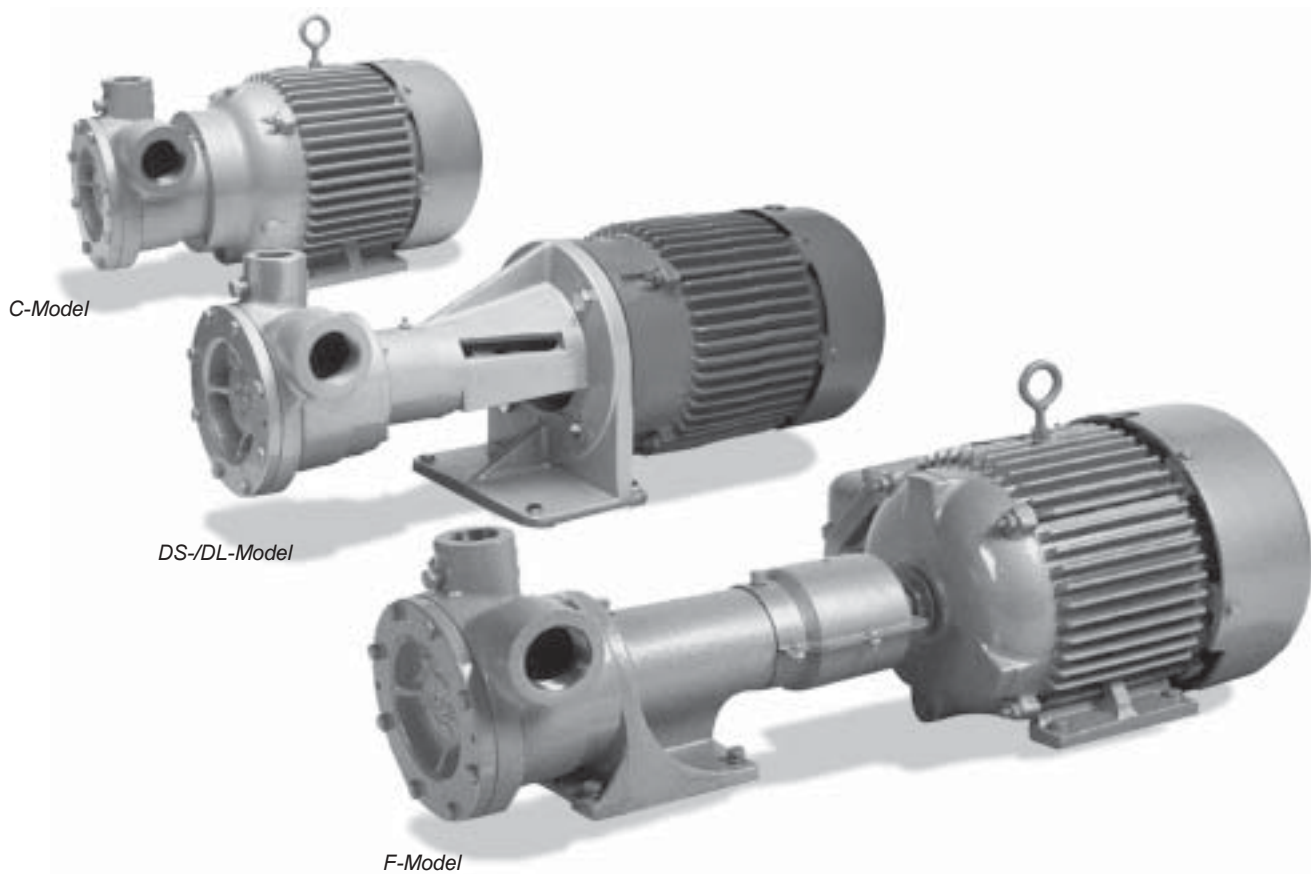


# Installation, Operation & Maintenance Manual

## Coro-Flo® Pumps



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

*Solutions beyond products...*

**CORKEN**  
**IDEX**

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## Warning

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

## Corken One Year Limited Warranty

Corken, Inc. warrants that its products will be free from defects in material and workmanship for a period of 12 months following date of purchase from Corken. Corken products which fail within the warranty period due to defects in material or workmanship will be repaired or replaced at Corken's option, when returned, freight prepaid to Corken, Inc., 3805 N.W. 36<sup>th</sup> Street, Oklahoma City, Oklahoma 73112.

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

All implied warranties, including any implied warranty of merchantability or fitness for a particular purpose, are expressly negated to the extent permitted by law and shall in no event extend beyond the expressed warranty period.

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

## 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 you contact the factory, note the model number and serial number of your pump. The serial number directs us to a file containing all information on material specifications and test data applying to your specific pump. 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 number: \_\_\_\_\_

Serial number: \_\_\_\_\_

Date purchased: \_\_\_\_\_

Date installed: \_\_\_\_\_

Purchased from \_\_\_\_\_

Installed by \_\_\_\_\_

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# Principles of the Corken Coro-Flo® Pump

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

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

## Exclusive Features of Your Corken Coro-Flo® Pump

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

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

- The C-model pumps of this series are manufactured directly connected to the electric motor or with their own frame for connection to a separate driver by means of a flexible coupling. The close-coupled pumps are the models C10, C12, C13 and C14. The frame pumps are available in the F- and DS/DL-models with the following pump sizes: 9, 10, 12, 13, 14 and 15.
- Underwriters' Laboratories, Inc. have tested and inspected the C-model pumps and have listed them for use in the handling of LP-gas and ammonia fluids. The nameplate on the pump shows the UL label.
- Ductile iron, the metal with the strength of steel, has been used in the manufacture of this pump for parts under pressure of the liquid.
- The impeller floats on a shaft and may be replaced easily without disturbing the piping or driver by simply removing the cover. No special tools are needed.

- The mechanical seal assembly may be replaced easily by removing the cover and the impeller, and without disturbing the piping or driver. No special tools are needed.
- The pump nozzles may be rotated into four different positions, 90 degrees apart, if desired.
- A bypass connection, 3/4" pipe thread, has been located on the outlet nozzle to make the piping of the pump more simple.
- Pressure gauge connections, 1/4" pipe thread, have been located on the outlet nozzle.
- Motors on models C10, C12, C13 and C14 are explosion-proof, Class I, Group D - UL and CSA listed. The C10, C12 and C13 motors are all single phase. 60 Hertz (50/60 Hertz on C13 only), 3450 RPM, 115/230 volt. The C14 motor is three-phase, 60 Hertz, 3450 RPM, 230/460 volts. Corken can provide manual motor starters for models C10, C12 and C13 with a built-in thermal overload protection. Both motor-mounted and wall-mounted manual starters are available for models C10, C12 and C13. These motors (after pump serial number TS185540) are provided with a conduit seal in the 3/4" NPT rigid galvanized steel nipple, fulfilling the 1996 requirement of NFPA 70-NEC, paragraphs 501.5.a.1 & 3. Separate motor starters with overload protection must be provided for the model C14 and all F series pumps.

## Installation of Your Corken Coro- Flo® Pump

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

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

No pump can discharge more liquid than it receives, so the location and the inlet piping must be given careful attention. If the inlet piping is inadequate to supply the demand of the pump, you may expect trouble! The inlet line sizes shown on Figures 1 and 2 are the smallest size piping you can use with success.

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

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

### Pump Weights

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

### 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 EVF without knowing its flow capacity.
2. The tank shutoff valve should be an angle valve or a free flow type—not a standard globe valve.
3. A strainer of the "Y" type, with 1/16" mesh screen, must be on the inlet line of the pump. For simpler inlet lines use a Corken 1836-X1 right angle strainer to replace an elbow and "Y" strainer.
4. A flexible connection should be used on the pump inlet or outlet to care for piping strains.
5. Unions must be installed near the pump inlet and outlet nozzles.
6. An eccentric swage should be used at the pump inlet nozzle to change line size (flat side up, to avoid vapor formation.)
7. The inlet line must be level or slope downward to the pump.
8. The minimum inlet piping sizes shown in Figures 1 and 2 must be observed.

### The Outlet Piping Should Include the Following:

1. A pressure gauge should be installed in the opening provided on the outlet nozzle or in the outlet piping near the pump. This pressure gauge will tell you the complete story of the operation inside your pump. Be sure you have one installed.
2. A hydrostatic relief valve is required to be installed in the outlet piping.
3. If the outlet piping exceeds 50 feet in length, a check valve should be installed near the pump outlet.
4. The minimum outlet piping sizes shown in Figures 1 and 2 must be observed.

### The Bypass System Must Include the Following:

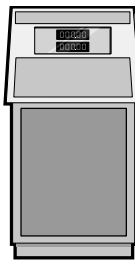
1. The pump bypass system must be installed. Without this system, the pump has little chance of performing.
2. A Corken B166 Bypass valve (a special valve to vent the pump of vapors and to act as a differential relief valve) makes the ideal installation.
3. The bypass line must rise uninterrupted to an opening in the vapor section of the storage tank. The tank fitting must be either an excess flow valve or a vapor return valve; it should never be a filler valve or a back check valve.

For more piping tips, see Appendix G. For a discussion of pumping from underground tanks, see Appendix H and you may also reference IF103, Underground Tank Application Installation Guide.

# Piping recommendations

Vapor line from meter  
vapor eliminator or meter  
back pressure valve

Either Coro-Flo® frame—F-models  
or close-coupled C-models—may  
be used.



Motor fueling

If discharge line is over  
50 feet long, install a  
check valve between  
valve 15 and ell 16.

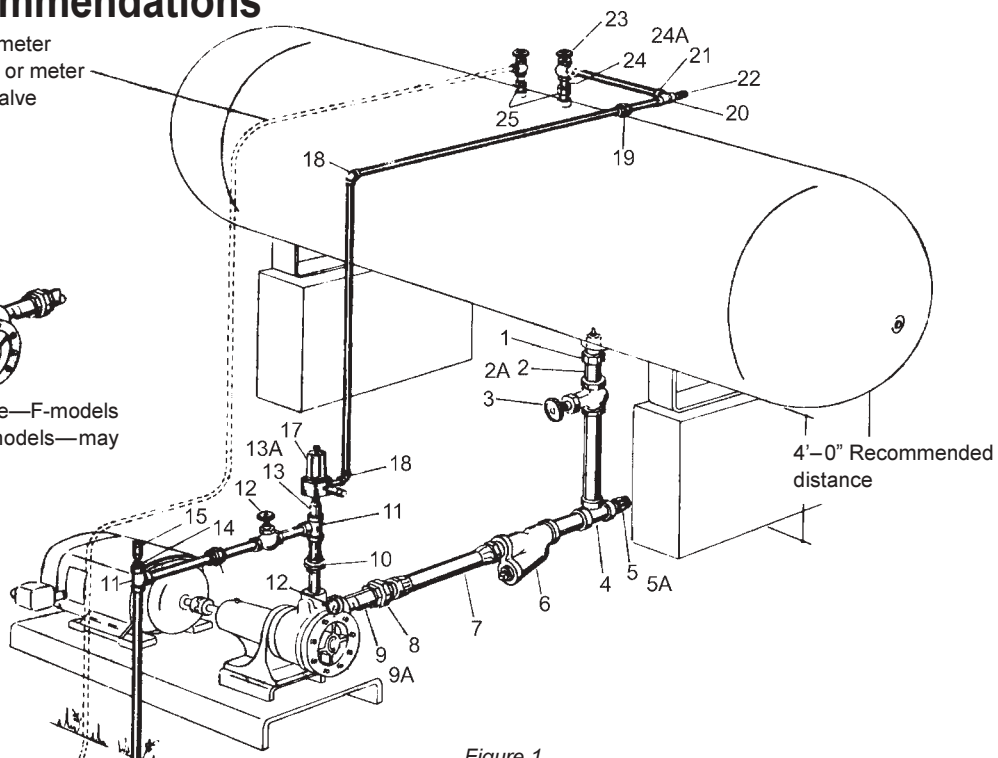


Figure 1

Item No.	Size of Fitting in Inches			Description
	Model 9, 10	Model 12, 13	Model 14, 15	
1	1-1/4	2	2	Excess flow valve
2	1-1/4	---	2	Nipple
2A	---	2 x 1-1/2	---	Swage nipple
3	1-1/4	1-1/2	2	Shutoff valve
4	1-1/4	1-1/2	2	Tee
5	1-1/4	1-1/4	2	Double check filler valve
5A	---	1-1/2 x 1-1/4	---	Bushing
6	1-1/4	1-1/2	2	Strainer with 1/16 mesh screen
7	1-1/4	1-1/2	2	Flexible hose connection with male hose connection
8	1-1/4	1-1/2	2	Union
9	1-1/4	1-1/2	---	Nipple
9A	---	---	2 x 1-1/2	Swage nipple
10	1	1	1	Union
11	1	1	1	Tee
12	1	1	1	Shutoff valve
13	1 x 3/4	1 x 3/4	---	Swage nipple
13A	---	---	1	Nipple
14	1 x 1/2	1 x 1/2	1 x 1/2	Bushing
15	1/2	1/2	1/2	Hydrostatic relief
16	1	1	1	Ell
17	3/4	3/4	1	Corken bypass valve B-166
18	3/4	3/4	1	Ell
19	3/4	3/4	1	Union
20	3/4	3/4	1	Tee
21	---	---	1 x 3/4	Swage nipple
22	3/4	3/4	3/4	Vapor return valve
23	3/4	3/4	1	Angle valve
24	3/4	3/4	---	Nipple
24A	---	---	1 x 3/4	Swage nipple
25	3/4	3/4	3/4	Excess flow valve
26	1/4	1/4	1/4	Pressure gauge with 1/4" x 2" nipple and 1/4" 90° ell

# Piping recommendations

**NOTE:**

1. Pipe, valves, fittings and electrical wiring must be in accordance with local, state or federal codes, standards and regulations having jurisdiction. Reference NFPA 58 "Standards for the Handling of Liquefied Petroleum Gases."
2. This configuration is not suitable for Models 14 and 15.

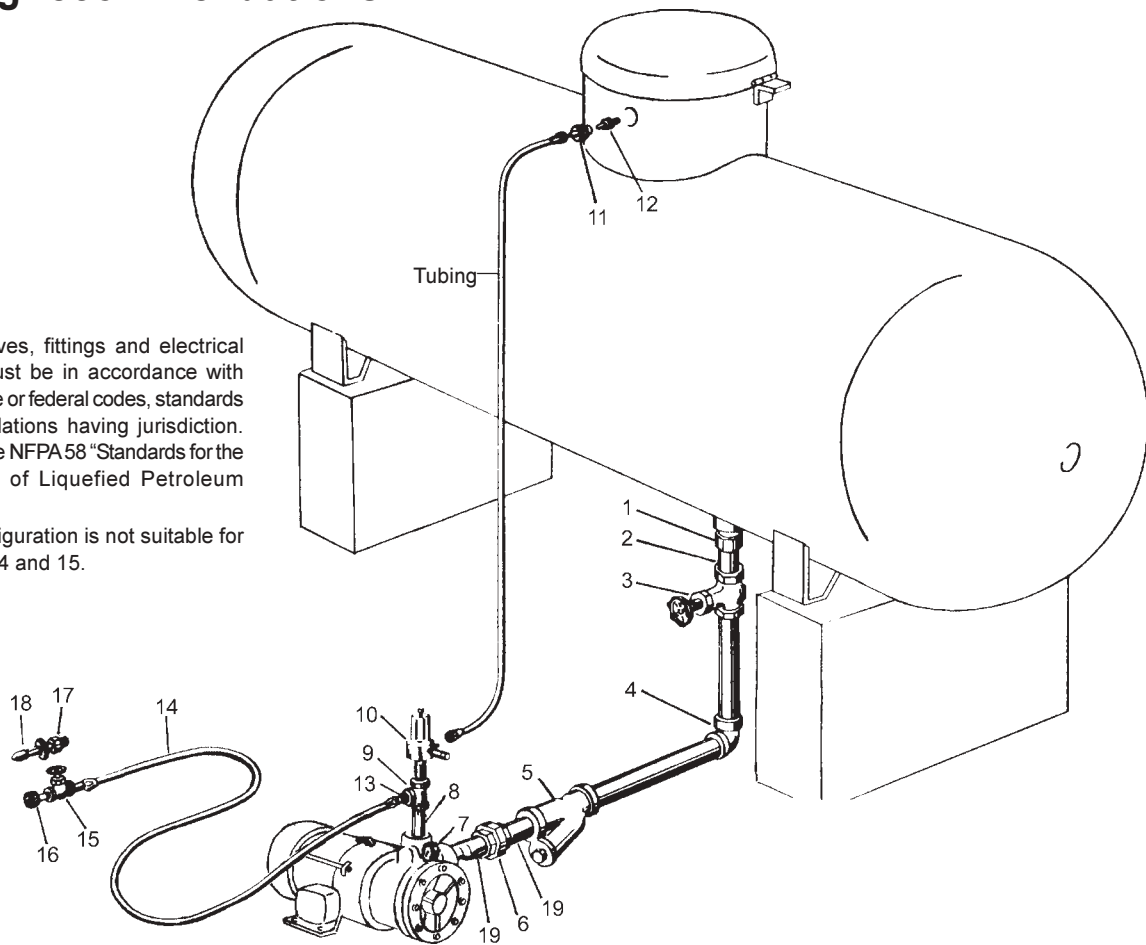
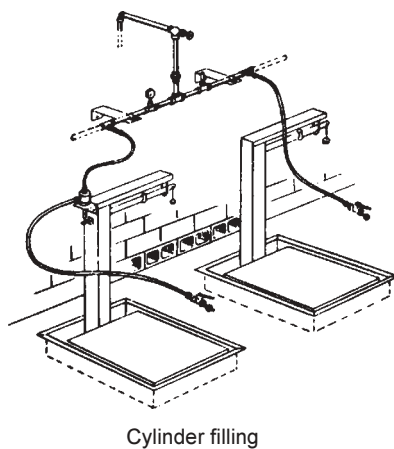


Figure 2: Piping Your Coro-Flo® Pump



Cylinder filling

Bill of Materials			
Item	Model 9, 10 Size in inches	Model 12, 13 Size in inches	Description
1	1-1/4	1-1/4	Excess flow valve
2	1-1/4 x 4	1-1/2 x 1-1/4 swage	Swage or nipple
3	1-1/4	1-1/2	LPG shutoff valve
4	1-1/4	1-1/2	X.H. 90½ ell
5	1-1/4	1-1/2	L.P.G. strainer with 1/16 mesh screen
6	1-1/4	1-1/2	X.H.G.J. union
7	1/4 NPT	1/4 NPT	Pressure gauge 2-1/2" face bottom connected
8	1 x 3/4	1 x 3/4	Concentric steel swage
9	3/4	3/4	X.H. tee
10	3/4	3/4	Corken by-pass valve with hydrostatic relief
11	3/4 FPT x 1/2 SAE flare	3/4 FPT x 5/8 SAE flare	Tube adapter O.D. tubing
12			Excess flow valve
13	3/4 x 1/2	None	Hex steel bushing
14	1/2 x 10'-0"	3/4 x 10'-0"	Single wire braid hose with male couplings both ends
15	1/2	3/4	L.P.G. shutoff valve
16	1/2 MPT x 1-3/4 6 ACME (female)	3/4 MPT x 1-3/4 6 ACME (female)	Filler valve coupling
17	1/4 FPT x 1-3/4 6 ACME (male)	1/4 FPT x 1-3/4 6 ACME (male)	Adapter
18	1/4 MPT x male POL	1/4 MPT x male POL	Cylinder filling connector with handwheel extension
19	1-1/4 x 4	1-1/2 x 4	X.H. nipple

# Pump Foundation F-Models

Every pump deserves a firm, neat concrete foundation (see figure 3). There are many ways to construct a foundation, and the example in Figure 3 is only a suggestion. The important features are to make the foundation level, and deep enough to get below the frost line for your locality (see Appendix C for outline dimensions).

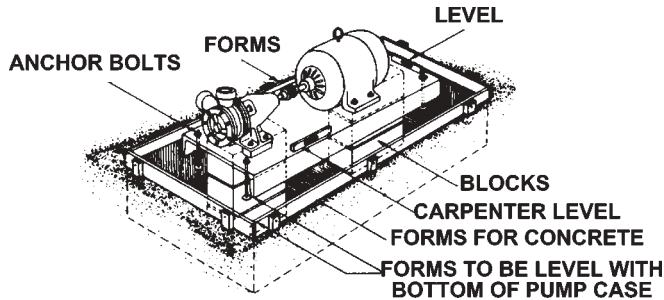


Figure 3

## Level Base

After the concrete has set, check the pump base for level. Drive metal shims under the base near the anchor bolts as below. Tighten anchor bolts and recheck the base for level (see Figure 4).

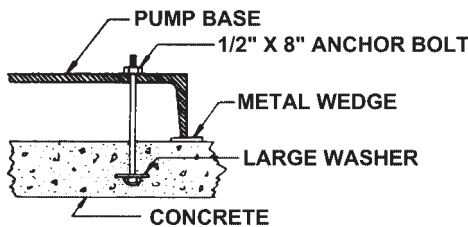


Figure 4

## Coupling alignment F-Models

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

Lay a straight edge across coupling halves, top, and side; both positions must line up to be correct (see figure 5).

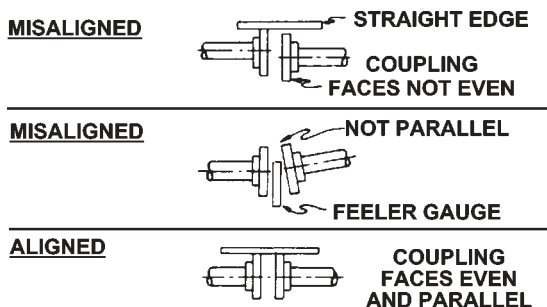


Figure 5

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

## Back-up Wrench

To keep from breaking the pump nozzle or springing the pump out of alignment, always use a back-up wrench as shown in Figure 6.

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

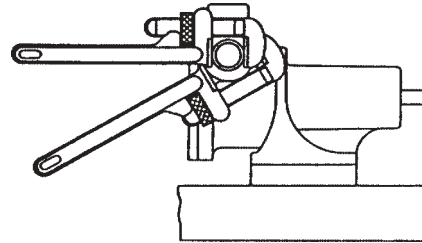


Figure 6

## Driver Installation

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

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

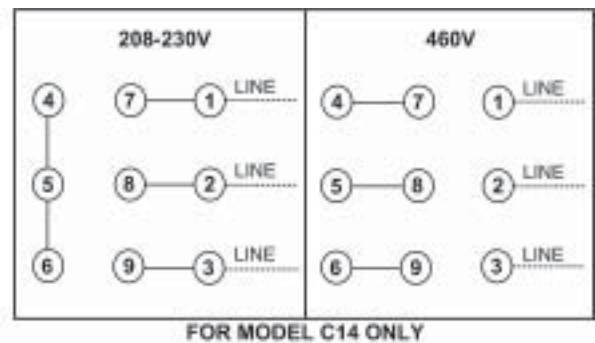
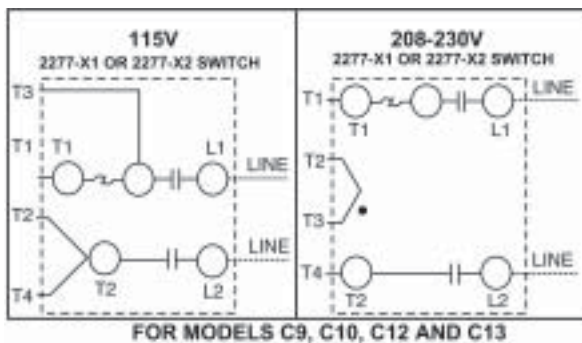
In explosion-proof motor applications in humid climates, the normal breathing and alternating temperatures of the motor (warm during operation and cold when stopped) will often cause moist air to be drawn into the motor housing. This moist air will condense and may eventually add enough free water to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

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



# Wire Sizing Chart

Motor					(a) Recommended Wire Size, AWG		
Model	Hp	Motor Phase	Volts	Approximate Full Load Amperes	Length of Run in Feet		
					0-100	to 200	to 300
C9	3/4	1	115	9.0	12	8	6
C10			230	5.0	12	12	12
C12	1	1	115	16.0	8	6	4
			230	8.0	12	12	10
C13	2	1	115	20.0	8	4	2
			230	10.0	12	10	8
C14	3	3	230	8.0	12	12	12
			460	4.0	12	10	8
Pump must rotate in the direction shown on pump case. If not, switch any two of the three incoming 3 phase lines.							
F/DS/DL	3/4	1	115	10.0	12	8	6
			230	5.0	12	12	12
		3	230	2.8	12	12	12
			460	1.4	12	12	12
F/DS/DL	1	1	115	14.0	10	6	6
			230	7.0	12	12	12
		3	230	3.6	12	12	12
			230	1.8	12	12	12
F/DS/DL	1-1/2	1	115	18.0	8	6	4
			230	9.0	12	12	10
		3	230	5.2	12	12	12
			460	2.6	12	12	12
F/DS/DL	2	1	115	24.0	8	4	2
			230	12.0	12	10	8
		3	230	6.8	12	12	12
			460	3.4	12	12	12
F/DS/DL	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
F/DS/DL	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
F/DS/DL	7-1/2	1	230	40.0	8	6	4
		3	230	22.0	10	10	8
			460	11.0	12	12	12
F/DS/DL	10	3	230	28.0	8	6	4
			460	14.0	12	12	10
F/DS/DL	15	3	230	42.0	6	4	4
			460	21.0	10	10	8



---

## Operation of Your Coro-Flo® Pump

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

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

## Filling New Cylinders and Tanks

All new containers are full of air and since air will not liquefy under reasonable filling pressures, it must be purged. To assure relatively easy filling and the proper gas supply to burners and carburetors, purging air from new containers is essential (see IG100 for information on Corken's Coro-Vac®).

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

## Pumping From Underground Tanks

The pumping of boiling liquids, like LPG and other liquefied gases, offers a unique set of challenges for underground tank installations. The Coro-Flo® pumps give superior performance in these applications if the system is well designed to function with the pump in mind.

Liquefied gases are stored at exactly their boiling points. Any increase in temperature, as well as any decrease in pressure, will cause the product to boil and form vapor. To minimize the amount of vapor formation at the pump's suction, the design of the suction piping system is an important aspect. For boiling liquids, the net positive suction head available (NPSHA) of an installation is reduced to the height of the liquid level above the pump minus the frictional losses. For an underground tank where the pump is located above the liquid level, the net static suction head becomes the net suction lift, which is negative not positive. This means that for aboveground pumps pumping from underground tanks, the installation NPSHA will always be negative, and the pump will always handle vapor in the liquid stream.

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

## Installation Design Criteria for Underground Tank Applications

Minimize frictional losses:

- Pump should be as close as possible to the tank's liquid outlet connection
- Use a minimal number of fittings and elbows
- No strainer is necessary since the tank itself acts as a gravity collector
- Use full-port ball valves, or low restriction valves
- Use at least the minimum piping sizes shown in the chart on page 43.
- Minimize the net static suction lift to approximately 14 feet (4.3 M)
- Use vapor eliminator valves (Corken B166 by-pass valves have this feature)
- Use back-pressure check valves downstream of the pump
- Vent the vapor eliminator on the liquid meter back to the tank, not to the by-pass line.
- Limit the capacity of the pump to a maximum of 1.5% of the tank's capacity or a 1000 gallon (3,785 L) tank, limit the capacity of the pump to 15 gpm (56.8 L/min)

See appendix H for piping diagram.

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## Preventative Maintenance for Your Coro-Flo® Pump

The only maintenance necessary on this pump is to lubricate the bearings about once every three months. NOTE: Continuous duty applications may require monthly lubrication. The bearings have been lubricated at the factory for the initial operation.

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

These models are equipped with lifetime lubricated bearings.

### Lubrication for models F9–F15, DS/DL9–DS/DL15

There are two bearings on the pump frame of these models that require lubrication. In addition, if the pump is driven by a motor, you may also have two bearings on the motor that require lubrication as well. If the driver is an engine, follow the engine manufacturer's instructions.

Lubricating the ball bearing is simple. Use only ball bearing grease—nothing else will do. Remove the plug or fitting over the bearing, add a small amount of grease, and run the pump and driver for several minutes with the plug removed. The bearings will pump out the excess grease. Replace the plug.

## Repair Service on Your Coro-Flo® Pump

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

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

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

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# Coro-Flo® Seal Replacement Instruction

## Caution

Bleed all pressure from the pump and piping before starting to install your seal assembly.

## Cleanliness

Even the smallest amount of dirt on your new seal can cause early failure. Keep all parts, tools and your hands clean while installing the seal. Never touch the smooth lapped faces of the carbon rotor or seal seat. For LP-gas, anhydrous ammonia and similar liquids, you are trying to seal a fluid that is 5 to 10 times thinner than water! Your new seal needs every chance it can get, so keep it clean.

## Workmanship

Your pump is a precision piece of equipment with very close clearances—treat it as such. Never beat on it to get parts in or out.

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1. Remove the cover cap screws and remove the cover from the case. If the cover is stuck, use two cover screws in the threaded holes to loosen it.



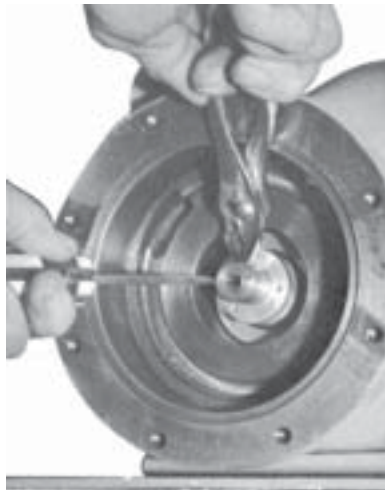
3. Carefully remove the impeller key with side cutters or by tapping with a punch, forcing the key up and out of its slot. Be careful not to damage the shaft.



5. Remove the pump nameplate. Through the exposed holes in the case, engage a screw driver in the grooves on the seal housing and pry the housing and seal sleeve from the pump chamber. Be sure to keep all of the shims with the housing so they will not be bent or lost.



2. Remove the impeller. It should slide freely, but if it is stuck use two cover cap screws in the threaded holes provided and pry off carefully. Care must be taken not to warp the impeller or damage the case O-ring groove.



4. Remove the three seal clamp ring screws and remove the seal clamp ring. Using a screw driver, press against the seal sleeve and remove the seal drive pin.



6. Carefully tap the old seal seat out of the seal housing. Do not damage the interior of the housing.



7. Clean the seal housing and apply a light coat of oil on the inside surfaces. Remove the new seal seat from its package and oil the seal seat O-ring. Wipe the smooth lapped face clean, being very careful not to scratch it or leave any fingerprints on it. Insert the seal seat with the notch pointing down and in line with the locator pin in the back of the seal housing. Place the small round piece of cardboard found in the seal package (being sure it is very clean) on the seal seat face. Use a hammer handle with cardboard disc to push the seal seat into place. Check to make sure the locator pin is in the seal seat notch.

coat of oil to the outside surfaces. Reinstall the seal housing into the pump case.



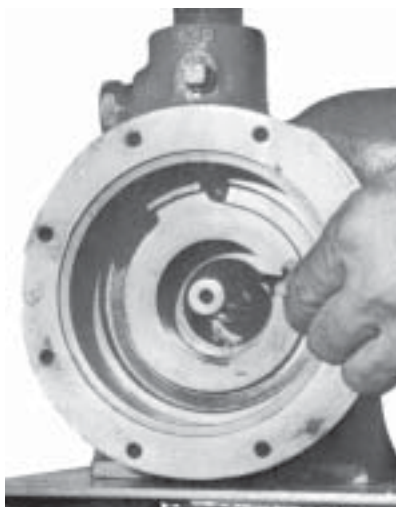
9. Carefully unwrap the remainder of your seal assembly, which includes the new retainer shell, carbon rotor and seal sleeve assembly. Carefully wipe the carbon rotor clean with a soft cloth, being sure that it is not scratched. Apply a thin coat of oil to the carbon face and the O-ring behind the carbon. Slide the entire assembly in place on the shaft. Oil and insert the follower O-ring and the follower ring. Make certain the follower ring is pointing out.

hole in the shaft. Then, install the clamp ring.

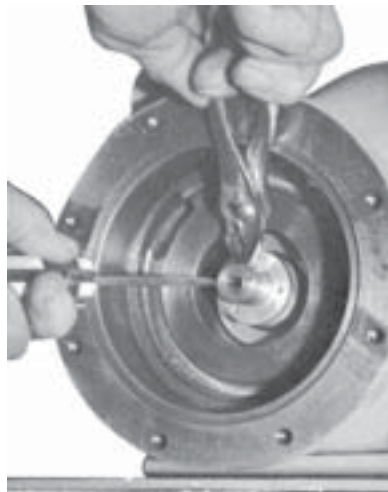
11. Install the new impeller key by using pliers to squeeze the key into the keyway slot. A small piece of cardboard should be used as a pad between the pliers and the shaft. The impeller must slide on the shaft very freely. If it is tight, carefully remove any burrs from the keyway or key with a small file. Be certain to clean all fillings off of the impeller before reinstalling.



12. Replace the cover O-ring or any shims which may have been damaged during removal. To obtain proper clearance, remove shims one at a time until binding is noted, then reinstall one shim.
13. Replace the cover and nameplate and check to see if the pump will spin freely. If at all possible, pressurize the pump case with vapor first. After the pump has been pressurized with vapor, allow liquid to slowly enter the pump.

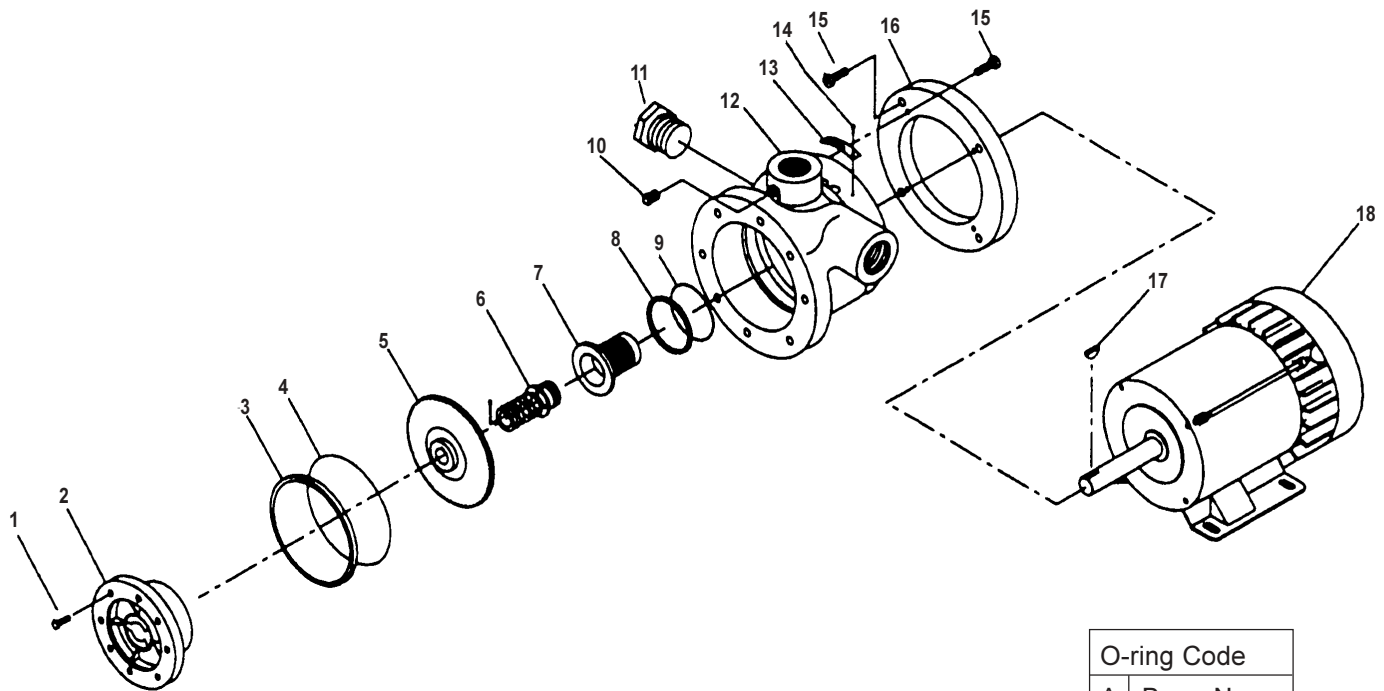


8. Using a knife, remove the old seal housing O-ring groove and install a new O-ring after applying a thin coat of oil. Clean the shaft and remove any burrs around the keyway. Replace all the shims on the seal housing and apply a light



10. Align the notches in the seal sleeve and the follower ring with the small hole in the shaft. With a screw driver push the seal sleeve and the follower ring back in order to drop a new drive pin into the

# Parts Details for Models C9 to C14



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

O-ring Code	
A	Buna-N
B	Neoprene <sup>®1</sup>
E	Teflon <sup>®1</sup>

Ref. No.	Part No.	Description	Qty.
1	7001-031NC100A	Hex head cap screw	8
2	1001-09 1001-0 1001-2 1001-3 1001-4 1001-5	Cover—model 9 Cover—model 10 Cover—model 12 Cover—model 13 Cover—model 14 Cover—model 15	1 1 1 1 1 1
3	1014 <sup>2</sup> 1014-1 <sup>2</sup>	Case clearance shim (.002" red) Case clearance shim (.003" green)	As req. As req.
4	2-246 <sup>2,3</sup> 2-247E <sup>2</sup>	Case O-ring (non-Teflon <sup>®1</sup> ) Case O-ring Teflon <sup>®1</sup>	1 1
5	1003-09 <sup>5</sup> 1003-0 <sup>5</sup> 1003-2 <sup>5</sup> 1003-3 <sup>5</sup> 1003-4 <sup>5</sup> 1003-5 <sup>5</sup>	Impeller, brass—model 9 Impeller, brass—model 10 Impeller, brass—model 12 Impeller, brass—model 13 Impeller, brass—model 14 Impeller, brass—model 15	1 1 1 1 1 1
6	113-CX <sup>3</sup>	Seal assembly	1
7	1004-1X 1004-11X 1004-2X 1004-21X	Seal housing, steel (non-Teflon <sup>®1</sup> O-rings) Seal housing, SS (non-Teflon <sup>®1</sup> O-rings) Seal housing, steel (Teflon <sup>®1</sup> O-rings) Seal housing, SS (Teflon <sup>®1</sup> O-rings)	1 1 1 1
8	1013 1013-1	Housing adjustment shim (0.010") Housing adjustment shim (0.020")	As req. As req.

Ref. No.	Part No.	Description	Qty.
9	2-224_ <sup>3</sup>	Housing O-ring	1
10	3442	Pipe plug, 1/4" NPT	1
11	3444	Pipe plug, 3/4" NPT	1
12	1002-09 1002-0 1002-2 1002-3 1002-4 1002-5	Case—model 9 Case—model 10 Case—model 12 Case—model 13 Case—model 14 Case—model 15	1 1 1 1 1 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 2497-1	Woodruff key, steel Woodruff key, SS	1 1
18	2555 2556 2557 <sup>5</sup> 2895 <sup>5</sup> 2896 <sup>5</sup> 4261 <sup>4</sup>	Motor 3/4 hp models 9, 10 Motor 1 hp model 12 Motor 3 hp models 14, 15 Motor 3/4 hp, obsolete models 9E, 10 Motor 1 1/2 hp, obsolete model 12E Motor 2 hp model 13	1 1 1 1 1 1

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

<sup>2</sup>Included with seal assembly/repair kit 113-CX\_.

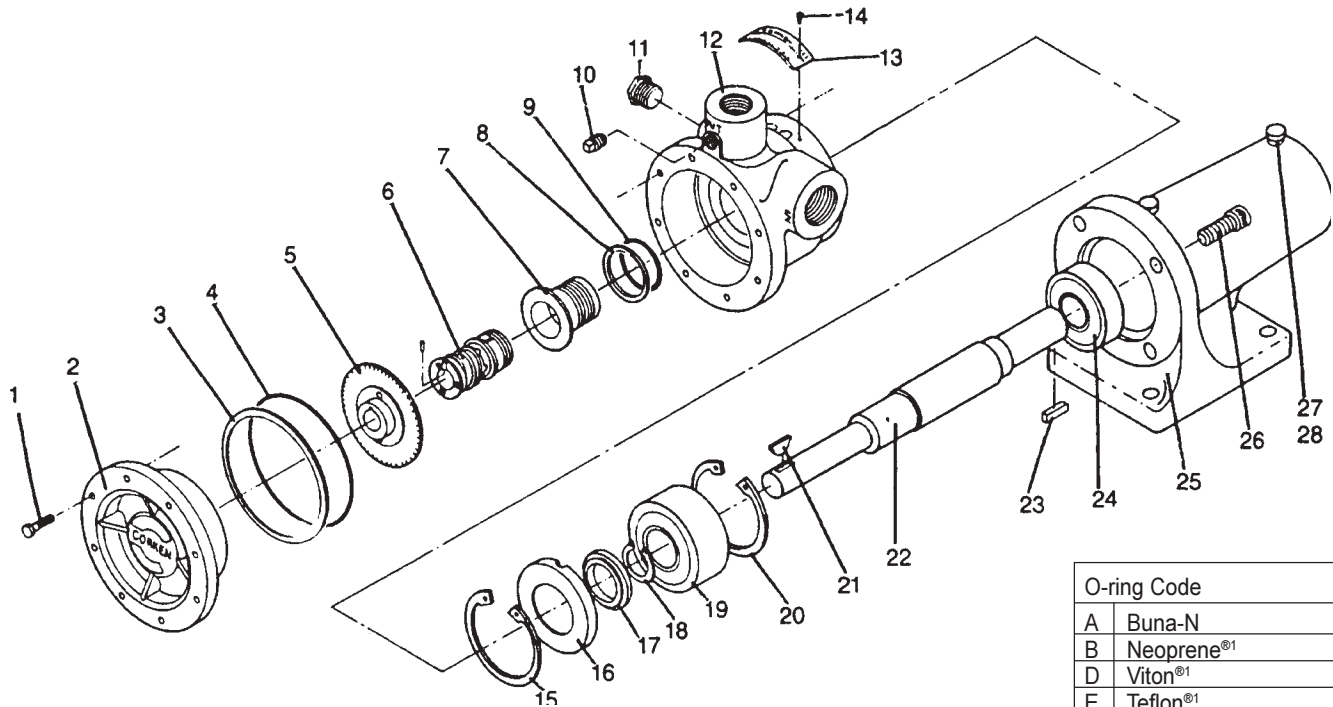
<sup>3</sup>\_Denotes O-ring code.

<sup>4</sup>Prior to S.N. PR166727 motor part number was 3760.

<sup>5</sup>Starting with S.N. PW168290 will be new motor frame size.

<sup>6</sup>Add a 1 to # for iron or a 2 for stainless steel (example: model 10 w/ iron is 1003-01).

# Parts Details for Models F9C to F15C, FF9 to FF15C and F109 to F115



O-ring Code	
A	Buna-N
B	Neoprene <sup>®1</sup>
D	Viton <sup>®1</sup>
E	Teflon <sup>®1</sup>
G	Ethylene Propylene <sup>®1</sup>
K	Kalrez <sup>®1</sup>

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

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

Ref. No.	Part No.	Description	Qty.
	1002-3	Case—model 13	1
	1002-4	Case—model 14	1
	1002-5	Case—model 15	1
	4206-09	Case—ANSI flanged model 9	1
	4206-0	Case—ANSI flanged model 10	1
	4206-2	Case—ANSI flanged model 12	1
	4206-3	Case—ANSI flanged model 13	1
	4206-4	Case—ANSI flanged model 14	1
	4206-5	Case—ANSI flanged model 15	1
13	1914-1	Name plate	1
14	7012-006SF019E	Phillips head screw 6-32 x 1/4"	2
15	5002-281	Bearing retainer ring	1
16	1238	Bearing cap	1
17	1006	Grease seal	1
18	5102-118	Bearing retainer ring	1
19	2758	Ball bearing	1
20	5000-281	Bearing retainer ring	1
21	2497 <sup>2</sup>	#5 Woodruff key, steel	1
	2497-1 <sup>2</sup>	#5 Woodruff key, stainless steel	1
22	1234	Shaft	1
	1234-1	Shaft, stainless steel	1
23	3226	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

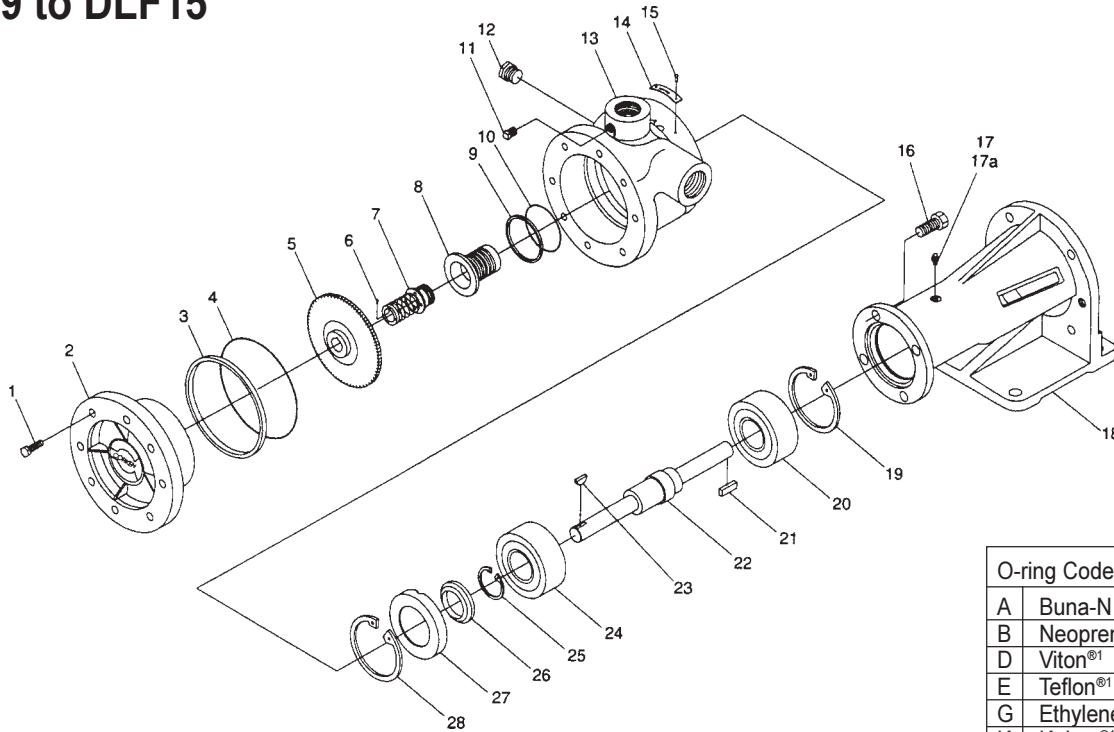
<sup>1</sup>Registered trademarks of the DuPont company.

<sup>2</sup>Included with seal assembly/repair kit 113-CX

<sup>3</sup>Denotes O-ring code.

<sup>4</sup>Add a 1 to # for iron or a 2 for stainless steel (example: model 10 w/iron is 1003-01).

# Parts Details for Models DS9 to DS15, DSF9 to DSF15, DL9 to DL15 and DLF9 to DLF15



O-ring Code	
A	Buna-N
B	Neoprene <sup>®1</sup>
D	Viton <sup>®1</sup>
E	Teflon <sup>®1</sup>
G	Ethylene Propylene <sup>®1</sup>
K	Kalrez <sup>®1</sup>

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

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

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

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

<sup>2</sup>Included with seal assembly/repair kit

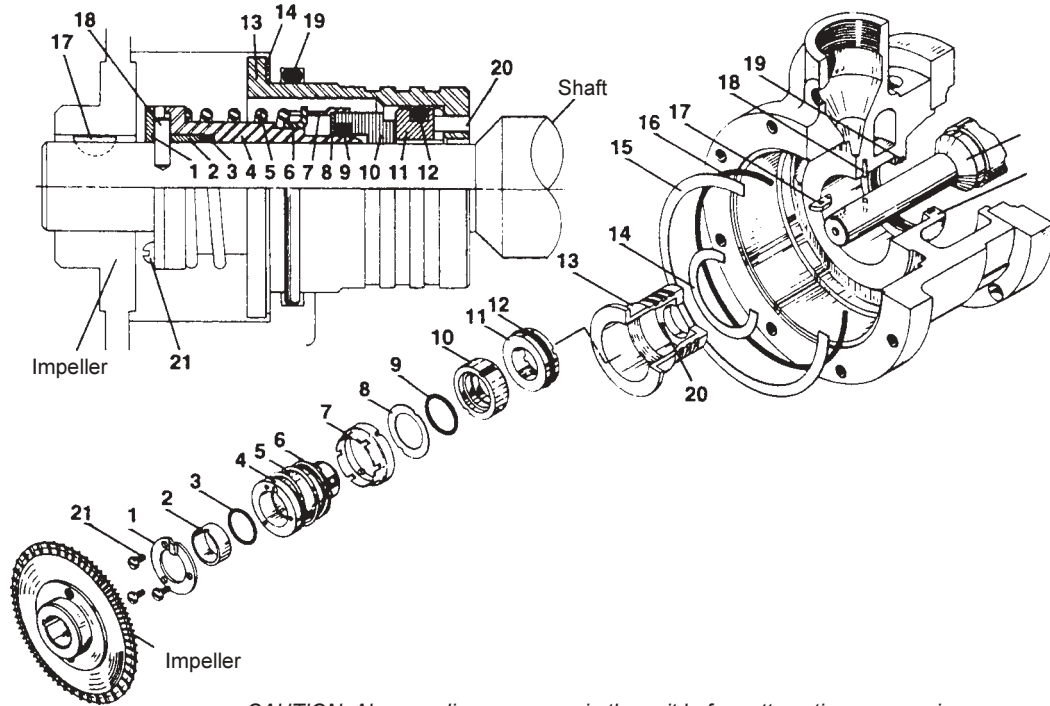
<sup>3</sup> Denotes O-ring code

<sup>4</sup>Add 1 to # for iron or a 2 for stainless steel (example: model 10 w/ iron is 1003-01).



# Parts Details for Balanced Seal Assembly 113-CX

## Models C9 to C15, DS/DL9 to DS/DL15, F9 to F15, F109 to F115 (obsolete)



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

O-ring Code	
A	Buna-N
B	Neoprene <sup>®1</sup>
D	Viton <sup>®1</sup>
E	Teflon <sup>®1</sup>
G	Ethylene Propylene <sup>®1</sup>
K	Kalrez <sup>®1</sup>

Ref. No.	Part No.	Description	Qty.
1	1008	Seal clamp ring	1
2	1080 1080-1	Follower, aluminum Follower, stainless steel	1 1
3	2-018_3	Follower O-ring	1
4	1007 <sup>2</sup> 1007-2	Seal sleeve, aluminum Seal sleeve, stainless steel	1 1
5	2734 <sup>2</sup>	Spring	1
6	2735 <sup>2</sup>	Drive band	1
7	2736 <sup>2</sup>	Retainer	1
8	2737 <sup>2</sup>	Disc	1
9	2-118_3,6 2343-X <sup>4,7</sup>	Rotor O-ring Coro-seal (not shown)	1 1
10	2738 <sup>2,6</sup> 2738-1 <sup>4,7</sup>	Rotor Rotor for Coro-Seal	1 1
11	2739 <sup>2</sup> 2739-1 <sup>2</sup> 2739-2 <sup>2</sup> 2739-3 <sup>2</sup> 2739-4 <sup>2</sup>	Seat, cast iron Seat, ceramic Seat, ni-resist Seat, stainless steel Seat, tungsten carbide	1 1 1 1 1
12	2-216_3	Seat O-ring	1
13	1004-1X <sup>5,6</sup> 1004-11X <sup>5,6</sup> 1004-2X <sup>5,7</sup> 1004-21X <sup>5,7</sup>	Seal housing, steel (with pin) Seal housing, stainless steel (with pin) Seal housing, steel Seal housing, stainless steel	1 1 1 1
14	1013 <sup>5</sup> 1013-1 <sup>5</sup>	Housing adjustment shim (0.010") Housing adjustment shim (0.020)	As req. As req.
15	1014 <sup>5</sup> 1014-1 <sup>5</sup>	Case clearance shim (0.002) Case clearance shim (0.003)	As req. As req.
16	2-246_3 2-247E	Case O-ring (Non-Teflon <sup>®1</sup> ) Case O-ring, Teflon <sup>®1</sup>	1 1

Ref. No.	Part No.	Description	Qty.
17	2497 2497-1	#5 Woodruff key, steel #5 Woodruff key, stainless steel	1 1
18	1009	Seal drive pin	1
19	2-224_3	Seal housing O-ring	1
20	3520	Roll pin (included with seal housing)	1
21	7012-006NC025B	Screw, 6-32 x 1/4" phillip pan head	3

Assembly No.	Assembly Name
113-CX_3,4	Seal assembly with 1007-X, 1008, 1009, 1014, 1014-1, 1080, 2497, 2736, 2737, 2739-X, 2-018, 2-224, 2-246
1007-X	Seal sleeve assembly with 1007, 2734, 2735
1007-2X	Seal sleeve assembly, stainless steel, with 1007-2, 2734, 2735
2739-X_3,4	Rotor-seat assembly, cast iron, with 2738, 2739, 2-118, 2-216
2739-1X_3,4	Rotor-seat assembly, ceramic, with 2738, 2739-1, 2-118, 2-216
2739-2X_3,4	Rotor-Seat assembly, ni-resist, with 2738, 2739-2, 2-118, 2-216
2739-3X_3,4	Rotor-seat assembly, stainless steel, with 2738, 2739-3, 2-118, 2-216
2739-4X_3,4	Rotor-seat assembly, tungsten carbide, with 2738, 2739-4, 2-118, 2-216

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

<sup>2</sup>These parts are not available separately.

<sup>3</sup>Denotes O-ring code

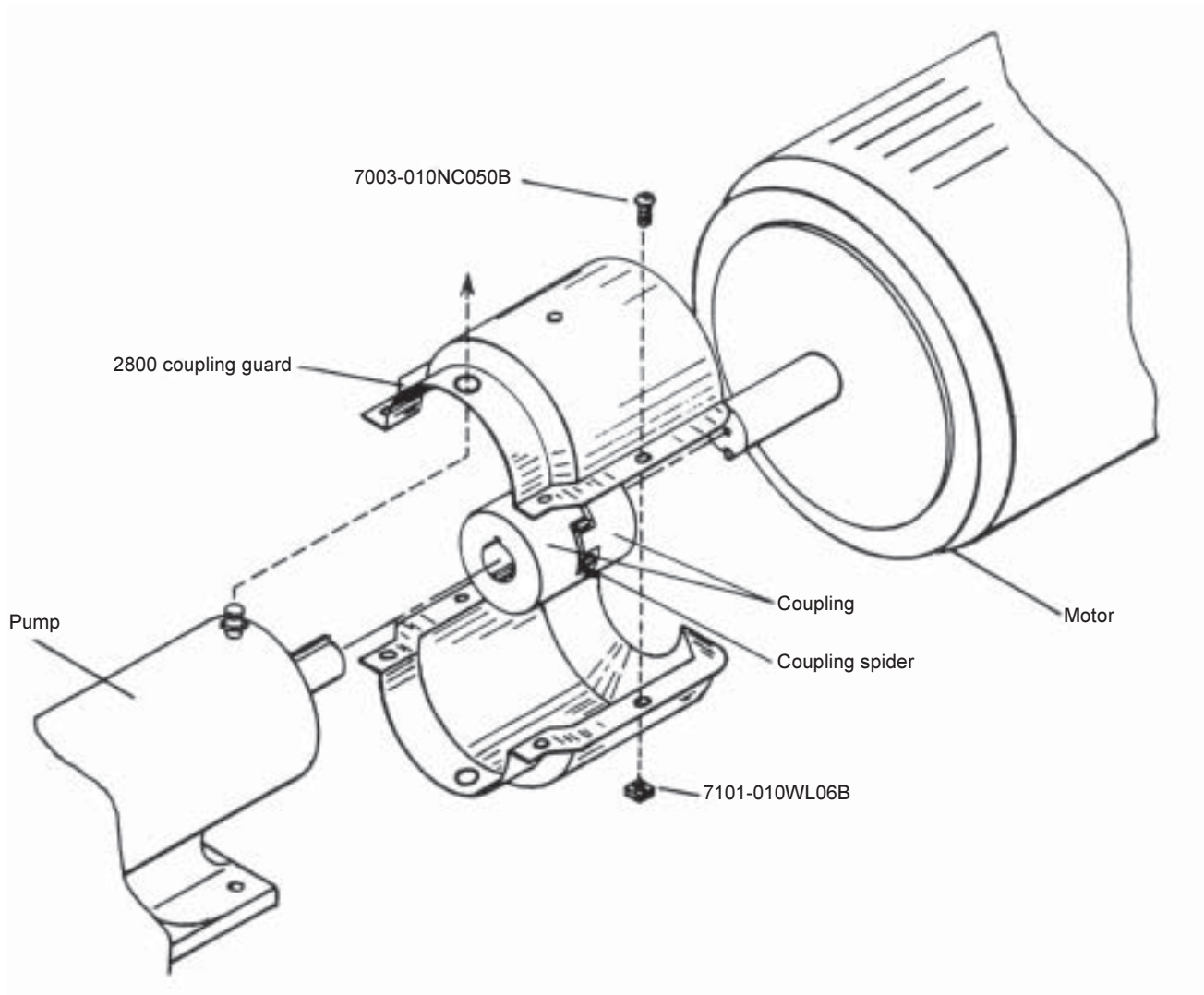
<sup>4</sup>For Teflon<sup>®1</sup> fitted seals, O-ring 2-118 is replaced by Coro-Seal 2343-X and rotor 2738 is replaced by 2738-1.

<sup>5</sup>Not included in 113-CX.

<sup>6</sup>Except Teflon<sup>®1</sup> O-rings.

<sup>7</sup>For Teflon<sup>®1</sup> O-rings Only.

## Coupling Guard for Models F9C to F15C and F109 to F115 (Obsolete)



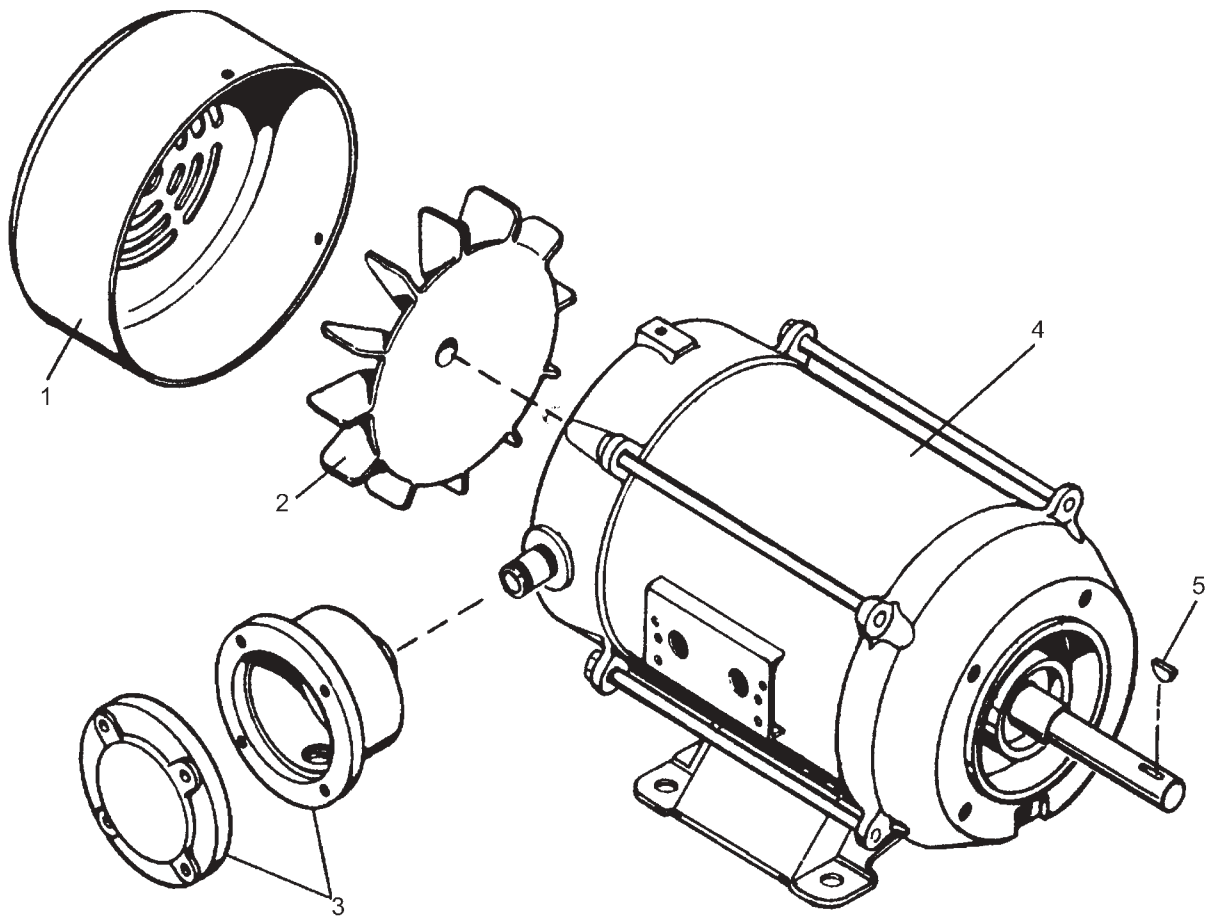
**CAUTION:** The power supply to the motor must be disconnected before working on the pump drive system.

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

# Parts Details for Coro-Flo® Pump Motors

## Models C9, C10, C12, C13, C14

### Specification: H and J



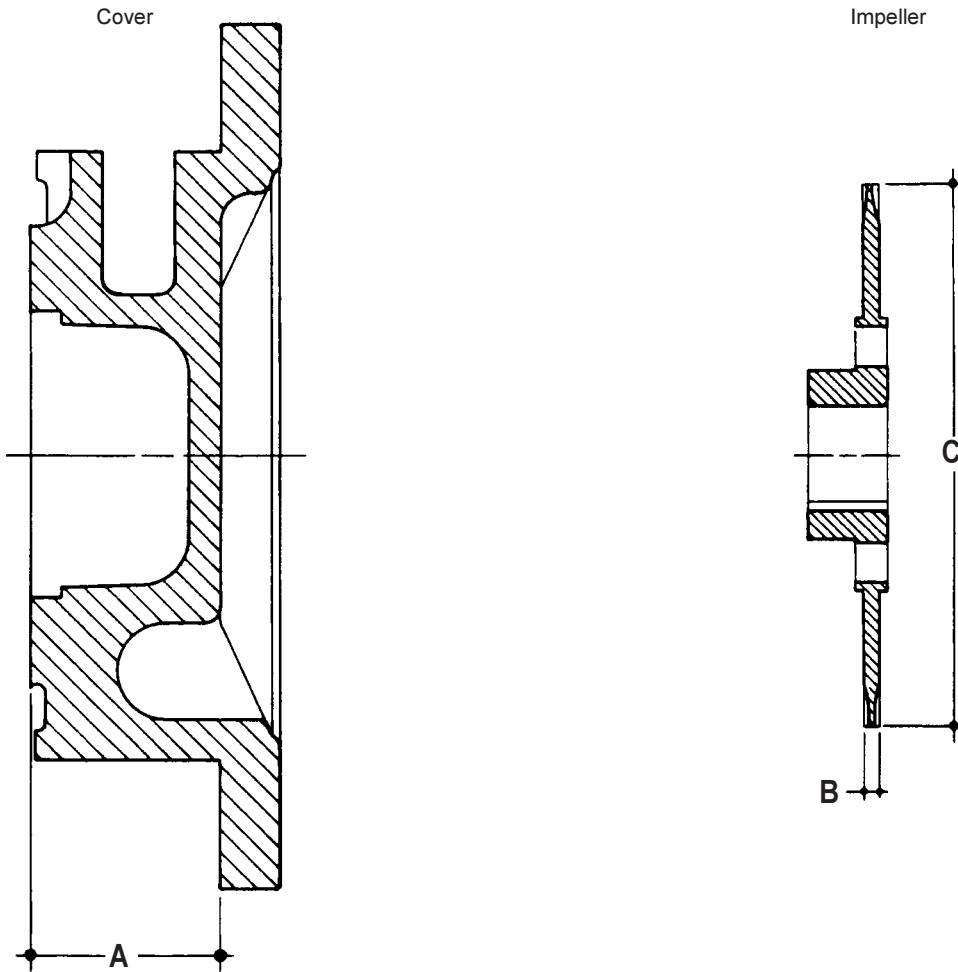
*CAUTION: Always relieve pressure in the unit before attempting any repairs.*

*CAUTION: To help prevent shock or ignition of hazardous atmospheres, always disconnect and lock out power circuit.*

Ref. No.	Part No.	Description
1	2660-2	Fan guard, Franklin (models C9, C10, C12)
2	3547	Fan—Franklin (models C9, C10, C12)
3	2686-X	Conduit box assembly (model C14 only)
4	2555 <sup>1</sup> 2556 2557 4261	Motor—3/4 hp (models C9, C10) Motor—1 hp (model C12) Motor—3 hp (model C14) Motor—2 hp (model C13)
5	2497	Key

<sup>1</sup>Individual motor parts other than those shown are not available. When repair is necessary, consult a manufacturer authorized UL repair depot.

# New Part Interference Dimensions—All Models



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

# Appendix A

## C-Model—Model Number Identification and Available Options

Base Model	C10	C12	C13	C14	CF10	CF12	CF13	CF14
Inlet	1-1/4" NPT	1-1/2" NPT	1-1/2" NPT	1-1/2" NPT	1-1/2" 300# ANSI	1-1/2" 300# ANSI	1-1/2" 300# ANSI	1-1/2" 300# ANSI
Outlet	1" NPT	1" NPT	1" NPT	1" NPT	1" 300# ANSI	1" 300# ANSI	1" 300# ANSI	1" 300# ANSI
Weight bare <sup>1</sup> pump lb (kg)	76 (35)	86 (39)	126 (57)	150 (68)	82 (37)	92 (42)	132 (60)	156 (71)

<sup>1</sup>Weight corresponds to standard motor.

Model Number  
Base X X X X

Motor Options <sup>2</sup>										
3/4 hp Single phase 115/208/230 Volt, 60 Hz	Standard					Standard				D
1 hp <sup>3</sup> Single phase 115/208/230 Volt, 60 Hz	Optional	Standard				Optional	Standard			E
2 hp Single phase 115/208/230 Volt, 50/60 Hz	Optional	Optional	Standard			Optional	Optional	Standard		F
3 hp Three phase 230/460 Volt 50/60 Hz	Optional	Optional	Optional	Standard		Optional	Optional	Optional	Standard	G

<sup>2</sup>These motors are listed by Underwriters' Laboratories, Inc. and CSA for Class 1, Group D, explosion proof service. These motors do not have internal overload protection.

<sup>3</sup>This is a special motor with a 1.5 service factor.

Material Selection			
Impeller	Bronze		
Seal Sleeve Follower	Aluminum	Standard	D
Shaft	Steel		
Seal seat	Cast iron	Standard	2
O-rings	Buna-N	Standard	A

Part Number	Accessory—Options
3000-X4	Hydrostatic test
B166B-.75BAU-Y	3/4" By-pass valve purchased with C-Model pump
B166B-1BAU-Y	1" By-pass valve purchased with C-Model pump
113-CXA	Repair kit—seal assembly
2555	3/4 hp, 60 Hz Coro-Flo® motor
2556	1 hp, 60 Hz Coro-Flo® motor
4261	2 hp, 50/60 Hz Coro-Flo® motor
2557	3 hp, 50/60 Hz Coro-Flo® motor
SM-10	Motor mounted starter for 3/4 hp motor <sup>4</sup>
S-10	Remote wall mounted starter for 3/4 hp motor <sup>4</sup>
SM-20	Motor mounted starter for 1 hp motor <sup>4</sup>
S-20	Remote wall mounted starter for 1 hp motor <sup>4</sup>
SM-30	Motor mounted starter for 2 hp motor <sup>4</sup>
S-30	Remote wall mounted starter for 2 hp motor <sup>4</sup>

<sup>4</sup>Starters provide thermal overload protection, manual reset and heater.

# Appendix A

## F-/DS-/DL-Model—Model Number Identification & Available Options

Base Model	F9	F10	F12	F13	F14	F15
Inlet	1-1/4" NPT	1-1/4" NPT	1-1/2" NPT	1-1/2" NPT	1-1/2" NPT	1-1/2" NPT
Outlet	1" NPT	1" NPT	1" NPT	1" NPT	1" NPT	1" NPT
Pump weight lb (kg)	48 (22)	48 (22)	48 (22)	48 (22)	48 (22)	48 (22)
Base Model	FF9	FF10	FF12	FF13	FF14	FF15
Inlet	1-1/2" ANSI	1-1/2" ANSI	1-1/2" ANSI	1-1/2" ANSI	1-1/2" ANSI	1-1/2" ANSI
Outlet	1" ANSI	1" ANSI	1" ANSI	1" ANSI	1" ANSI	1" ANSI
Pump weight lb (kg)	52 (24)	52 (24)	52 (24)	52 (24)	52 (24)	52 (24)

Base Model	DS9	DS10	DS12	DS13	DS14	DS15
Inlet	1-1/4" NPT	1-1/4" NPT	1-1/2" NPT	1-1/2" NPT	1-1/2" NPT	1-1/2" NPT
Outlet	1" NPT	1" NPT	1" NPT	1" NPT	1" NPT	1" NPT
Pump weight lb (kg)	52 (24)	52 (24)	52 (24)	52 (24)	52 (24)	52 (24)
Base Model	DSF9	DSF10	DSF12	DSF13	DSF14	DSF15
Inlet	1-1/2" ANSI	1-1/2" ANSI	1-1/2" ANSI	1-1/2" ANSI	1-1/2" ANSI	1-1/2" ANSI
Outlet	1" ANSI	1" ANSI	1" ANSI	1" ANSI	1" ANSI	1" ANSI
Pump weight lb (kg)	58 (26)	58 (26)	58 (26)	58 (26)	58 (26)	58 (26)

Base Model	DL9	DL10	DL12	DL13	DL14	DL15
Inlet	1-1/4" NPT	1-1/4" NPT	1-1/2" NPT	1-1/2" NPT	1-1/2" NPT	1-1/2" NPT
Outlet	1" NPT	1" NPT	1" NPT	1" NPT	1" NPT	1" NPT
Pump weight lb (kg)	62 (28)	62 (28)	62 (28)	62 (28)	62 (28)	62 (28)
Base Model	DLF9	DLF10	DLF12	DLF13	DLF14	DLF15
Inlet	1-1/2" ANSI	1-1/2" ANSI	1-1/2" ANSI	1-1/2" ANSI	1-1/2" ANSI	1-1/2" ANSI
Outlet	1" ANSI	1" ANSI	1" ANSI	1" ANSI	1" ANSI	1" ANSI
Pump weight lb (kg)	68 (31)	68 (31)	68 (31)	68 (31)	68 (31)	68 (31)

Motor	No integral motor	Standard	C
Impeller	Bronze	Standard	D
	Ductile iron	No charge option	F
Sleeve follower	Aluminum	Standard	N/A
Shaft	Steel		
Seal seat	Cast iron	Standard	2
O-rings	Buna-N	Standard	A
	Neoprene® <sup>1</sup>	No charge option	B

Mounting Options	Model Reference	Part Number	Motor Frame Size Range	Ship Weight lb (kg) Mounting Only
Mounting set-up for <b>Direct Drive</b> includes steel baseplate, flexible coupling and coupling guard	F-Model and FF-Model pumps only	101-8	145T–215T	128 (58)
Mounting set-up for <b>V-Belt Drive</b> Includes steel baseplate, adjustable driver slide base, V-belt drive and enclosed belt guard	F-Model and FF-Model pumps only	103-12	184T–256T	175 (79)
Coupling for DS (specify motor shaft size)	DS-Model pumps only	1344	56C–145TC	
Coupling for DL (specify motor shaft size)	DL-Model pumps only	1345	182TC–215TC	

Part Number	Accessory—Options
3000-X4	Hydrostatic test
113-CXA	Seal assembly (Buna-N)
113-CXB	Seal assembly (Neoprene® <sup>1</sup> )
1010-2X	Conversion kit (3/4" input shaft to 1" input shaft)

<sup>1</sup>Neoprene® is a registered trademark of the DuPont company.

## Appendix B—Specifications

### C-Model Pumps—Operating Specifications

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

### C-Model Pumps—Materials Specifications

Part	Standard		Optional	
	Model	Material	Model	Material
Case, cover	All	Ductile iron ASTM A536		None
Impeller	All	Bronze	All	Ductile iron 416 Stainless steel
Impeller key	All	Steel	All	Stainless steel
Seal seat	All	Cast iron	All	304 Stainless steel Ni-Resist cast iron Ceramic Tungsten carbide
Seal rotor	All	Carbon		None
Seal metal parts	All	Steel		None
Seal sleeve	All	Aluminum	All	416 Stainless steel
Seal follower	All	Aluminum	All	416 Stainless steel
Seal housing	All	Steel, cadmium plated	All	416 Stainless steel
O-rings	All	Buna-N	All	PTFE, Viton®, Neoprene® <sup>1</sup> ethylene-propylene
Bearings	All	Ball		None

<sup>1</sup>Viton® and Neoprene® are registered trademarks of the DuPont Company.

## Appendix B—Specifications

### F-/DS-/DL-Model Pumps—Operating Specifications

Inlet:	F/DS/DL 9 thru 10, 1-1/4" NPT	Maximum working pressure:	400 psig (27.6 bar)
	F/DS/DL 12 thru 14, 1-1/2" NPT	Maximum differential pressure:	125 psig (8.6 bar)
optional:	1" NPT, 1" or 1-1/2" 300# ANSI	Optional driver range:	1/2 to 10 hp (0.37 to 7.5 kW)
Outlet:	1" NPT, 300# ANSI optional	Temperature range:	-25° to 225°F (-32° to 107°C)
RPM:	3450 @ 60 Hz, 2880 @ 50 Hz	Flow range:	2–36 gpm (7.6–136.3 L/min)
Rotation:	Clockwise only	Maximum viscosity:	400 SSU (88 cSt)

### F-/DS-/DL-Model Pumps—Materials Specifications

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

<sup>1</sup>Neoprene® and Viton® are registered trademarks of the DuPont company.



## Appendix D—Performance for C-Model Pumps

### Performance

#### C10 (60 Hz only)

Service: Fill 20# cylinders in 30 seconds to 1 minute, 100# cylinders in 2-1/2 to 3-1/2 minutes, motor fueling through a meter at 7 gpm (26.5 L/min) <sup>1</sup>	
3/4 hp (0.56 kW) Continuous Duty Motor	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 75 psid (5.2 bar d)	3 (11.4)

#### C12 (60 Hz only)

Service: Fill 20# cylinders in 15 to 30 seconds, 100# I.C.C cylinders in 2 to 3 minutes, motor fueling through a meter at 15 gpm (56.8 L/min) <sup>1</sup>	
1 hp (0.75 kW) Continuous Duty Motor	gpm (L/min)
Capacity at 20 psid (1.4 bar d)	19 (71.9)
Capacity at 70 psid (4.8 bar d)	12.5 (47.3)
Capacity at 85 psid (5.9 bar d)	10 (37.9)

#### C13

Service: Fill 20# cylinders in 10 to 20 seconds, 100# cylinders in 1-1/2 minutes, motor fueling through a meter at 23 gpm (87.1 L/min) <sup>1</sup>	
2 hp (1.5 kW) Continuous Duty Motor	gpm (L/min)
Capacity at 20 psid (1.4 bar d)	28 (106.0)
Capacity at 75 psid (5.2 bar d)	16 (60.6)
Capacity at 100 psid (6.9 bar d)	11.5 (43.5)

#### C14

Service: Fill 100# cylinders in less than one minute, motor fueling through a meter at 30 gpm (113.6 L/min) <sup>1</sup>	
3 hp (2.2 kW) Continuous Duty Motor	gpm (L/min)
Capacity at 20 psid (1.4 bar d)	38 (143.8)
Capacity at 70 psid (4.8 bar d)	26 (98.4)
Capacity at 100 psid (6.9 bar d)	20 (75.7)

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

## Appendix D—Performance for F-/DS-/DL-Model Pumps

### Cylinder Filling Performance

#### Model 9 (usable at 60 hz only)

Fill small cylinders, fork lift cylinders and 20# cylinders in 30 to 45 seconds <sup>1</sup>	
3/4 hp (0.56 kW) continuous duty motor	gpm (L/min)
Capacity @ 20 psid (1.4 bar d)	7 (26.5)
Capacity @ 60 psid (4.1 bar d)	3.5 (13.2)
Capacity @ 85 psid (5.9 bar d)	1.5 (5.7)

#### Model 10

Fill 20# cylinders in 30 seconds to 1 minute, 100# cylinders in 2.5 to 3.5 minutes. Motor fueling through a meter at 7 gpm (26.5 L/min) <sup>1</sup>	
3/4 to 1 hp (0.56 to 0.75 kW) continuous duty motor	gpm (L/min)
Capacity @ 20 psid (1.4 bar d)	12 (45.4)
Capacity @ 50 psid (3.4 bar d)	7 (26.5)
Capacity @ 75 psid (5.2 bar d)	3 (11.4)
Capacity @ 80 psid (5.5 bar d)	2 (7.6)

#### Model 12

Fill 20# cylinders in 15 to 30 seconds, 100 # cylinders in 2 to 3 minutes. Motor fueling through a meter at 15 gpm (56.8 L/min) <sup>1</sup>	
1 to 2 hp (0.75 to 1.5 kW) continuous duty motor	gpm (L/min)
Capacity @ 20 psid (1.4 bar d)	19 (71.9)
Capacity @ 70 psid (4.8 bar d)	12.5 (47.3)
Capacity @ 100 psid (6.9 bar d)	7.5 (28.4)
Capacity @ 85 psid (5.9 bar d)	10 (37.9)

#### Model 14

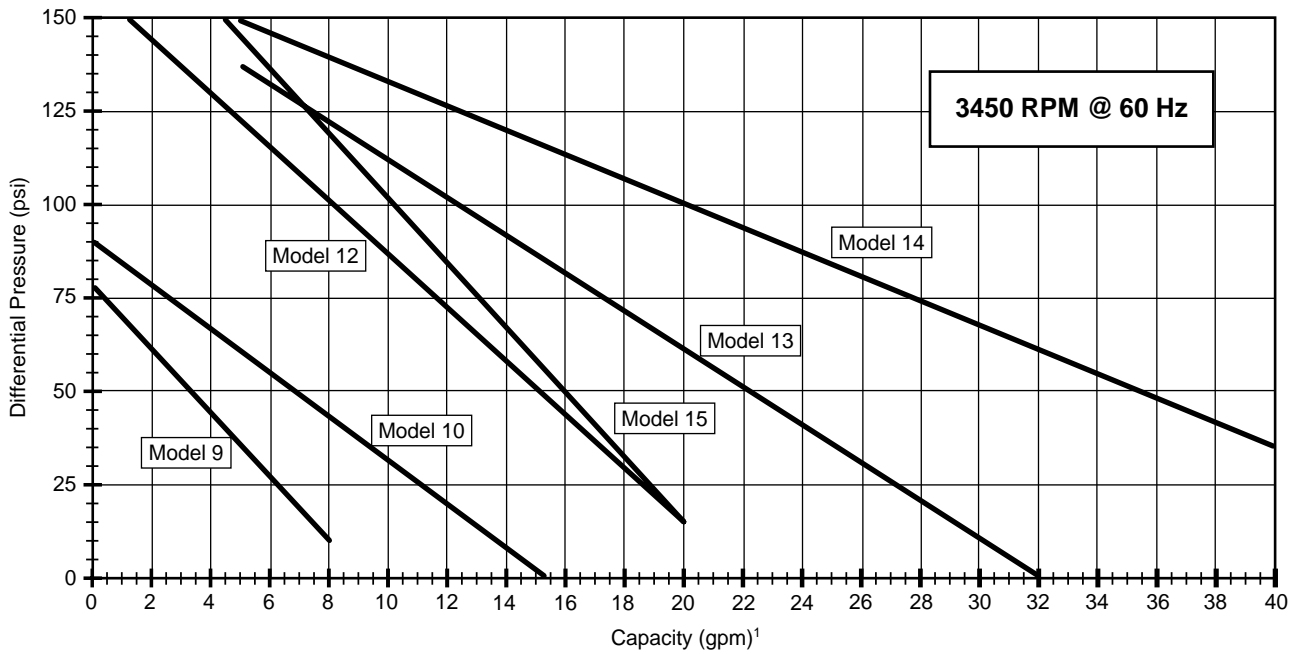
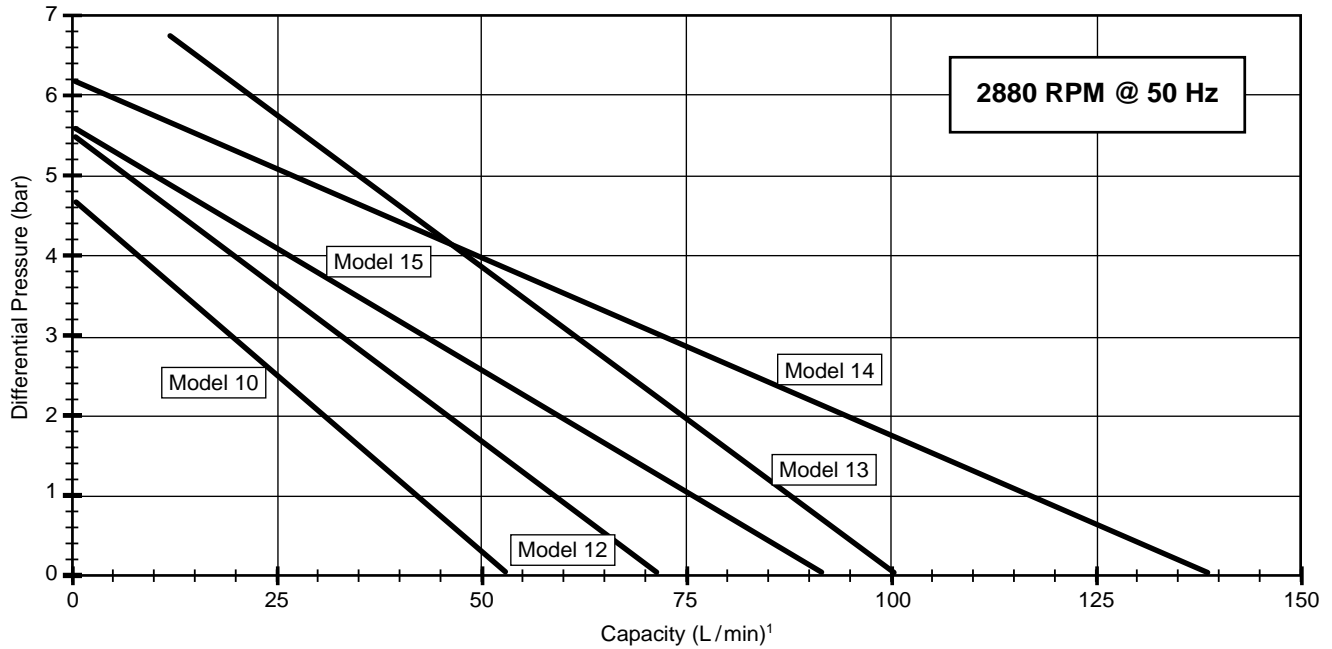
Fill 100# cylinders in less than one minute. Motor fueling through a meter at 30 gpm (113.6 L/min) <sup>1</sup>	
3 to 5 hp (2.2 to 3.7 kW) continuous duty motor	gpm (L/min)
Capacity @ 20 psid (1.4 bar d)	38 (143.8)
Capacity @ 70 psid (4.8 bar d)	26 (98.4)
Capacity @ 100 psid (6.9 bar d)	20 (75.7)
Capacity @ 125 psid (8.6 bar d)	14 (53.0)

### Driver Range

F-Models	56–256T	DS-Models	56C–145TC	DL-Models	182TC–215TC
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<sup>1</sup>Times are estimates with pumps running at 60 Hz and will be affected by conditions at the site, cylinder and OPD design. Psid is pounds per square inch differential, or “differential pressure”.

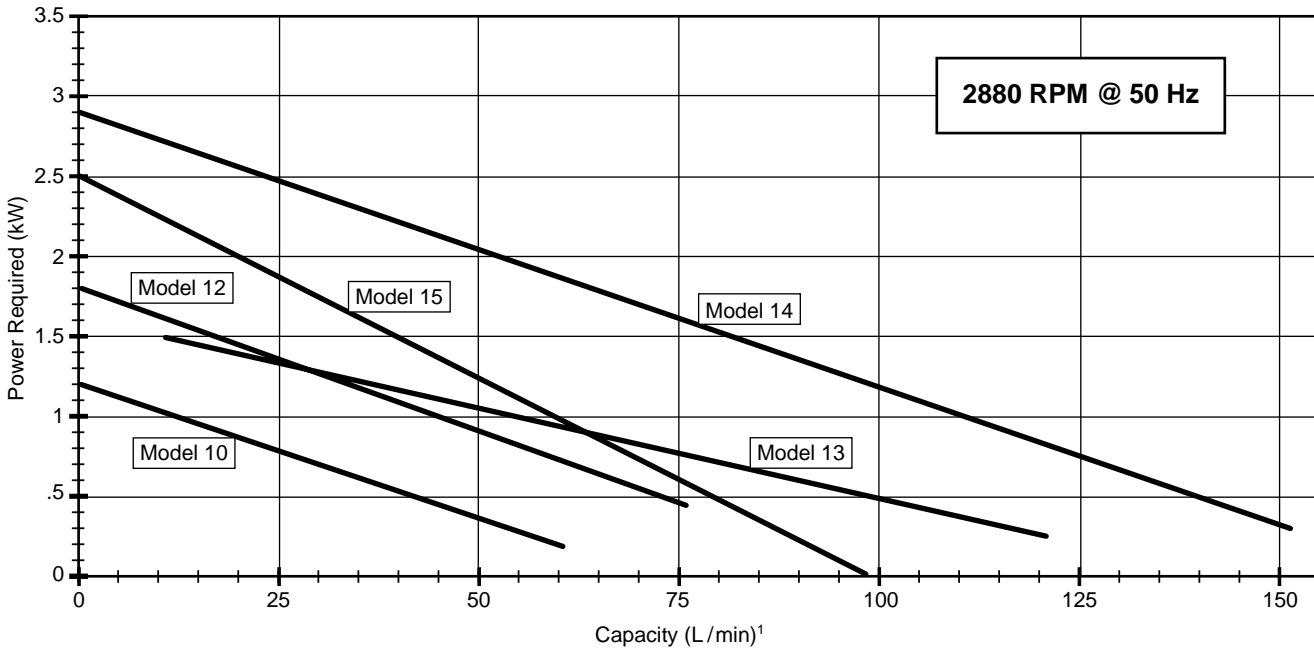
# Appendix D—Performance (Differential Pressure vs Capacity) F-/DS-/DL-Model Pumps



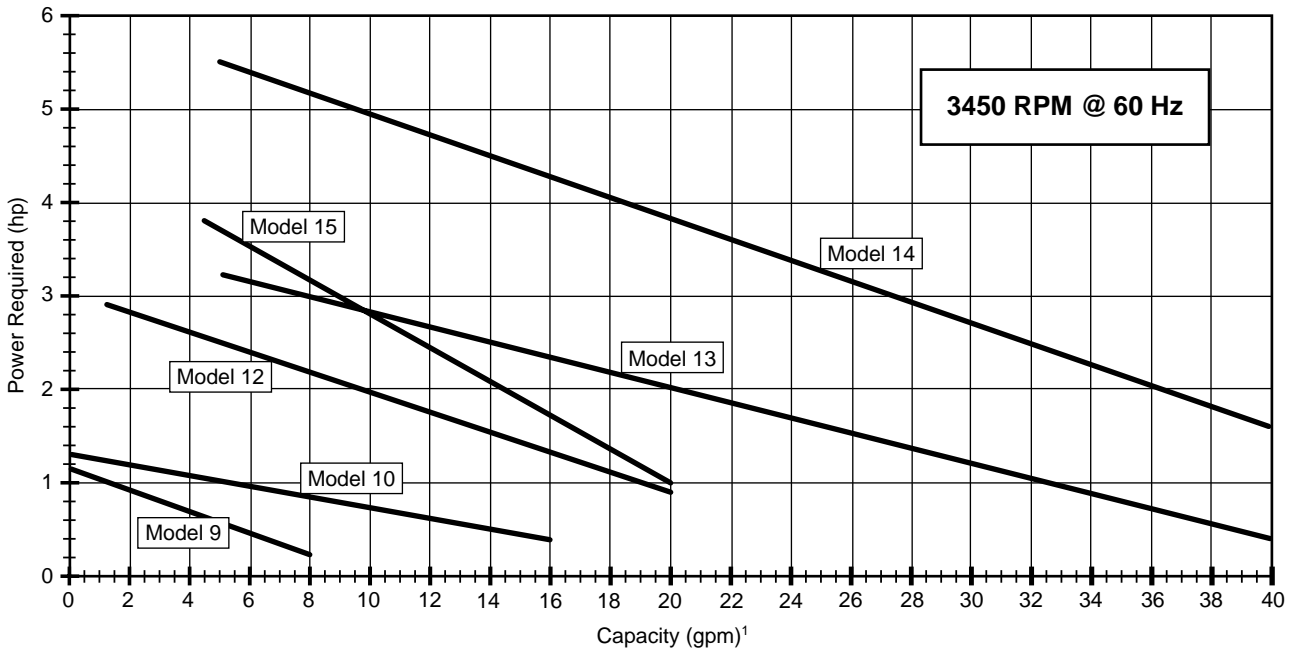
<sup>1</sup>The performance curves are based on aboveground LPG installations. Performance curves for underground LPG tanks will vary based on the specific installation. Consult factory.

# Appendix D—Performance (Power Required vs Capacity) F-/DS-/DL-Model Pumps

Flow vs. Power Required



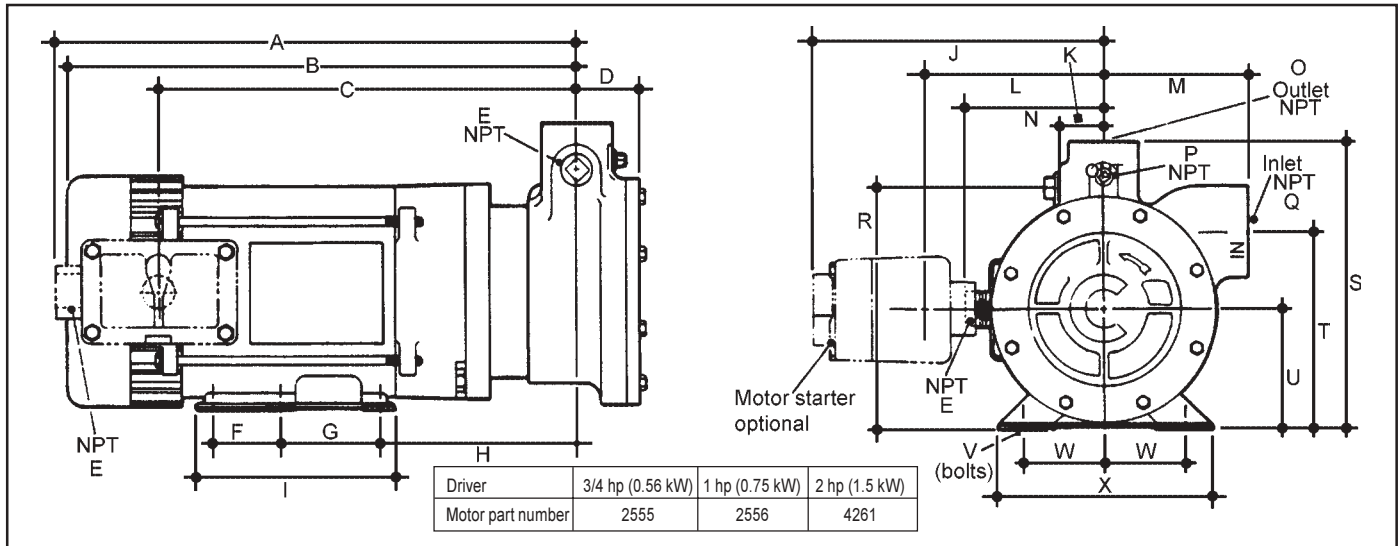
Flow vs. Differential Pressure



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

# Appendix C—Outline Dimensions for C-Model Pumps

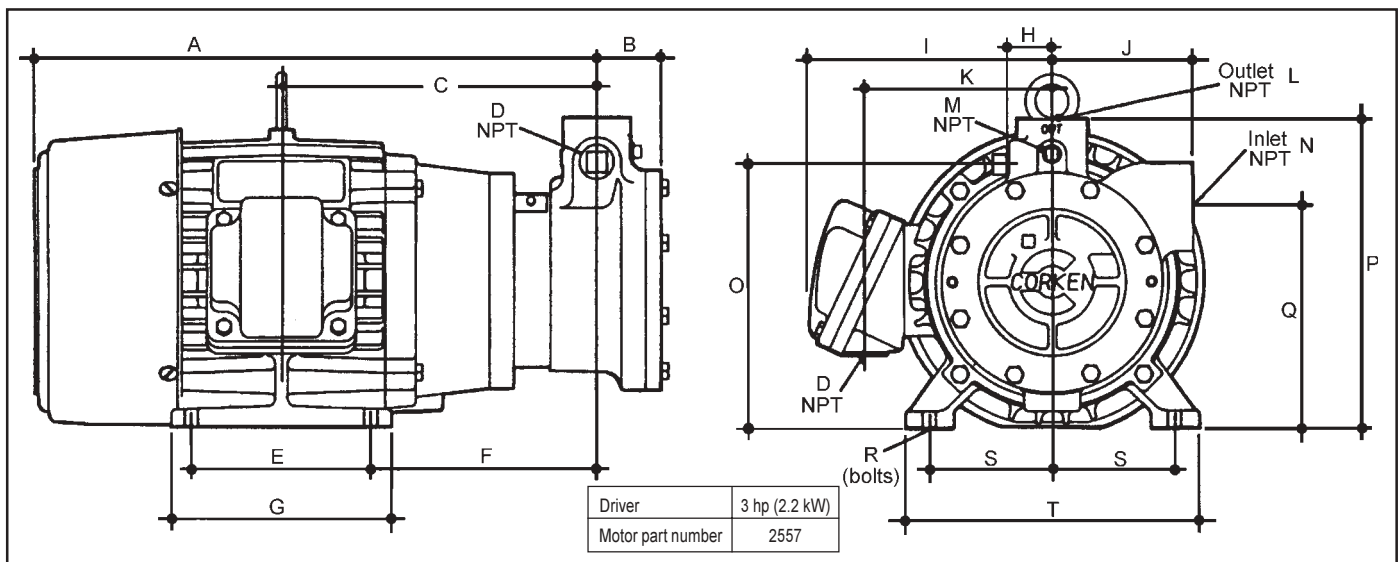
## 3/4 to 2 Hp Motors



Outline Dimensions—Inches (Centimeters)

Model	hp	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
C9, C10	3/4	15-5/8	15-1/4	12-1/2	2	3/4	1	4	5-7/8	5-7/8	8-11/16	1-5/16	5-3/8	4-5/16	4-3/16	1	1/4	1-1/4	6-1/8	8-1/2	5-3/4	3-1/2	1/4 bolt	2-7/16	6-1/2
		(39.69)	(38.74)	(31.75)	(5.08)	(1.91)	(2.54)	(10.16)	(14.90)	(14.90)	(22.06)	(3.33)	(13.65)	(10.95)	(10.63)	(2.54)	(0.64)	(3.18)	(15.56)	(21.59)	(14.61)	(8.89)	(0.64)	(6.19)	(16.51)
C12	1	17-1/8	16-3/4	14	2	3/4	1	4	5-7/8	5-7/8	8-11/16	1-5/16	5-3/8	4-5/16	4-3/16	1	1/4	1-1/2	6-1/8	8-1/2	5-3/4	3-1/2	1/4 bolt	2-7/16	6-1/2
		(43.50)	(42.55)	(35.58)	(5.08)	(1.91)	(2.54)	(10.16)	(14.90)	(14.90)	(22.06)	(3.33)	(13.65)	(10.95)	(10.63)	(2.54)	(0.64)	(3.81)	(15.56)	(21.59)	(14.61)	(8.89)	(0.64)	(6.19)	(16.51)
C12, C13	2	18-17/32	8-1/16	14-15/16	2	3/4	1	4	5-7/8	6-1/2	9-5/16	1-5/16	6	4-5/16	4-13/16	1	1/4	1-1/2	7-1/8	9-1/2	6-13/16	3-1/2	3/8 bolt	2-7/16	6-1/2
		(47.07)	(45.88)	(39.94)	(5.08)	(1.91)	(2.54)	(10.16)	(14.90)	(16.51)	(23.65)	(3.33)	(15.24)	(10.95)	(12.22)	(2.54)	(0.64)	(3.81)	(18.10)	(24.13)	(17.30)	(8.89)	(0.95)	(6.19)	(16.51)

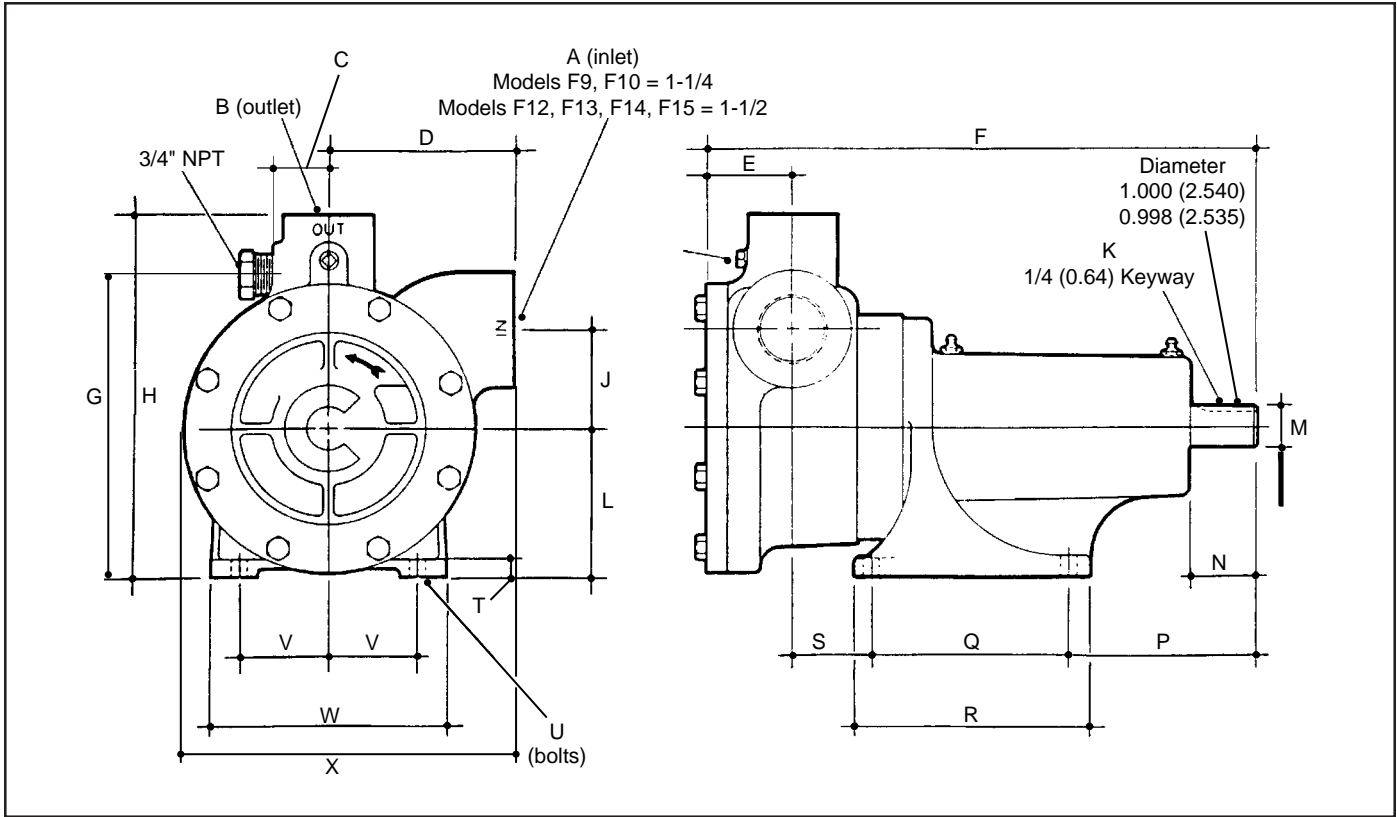
## 3 Hp Motor



Outline Dimensions—Inches (Centimeters)

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

# Appendix C—Outline Dimensions for F9 thru F15 Model Pumps

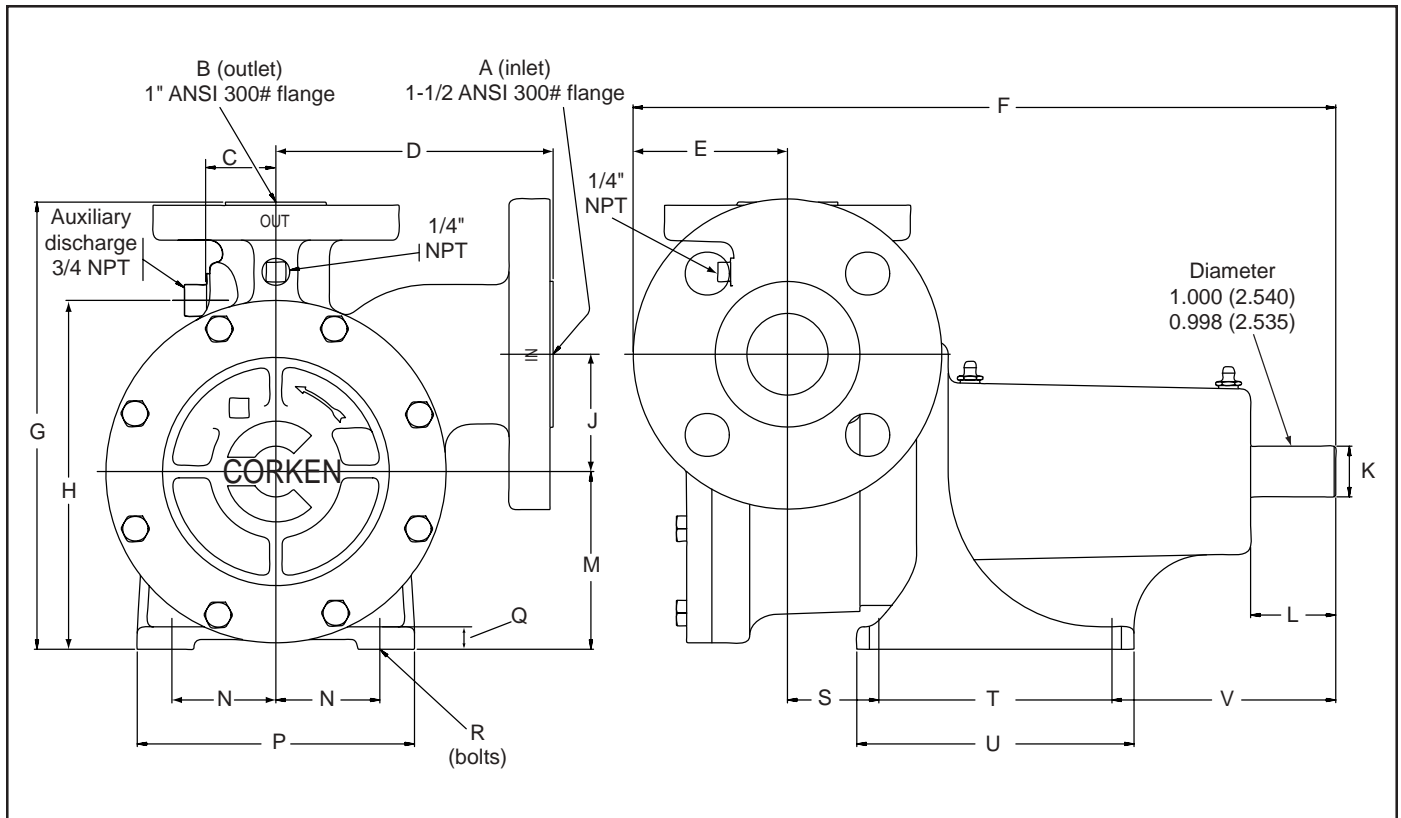


Flange Dimensions		
Model	A (inlet)	B (outlet)
F9-F10	1-1/4" NPT	1" NPT
F12-F15	1-1/2" NPT	1" NPT

F9-F15 NPT Outline Dimensions—Inches (Centimeters)									
C	D	E	F	G	H	J	K	L	M
1-5/16 (3.33)	4-5/16 (10.95)	2 (5.08)	12-13/16 (32.54)	7-1/8 (18.10)	8-1/2 (21.59)	2-1/4 (5.71)	1/4 (0.64)	3-1/2 (8.90)	1 diameter (2.54)

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

# Appendix C—Outline Dimensions for FF9 thru FF15 Model Pumps

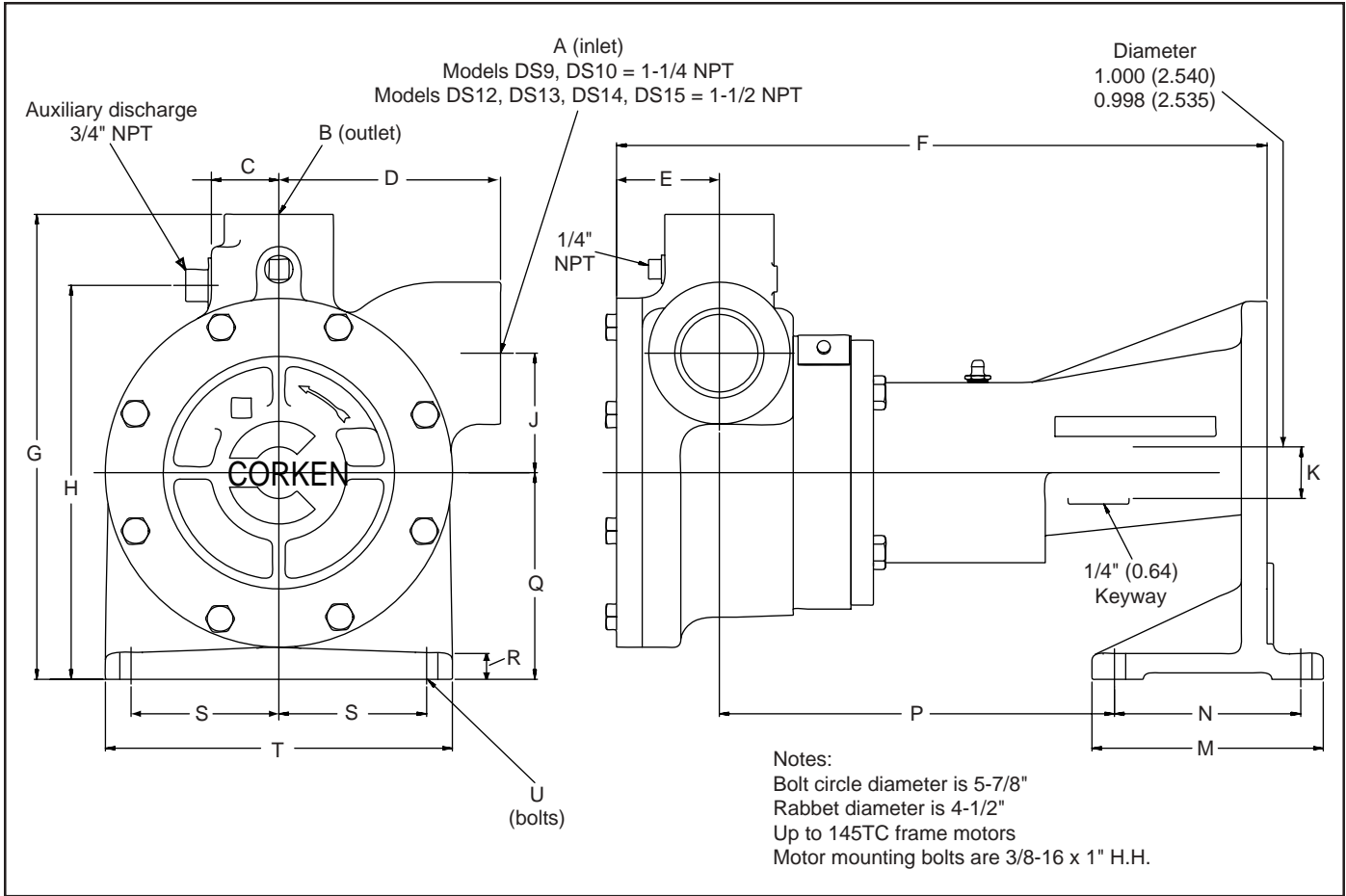


Flange Dimensions		
Model	A (inlet)	B (outlet)
FF9–FF15	1-1/2" 300# ANSI	1" 300# ANSI

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

FF9–FF15 300# ANSI Outline Dimensions—Inches (Centimeters)									
M	N	P	Q	R	S	T	U	V	W
3-1/2 (8.90)	2-1/16 (5.24)	5-1/2 (13.97)	1-1/2 (3.81)	5/16 bolt (0.79)	1-13/16 (4.61)	4-5/8 (11.75)	5-1/2 (13.97)	4-7/16 (11.27)	8-7/8 (22.54)

# Appendix C—Outline Dimensions for DS9 thru DS15 Model Pumps



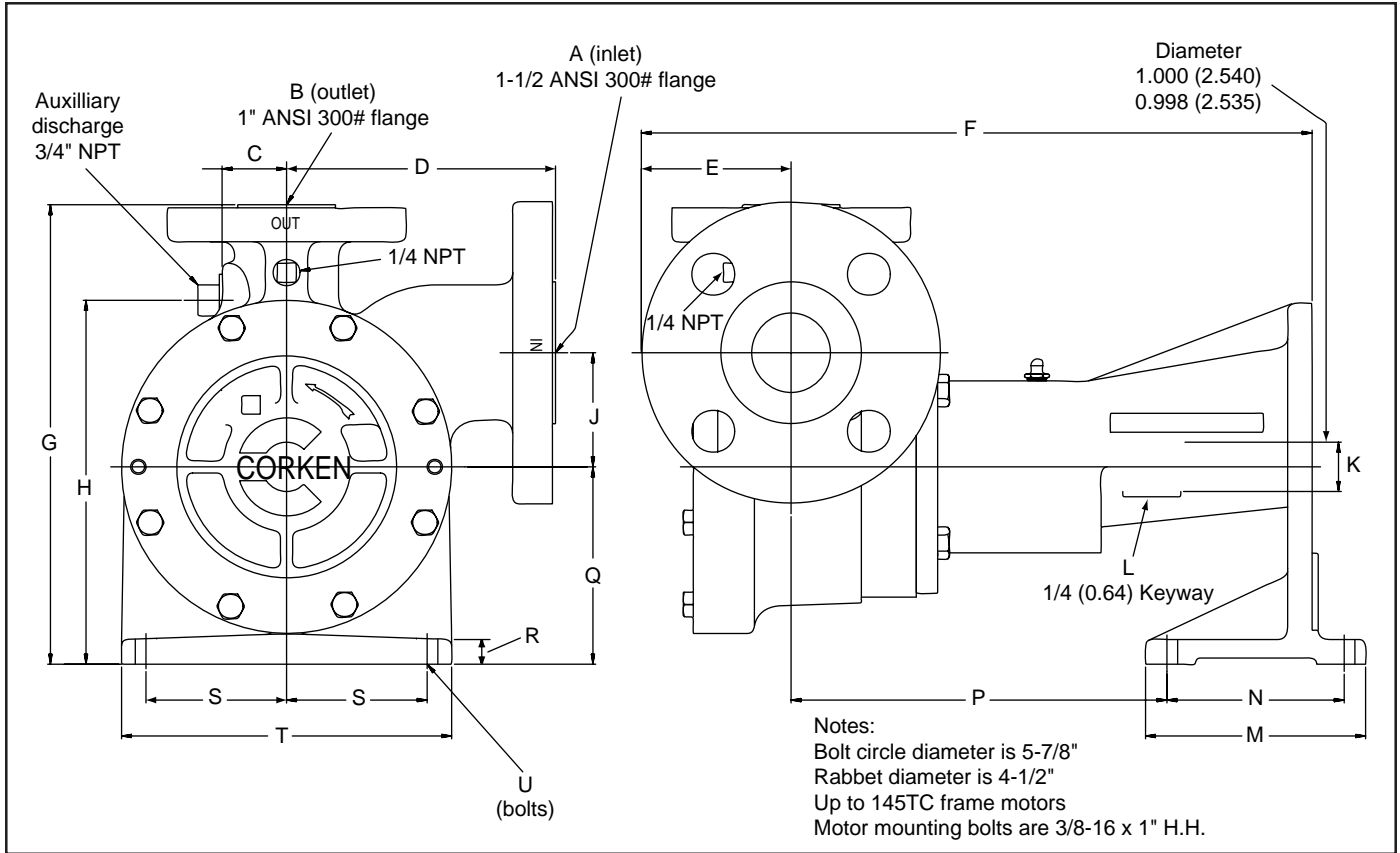
Flange Dimensions		
Model	A (inlet)	B (outlet)
DS9-DS10	1-1/4" NPT	1" NPT
DS12-DS15	1-1/2" NPT	1" NPT

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

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



# Appendix C—Outline Dimensions for DSF9 thru DSF15 Model Pumps

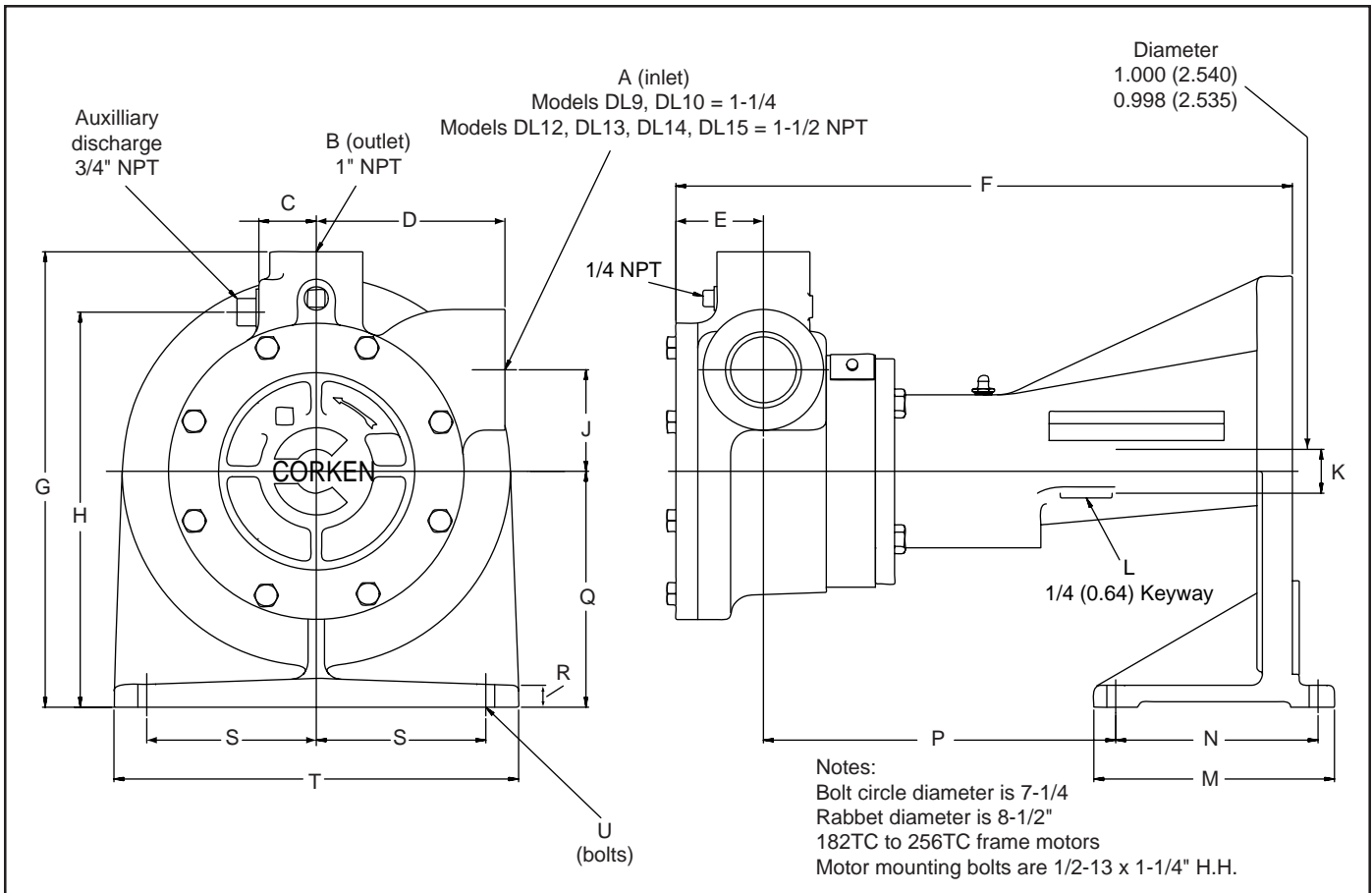


Flange Dimensions		
Model	A (inlet)	B (outlet)
DSF9–DSF15	1-1/2" 300# ANSI	1" 300# ANSI

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

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

# Appendix C—Outline Dimensions for DL9 thru DL15 Model Pumps

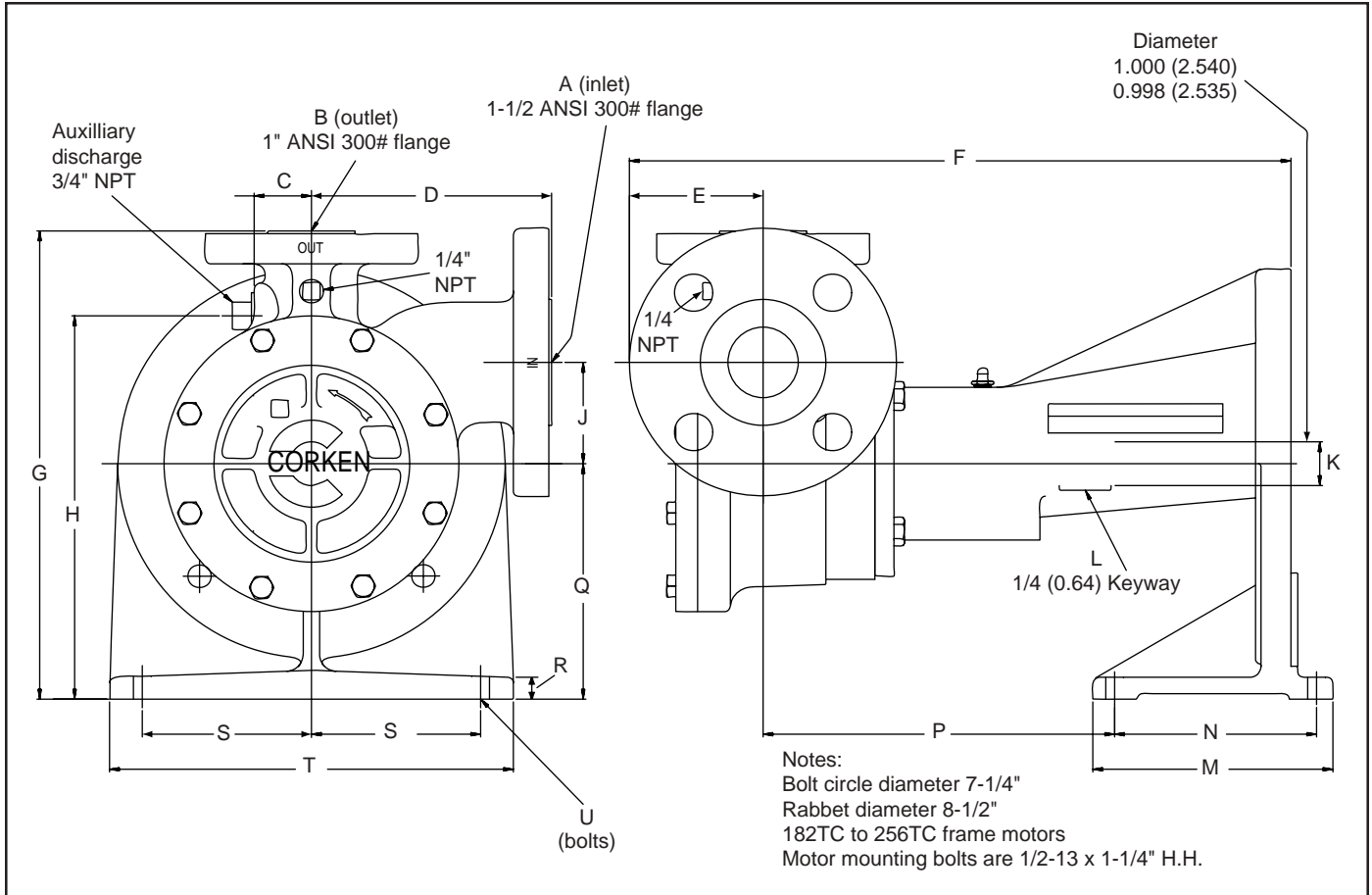


Flange Dimensions		
Model	A (inlet)	B (outlet)
DL9–DL10	1-1/4" NPT	1" NPT
DL12–DL15	1-1/2" NPT	1" NPT

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

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

# Appendix C—Outline Dimensions for DLF9 thru DLF15 Model Pumps

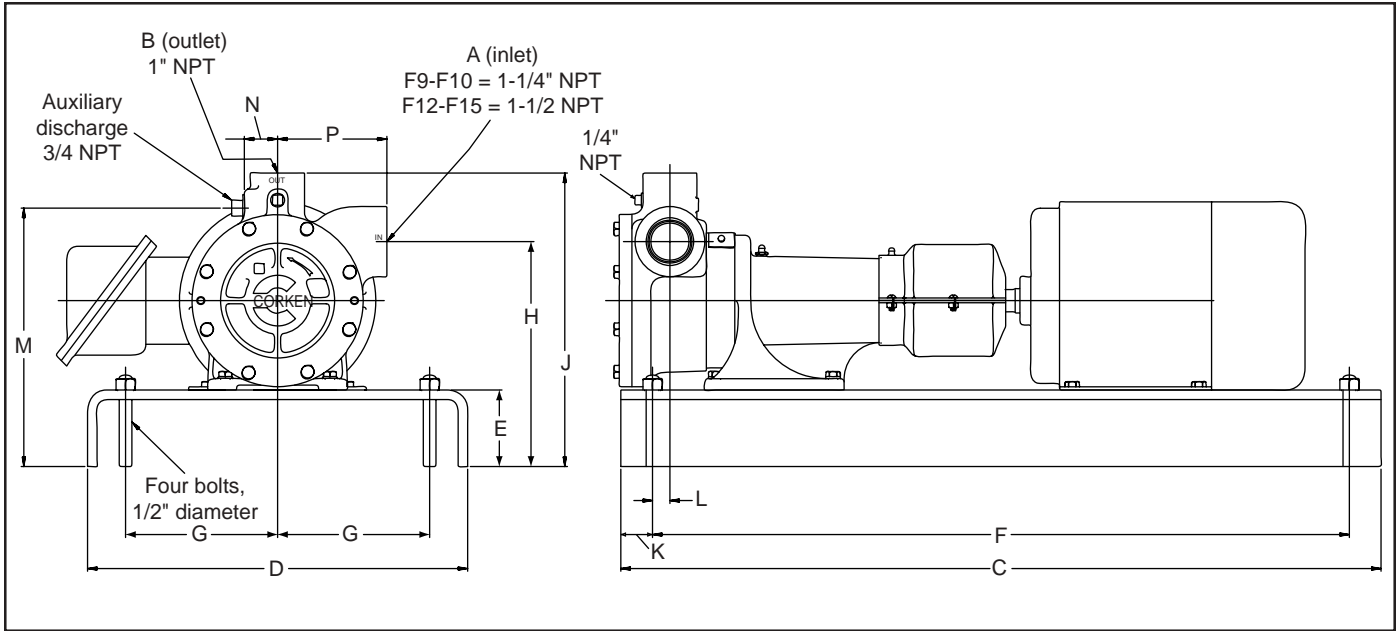


Flange Dimensions		
Model	A (inlet)	B (outlet)
DLF9–DLF15	1-1/2" 300# ANSI	1" 300# ANSI

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

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

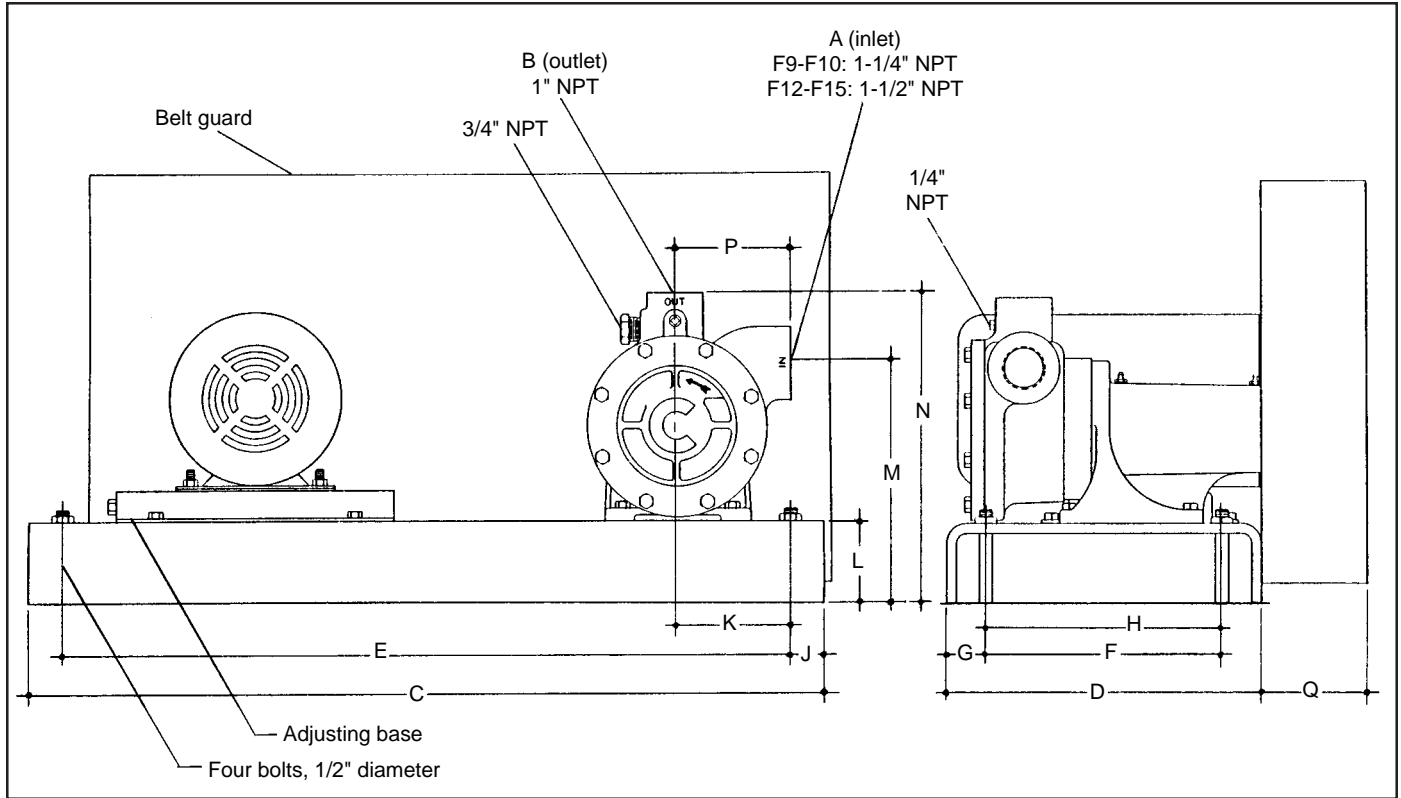
# Appendix C—Outline Dimensions for F9-101 thru F15-101 Model Pumps



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

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

# Appendix C—Outline Dimensions for F9-103 thru F15-103 Model Pumps



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

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

## Appendix E—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

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

## Appendix E—Troubleshooting Guide

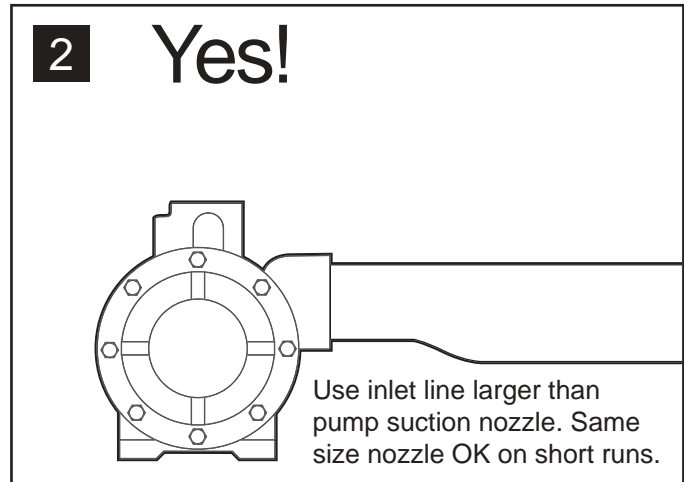
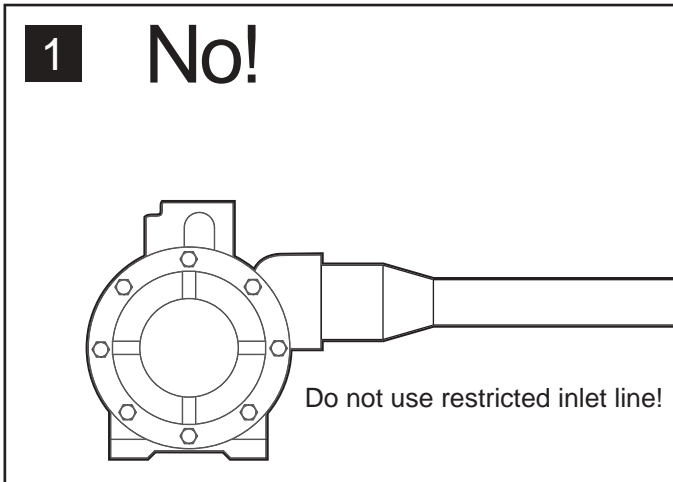
Problem	Cause	What to do
Noise or vibration in the pump (continued)	Defective or wrong size By-pass valve	Confirm the size of the by-pass valve required for your application. Inspect, repair or replace the valve.
	Loose anchor bolts	Tighten all pump's anchor bolts.
Electric motor gets hot or overload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

## Appendix F—Extended Storage Procedures

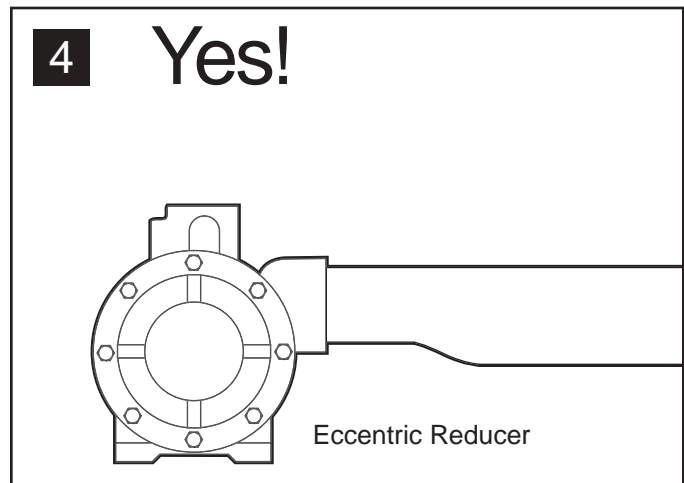
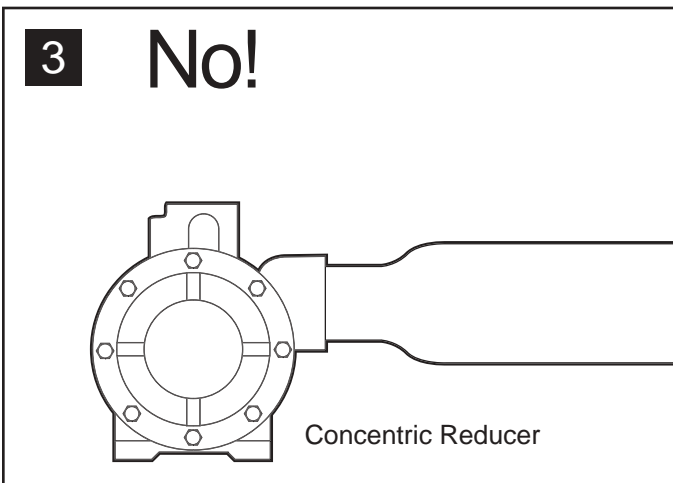
If your Coro-Flo® pump is to be removed from service for some time, the pump must be protected, as propane, butane and anhydrous ammonia all leave the metal "bare" and open to corrosion. Piping and tanks not in service should also be protected, as the rust that forms can destroy the pump's seals almost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

1. Fill or thoroughly flush the pump with a light rust-inhibiting oil. (If the pump is flushed with oil, placing some desiccant packets inside the pump will provide added protection.)
2. Plug all pump openings.
3. Store in a dry location.
4. Before placing the pump back into service, drain the oil and remove any desiccant packets.
5. Refer to "Operation of your Coro-Flo® pump" on page 10.

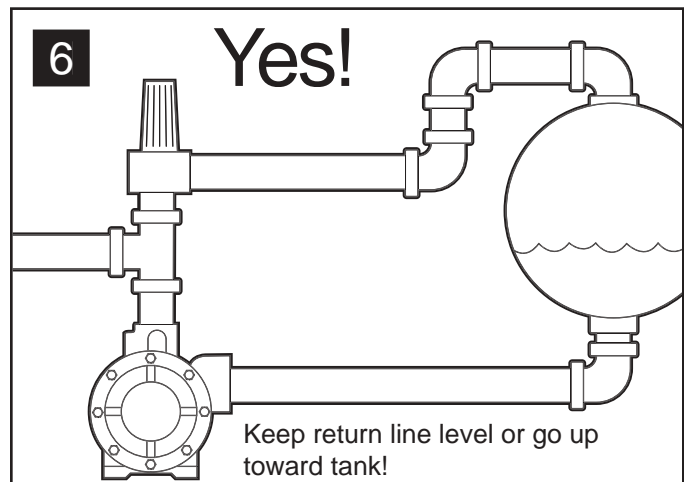
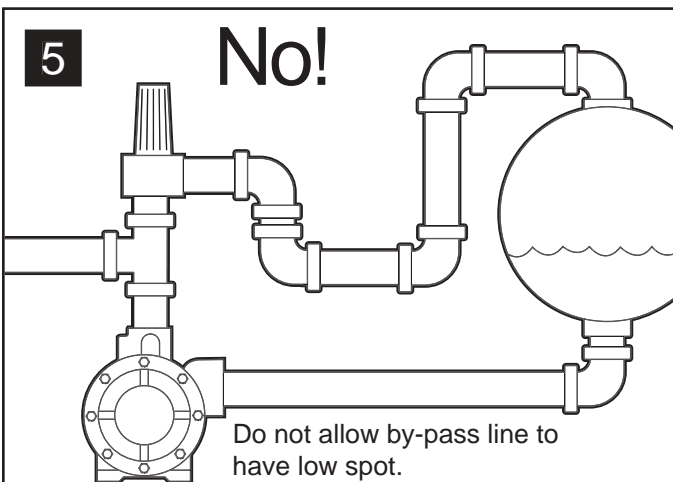
## Appendix G—Above Ground Installation Tips



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



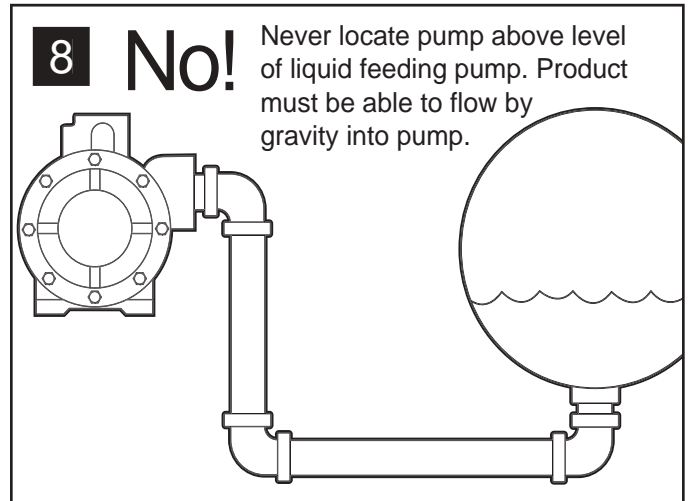
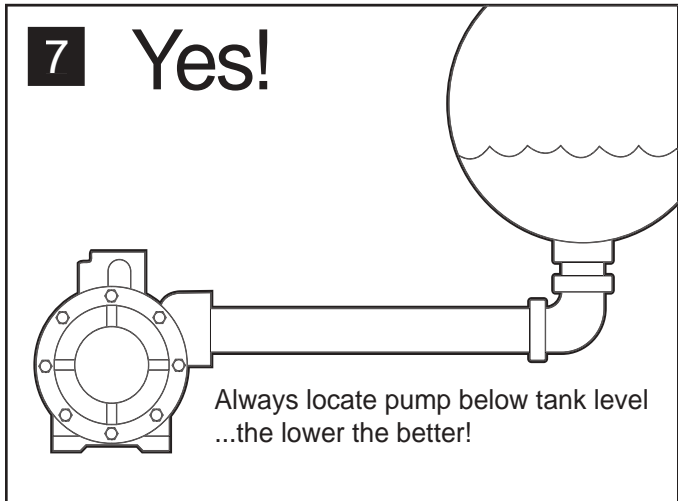
An eccentric reducer should always be used when reducing into any pump inlet where vapor might be encountered in the pumpage. The flat upper portion of the reducer prevents an accumulation of vapor that could interfere with pumping action.



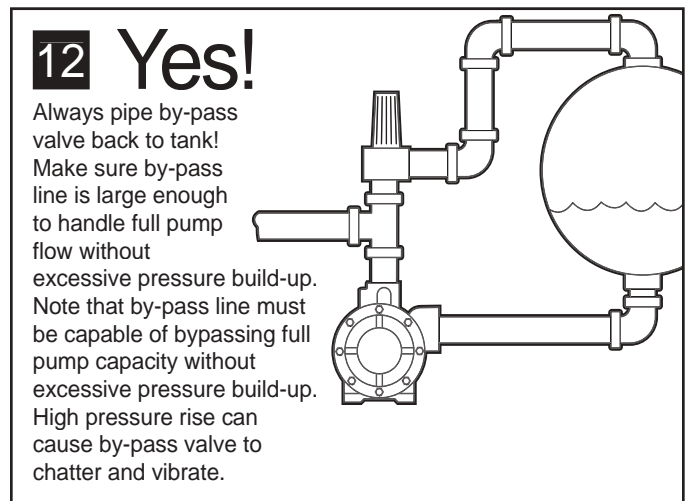
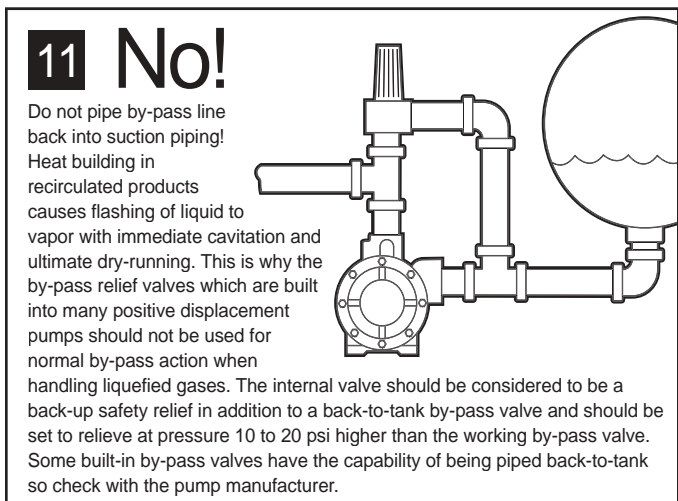
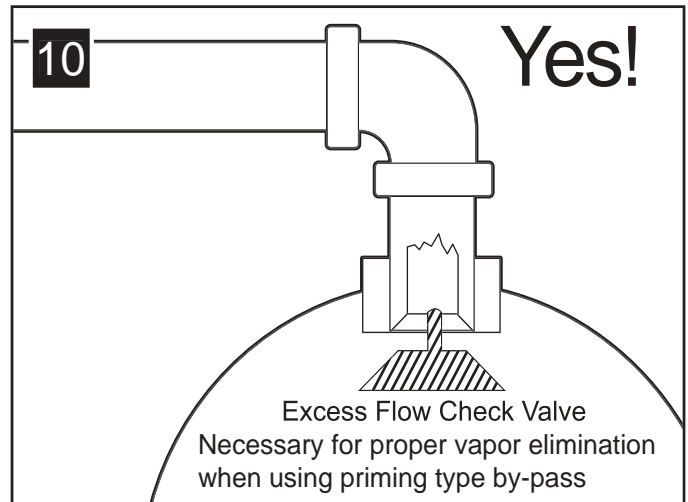
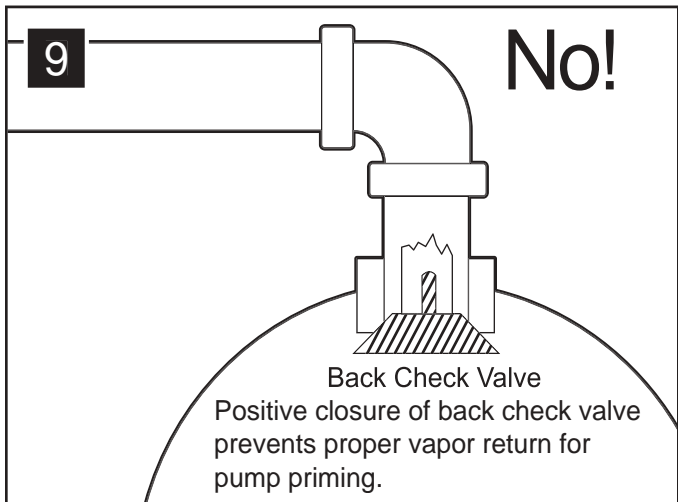
Low spots in by-pass line can collect liquid which prevents normal vapor passage for priming purposes just like the P trap in the drain of a kitchen sink. This is not a problem for by-pass lines where vapor elimination is not required.



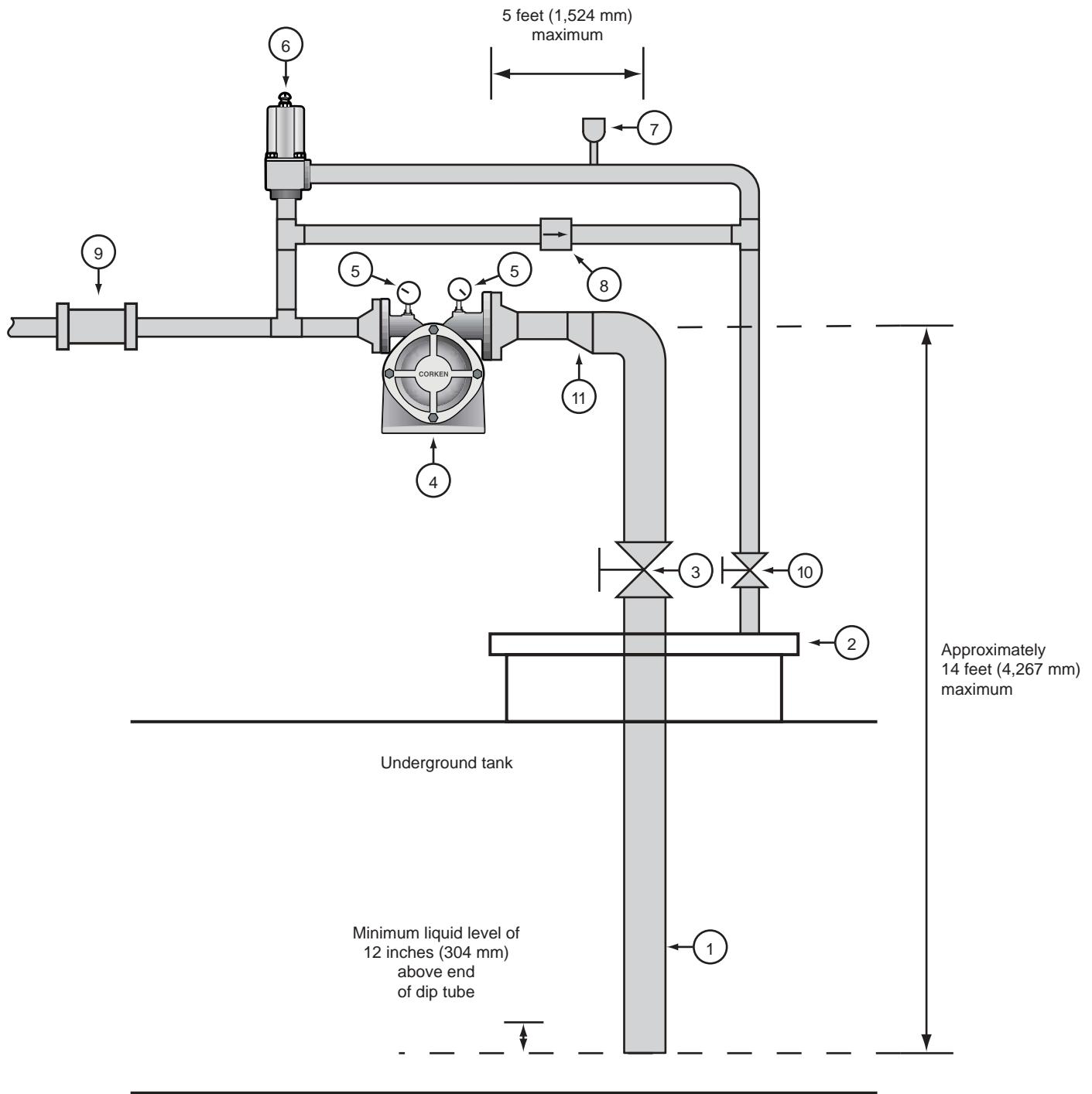
## Appendix G—Above Ground Installation Tips



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



# Appendix H—Underground Piping Diagram



## Appendix H—Bill of Materials for Underground Installations

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

### Warning:

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

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