Seal Seat Material	Silicon carbide	Standard	6

O-ring Material	Buna-N	Standard	A
	Neoprene®[a]	No charge option	B
	Viton®[a]	Charge option	D
	PTFE	Charge option	E
	Ethylene propylene	Charge option	G
	Kalrez®[a]	Charge option	K

Mounting Options

Part Number	Description	Maximum Motor Frame Size
101-8[b]	Mounting setup for **direct drive.** Includes steel baseplate, flexible coupling, and coupling guard. Pump and motor not included.	145T 184T 215T 256T
101-13[b]	Mounting setup for **direct drive of two Coro-Flo pumps.** Includes steel baseplate, flexible coupling, and coupling guard. Pump and motor not included.	215T
103-12[b]	Mounting setup for **V-belt drive.** Includes steel baseplate, adjustable driver slide base, V-belt drive, and enclosed belt guard. Pump and motor not included.	184T 215T 256T

[a] Registered trademark of the DuPont company.
[b] Specify motor frame size when ordering.

Appendix B—Specifications

Operating Specifications for C10, C12, C13, C14, and C16 Model Pumps

Inlet:	1-1/4" NPT—C10 and C16 1-1/2" NPT—C12, C13, and C14
Outlet:	1" NPT
RPM:	3,450 @ 60 Hz, limited use in 50 Hz @ 2,880 RPM
Maximum working pressure:	400 psig (27.6 bar)
Maximum differential pressure:	75 psig (5.2 bar)—C10
	100 psig (6.9 bar)—C12
	125 psig (8.6 bar)—C13 and C14
	150 psig (10.3 bar)—C16
Driver range:	1 to 3 hp (0.75–2.2 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, and C16 Model Pumps

Part	**Standard Material**
Case, cover	Ductile iron ASTM A536
Impeller	Bronze (Models C10, C12, C13, and C14)
	Ductile Iron (Model C16)
Impeller key	Steel
Seal seat	Silicon carbide
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- and F-Model Pumps

Inlet:	1-1/4" NPT—F10, F16, F17, DL10, DL16, and DL17
	1-1/2" NPT—F12, F13, F14, F18, F19, DL12, DL13, DL14, DL18, and DL19
Outlet:	1" NPT
RPM:	3,450 @ 60 Hz, 2,880 @ 50 Hz
Rotation:	Clockwise only
Maximum working pressure:	400 psig (27.6 bar)
Maximum differential pressure:	125 psig (8.6 bar)—all models 10, 12, 13, and 14
	200 psig (13.8 bar)—all models 16, 17, 18, and 19
Optional driver range:	1 to 15 hp (0.75 to 11.2 kW)
Temperature range:	-25° to 225°F (-32° to 107°C)
Flow range:	2–38 gpm (7.6–143.9 L/min)
Maximum viscosity:	400 SSU (88 cSt)

Material Specifications for DL- and F-Model Pumps

Part	Model	Standard Material	Optional Material
Case, cover	All	Ductile iron ASTM A536	None
Impeller	DL10, DL12, DL13, DL14, F10, F12, F13, and F14	Bronze	Ductile iron ASTM A536, 416 stainless steel
	DL16, DL17, DL18, DL19, F16, F17, F18, and F19	Ductile iron ASTM A536	None
Impeller key	All	Steel	Stainless steel
Seal seat	All	Silicon carbide	None
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®[1], Neoprene®[1], Ethylene propylene, Kalrez®[1]
Retainer rings	F-Models	Steel	None
Bearings	All	Ball	None

[1] *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) [1]	
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) [1]	
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) [1]	
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) [1]	
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)

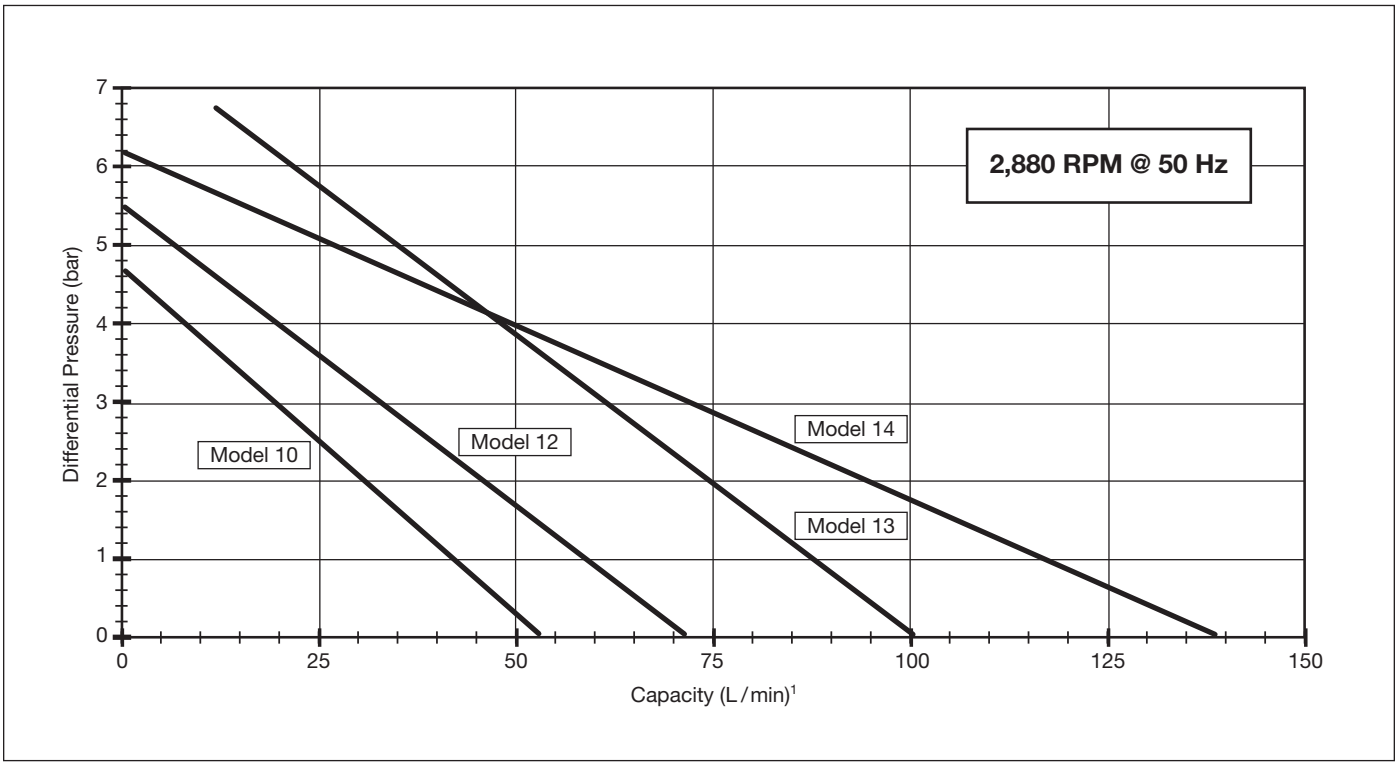
C16

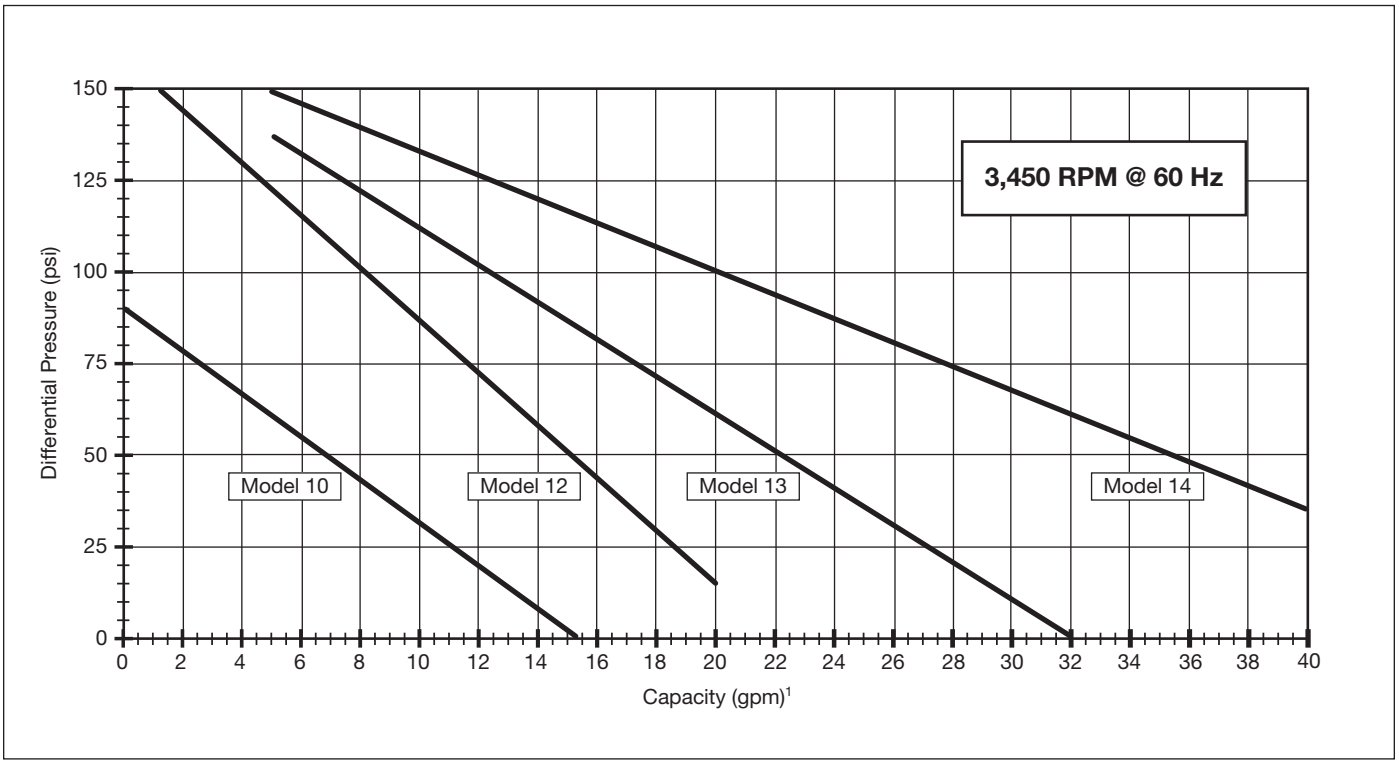
Service: Motor fueling through a meter at 9.8 gpm at 150 psid.	
Differential Pressure	gpm (L/min)
Capacity at 75 psid (5.2 bar d)	14.7 (55.6)
Capacity at 100 psid (6.9 bar d)	13 (49.2)
Capacity at 125 psid (8.6 bar d)	11.4 (43.1)
Capacity at 150 psid (10.3 bar d)	9.8 (37.1)

[1] 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- and F-Model Pumps

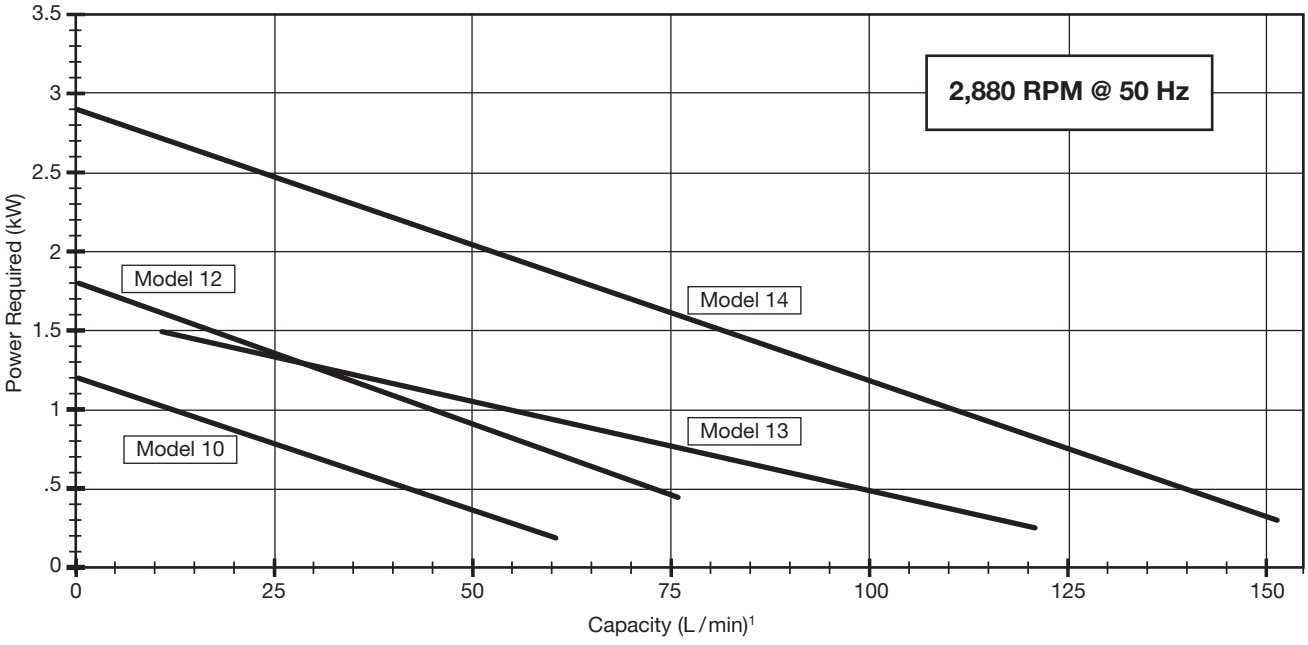


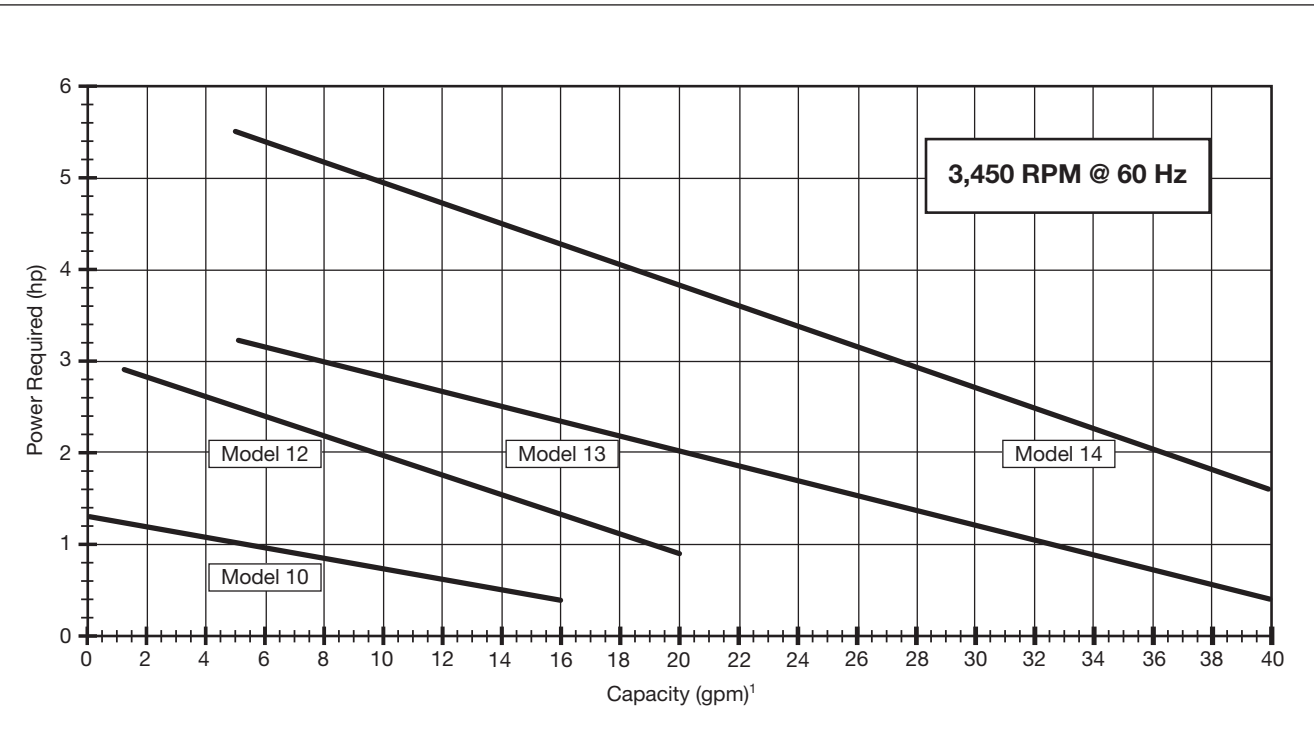


[1] The performance curves are based on aboveground LPG installations. Performance curves for underground LPG tanks will vary based on the specific installation. Consult factory.

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

All DL- and F-Model Pumps

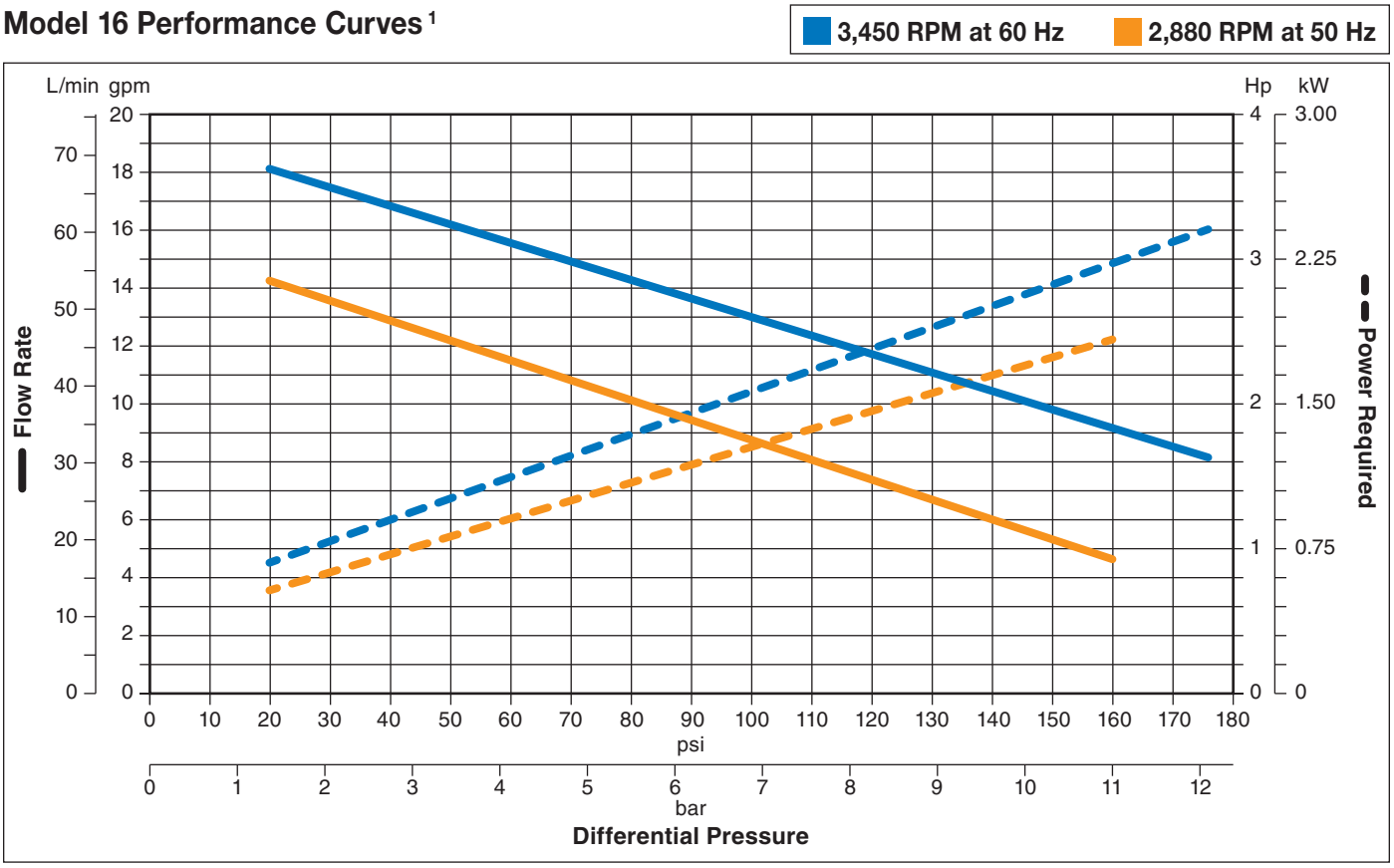




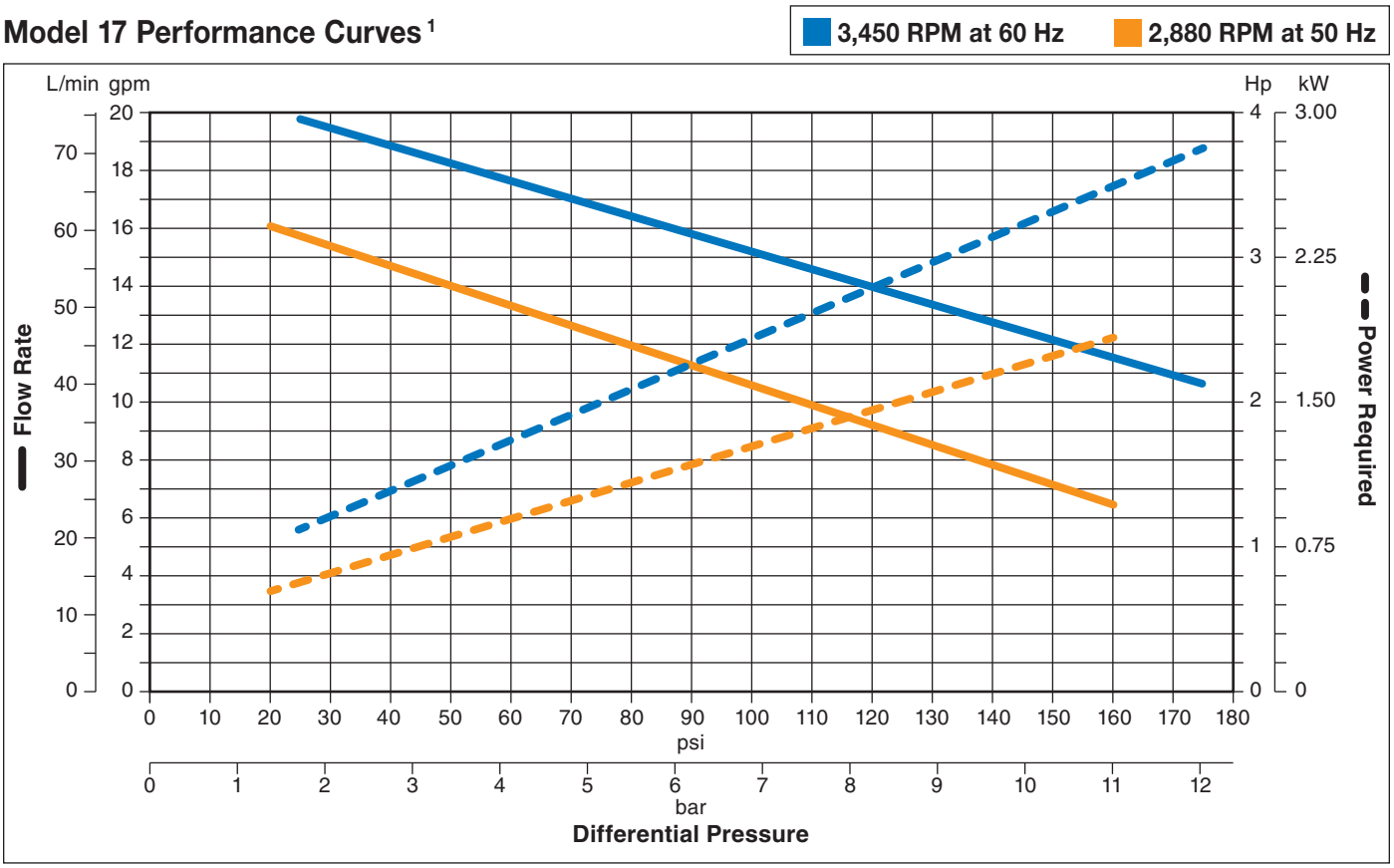
[1] The performance curves are based on aboveground LPG installations. Performance curves for underground LPG tanks will vary based on the specific installation. Consult factory.

Appendix C—Performance (Differential Pressure vs. Capacity) Models 16 and 17 (C-, DL-, and F-Models)

Model 16 Performance Curves [1]



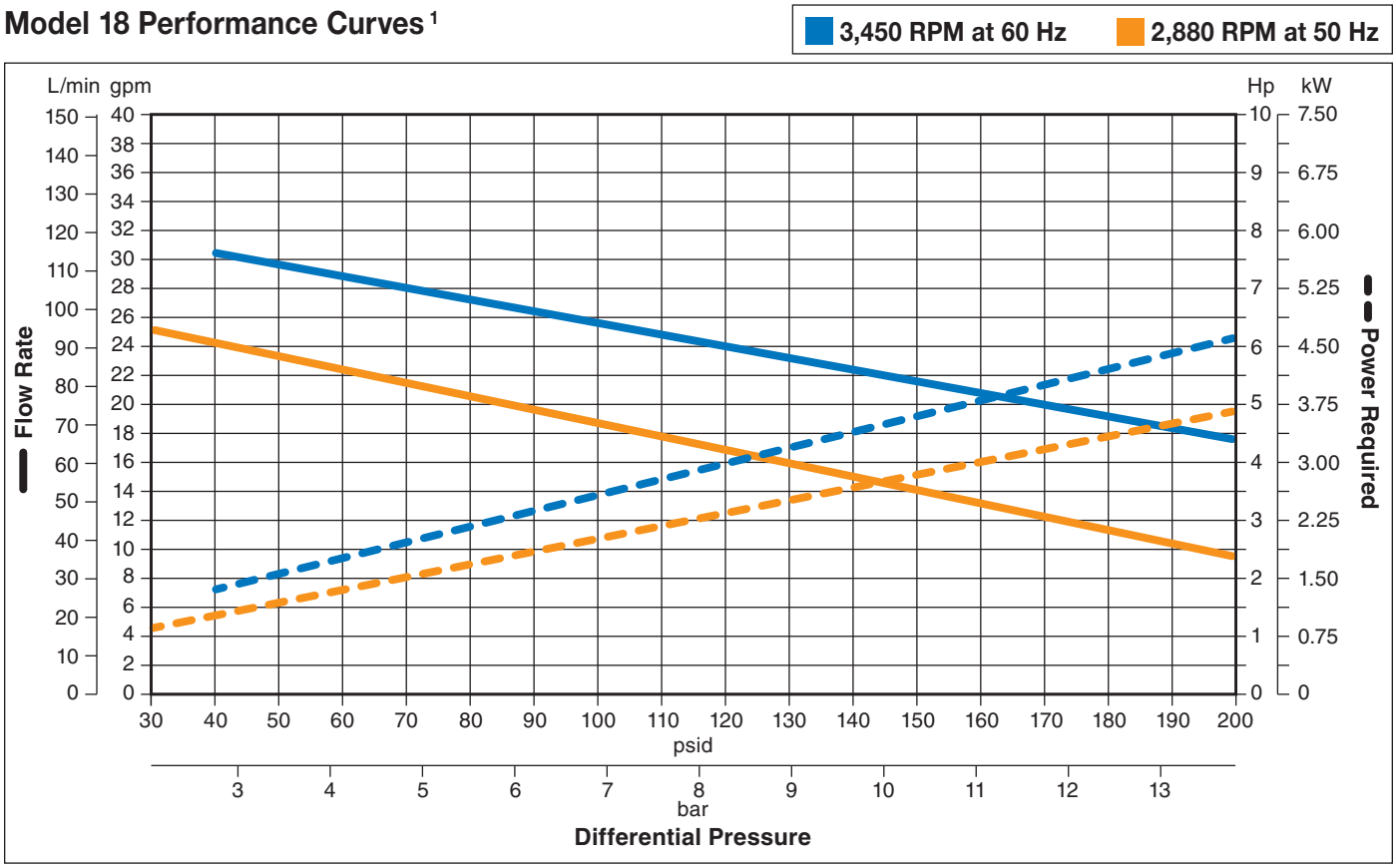
Model 17 Performance Curves [1]



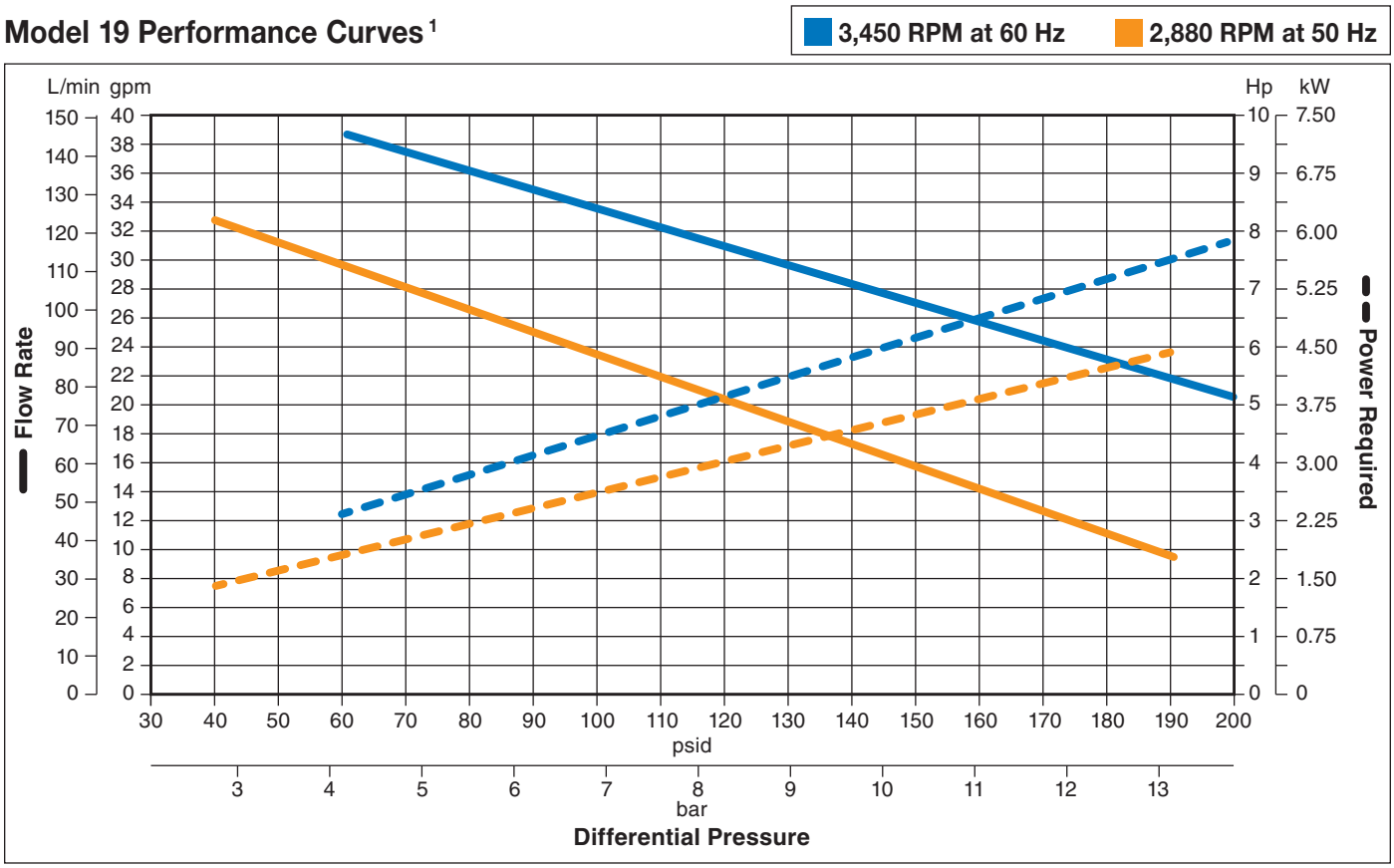
[1] *Curves shown are based on 100% propane from an above ground installation.*

Appendix C—Performance (Differential Pressure vs. Capacity) Models 18 and 19 (DL- and F-Models)

Model 18 Performance Curves [1]



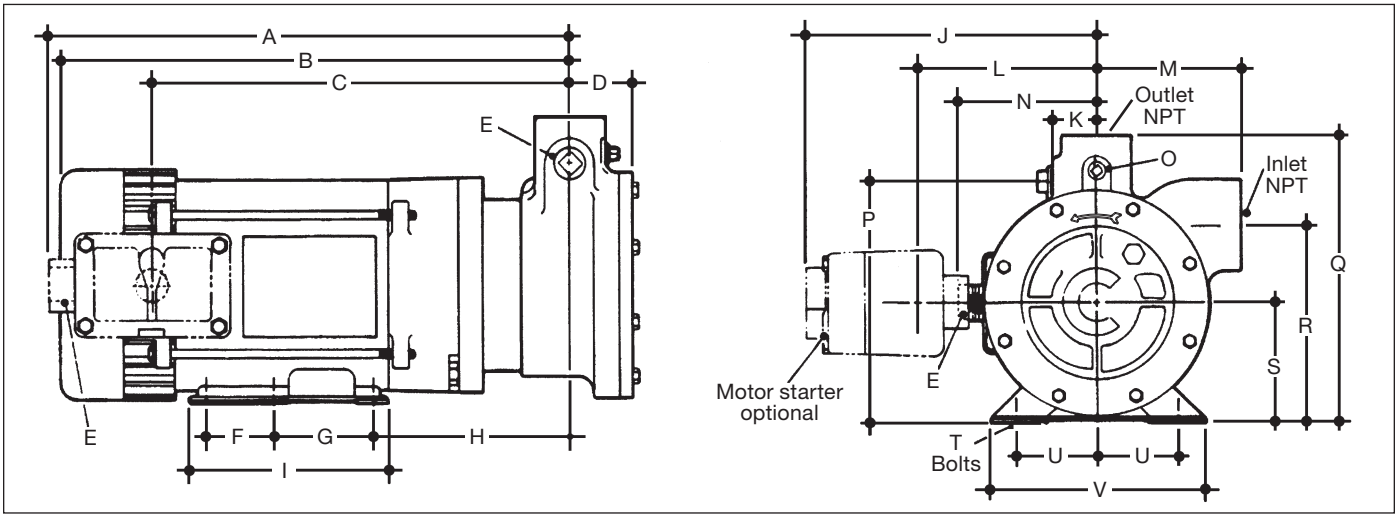
Model 19 Performance Curves [1]



[1] *Curves shown are based on 100% propane from an above ground installation.*

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

1 to 2 Hp Motors



Model Number	Inlet Size	Outlet Size
C10	1-1/4" NPT	1" NPT
C12, C13	1-1/2" NPT	1" NPT

Driver	1 hp (0.75 kW)		2 hp (1.5 kW)
Motor part number	2556[a]	4261-1	4261

Outline Dimensions for Pumps with Obsolete Bluffton Motors

Model	hp	A	B	C	D	E	F	G	H	I	J	K
C10, C12	1	17-1/8 (435.0)	16-3/4 (425.5)	14 (355.6)	2 (50.8)	3/4" NPT	1 (25.4)	4 (101.6)	5-7/8 (149.2)	5-7/8 (149.2)	8-11/16 (220.7)	1-5/16 (33.3)
C12, C13	2	18-17/32 (470.7)	18-1/16 (458.8)	14-15/16 (379.4)	2 (50.8)	3/4" NPT	1 (25.4)	4 (101.6)	5-7/8 (149.2)	6-1/2 (165.1)	9-5/16 (236.5)	1-5/16 (33.3)

Model	hp	L	M	N	O	P	Q	R	S	T	U	V
C10, C12	1	5-3/8 (136.5)	4-5/16 (109.5)	4-3/16 (106.4)	1/4" NPT	6-1/8 (155.6)	8-1/2 (215.9)	5-3/4 (146.1)	3-1/2 (88.9)	1/4 bolt (6.4)	2-7/16 (61.9)	6-1/2 (165.1)
C12, C13	2	6 (152.4)	4-5/16 (109.5)	4-13/16 (122.2)	1/4" NPT	7-1/8 (181.0)	9-1/2 (241.3)	6-13/16 (173.0)	3-1/2 (88.9)	3/8 bolt (0.95)	2-7/16 (61.9)	6-1/2 (165.1)

Outline Dimensions for Pumps with Marathon Motors

Model	hp	A	B	C	D	E	F	G	H	I	J	K
C10, C12	1	15-13/16 (401.6)	15-3/4 (400.1)	12-1/8 (308.0)	2 (50.8)	3/4" NPT	N/A	3 (76.2)	5-7/8 (149.2)	4 (101.6)	10-3/16 (258.8)	1-5/16 (33.3)
C12, C13	2											

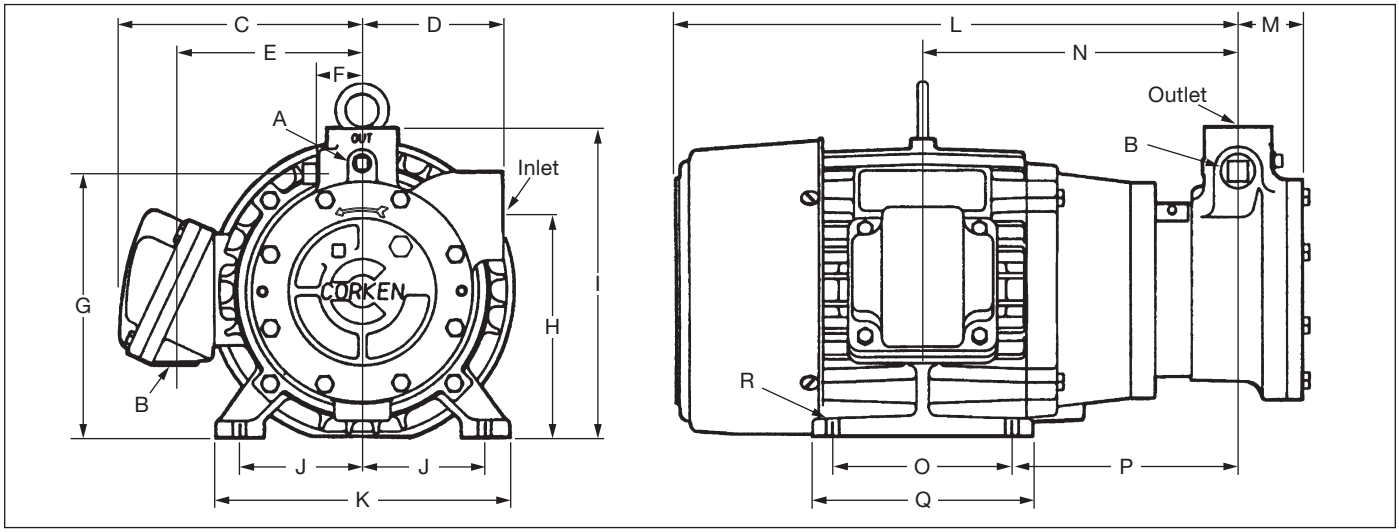
Model	hp	L	M	N	O	P	Q	R	S	T	U	V
C10, C12	1	6-7/8 (174.6)	4-5/16 (109.5)	5-5/8 (142.9)	1/4" NPT	7-1/8 (181.0)	9-1/2 (241.3)	5-13/16 (147.6)	3-1/2 (88.9)	3/8 bolt (9.5)	2-7/16 (61.9)	6-1/2 (165.1)
C12, C13	2											

[a] *This part number is obsolete and has been replaced by part #4261-1 (1 hp).*

All dimensions are in inches (millimeters).

Appendix D—Outline Dimensions for C-Model (Close-Coupled) Pumps C10, C12, C13, C14, and C16

3 Hp Motors (Single and Three Phase)



Model Number	Inlet Size	Outlet Size
C12, C13, C14	1-1/2" NPT	1" NPT
C10, C16	1-1/4" NPT	1" NPT

Driver	3 hp (2.2 kW)	
Phase	Three	Single
Motor part number	2557	4885

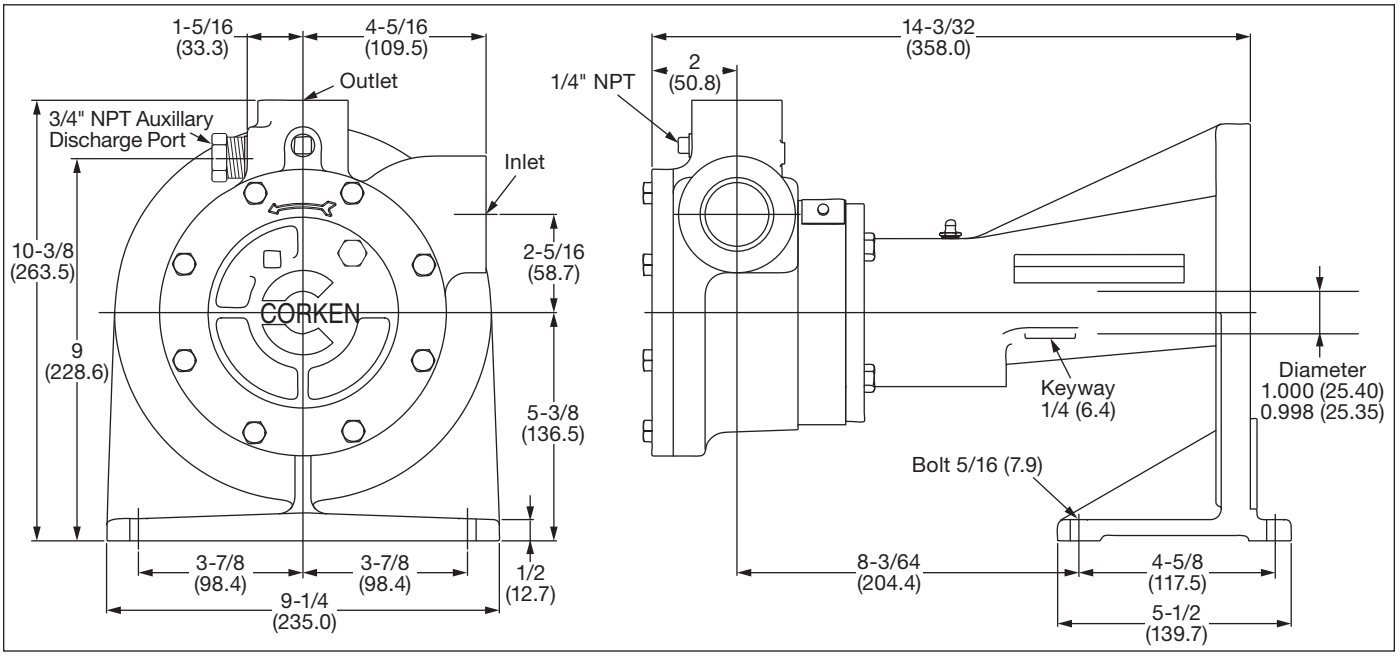
Motor Phase	A	B	C	D	E	F	G	H	I
Single	1/4" NPT	3/4" NPT	7-1/2 (190.5)	4-5/16 (109.5)	6 (152.4)	1-5/16 (33.3)	8-1/8 (206.4)	6-13/16 (173.0)	9-1/2 (241.3)
Three	1/4" NPT	3/4" NPT	10-1/2 (266.7)	4-5/16 (109.5)	7-1/8 (181.0)	1-5/16 (33.3)	8-1/8 (206.4)	6-13/16 (173.0)	9-1/2 (241.3)

Motor Phase	J	K	L	M	N	O	P	Q	R
Single	3-3/4 (95.3)	8-5/8 (219.1)	19-13/16 (503.2)	2 (50.8)	13-15/16 (354.0)	4-1/2 (114.3)	7-1/16 (179.4)	6-5/8 (168.3)	Bolt: 7/16 (11.1)
Three	3-3/4 (95.3)	8-7/8 (225.4)	17-1/4 (438.2)	2 (50.8)	10-3/4 (273.1)	4-1/2 (114.3)	6-5/8 (168.3)	6-5/8 (168.3)	Bolt: 7/16 (11.1)

All dimensions are in inches (millimeters).

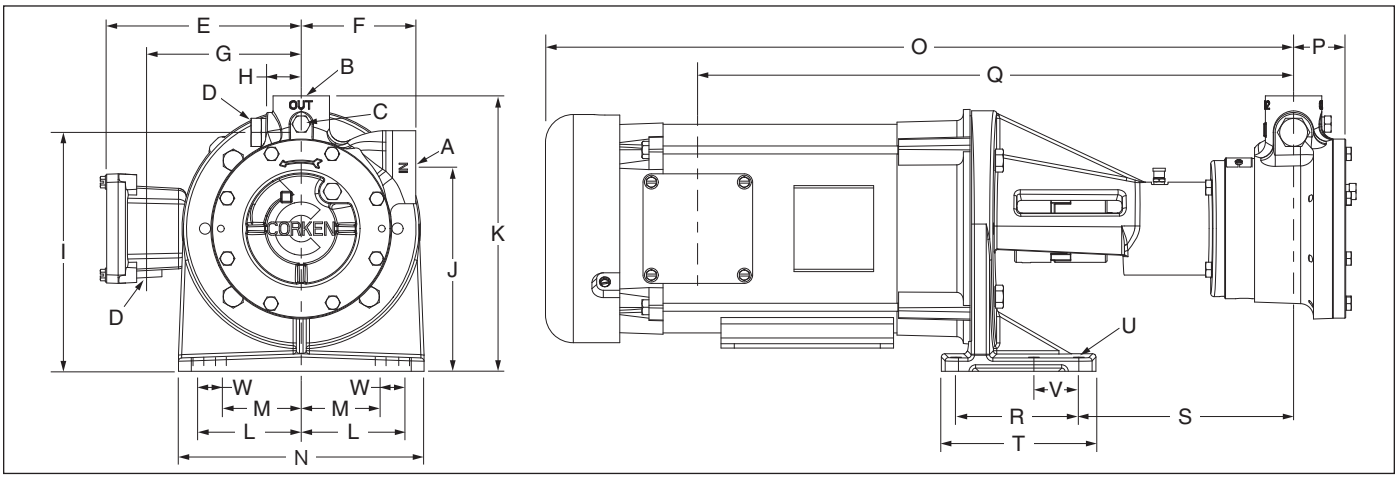
Appendix D—Outline Dimensions for DL-Model (Direct-Mount) Pumps

DL10, DL12, DL13, DL14, DL16, DL17, DL18, and DL19 Model Pumps



Flange Dimensions		
Model	A (inlet)	B (outlet)
DL10, DL16, and DL17	1-1/4" NPT	1" NPT
DL12, DL13, DL14, DL18, and DL19	1-1/2" NPT	1" NPT

Models DL16, DL17, DL18, and DL19



3 Hp Motor for Models DL16 and DL17 Only (Single and Three Phase—60 Hz)

Motor Phase	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
Single	Inlet: 1-1/4" NPT	Outlet: 1" NPT	1/4" NPT	3/4" NPT	7-9/16 (192.1)	4-5/16 (109.5)	6 (152.4)	1-5/16 (33.3)	9 (228.6)	7-11/16 (195.3)	10-3/8 (263.5)	3-7/8 (98.4)	2-3/8 (60.33)	9-1/4 (235.0)	28-3/16 (716.0)	2 (50.8)	22-7/16 (569.9)	4-5/8 (117.5)	8-3/16 (208.0)	5-13/16 (147.6)	Bolt: 13/32 (10.3)	2-1/16 (52.39)	1-1/2 (38.10)
Three	Inlet: 1-1/4" NPT	Outlet: 1" NPT	1/4" NPT	3/4" NPT	9-3/8 (238.1)	4-5/16 (109.5)	6-7/16 (163.5)	1-5/16 (33.3)	9 (228.6)	7-11/16 (195.3)	10-3/8 (263.5)	3-7/8 (98.4)	2-3/8 (60.33)	9-1/4 (235.0)	24-3/16 (614.4)	2 (50.8)	17-1/16 (433.4)	4-5/8 (117.5)	8-3/16 (208.0)	5-13/16 (147.6)	Bolt: 13/32 (10.3)	2-1/16 (52.39)	1-1/2 (38.10)

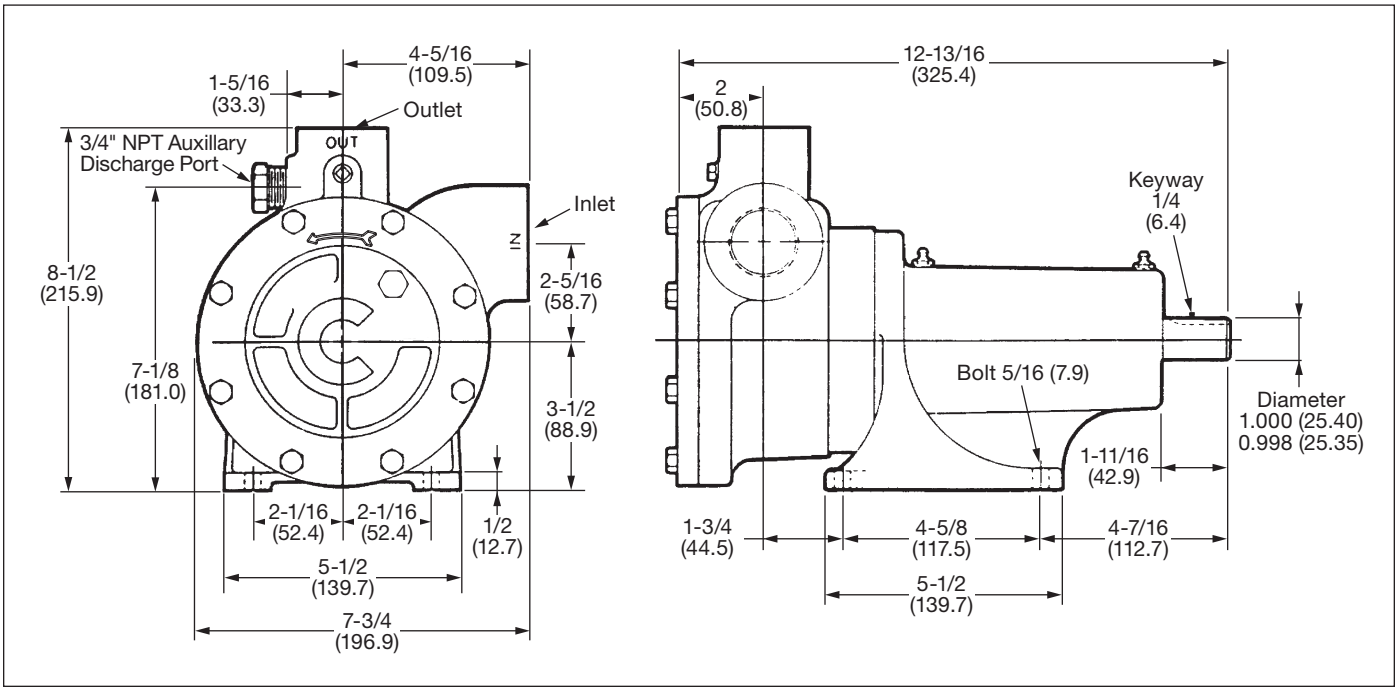
5 Hp Motor for Models DL18 and DL19 Only (Single and Three Phase—60 Hz)

Motor Phase	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
Single	Inlet: 1-1/2" NPT	Outlet: 1" NPT	1/4" NPT	3/4" NPT	8-3/8 (212.7)	4-5/16 (109.5)	6-13/16 (173.0)	1-5/16 (33.3)	9 (228.6)	7-11/16 (195.3)	10-3/8 (263.5)	3-7/8 (98.4)	2-3/8 (60.33)	9-1/4 (235.0)	29-3/16 (741.4)	2 (50.8)	22-3/4 (577.9)	4-5/8 (117.5)	8-3/16 (208.0)	5-13/16 (147.6)	Bolt: 13/32 (10.3)	2-1/16 (52.39)	1-1/2 (38.10)
Three	Inlet: 1-1/2" NPT	Outlet: 1" NPT	1/4" NPT	3/4" NPT	8-11/16 (220.7)	4-5/16 (109.5)	6-7/16 (163.5)	1-5/16 (33.3)	9 (228.6)	7-11/16 (195.3)	10-3/8 (263.5)	3-7/8 (98.4)	2-3/8 (60.33)	9-1/4 (235.0)	25-1/2 (647.7)	2 (50.8)	17-11/16 (449.3)	4-5/8 (117.5)	8-3/16 (208.0)	5-13/16 (147.6)	Bolt: 13/32 (10.3)	2-1/16 (52.39)	1-1/2 (38.10)

All dimensions are in inches (millimeters). Motor dimensions are for reference only.

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

F10, F12, F13, F14, F16, F17, F18, and F19 Model Pumps

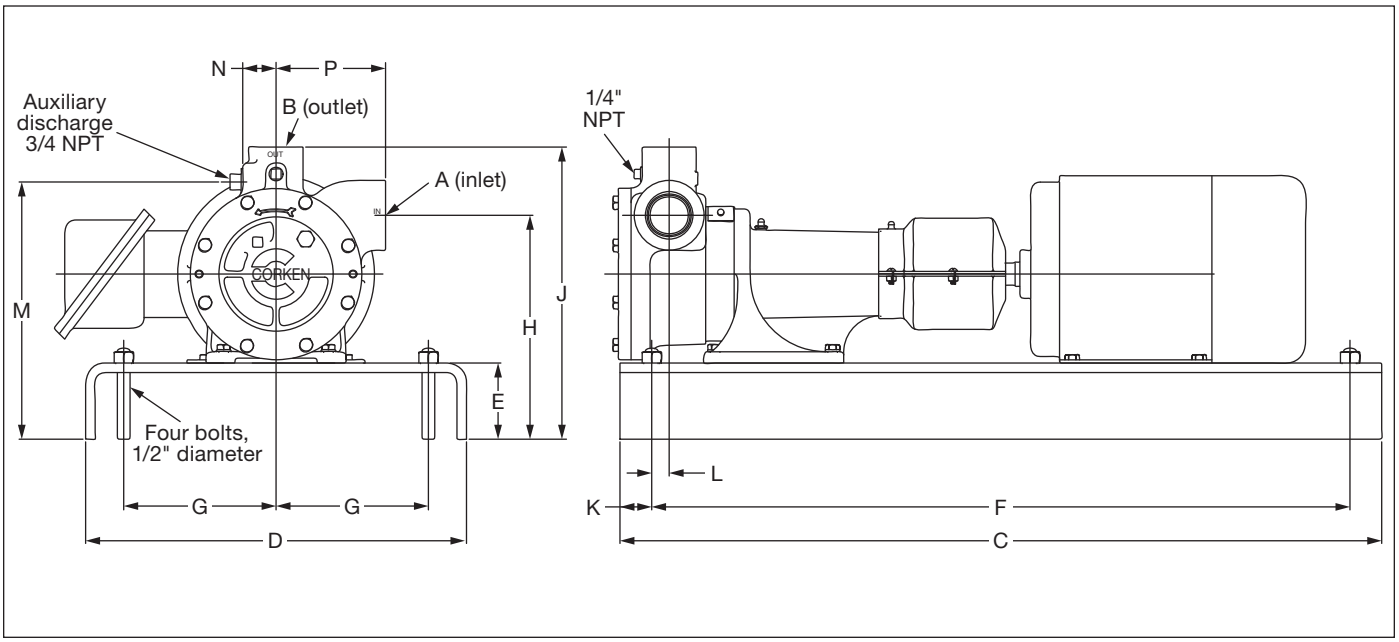


Flange Dimensions		
Model	A (inlet)	B (outlet)
F10, F16, and F17	1-1/4" NPT	1" NPT
F12, F13, F14, F18, and F19	1-1/2" NPT	1" NPT

All dimensions are in inches (millimeters).

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

F10-101, F12-101, F13-101, F14-101, F16-101, F17-101, F18-101, and F19-101 Model Pumps



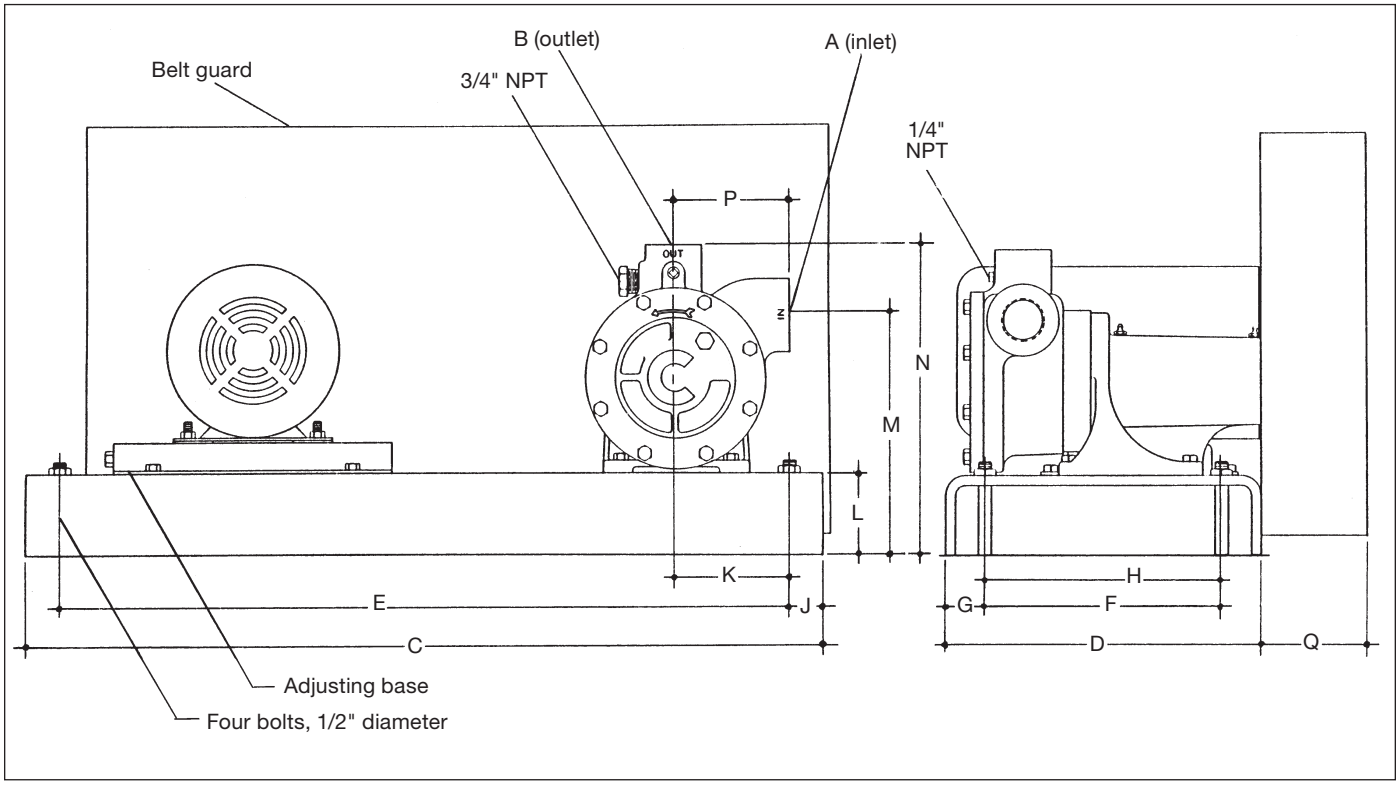
Flange Dimensions		
Model	A (inlet)	B (outlet)
F10, F16, and F17	1-1/4" NPT	1" NPT
F12, F13, F14, F18, and F19	1-1/2" NPT	1" NPT

Mounting Dimensions												
Motor Frame	C	D	E	F	G	H	J	K	L	M	N	P
56	22 (558.8)	10 (254.0)	2-1/2 (63.5)	20 (508.0)	4 (101.6)	8-1/4 (209.6)	11 (279.4)	1 (25.4)	11/16 (17.5)	10-1/8 (257.2)	1-5/16 (33.3)	4-5/16 (109.5)
66	30 (762.0)	15 (381.0)	3 (76.2)	27-1/2 (698.5)	6 (152.4)	9-3/8 (238.1)	12-1/8 (308.0)	1-1/4 (31.8)				
143T, 145T						8-13/16 (223.8)	11-1/2 (292.1)					
182T, 184T						9-3/4 (247.7)	12-1/2 (317.5)					
213T, 215T	34 (863.6)			31-1/2 (800.1)		10-1/2 (266.7)	13-1/4 (336.6)					
254U						11-1/2 (292.1)	14-1/4 (362.0)					

All dimensions are in inches (millimeters).

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

F10-103, F12-103, F13-103, F14-103, F16-103, F17-103, F18-103, and F19-103 Model Pumps



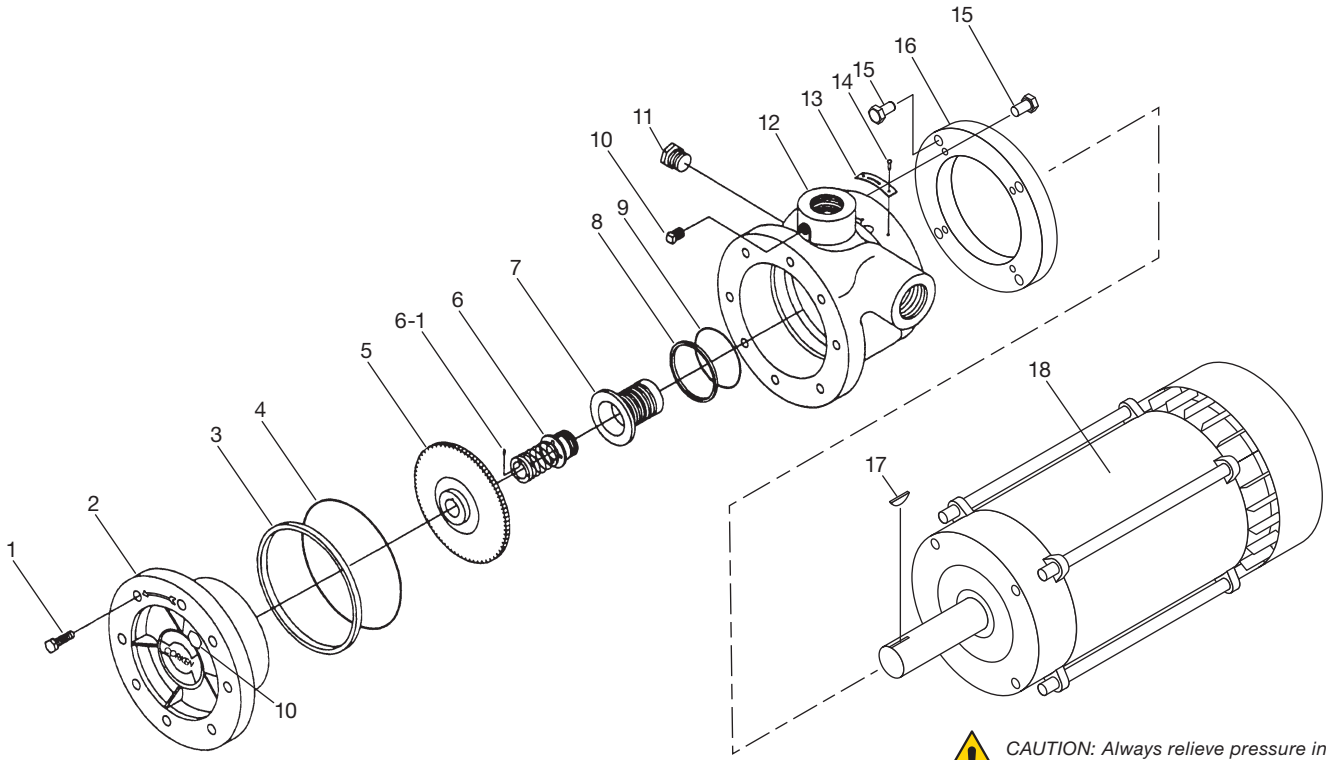
Flange Dimensions		
Model	A (inlet)	B (outlet)
F10, F16, and F17	1-1/4" NPT	1" NPT
F12, F13, F14, F18, and F19	1-1/2" NPT	1" NPT

Mounting Dimensions													
Motor Frame	C	D	E	F	G	H	J	K	L	M	N	P	Q
56, 66, 143T, 145T, 182T, 184T, 213T, 215T	30 (762.0)	12 (304.8)	27-1/2 (698.5)	9 (228.6)	1-1/2 (38.1)	7-9/16 (192.1)	1-1/4 (31.8)	4-1/4 (108.0)	3 (76.2)	8-3/4 (222.3)	11-1/2 (292.1)	4-5/16 (109.5)	5 (127.0)
254U		15 (381.0)		12 (304.8)									
256U	34 (863.6)		31-1/2 (800.1)										

All dimensions are in inches (millimeters).

Appendix E—Parts Details for All C-Model (Close-Coupled) Pumps

C10, C12, C13, C14, and C16



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

WARNING

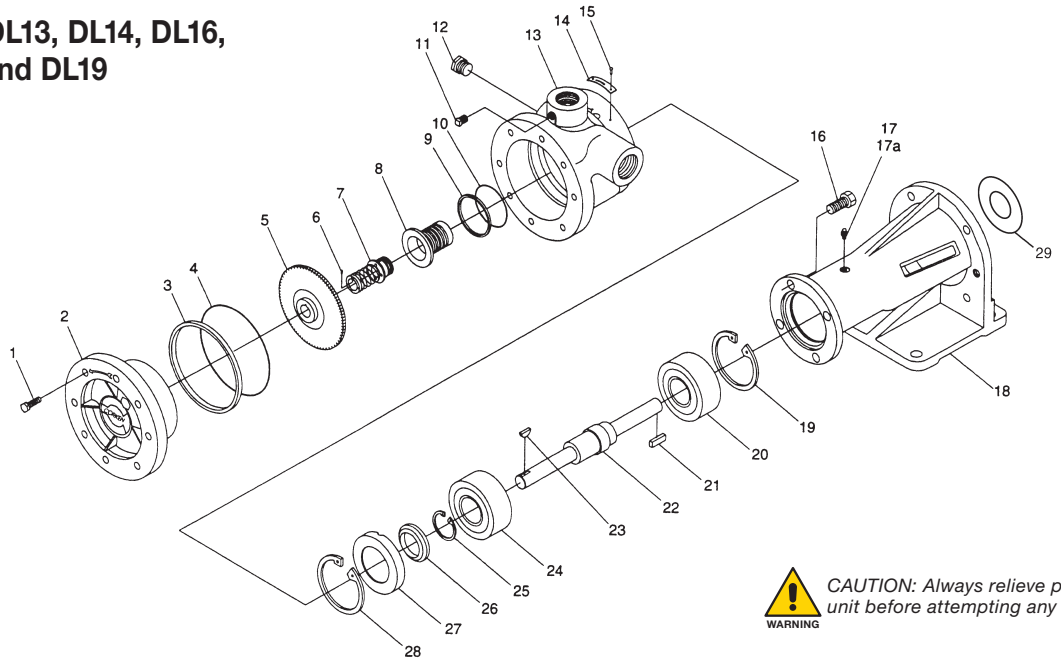
Ref No.	Part No.	Description	Qty.
1.	7001-031NC100A	Hex head cap screw	8
2.	1001-0	Cover—model 10	1
	1001-2	Cover—model 12	1
	1001-3	Cover—model 13	1
	1001-4	Cover—model 14	1
	1001-6	Cover—model 16	1
3.	1014 [a]	Case clearance shim (.002" red)	As req.
	1014-1 [a]	Case clearance shim (.003" green)	As req.
4.	2-246A [a]	Case O-ring (Buna-N)	1
5.	1003-0 [b]	Impeller, bronze—model 10	1
	1003-2 [b]	Impeller, bronze—model 12	1
	1003-3 [b]	Impeller, bronze—model 13	1
	1003-4 [b]	Impeller, bronze—model 14	1
	1003-6 [b]	Impeller, bronze—model 16	1
6.	113-CXA6	Seal assembly (Buna-N O-rings)	1
6-1.	1009 [a]	Seal pin	1
7.	1004-1 [c]	Seal housing without pin (steel)	1
	1004-1X [d]	Seal housing with pin (steel)	1
8.	1013	Housing adjustment shim (.010")	As req.
	1013-1	Housing adjustment shim (.020")	As req.
9.	2-224A [a]	Housing O-ring (Buna-N)	1
10.	3442	Pipe plug, 1/4" NPT	2

Ref No.	Part No.	Description	Qty.
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
	1002-6	Case—model 16	1
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 [a]	Woodruff key (steel)	1
	2497-1 [a]	Woodruff key (stainless steel)	1
18.	2557	Motor 3 hp—model 14 and 16 (three phase)	1
	4261	Motor 2 hp—models 10, 12, and 13	1
	4261-1	Motor 1 hp—models 10 and 12	1
	4885	Motor 3 hp—models 14 and 16 (single phase)	1

[a] Included with seal assembly/repair kit 113-CXA6.
[b] For a ductile iron impeller, add a 1 to the end of the part number (example: model 10 with ductile iron is 1003-01).
[c] Pin is not required for Buna-N, Neoprene®, and Viton® O-rings.
[d] Pin is required for PTFE and Kalrez® O-rings.

Appendix E—Parts Details for All DL-Model (Direct-Mount) Pumps

DL10, DL12, DL13, DL14, DL16, DL17, DL18, and DL19



WARNING *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.	1001-0	Cover—model 10	1
	1001-2	Cover—model 12	1
	1001-3	Cover—model 13	1
	1001-4	Cover—model 14	1
	1001-6	Cover—model 16	1
	1001-7	Cover—model 17	1
	1001-8	Cover—model 18	1
	1001-9	Cover—model 19	1
3.	1014 [c]	Case clearance shim (0.002—red)	As req.
	1014-1 [c]	Case clearance shim (0.003—green)	As req.
4.	2-246_ [a,c]	Case O-ring (non-PTFE)	1
	2-247E [c]	Case O-ring PTFE	1
5.	1003-0 [d]	Impeller (bronze standard)—model 10	1
	1003-2 [d]	Impeller (bronze standard)—model 12	1
	1003-3 [d]	Impeller (bronze standard)—model 13	1
	1003-4 [d]	Impeller (bronze standard)—model 14	1
	1003-61	Impeller (ductile iron)—model 16 and 17	1
	1003-81	Impeller (ductile iron)—model 18	1
	1003-91	Impeller (ductile iron)—model 19	1
6.	1009 [c]	Seal pin	1
7.	113-CX_6 [a]	Seal assembly (aluminum sleeve)	1
	113-CX_6A [a]	Seal assembly (stainless steel sleeve)	1
8.	1004-1 [e]	Seal housing without pin (steel)	1
	1004-11 [e]	Seal housing without pin (stainless steel)	1
	1004-1X [f]	Seal housing with pin (steel, applies to Kalrez®[b] O-rings)	1
	1004-11X [f]	Seal housing with pin (stainless steel, applies to Kalrez®[b] O-rings)	1
	1004-2X [f]	Seal housing with pin (steel, applies to PTFE O-rings)	1
	1004-21X [f]	Seal housing with pin (stainless steel, applies to 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_ [a,c]	O-ring (housing)	1
11.	3442	Pipe plug 1/4"	1
12.	3444	Pipe plug 3/4"	1

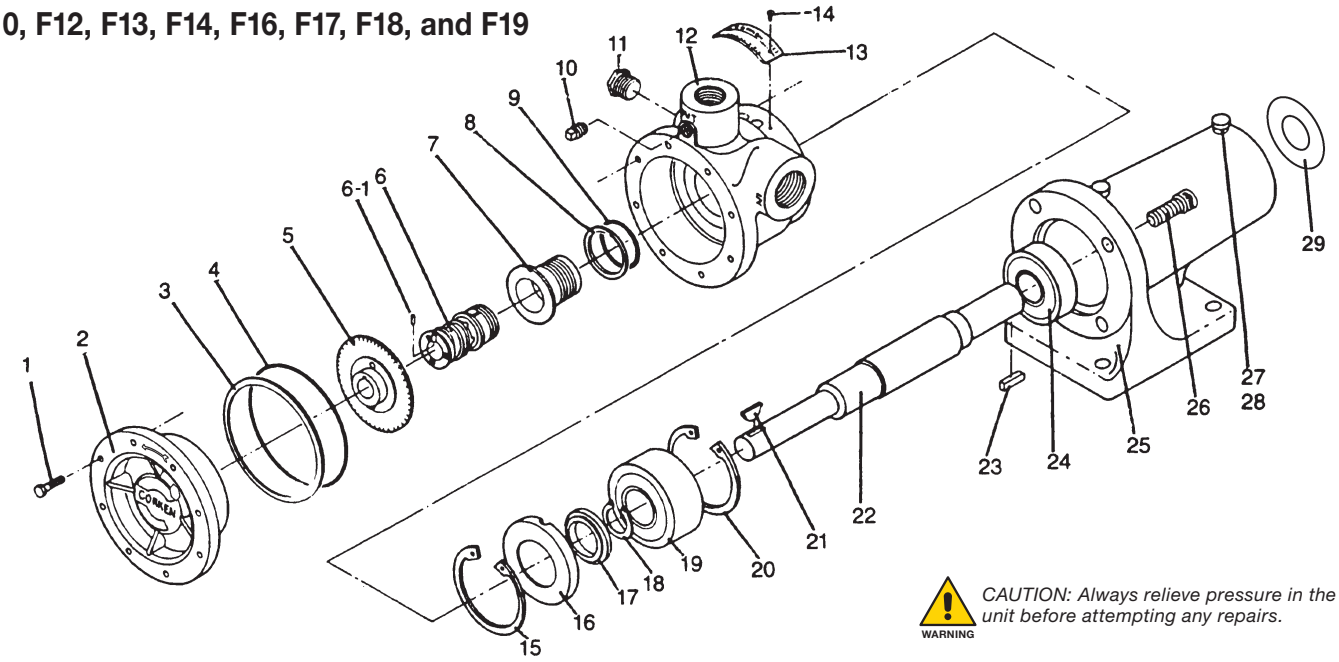
Ref No.	Part No.	Description	Qty.
13.	1002-0	Case—model 10	1
	1002-2	Case—model 12	1
	1002-3	Case—model 13	1
	1002-4	Case—model 14	1
	1002-6	Case—model 16	1
	1002-7	Case—model 17	1
	1002-8	Case—model 18	1
	1002-9	Case—model 19	1
14.	1914-1	Name plate	1
15.	7012-0065F019E	Phillips head screw 6-32 x 1/4"	2
16.	7001-037NC100A	Hex head mounting bolts	4
17.	2158	Grease zerk	2
17A.	2159	Lubricap	2
18.	4298	Mounting frame—DL	1
19.	5002-281	Bearing retainer ring	1
20.	4378	Bearing	1
21.	3226	Key	1
22.	4303	Shaft (steel)	1
	4303-X [g]	Shaft assembly (steel)	1
	4303-1	Shaft (stainless steel)	1
	4303-1X [g]	Shaft assembly (stainless steel)	1
23.	2497 [c]	#5 Woodruff key (steel)	1
	2497-1 [c]	#5 Woodruff key (stainless steel)	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

[a] *_ denotes material code. See material code chart for details.*
[b] *Registered trademark of the DuPont company.*
[c] *Included with seal assembly/repair kit.*
[d] *Add a 1 to the part number for ductile iron or a 2 for stainless steel. (ex. - model 10 with ductile iron is 1003-01)*
[e] *Pin is not required for Buna-N, Neoprene®, and Viton® O-rings.*
[f] *Pin is required for PTFE and Kalrez® O-rings.*
[g] *Shaft assembly comes with the bearings pressed on the shaft and includes part numbers 2758, 4378, and 5102-118.*

Material Code	
A	Buna-N
B	Neoprene®[b]
D	Viton®[b]
E	PTFE
G	Ethylene Propylene
K	Kalrez®[b]

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

F10, F12, F13, F14, F16, F17, F18, and F19



WARNING *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.	1001-0	Cover—model 10	1
	1001-2	Cover—model 12	1
	1001-3	Cover—model 13	1
	1001-4	Cover—model 14	1
	1001-6	Cover—model 16	1
	1001-7	Cover—model 17	1
	1001-8	Cover—model 18	1
	1001-9	Cover—model 19	1
3.	1014 [c]	Case clearance shim (0.002—red)	As req.
	1014-1 [c]	Case clearance shim (0.003—green)	As req.
4.	2-246_ [a, c]	Case O-ring (non-PTFE)	1
	2-247E [c]	Case O-ring PTFE	1
5.	1003-0 [d]	Impeller (bronze standard)—model 10	1
	1003-2 [d]	Impeller (bronze standard)—model 12	1
	1003-3 [d]	Impeller (bronze standard)—model 13	1
	1003-4 [d]	Impeller (bronze standard)—model 14	1
	1003-61	Impeller (ductile iron)—model 16 and 17	1
	1003-81	Impeller (ductile iron)—model 18	1
	1003-91	Impeller (ductile iron)—model 19	1
6.	113-CX_6 [a]	Seal assembly (aluminum sleeve)	1
	113-CX_6A [a]	Seal assembly (stainless steel sleeve)	1
6-1.	1009 [c]	Seal pin	1
7.	1004-1 [e]	Seal housing without pin (steel)	1
	1004-11 [e]	Seal housing without pin (stainless steel)	1
	1004-1X [f]	Seal housing with pin (steel, applies to Kalrez®[b] O-rings)	1
	1004-11X [f]	Seal housing with pin (stainless steel, applies to Kalrez®[b] O-rings)	1
	1004-2X [f]	Seal housing with pin (steel, applies to PTFE O-rings)	1
	1004-21X [f]	Seal housing with pin (stainless steel, applies to 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_ [a, c]	O-ring (housing)	1
10.	3442	Pipe plug 1/4"	1
11.	3444	Pipe plug 3/4"	1

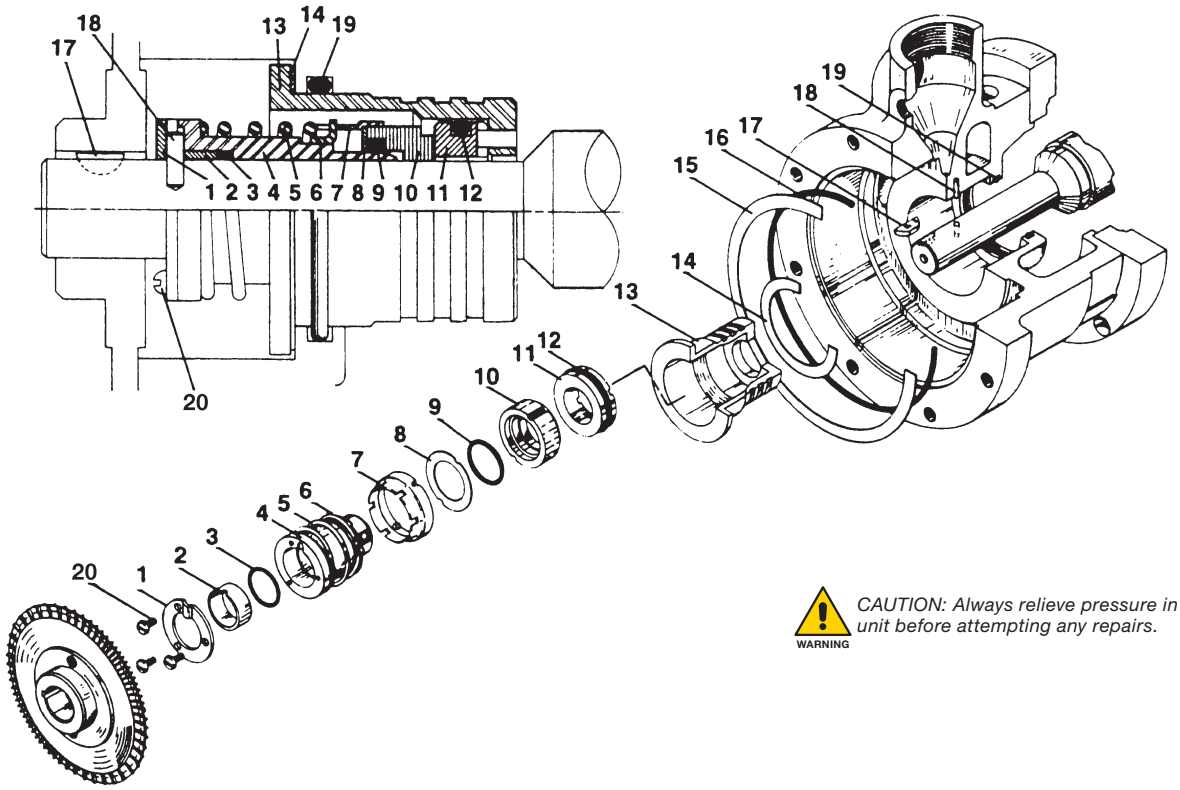
Ref No.	Part No.	Description	Qty.
12.	1002-0	Case—model 10	1
	1002-2	Case—model 12	1
	1002-3	Case—model 13	1
	1002-4	Case—model 14	1
	1002-6	Case—model 16	1
	1002-7	Case—model 17	1
	1002-8	Case—model 18	1
	1002-9	Case—model 19	1
13.	1914-1	Name plate	1
14.	7012-006SF019E	Phillips head screw 6-32 x 1/4"	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
21.	2497 [c]	#5 woodruff key (steel)	1
	2497-1 [c]	#5 woodruff key (stainless steel)	1
22.	1234	Shaft (steel)	1
	1234-X [g]	Shaft assembly (steel)	1
	1234-1	Shaft (stainless steel)	1
	1234-1X [g]	Shaft assembly (stainless steel)	1
23.	3226 [c]	Key	1
24.	2759	Ball bearing	1
25.	1010-2	Frame	1
26.	7002-037NC087A	Socket head screw	4
27.	2158	Grease zerk	2
28.	2159	Lubricap	2
29.	3227	Bearing plate	1

[a] _ denotes material code. See material code chart for details.
[b] Registered trademark of the DuPont company.
[c] Included with seal assembly/repair kit.
[d] Add a 1 to the part number for ductile iron or a 2 for stainless steel. (ex. - model 10 with ductile iron is 1003-01)
[e] Pin is not required for Buna-N, Neoprene®, and Viton® O-rings.
[f] Pin is required for PTFE and Kalrez® O-rings.
[g] Shaft assembly comes with bearing pressed on the shaft and includes part numbers 2758, 2759, and 5102-118.

Material Code	
A	Buna-N
B	Neoprene®[b]
D	Viton®[b]
E	PTFE
G	Ethylene Propylene
K	Kalrez®[b]

Appendix E—Parts Details for the Balanced Seal Assembly (113-CX_)

All Models 10, 12, 13, 14, 16, 17, 18, and 19



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

WARNING

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_ [a]	Follower O-ring	1
4.	1007 [c]	Seal sleeve (aluminum)	1
	1007-2	Seal sleeve (stainless steel)	1
5.	2734 [c]	Spring	1
6.	2735 [c]	Drive band	1
7.	2736 [c]	Retainer	1
8.	2737 [c]	Disc	1
9.	2-118_ [a, f]	Rotor O-ring	1
	2343-X [d, g]	Coro-seal (not shown)	1
10.	2738 [c, f]	Rotor	1
	2738-1 [d, g]	Rotor for Coro-Seal	1
11.	2739	Seat (silicon carbide)	1
12.	2-216_ [a]	Seat O-ring	1
13.	1004-1 [h]	Seal housing without pin (steel)	1
	1004-11 [h]	Seal housing without pin (stainless steel)	1
	1004-1X [e, f, i]	Seal housing with pin (steel, applies to Kalrez®[b] O-rings)	1
	1004-11X [e, f, i]	Seal housing with pin (stainless steel, applies to Kalrez®[b] O-rings)	1
	1004-2X [e, g, i]	Seal housing with pin (steel, applies to PTFE O-rings)	1
	1004-21X [e, g, i]	Seal housing with pin (stainless steel, applies to PTFE O-rings)	1
14.	1013 [e]	Housing adjustment shim (.010)	As req.
	1013-1 [e]	Housing adjustment shim (.020)	As req.

Ref No.	Part No.	Description	Qty.
15.	1014	Case clearance shim (.002)	As req.
	1014-1	Case clearance shim (.003)	As req.
16.	2-246_ [a]	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_ [a]	Seal housing O-ring	1
20.	7012-006NC025B	Screw, 6-32 x 1/4" phillip pan head	3

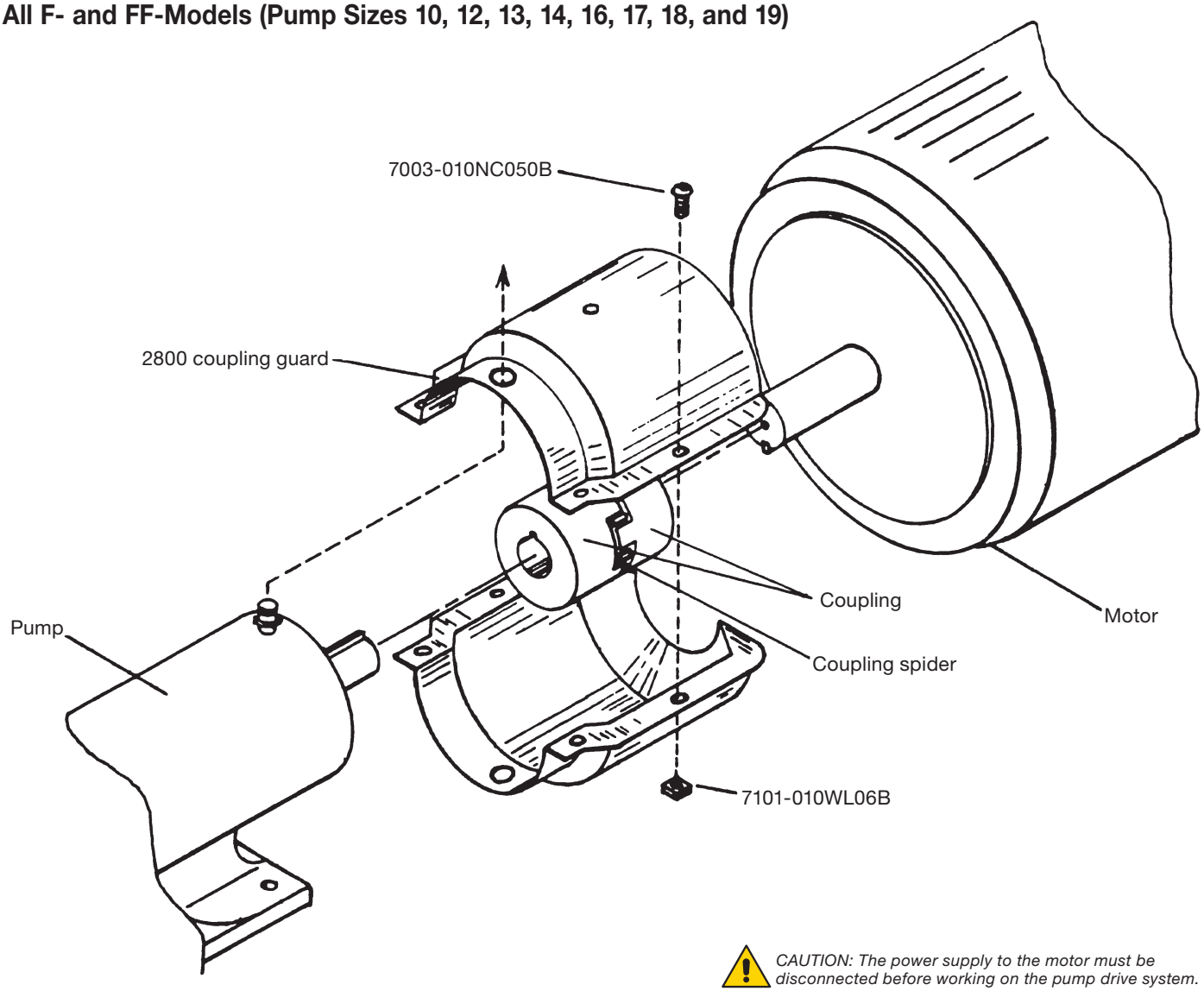
Assembly No.	Assembly Name
113-CX_6 [a, d]	Seal assembly with 1007-X, 1008, 1009, 1014, 1014-1, 1080, 2497, 2736, 2737, 2739-X, 2-018, 2-224, 2-246
113-CX_6A [a, d]	Seal assembly with 1007-2X, 1008, 1009, 1014, 1014-1, 1080, 2497, 2736, 2737, 2739-X, 2-018, 2-224, 2-246
1007-X	Seal sleeve assembly with 1007, 2734,2735
1007-2X	Seal sleeve assembly, stainless steel, with 1007-2, 2734, 2735

[a] *_ denotes material code. See material code chart for details.*
[b] *Registered trademark of the DuPont company.*
[c] *These parts are not available separately.*
[d] *For PTFE fitted seals, O-ring 2-118 is replaced by Coro-Seal 2343-X and rotor 2738 is replaced by 2738-1.*
[e] *Not included in 113-CX.*
[f] *Except PTFE O-rings.*
[g] *Not used with PTFE O-rings.*
[h] *Pin is not required for Buna-N, Neoprene®, and Viton® O-rings.*
[i] *Pin is required for PTFE and Kalrez® O-rings.*

Material Code	
A	Buna-N
B	Neoprene ®[b]
D	Viton ®[b]
E	PTFE
G	Ethylene Propylene
K	Kalrez ®[b]

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

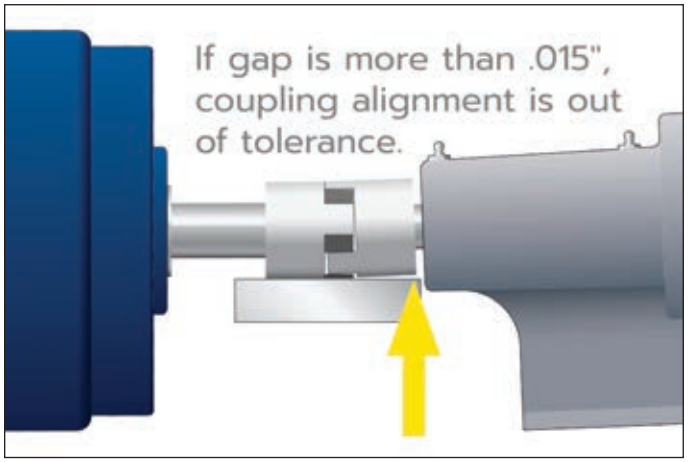
All F- and FF-Models (Pump Sizes 10, 12, 13, 14, 16, 17, 18, and 19)



WARNING *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®[a]
1351	Coupling spider AL/L-095
1352	Coupling spider AL/L-100
1353	Coupling spider AL/L-110, Hytrel®[a]
2800-X	Coupling guard assembly - Coro-Flo® (includes (2)2800, (4)7003-010NC050B, and (4)7101-010WL06B)

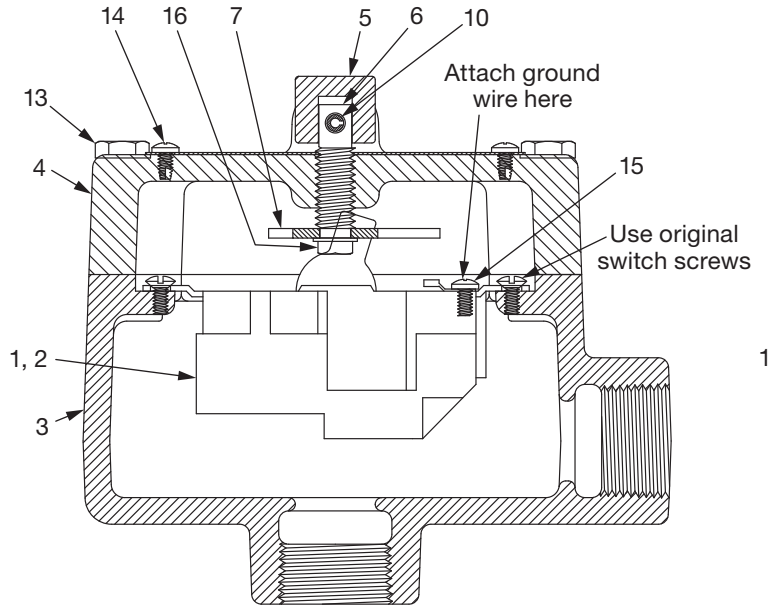
[a] *Registered trademark of the DuPont company.*



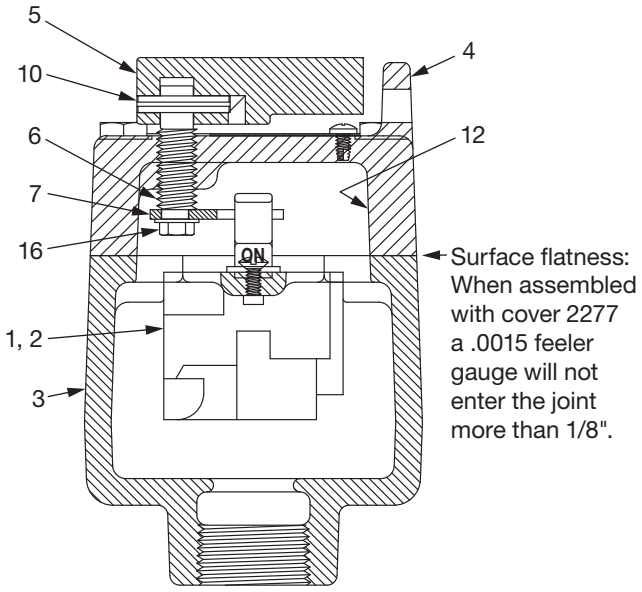
Scan QR code to view maintenance video.

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

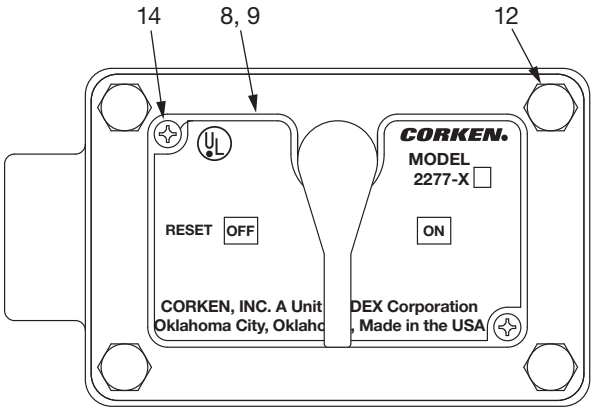
Motor Mounted Model (2277-X1)



Section A



Section B



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

WARNING *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: 1 hp	1
2.	3784 [a]	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

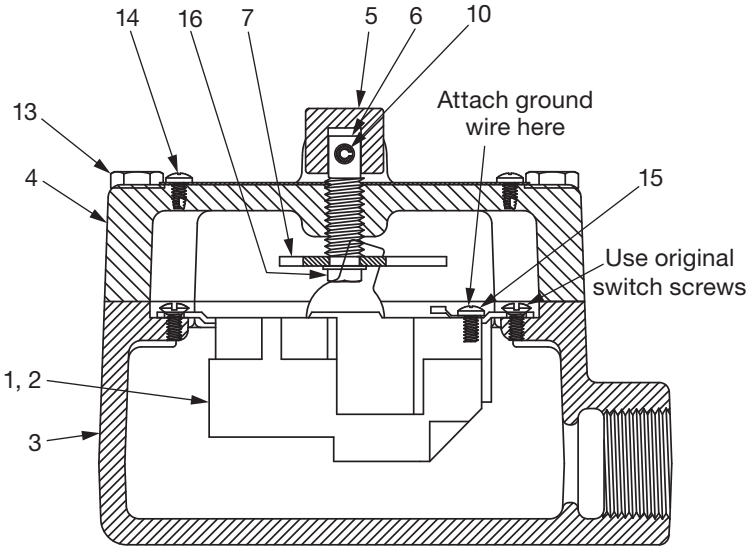
For current Corken Coro-Flo C-Model motors the following heaters are standard.

Motor No.	Horsepower	Heater No.
2556 (Obsolete) [c]	1	2610
4261 [b]	2	Not available
4261-1 [d]	1	4250

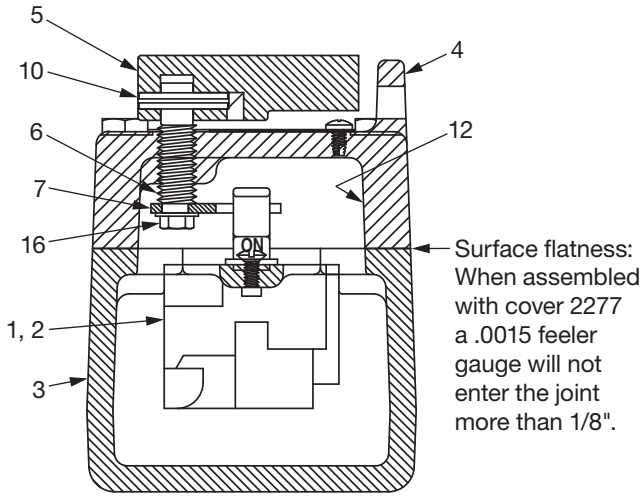
[a] *Motor number 4261 uses switch 3784 which does not use a heater element.*
[b] *Motor number 4261 uses switch assembly 2277-X3.*
[c] *Replaced by 4261 (2 hp) or 4261-1 (1 hp).*
[d] *Motor 4261-1 uses switch 2275.*

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

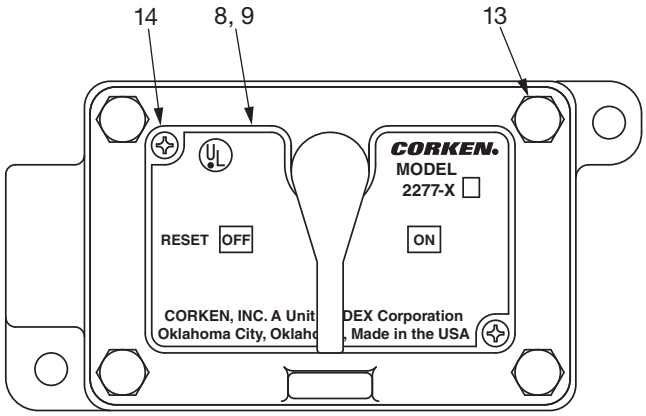
Wall Mounted Model (2277-X2)



Section A



Section B



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

WARNING *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: 1 hp	1
2.	3784 [a]	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.
2556 (Obsolete) [c]	1	2610
4261 [b]	2	Not available
4261-1 [d]	1	4250

[a] Motor number 4261 uses switch 3784 which does not use a heater element.
[b] Motor number 4261 uses switch assembly 2277-X4.
[c] Replaced by 4261 (2 hp) or 4261-1 (1 hp).
[d] Motor 4261-1 uses switch 2275.

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.
	Bypass valve stuck open or set too low	Readjust, repair, or replace the bypass 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 or is locked	Foreign matter in the pump	Clean out the pump and inspect the strainer screen.
	Bearing seized	Replace the bearings and grease every three months.
	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 and clean filter screen. The suction pipe might be too small or restricted. Remove restrictions and/or increase pipe size.
	Bypass valve set too low	Set the valve for higher pressure (see valve’s instructions).
	Too much impeller clearance	Conduct 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 and lubricate every three months. Use a low temperature ball bearing grease with a minimum rating of at least -25°F to 250°F. The lubricant used by the factory is Mystik JT-6 Low Temperature Extreme Grease.

Symptom	Probable Cause	Remedy
Noise or vibration in the pump (continued)	Defective or wrong size bypass valve	Confirm the size of the bypass valve required for the 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 bypass 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 or heater is 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 (TEFC) electric motors and explosion proof electric motors are subject to moisture condensation inside when used intermittently. To eliminate moisture and prevent buildup, run the motor at least once a week until it gets hot enough to evaporate moisture.
Leaks	Failed O-rings or mechanical seal assembly	Inspect and replace the mechanical seal and O-rings if needed.

Appendix G—Extended Storage Procedures

If the pump is removed from service for some time, it must be protected. Propane, butane, and anhydrous ammonia all leave the metal "bare" and open to corrosion. Piping and tanks not in service should also be protected.

1. Fill or thoroughly flush the pump with a light rust-inhibiting oil. If the pump is flushed with oil, place some desiccant packets inside the pump for added protection.

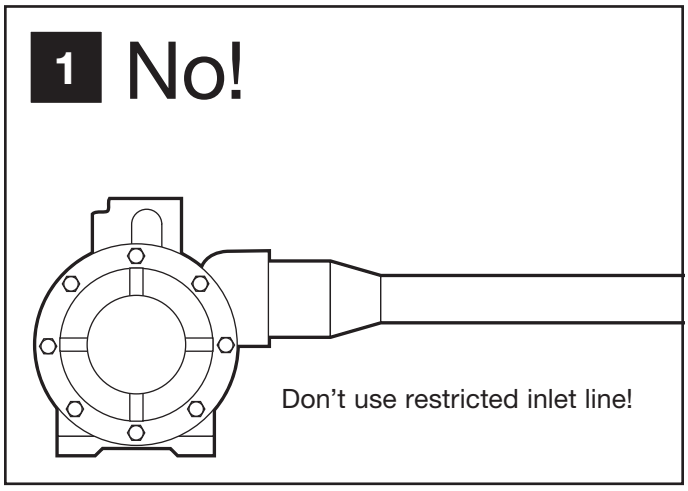
2. Plug all openings of the pump.

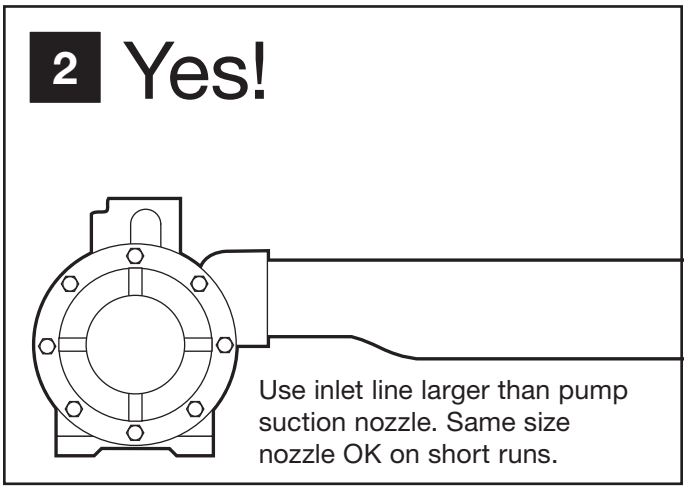
3. Store in a dry location.

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

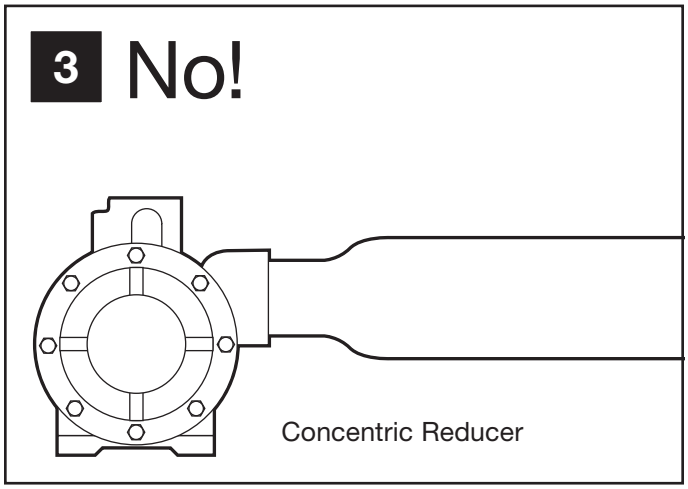
5. Refer to the "Operation" section of this manual.

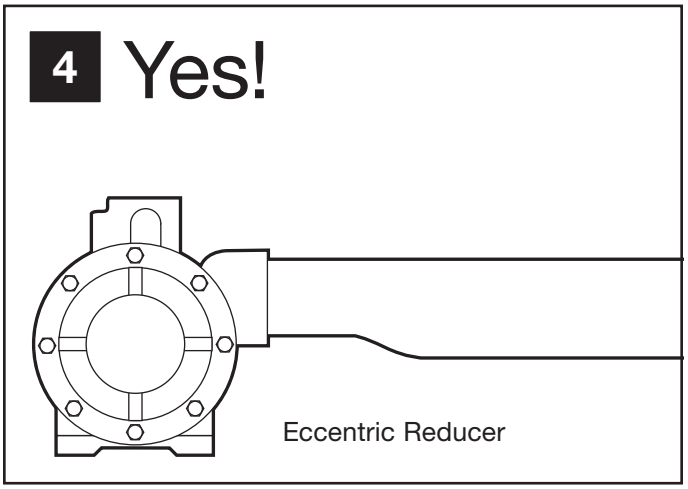
Appendix H—Aboveground Installation/Piping Instructions



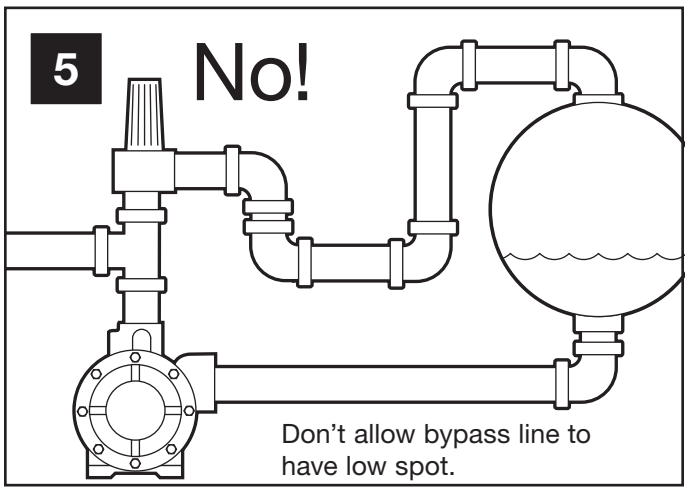


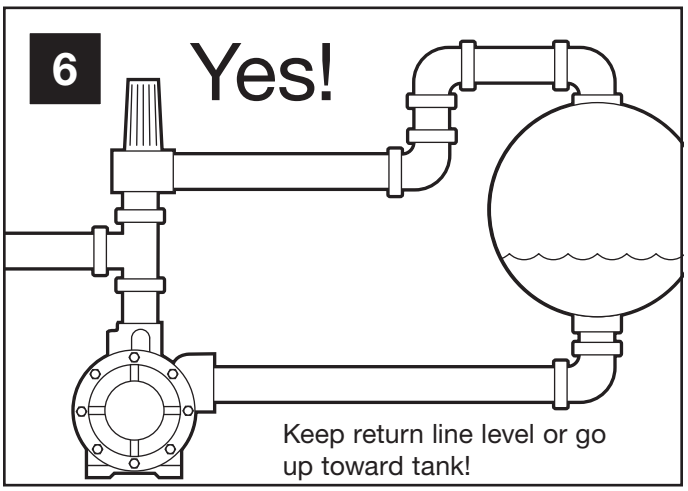
Pressure drop caused by restriction in suction line will cause vaporization and cavitation.





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.

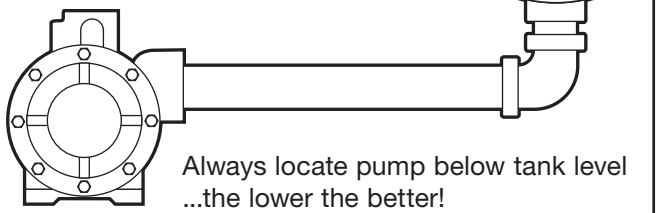




Low spots in bypass line can collect liquid which prevents normal vapor passage for priming purposes just like the P trap in the drain of a kitchen sink. This is not a problem for bypass lines where vapor elimination is not required.

Appendix H—Aboveground Installation/Piping Instructions

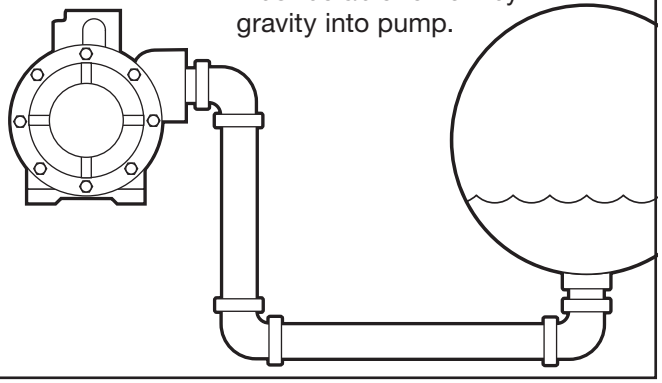
7 Yes!



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

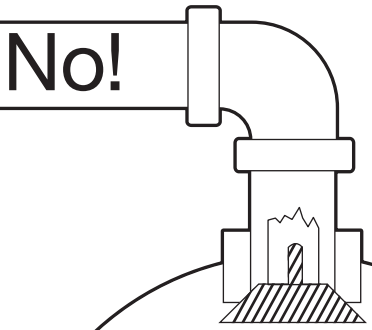
8 No!

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



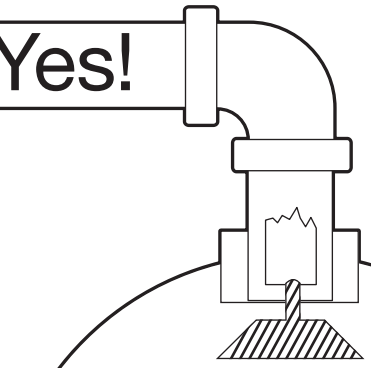
Since liquefied gases boil when drawn into a pump by its own suction, the pump must be fed by gravity flow to give stable, trouble-free operation.

9 No!



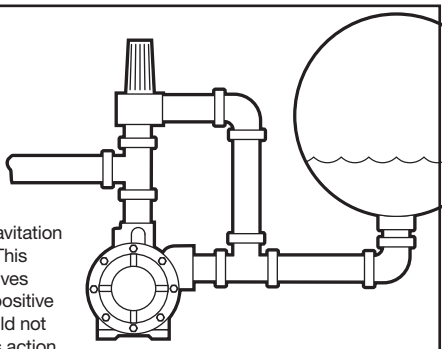
Back Check Valve
Positive closure of back check valve prevents proper vapor return for pump priming.

10 Yes!



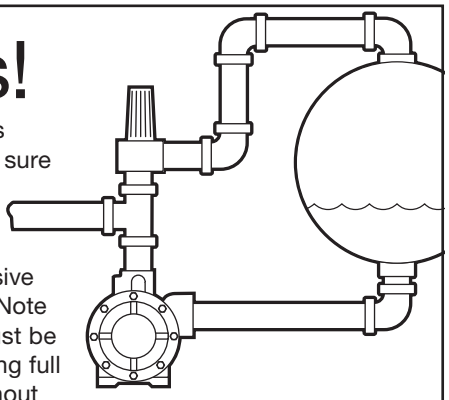
Excess Flow Check Valve
Necessary for proper vapor elimination when using priming type bypass valves.

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 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.

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Printed in the U.S.A.
March 2020