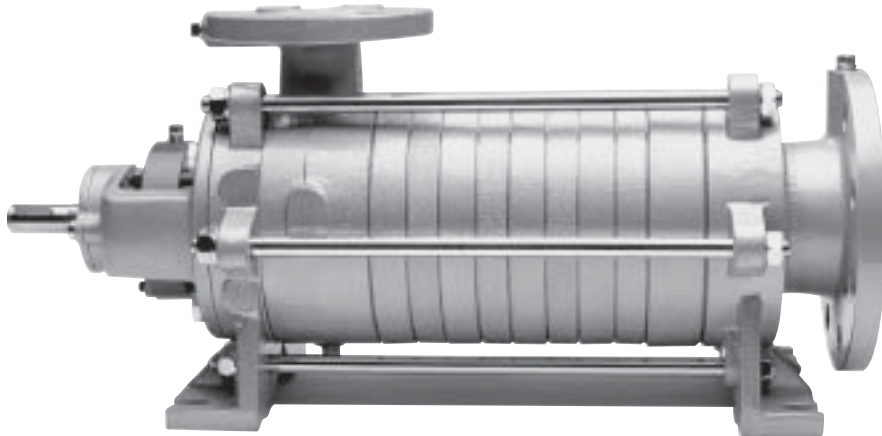


Installation, Operation & Maintenance Manual

SC-Series Multistage Side Channel Pumps



Mechanically Sealed Model



Magnetic Drive Model

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

Solutions beyond products...

CORKEN[®]
IDEX[®]

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. 36th 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 Operations, Installation and Maintenance 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 _____

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Principle of Side Channel Operation

The design of the side channel pump allows for the transfer of liquid-gas mixtures with up to 50% vapor; therefore eliminating possible air or vapor locking that can occur in other pump designs. A special suction impeller lowers the NPSH requirement for the pump.

The side-channel pump design is similar to a regenerative turbine in that the impeller makes regenerative passes through the liquid. However, the actual design of the impeller and casing as well as the principles of operation differ greatly. The side-channel pump has a channel only in the discharge stage casing (A) and a flat surface which is flush with the impeller on the suction stage casing (B). A star-shaped impeller (C) is keyed to the shaft and is axially balanced through equalization holes (D) in the hub of the impeller.

The liquid or liquid/vapor mixture enters each stage of the pump through the inlet port (E). Once the pump is initially filled with liquid, the pump will provide a siphoning effect at the inlet port. The effect is similar to what happens in water ring pumps. The water remaining in the pump casing forms a type of water ring with a free surface. A venturi effect is created by the rotation of the impeller and the free surface of the water, thus pulling the liquid into the casing.

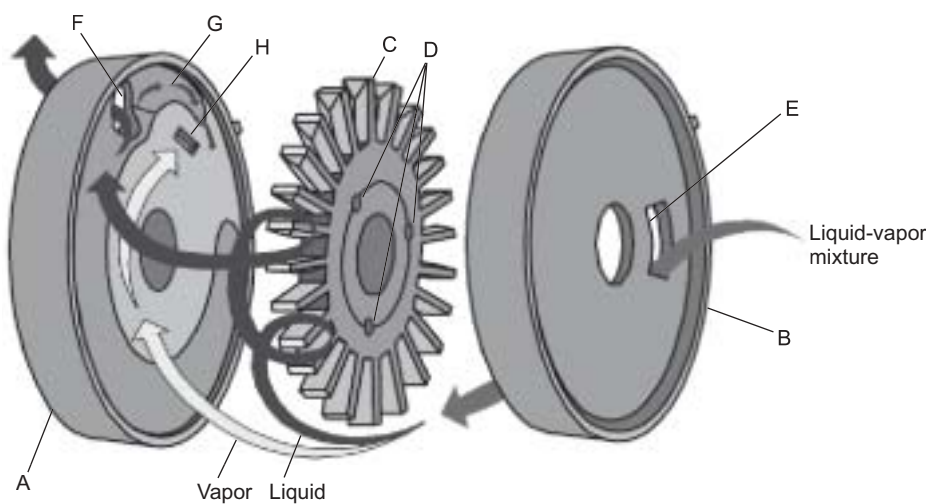
After the liquid is pulled through the inlet port, it is forced to the outer periphery of the impeller blade by centrifugal action. It is through this centrifugal action that the liquid is accelerated and forced into the side channel. The liquid then flows along the semicircular contour of the side channel from the outermost point to the innermost point until once again it is accelerated by the impeller blade. The liquid moves several times between the impeller and the side channel. Thus the rotating impeller makes several regenerative passes until the liquid reaches the outlet port. The speed of the impeller along with the centrifugal action impart energy

to the liquid through the exchange of momentum, thus allowing the pump to build pressure.

The side channel leads directly to the outlet port (F). At the outlet port, the main channel ends and a smaller minichannel (G) begins. At the point where the mini-channel ends, there is a small secondary discharge port (H) level with the base of the impeller blades.

As the liquid is forced to the periphery through centrifugal action due to its density, the vapor within the liquid stream tends to remain at the base of the impeller blades since it has a much lower density. The main portion of liquid and possibly some vapor, depending on the mix, is discharged through the outlet port. A small portion of the liquid flow follows the mini-channel and eventually is forced into the area between the impeller blades. The remaining vapor which was not drawn through the outlet port resides at the base of the impeller blades. At the end of the minichannel, as the liquid is forced into the area between the blades, the area between and around the impeller blade is reduced. The liquid between the blades displaces and thus compresses the remaining vapor at the base of the impeller blades. The compressed vapor is then forced through the secondary discharge port where it combines with the liquid discharged through the outlet port as it is pulled into the next stage or discharged from the pump. Thus entrained vapor is moved through each stage of the pump.

Each subsequent stage operates under the same principle. The number of stages can be varied to meet the required discharge head. When multiple stages are required, the relative positions of the stage outlet ports are radially staggered to balance shaft loads.



Item	Description
A	Discharge Stage Casing
B	Suction Stage Casing
C	Impeller
D	Equalization Holes
E	Inlet Port
F	Outlet Port
G	Mini-Channel
H	Secondary Discharge Port

Exclusive Features Of Your Corken Side Channel Pump

The Corken SC pump line utilizes an integral centrifugal impeller, multi-stage impellers in series and side channel design to allow for the following features:

- High differential pressure capacity at relatively low flow
- Self-priming capability
- Low NPSH requirements
- Pumping of up to 50% entrained vapor without cavitation
- Non-pulsating flow
- Multiple sealing options, including magnetic drive, as well as multiple materials options providing maximum flexibility for a wide range of industrial applications.
- Modular design minimizes the need for spare parts and makes assembly and disassembly easier.

Installation

Transportation

The pump must be transported as illustrated in Figure 1. DO NOT lift the unit by the eye rings on the motor.

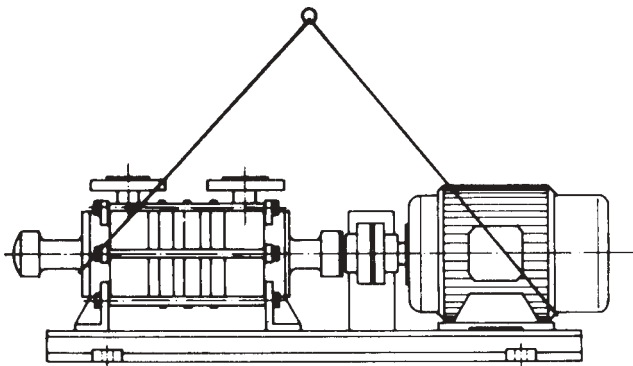


Figure 1

Performance of the side channel pump depends on the clearance between each impeller and stage casing (between 0.006 and 0.007 inches or 0.152–0.178 mm wide). Due to the narrow clearances the pump is not suitable for delivery of liquids containing solids with a grain size larger than 100 mesh. In all cases a strainer must be installed on the suction side, to prevent foreign matter from damaging the impellers and casings. Place the pump and driver evenly and free from stresses onto the base plate. Leave flange covers in place until the piping is connected. If the motor is not pre-installed with the pump, the set must be aligned at installation. To do this, make sure the two coupling halves

are 100% flush. They should be approximately 0.08 to 0.12 inches or 2–3 mm apart (see Figure 2).

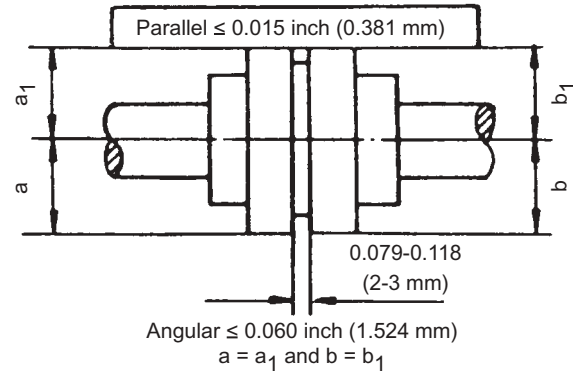


Figure 2

Never mount couplings using force (e.g. blows with a hammer). After completing the foundation and connecting the piping, check alignment of the coupling once more and realign, if required.

WARNING: Couplings are aligned at the factory but should be checked after installation and before start up.

Misalignment may occur due to handling and installation.

A protective guard needs to be installed to prevent someone coming into contact with the coupling during operation.

For liquids in excess of 250°F (120°C) and below -40°F (-40°C), the pump has to be fitted with a support sleeve on the side opposite the drive side to account for thermal expansion.

Fit the pump with a pressure gauge on both suction and discharge sides.

Install a throttle valve on the discharge side in order to maintain the exact delivery head (see rating plate).

Make sure the pump is always filled with the pumping liquid to maintain the self-priming feature. Use a back flow check valve to stop reverse flow when operating with suction lift (see Figure 3).

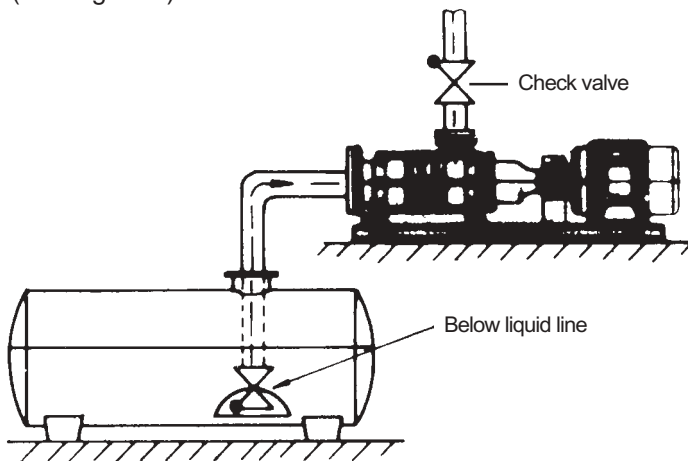


Figure 3

With higher delivery heads (i.e. > 65 ft. or 19.8 m), long pipelines, parallel operation and/or backpressure from the plant (system pressure), use a back flow check valve on the discharge side to prevent reverse flow of the liquid through the pump when it is shut down (see Figure 4).

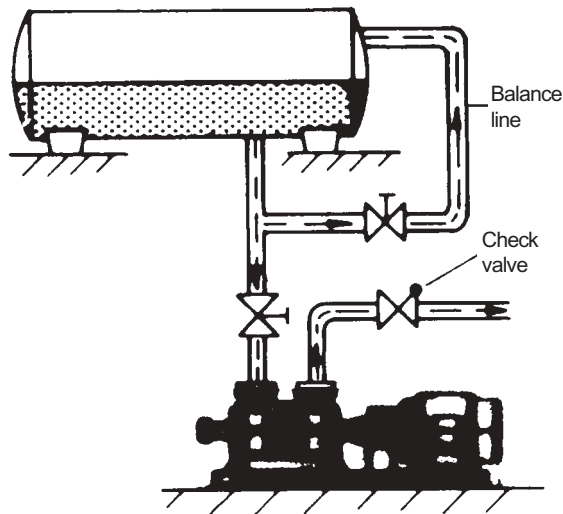


Figure 4

After completing installation of the pump, check all piping and connections for leakage. Check the pump for freedom of movement. It should be possible to rotate the shaft of smaller sized pumps by hand. Check the operating safety of the entire pumping plant on the basis of the applicable accident prevention regulations (electrical connections, coupling guard etc.).

Piping

All pumps come filled with an anti-rust agent that will have to be removed before connecting the pump to the piping. Dispose of this fluid according to local regulations.

The direction of flow through the pump is indicated by arrows on the pump casing.

Do not use the pump or its mounting as an anchorage point for pipelines. Connect all pipes making sure that no forces/moments resulting from the system can be transmitted to the pump or driver. Any stresses resulting from temperature fluctuations must be minimized.

At a temperature in excess of 250°F (120°C), suction and discharge lines are to be fitted with compensators or expansion joints to account for thermal expansion.

Make sure all pipes are completely clean before startup. Gaskets must be perfectly flush with the inside walls. Check all connections for leakage.

Do not use small angle bends in the suction or discharge lines.

Suction line:

To ensure disturbance-free continuous operation, the inflow conditions of the plant have to be adjusted to the suction requirements of the pump (NPSH_R).

The maximum suction lift is 23 ft. (7.0 m) for water (cold). Please keep in mind that fluids with a low vapor pressure also have a smaller suction lift.

Pay close attention to the suction head or NPSH-value of liquids pumped at or near their boiling point, because flashing could occur and cause the pump to cavitate, which in turn, could severely damage the internal parts.

The decisive factors for determining the NPSH_R available are temperature, vapor pressure, density, suction head and pipe loss (See Appendix C to find the NPSH_R of your application).

EXCEPTION: SC operating with suction lift:

The suction and discharge lines are to be the same diameter. Provide a steadying distance before the pump with a length measuring 10 times the pipe diameter (see Figure 5).

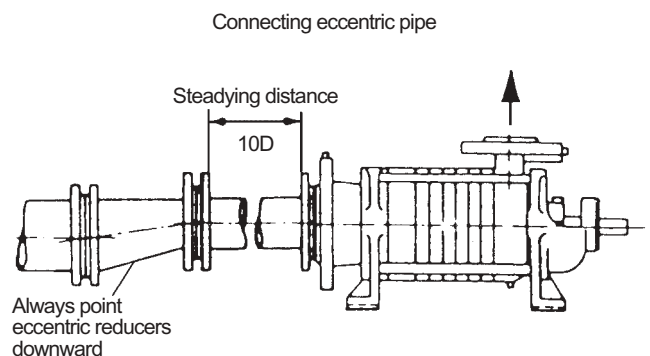


Figure 5

With suction lift operation, place the suction strainer at least 6 inches below the minimum liquid level as shown in *Figure 3*.

With positive suction operation from a tank under vacuum, it is advisable to place a vacuum balance line in the piping as shown in *Figure 4*.

To maintain the self-priming feature of the pump, it must be filled with liquid at all times.

Discharge line:

The discharge pipe should be sized so that its diameter is at least as large as the cross-section of the pump discharge flange.

External By-Pass Valve

The Corken side channel pump is not equipped with an internal relief valve, therefore it is essential that some type of external by-pass or hydrostatic relief valve be installed in the discharge side of the system as close to the pump as possible. The by-pass valve, while acting as a relief, also guards against excessive differential pressures in the pumping system to protect the pump, piping, and system components. Corken recommends using our B166 by-pass valve, for flows up to 40 gpm (151.4 L/min), and pressures up to 225 psid (15.5 bar d), as it has the added benefit of a vapor eliminator that prevents vapor lock upon start up. This is especially helpful when pumping liquefied gases, such as propane or ammonia. Consult Corken for more details.

Noise Considerations

A certain amount of noise during the operation of self-priming centrifugal pumps cannot be avoided. Nevertheless our patented pump has a very low noise level owing to the speed of operation and its special design features. Depending on the pump size, the noise level of our pumps range between 60 and 80 dBA. However, the reason for the noise is not always to be found in the pump. Other possible sources of noise are as follows:

- Driver, motor or engine
- Improperly installed coupling
- Other apparatus in the same room (e.g. heating system, water main, taps or valves. Flowing water always produces noise (e.g. water hammer). The velocity of the water should be kept as low as possible: between 3 and 7 feet per second (0.9 and 2 m), at the most 10 feet per second (3 m). Further possibilities of reducing the flow velocity and thereby limiting quantity of out flowing water are generously dimensioned pipelines and the use of regulators and other devices.

If the pump is the source of most of the noise, the following measures will reduce the noise level:

- Place the pump on rubber cushions (buffers).

- Insert a rubber connecting piece between the pump and piping both in the suction and the discharge line.
- Pipelines should not be in direct contact with walls, ceilings or floors.
- If necessary, place pump (not motor!) inside a sound-proof enclosure.

Start up

Fill the pump with the liquid to be pumped and vent it by means of the vent ports on the flanges. Pumps with balanced or un-balanced mechanical seal construction must be vented too, by means of threaded seal housing plugs. Venting is also necessary in case of positive suction and for hot liquids. This is only done once and could, for example, take place before connecting up the piping. For all subsequent startups the pump will take up suction operation automatically.

The pump must be supplied with liquid at all times and must never run dry! Mechanical seals are destroyed with only a few seconds of dry running.

The power requirement increases with increasing head and decreasing flow rate. Never run the pump with the suction and/or discharge line closed! Dead heading the pump can cause impeller teeth to bend or break and can lead to shaft deflection.

Open all shutoff valves in the suction and discharge lines!

If the unit is fitted with a bypass line, see that it is closed for suction lift operation, with positive suction operation it may remain open.

The bearings are sealed and do not require lubricating and are ready for operation.

Motor

Check the operating voltage and speed of the motor.

The speed of the 50 Hz model is 1450 RPM and the speed of the 60 Hz model is 1750 RPM or 1150 RPM. NOTE: The minimum speed of a side channel pump is 900 RPM and the maximum is 1800 RPM.

Use a motor overload protection switch!

Check the direction of rotation of the motor by switching the motor on and then off again immediately. The direction of rotation of the pump is indicated on the pump casing.

Never run the pump against the specified direction of rotation!

The electrical connections are to be made by an authorized electrician and in compliance with local regulations, in particular in respect to the safety measures to be performed.

Switch the pump on with the shutoff valves open.

The valves incorporated in the suction line must also be open!

Close bypass line.

Once the pump has reached full speed (rated speed indication on the rating plate), adjust the delivery head by slowly closing the valve on the discharge side.

The time required for suction to start depends on the length of the suction line and will take several seconds at first startup. If the suction line is fitted with a foot or non-return valve, delivery will start immediately the second time the unit is switched to the on position.

High Temperature Pumps for Temperatures of 250°F (120°C) and More

If the pump is to be used for delivering hot liquid, make sure the pump is not affected by thermal shock. Shocks of this nature in a cold pump are only permissible without additional protective measures for a temperature of 250°F (120°C), maximum. After a thermal shock, check for free rotation of the pump by manually turning the coupling. Wait between one and two minutes until the pump has heated up. The hot pump can now be switched on.

Tighten the tie bolts of the casing opposite the drive side, but only so much that the pump feet can still move in the direction of the longitudinal pump axis. We recommend that you use a support sleeve (see *Figure 6*).

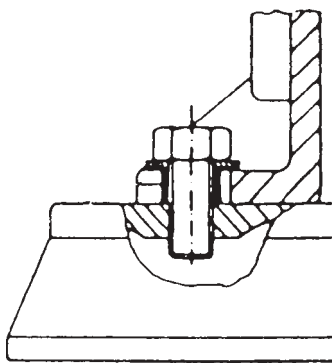


Figure 6

Operation

Shaft Seal

Mechanical seals do not require maintenance and do not leak during operation. On pumps with double-acting mechanical seals, the sealing chamber is to be wetted with sealing liquid. The pressure of the sealing/purging liquid is to be kept at between 15 to 30 psi (1–2 bar) above the pressure at the discharge nozzle of the pump. During the initial starting phase (approximately 50 hours) the temperature of the mechanical seal is to be monitored. It should never exceed the temperature of the liquid to be pumped by more than approximately 59°F (15°C); its maximum temperature is 176°F (80°C).

Cooling of the Shaft Seal Housing

Cooling of the shaft seal housing is required when the temperature of the liquid to be pumped exceeds 250°F (120°C). The cooling water requirement depends on the temperature of the pumping liquid and on the pump size: it is about 0.50 gpm (1.9 L/min) at maximum 145 psi (10 bar). The cooling liquid enters the housing in the upper section of the pump foot, whereas it drains off diagonally across on the opposite side (see *Figure 7*).

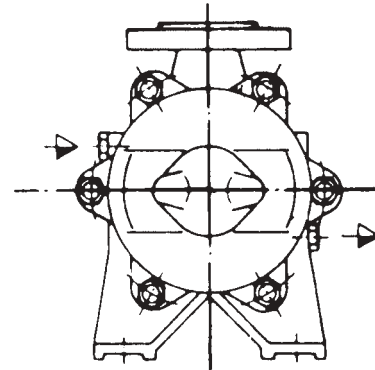


Figure 7

Heating of the Shaft Seal Housing

When pumping liquids that tend to become crystalline in the temperature range of pump operation or form incrustations or sticky deposits on the shaft seal, we recommend wetting of the shaft seal housing with a heating liquid from an external source. The heating liquid enters in the bottom section of the pump foot, whereas it drains off diagonally across in the upper section of the foot (see *Figure 8*). The heating liquid quantity depends on the pump size and the size of the temperature difference and amounts to approximately 0.50 gpm (1.9 L/min) at a maximum of 145 psi (10 bar).

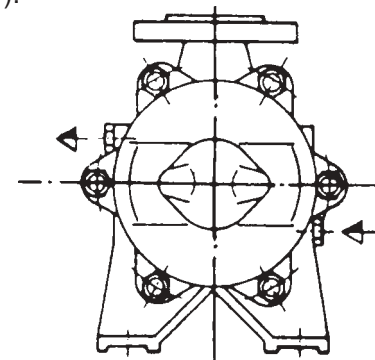


Figure 8

Operation as a Boiler Feed Pump

When the pump is employed as a boiler feed pump, care must be taken that it is not run at a lower operating pressure than specified. If the feed tank is operated at a lower operating pressure for any length of time, the pump discharge pressure must be reduced to the normal operating pressure of the tank by means of a hand-operated shutoff valve and a pressure gauge fitted at the discharge nozzle of the pump casing.

Coupling

As soon as the flexible elements of the shaft connection show signs of wear (abrasion), these parts have to be replaced. Verify the alignment of the shaft ends.

Shutdown

1. Do not close the shut off valve on the discharge side until the pump has come to a complete standstill.
2. Switch off the driver.
3. The shutoff valve can remain open if back check valves are installed.
4. The shut off valve on the suction side is to be closed both during prolonged standstill of the pump or if there is an overpressure on the suction side (positive suction).
5. Shut down all auxiliary facilities (cooling liquid, etc.). The shaft seal on the pumps pumping liquid under vacuum has to remain wetted by the sealing liquid during shutdown.
6. If there is a danger of frost, protect the pump, cooling circuit, etc. against freezing or drain off the liquid.

Maintenance

Bearings

The pump requires only very little maintenance once it has been started up. The external antifriction bearings are also maintenance-free and filled with grease for the life of the bearing. It is not necessary to re-grease the closed bearings. If the pump is operated according to the specified duty data and these instructions, the first bearing change is only necessary after approximately 8,000 to 10,000 hours of operation, and can last longer in cases of flooded suction and/or a self lubricating liquid. The internal carbon bearings are then replaced as well.

Mechanical Seal

Mechanical seals do not leak or require maintenance. However, make sure they never run dry during operation and that the operating conditions remain within the set limits of the mechanical seal in question. In the event of leakage, the mechanical seal cannot be re-tightened. In this case we recommend dismantling the mechanical seal and checking the rotating ring, the shaft, the o-ring and the counter ring.

Single-Acting Mechanical Seals

This type of single mechanical seal offers the possibility of internal flushing through a borehole in the casing (see Figure 9). In addition, the pump can be fitted with an external circulation pipe. This is fixed onto the shaft seal casing at the position of the threaded plug. This plug serves also for venting of the shaft seal chamber.

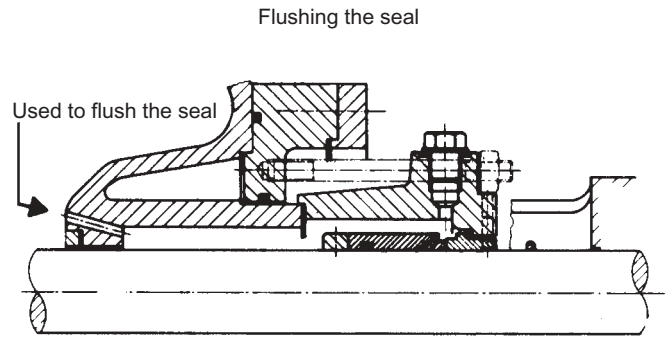


Figure 9

Double-Acting Mechanical Seals

Double-acting mechanical seals require sealing liquid to function properly. The purpose of this liquid is to dissipate the friction heat and keep the product from entering the sealing clearance. The sealing liquid fills the space between the two mechanical seal assemblies—one on the product side and the other in contact with the atmosphere.

Any liquid can serve as a sealing medium as long as the corrosion-resistance of the parts that come in contact with it are taken into consideration. The sealing liquid must not contain any solid particles or be liable to form deposits and it should have a high boiling point as well as good thermal conductivity properties. Clean water of low hardness meets these requirements to a high degree. The sealing liquid pressure should exceed the pressure of the medium to be sealed by 15 to 30 psi (1–2 bar).

The outlet temperature should at the most be approximately 140°F (60°C), or remain 104°F (40°C) below the boiling point of the sealing liquid at normal pressure. To prevent the possible formation of gas bubbles, place the sealing liquid inlet at the bottom connection of the discharge casing and the outlet at the shaft seal housing (see Figure 10).

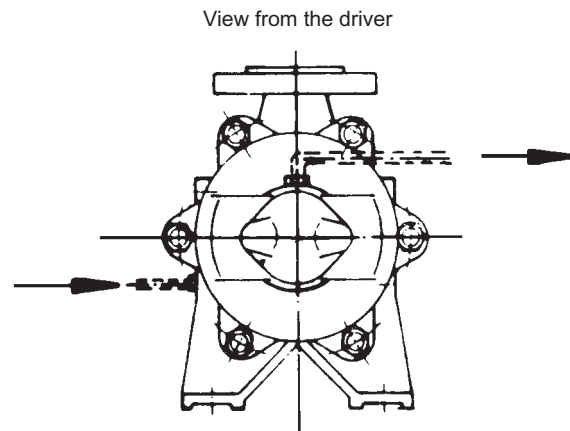


Figure 9

Make absolutely sure to wet the mechanical seals with sealing liquid prior to start up. With low operating pressures, the water main is all that is required to establish a sealing pressure system. For higher pressures we recommend a sealing pressure system incorporating a gravity circuit, which is suitable for an operating pressure of up to 435 psi (30 bar).

Coupling

The coupling is used as a point of reference to check whether the motor shaft is still in alignment with the pump shaft. This check is to be performed after approximately 1000 hours of operation. Check the rubber coupling buffers installed in the coupling used for this pump. In case of heavy wear the motor will no longer be in alignment with the pump. This normally results in bearing damage.

Drive/Auxiliary Equipment

The manufacturers operating instructions are applicable.

Standby Pumps

Put the pump into operation regularly once a week for a short period of time to make sure it remains ready for operation and to avoid, among other things, the possible formation of corrosion.

Disassembly and Assembly Instructions for Mechanically Sealed Models

During the term of warranty the pump may only be dismantled by Corken, Inc. or by one of the authorized workshops.

Disassembly of the Pump

After the term of warranty has ended, the pump should only be dismantled by adequately trained personnel. Before dismantling, mark the individual casing components so they can be reassembled in the correct order and orientation in relation to each other. To repair the pump, it must be disconnected from driver, baseplate and piping and follow the steps listed below.

1. Although pump stage casings and impellers are interchangeable it is good practice to consecutively number all stages and draw a straight line down the length of the pump. The stages are set in a specific position (either 120° or 180° apart) and must be reassembled in the same position (see Appendix G).
2. It is best to work on the pump with it in the vertical position. With the drive end facing down, put the feet in a vise to assist in doing this. The pump can be disassembled from the suction or drive end. Typically it is done from the suction end to avoid disrupting the mechanical seal.
3. With suction flange upward, loosen the six tie rod bolts and remove the suction flange. Note the green casing

gasket and take care not to damage it. Always use new stage gaskets when practical.

4. Flatten the lock washer on the shaft nut.
5. Loosen the shaft nut. **The nut has left hand threads and must be turned clock-wise to remove.** Then remove the lock washer.
6. Remove the NPSH suction impeller and shaft key. This impeller should pull off with little resistance. Remove the shaft sleeve.
7. Remove the NPSH suction casing.
8. Remove the suction stage casing.
9. Remove the stage impeller. This is a free-floating impeller, but will take more resistance to remove than the NPSH impeller. If prying is necessary be very careful not to damage any parts. Then remove the shaft key.
10. Remove the discharge stage casing.
11. Repeat steps 9–11 until all stages have been removed.
12. To re-assemble complete steps in reverse order.

NOTE: When re-ordering stage gaskets for the pump refer to the fourth digit in the model number. This indicates the number of stages. For example, an SC15WC2AG12 pump would have five stages. Add one to this number and multiply by two. For example, a five stage pump would use twelve stage gaskets (5+1x2=12).

Mechanical Seal

The mechanical seal in the pump is maintenance free. If leakage is detected over a longer period of time, the mechanical seal must be replaced. To do this, the pump does not necessarily have to be removed from the baseplate, nor does the piping have to be dismantled.

To fit a new mechanical seal, proceed as follows:

Be sure the unit is secured, can not be switched on, and the inlet and discharge valves are closed.

It is not required to remove the pump from the baseplate or to disassemble piping. The design enables the mechanical seal to be replaced while the pump is still installed. The motor, however, must be removed from the baseplate.

1. On the pump side, remove the coupling half, loosen the two flat head screws and remove the bearing cover.
2. Remove the retainer ring.
3. Remove the four hexagonal screws that secure the bearing bracket.

4. Pull the bearing bracket together with the roller bearing away from the shaft. NOTE: the bearing is pressed on the shaft and therefore will be hard to remove by hand. It is recommended that a puller be used to aid in this task.
5. Strip off the thrower.
6. Remove the four hexagonal nuts from the studs and pull the seal housing with the stationary seat, which is inside it, away from the casing seat.
7. Remove the mechanical seal from the shaft.

Important: When removing or installing the mechanical seal, make sure that the o-ring is not damaged by the grooves on the shaft.

8. After replacing the mechanical seal, re-assemble the pump in reverse order.

Torque Values

Assembly of the Pump

Tie Bolts		
Model Series	Torque	
	ft•lb	(N•m)
SC/SCM10	23	(31)
SC/SCM20, SC/SCM30	29	(39)
SC/SCM40	35	(48)
SC/SCM50	44	(60)
SC/SCM60	80	(108)

Shaft Bolt		
Model Series	Torque	
	ft•lb	(N•m)
SC/SCM10	35	(48)
All others	55	(75)

The pump is re-assembled in reverse order and in accordance with the identification marks made on the components before disassembly. Pay special attention to the following:

1. Parts that are to be used again must be cleaned well.
2. Remaining bits of gasket must be removed and new gasket used.

3. When mounting the impellers, slide these along the shaft until they about on the stage casing shrouds.
4. Tighten the tie bolts with a torque wrench.
5. After completing pump reassembly, it should be possible to rotate the pump shaft easily by hand.
6. The individual stage casing assemblies have been staggered in relation to each other to better absorb the radial forces of the pump. It is, therefore, of great importance to reassemble these stage casing assemblies in their original, staggered, position in relation to each other.

Disassembly and Assembly Instructions for Magnetic Drive Models

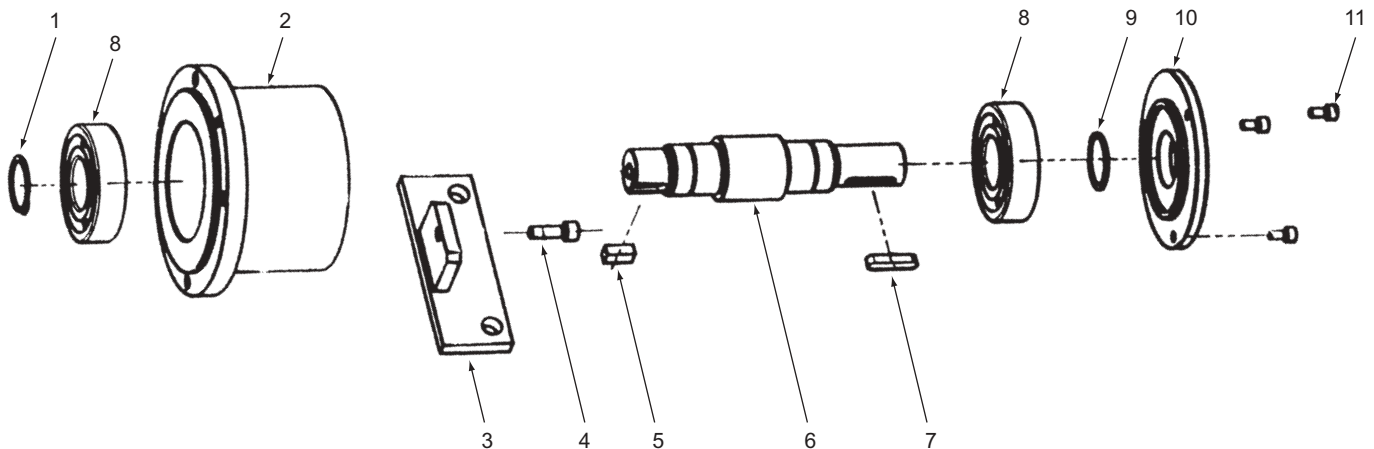
After the term of warranty has ended, the pump should only be dismantled by adequately trained personnel. Before dismantling, mark the individual casing components so they can be reassembled in the correct order and orientation in relation to each other. To repair the pump, it must be disconnected from driver, baseplate and piping and follow the steps listed below.

1. Although pump stage casings and impellers are interchangeable it is good practice to consecutively number all stages and draw a straight line down the length of the pump. The stages are set in a specific position (either 120° or 180° apart) and must be reassembled in the same position (see Appendix G).
2. It is best to work on the pump with it in the vertical position. With the drive end facing down, put the feet in a vise to assist in doing this. The pump can be disassembled from the suction or drive end.
3. See Appendix H for cautions on operating safety and handling of the magnetic drive coupling.

Step 1 - Assemble the Bearing Unit

- Start with the small drive shaft. Using a press install the sealed ball bearing on the drive side first. (Note: the two ball bearings are interchangeable.) Secure to shaft using the retainer clip.
- Place the shaft and bearing assembly into the bearing housing and install the bearing cap using 3 screws.
- Flip the bearing housing over and install the other ball bearing using a press. Secure using the retainer clip.
NOTE: To disassemble the bearing housing assembly remove the bearing cap, both retainer rings and press the shaft out of the bearing housing from the drive side first.
- Once the bearing assembly is complete, place in a vise drive side down. Make sure a helicoil is in the end of the shaft.
- Insert the shaft key and test fit the outer rotor adapter plate, and then remove plate.

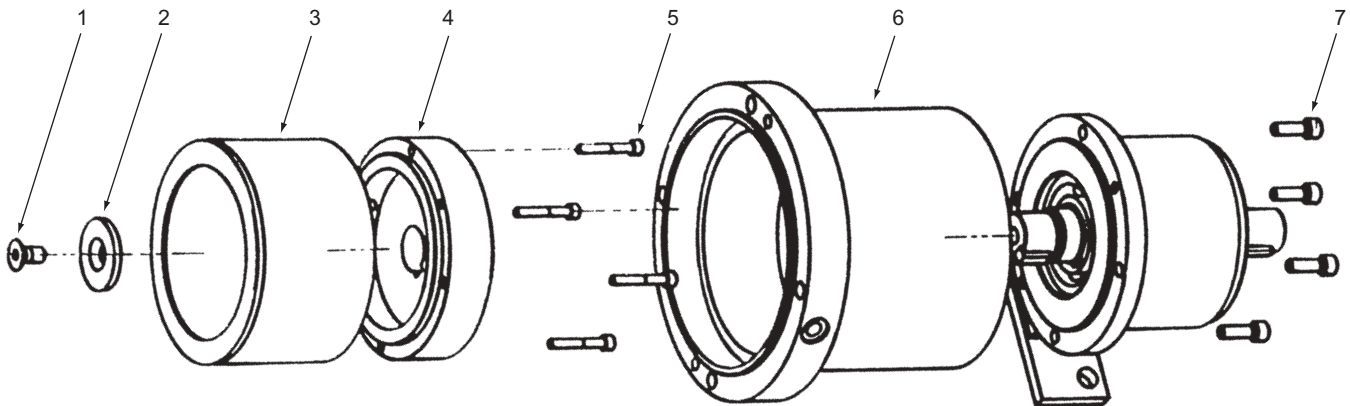
Ref. No.	Description	Qty
1	Retainer clip	1
2	Bearing casing	1
3	Front support foot	1
4	Cap screw	1
5	Key	1
6	Driving shaft	1
7	Woodruff key	1
8	Ball bearing	2
9	Retainer clip	1
10	Bearing cap	1
11	Cap screw	3



Step 2 - Assemble Magnetic Coupling with Bearing Unit

- a. Place outer magnet housing on the bearing assembly and tighten using four screws. Note the location of the 1/4" NPT hole and make sure it is facing the top left of the pump.
- b. Assemble the rotor adapter plate to outer magnetic drive rotor. The outer mag drive rotor also uses helicoils.
- c. Place outer magnetic rotor assembly into the magnetic housing and align with key in shaft. Secure with washer and screw. Hold the lower shaft so it does not turn when tightening the screw.

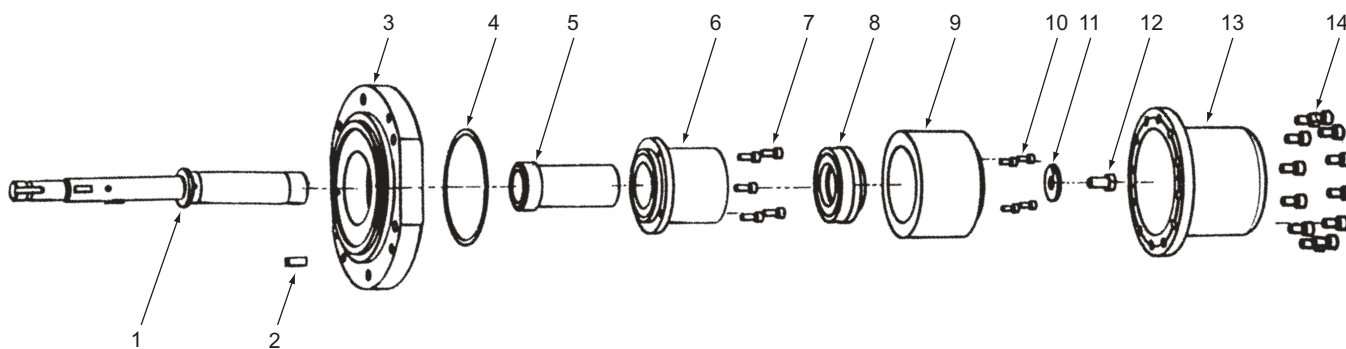
Ref.No.	Description	Qty
1	Bolt	1
2	Washer	1
3	Outer mag drive	1
4	Rotor adapter plate	1
5	Cap screw	4
6	Magnetic housing	1
7	Cap screw	4



Step 3 - Assemble Shaft with Magnetic Bearing Unit

- a. Insert helicoil into the mag end of the pump shaft.
- b. Place the shaft in a vise, mag end up and insert the small dowel pin.
- c. Place the thrust bearing on shaft, making sure to align the notch on the dowel pin.
- d. Attach sleeve-bearing housing to adapter plate using 5 bolts. High-pressure pumps have two bearings and low-pressure pumps have one bearing. If your pump has two bearings protect the lower bearing from the underneath side so it will not fall out.
- e. Apply a small amount of Vaseline to the bearing face and insert the pump shaft into the adapter plate and place vertically in the vise.
- f. Slide the long carbon or steel (depending on model) shaft sleeve on to the shaft and insert the non-metallic key into the shaft.
- g. Slide the inner magnetic drive rotor on to the shaft and secure using the washer and bolt that has the hole drilled through it. Torque to prescribed value.
- h. Insert the separation chamber gasket on the adapter ring and install the separation chamber. **CAUTION:** Chamber will resist at first and then slam onto the plate. Secure using 16 screws.

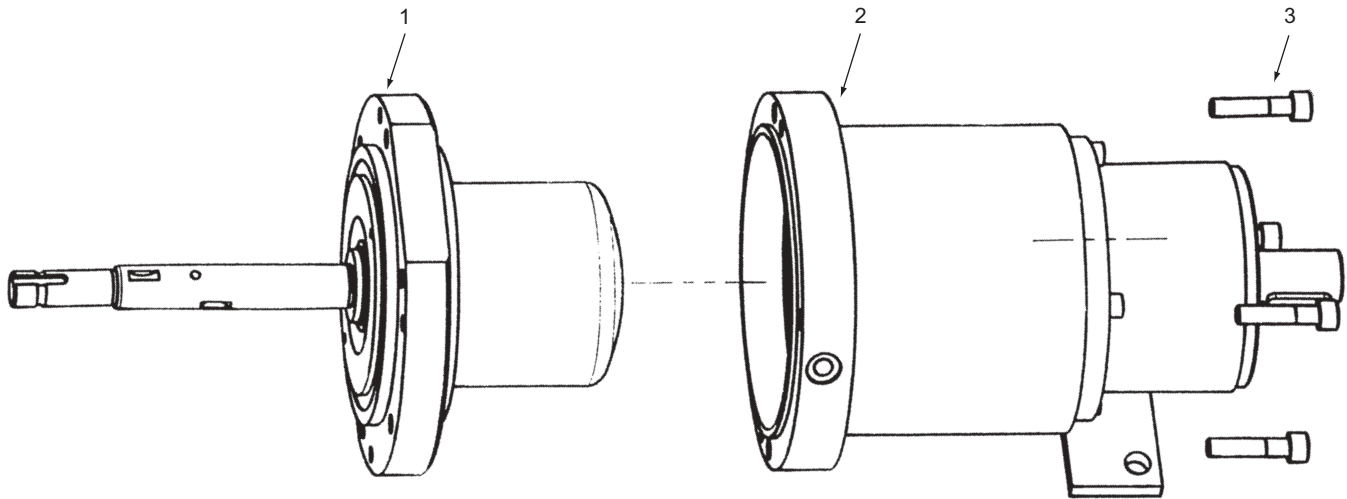
Ref.No.	Description	Qty
1	Pump shaft	1
2	Key	1
3	Adapter ring	1
4	Gasket	1
5	Shaft sleeve	1
6	Sleeve bearing	1
7	Cap screw	5
8	Thrust bearing	1
9	Inner mag drive	1
10	Cap screw	4
11	Washer	1
12	Hex head screw w/hole	1
13	Separation chamber	1
14	Cap screw	16



Step 4 - Assemble shaft unit with bearing unit

- a. Return the magnet housing to the vise and secure it vertically. Next lower the shaft assembly into the casing and tighten using 8 screws. This completes the magnetic end of the pump.

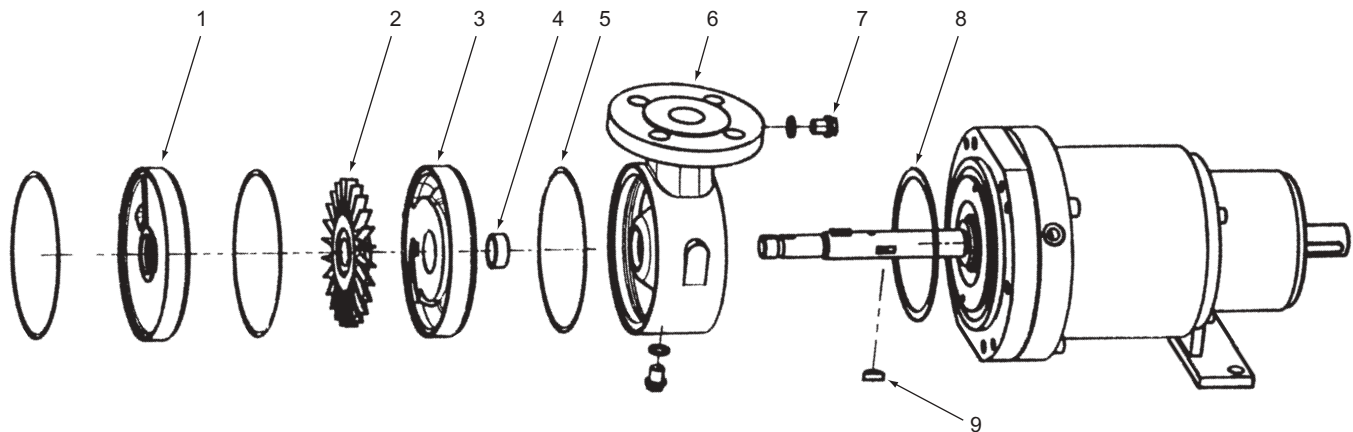
Ref.No.	Description	Qty
1	Adapter ring	1
2	Magnetic housing	1
3	Cap screw	4



Step 5 - Assemble hydraulic parts with magnetic bearing unit

- a. Place the smaller gray gasket onto the mag assembly and install the discharge casing.
- b. Install the green stage gasket and discharge stage casing. Make sure the notch on the outside of the casing is correctly positioned.
- c. Install the half moon key and impeller. The impeller should slide easily onto the key.
- d. Install another green stage gasket and the suction stage casing, again noting the location of the outer casing notch.
- e. Repeat steps a. through d. until all stages of the pump are assembled.

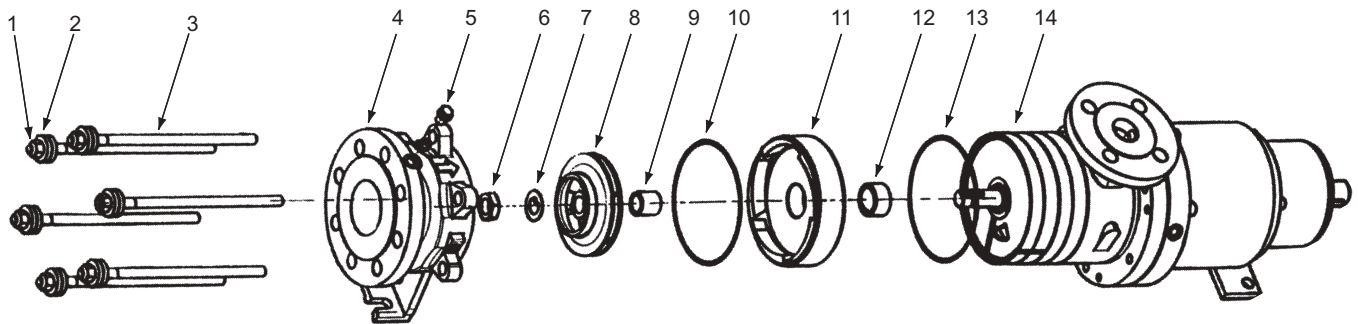
Ref.No.	Description	Qty
1	Suction stage casing	as req
2	Impeller	as req
3	Discharge stage casing	as req
4	Stage bushing	as req
5	Stage gasket	as req
6	Discharge casing	1
7	NPT plug	1
8	Gasket	1
9	Woodruff key	1



Step 6 - Assemble NPSH end to pump unit

- The last stage you will install is the NPSH stage and impeller. This impeller looks like a centrifugal impeller. Also install steel sleeve bushing.
- Secure to shaft using washer and nut. Please note that this is a left-handed thread and screws on backwards. Torque to the prescribed value and bend washer up to lock the nut. **NOTE:** In some cases the magnets might de-couple while torqueing. At this point the nut is tight enough and should not be torqued further.
- Install the suction flange using a green gasket.
- Install the six tie bolts and snug up the nuts.
- Lay the pump horizontally on a flat surface and make sure the flanges and feet are level. Tighten the six tie bolt nuts evenly using a star pattern.

Ref.No.	Description	Qty
1	Nut	6
2	Washer	6
3	Tie bolt	6
4	Suction casing	1
5	NPT plug	1
6	Shaft nut	1
7	Lock washer	1
8	Suction impeller	1
9	Suction impeller shaft sleeve	1
10	Stage gasket	1
11	Suction impeller casing	1
12	Suction impeller sleeve	1
13	Stage gasket	1
14	Suction stage casing	1



Motor Repair

Repairs to electrical components must only be performed by an authorized electrician.

Spare Parts Stock

Please always quote the following information when ordering spare parts:

Model number and serial number that is listed on the nameplate.

Recommended Spare Parts Stock

We recommend the following spare parts per pump. Critical applications should stock more or have a standby pump.

- Seal assembly and seal housing gasket
- Stage gasket
- Ball bearing and stage bushing

4. Optional parts:

Suction and discharge casing

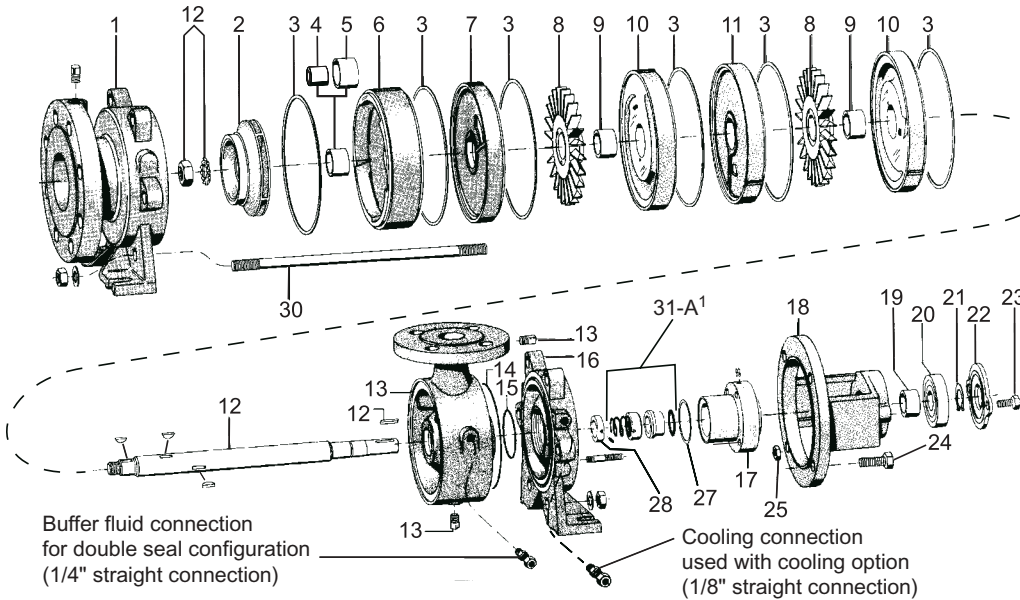
Impeller

NPSH bushing

Service

During the term of warranty the pumps may only be dismantled by an authorized workshop. Therefore, if service is required send your pump(s) to the nearest authorized service agent. Contact the factory for a listing in your area. This service is still available after the warranty term has expired.

Part Details for SC10 Series



¹ Illustration to the left contains single unbalanced seal (part #31-A). Optional seals are shown below.

Single Balanced Seal



31-B

Double Unbalanced Seal



31-C

Double Balanced Seal

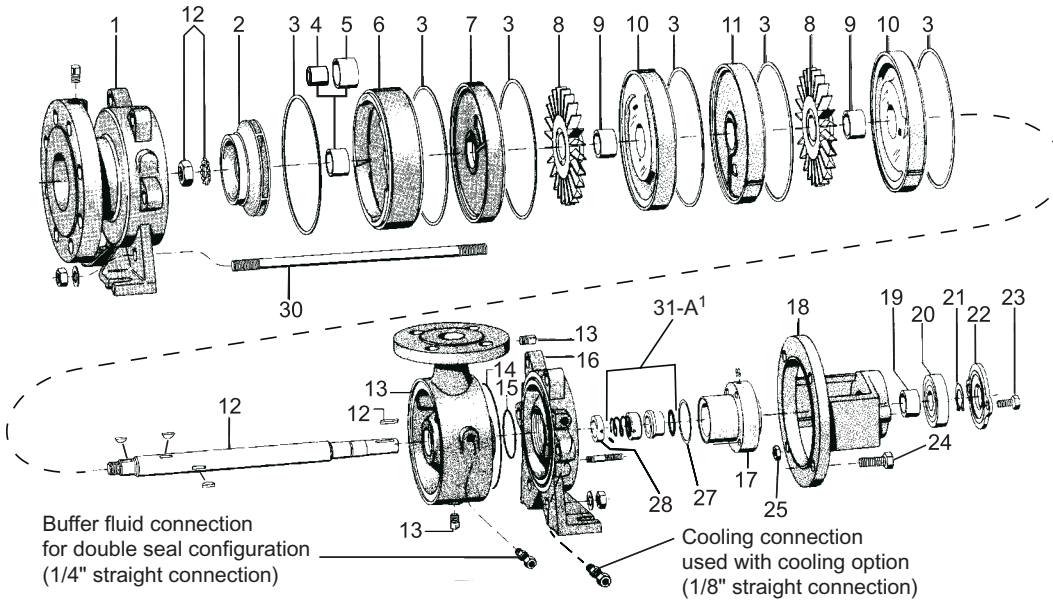


31-D

Item	Part No.	Description	Item	Part No.	Description
1	5742 5600 5741	Suction casing with plug, cast iron Suction casing with plug, ductile iron Suction casing with plug, stainless	12	5887 5886 5684 5885 5884 5883 5882 5881 5880 5879 5878	Shaft assembly, three stage, stainless Shaft assembly, four stage, iron Shaft assembly, four stage, stainless Shaft assembly, five stage, iron Shaft assembly, five stage, stainless Shaft assembly, six stage, iron Shaft assembly, six stage, stainless Shaft assembly, seven stage, iron Shaft assembly, seven stage, stainless Shaft assembly, eight stage, iron Shaft assembly, eight stage, stainless
2	5660 5703	Suction impeller, bronze Suction impeller, stainless	13	5754 5753 5752	Discharge case, cast iron Discharge case, ductile iron Discharge case, stainless
3	5604	Stage gasket	14	2-2049A	Discharge case O-ring (high temperature only)
4	5919	Suction impeller shaft sleeve	15	2-2086A	Foot O-ring (high temperature only)
5	5702	Suction impeller sleeve bearing	16	5835 5834	Foot, standard models Foot, high temperature models
6	5701 5762 5679	Suction impeller case, cast iron Suction impeller case, ductile iron Suction impeller case, stainless	17	5923 5924	Seal housing, iron Seal housing, stainless
7	N/A N/A N/A	First stage suction case, cast iron First stage suction case, ductile First stage suction case, stainless	18	5902	Bearing bracket
8	5602	Impeller, brass	19	5649	Spacer sleeve
	5640 5681	Impeller, steel Impeller, stainless	20	5603 5725	Ball bearing, standard Ball bearing, high temperature
9	5721 5648 5724 5991	Stage imp. sleeve bearing, bronze Stage imp. sleeve bearing, carbon Stage imp. sleeve bearing, high temperature (prior to and including s/n: 9701448/1) Stage imp. sleeve bearing, high temperature (After s/n: 9701448/1)	21	5650	Retainer ring
10	5814 5699 5813 5812 5683 Consult F.	Discharge stage case, cast iron, bronze bearing Discharge stage case, cast iron, carbon bearing Discharge stage case, ductile iron, bronze bearing Discharge stage case, ductile iron, carbon bearing Discharge stage case, stainless steel, carbon bearing High temperature models	22	5651	Bearing cover
11	5700 5674 5682 Consult F.	Suction stage case, cast iron Suction stage case, ductile iron Suction stage case, stainless Suction stage case, high temperature	23	Consult F.	Cover screw
12	5868 5890 5889 5722 5888	Shaft assembly, one stage, iron Shaft assembly, one stage, stainless Shaft assembly, two stage, iron Shaft assembly, two stage, stainless Shaft assembly, three stage, iron	24	5935	Bearing bracket screw
			25	5933	Seal housing hex nut
			26	5932	Stud bolt
			27	5661	Seal housing gasket
			28	5662	Seal locator ring (unbalanced only)
			29	5978-XA	Seal locator sleeve with O-ring (balanced only)
			30	Consult F.	Tie rod
			31		Mechanical seal a) single unbalanced 5605-XA__ ² b) single balanced 5605-XB__ ² c) double unbalanced 5605-XC__ ² d) double balanced 5605-XD__ ²

² Refer to the 9th and 10th digit of the pump model number.

Part Details for SC20 Series



¹ Illustration to the left contains single unbalanced seal (part #31-A). Optional seals are shown below.

Single Balanced Seal



31-B

Double Unbalanced Seal



31-C

Double Balanced Seal

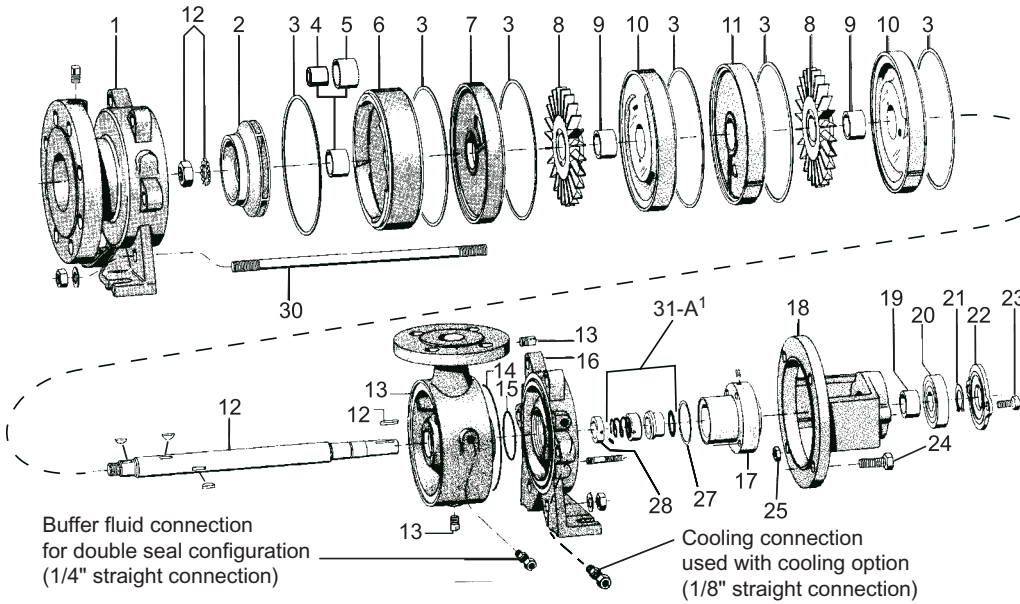


31-D

Item	Part No.	Description	Item	Part No.	Description	
1	5707	Suction casing with plug, cast iron	12	5873	Shaft assembly, three stage, stainless	
	5740	Suction casing with plug, ductile iron		5872	Shaft assembly, four stage, iron	
	5739	Suction casing with plug, stainless		5871	Shaft assembly, four stage, stainless	
2	5720	Suction impeller, bronze		5713	Shaft assembly, five stage, iron	
	5733	Suction impeller, stainless		5870	Shaft assembly, five stage, stainless	
3	5615	Stage gasket		5644	Shaft assembly, six stage, iron	
4	5695	Suction impeller shaft sleeve		5869	Shaft assembly, six stage, stainless	
5	5694	Suction impeller sleeve bearing		5867	Shaft assembly, seven stage, iron	
6	5712	Suction impeller case, cast iron		5866	Shaft assembly, seven stage, stainless	
	5761	Suction impeller case, ductile iron		5865	Shaft assembly, eight stage, iron	
	5760	Suction impeller case, stainless	5864	Shaft assembly, eight stage, stainless		
7	5716	First stage suction case, cast iron	13	5751	Discharge case, cast iron	
	5784	First stage suction case, ductile		5750	Discharge case, ductile iron	
	5783	First stage suction case, stainless		5749	Discharge case, stainless	
8	5613	Impeller, brass	14	2-2060A	Discharge case O-ring (high temperature only)	
	5643	Impeller, steel	15	2-2131A	Foot O-ring (high temperature only)	
	5731	Impeller, stainless	16	5645	Foot, standard models	
9	5766	Stage imp. sleeve bearing, bronze	5763	Foot, high temperature models		
	5696	Stage imp. sleeve bearing, carbon	17	5925	Seal housing, iron	
	5730	Stage imp. sleeve bearing, high temperature (prior to and including s/n: 9701448/1)		5764	Seal housing, stainless	
	5994	Stage imp. sleeve bearing, high temperature (after s/n: 9701448/1)	18	5901	Bearing bracket	
10	5811	Discharge stage case, cast iron, bronze bearing	19	5718	Spacer sleeve	
		5715	Discharge stage case, cast iron, carbon bearing	20	5614	Ball bearing, standard
	5810	Discharge stage case, ductile iron, bronze bearing	5687	Ball bearing, high temperature		
	5809	Discharge stage case, ductile iron, carbon bearing	21	5717	Retainer ring	
	5808	Discharge stage case, stainless steel, carbon bearing	22	5899	Bearing cover	
	Consult F.	High temperature models	23	Consult F.	Cover screw	
	11	5714	Suction stage case, cast iron	24	5934	Bearing bracket screw
		5792	Suction stage case, ductile iron	25	5933	Seal housing hex nut
12	5791	Suction stage case, stainless	26	5931	Stud bolt	
	Consult F.	Suction stage case, high temperature	27	5642	Seal housing gasket	
	5877	Shaft assembly, one stage, iron	28	5708	Seal locator ring (unbalanced only)	
	5732	Shaft assembly, one stage, stainless	29	5719-XA	Seal locator sleeve with O-ring (balanced only)	
	5876	Shaft assembly, two stage, iron	30	Consult F.	Tie rod	
	5875	Shaft assembly, two stage, stainless	31	Mechanical seal		
5874	Shaft assembly, three stage, iron	a) single unbalanced		5616-XA__ ²		
		b) single balanced		5616-XB__ ²		
		c) double unbalanced		5616-XC__ ²		
		d) double balanced	5616-XD__ ²			

²Refer to the 9th and 10th digit of the pump model number.

Part Details for SC30 Series



¹ Illustration to the left contains single unbalanced seal (part #31-A). Optional seals are shown below.

Single Balanced Seal



31-B

Double Unbalanced Seal



31-C

Double Balanced Seal

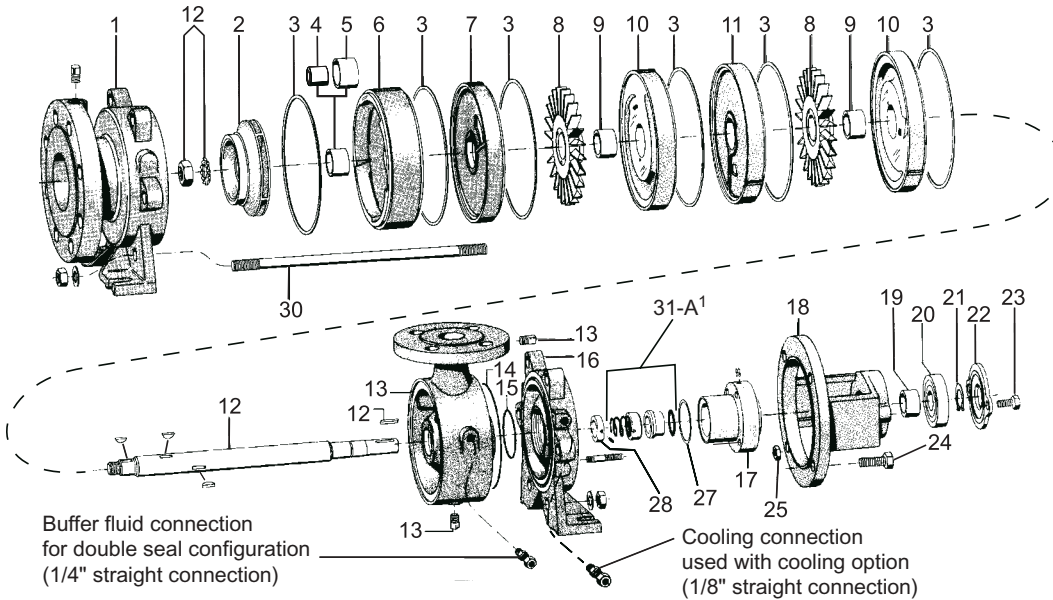


31-D

Item	Part No.	Description	Item	Part No.	Description
1	5707	Suction casing with plug, cast iron	12	5873	Shaft assembly, three stage, stainless
	5740	Suction casing with plug, ductile iron		5872	Shaft assembly, four stage, iron
	5739	Suction casing with plug, stainless		5871	Shaft assembly, four stage, stainless
2	5720	Suction impeller, bronze		5713	Shaft assembly, five stage, iron
	5733	Suction impeller, stainless		5870	Shaft assembly, five stage, stainless
3	5615	Stage gasket		5644	Shaft assembly, six stage, iron
4	5695	Suction impeller shaft sleeve		5869	Shaft assembly, six stage, stainless
5	5694	Suction impeller sleeve bearing		5867	Shaft assembly, seven stage, iron
6	5712	Suction impeller case, cast iron	5866	Shaft assembly, seven stage, stainless	
	5761	Suction impeller case, ductile iron	5865	Shaft assembly, eight stage, iron	
	5760	Suction impeller case, stainless	5864	Shaft assembly, eight stage, stainless	
7	5716	First stage suction case, cast iron	13	5751	Discharge case, cast iron
	5784	First stage suction case, ductile		5750	Discharge case, ductile iron
	5783	First stage suction case, stainless		5749	Discharge case, stainless
8	5613	Impeller, brass	14	2-2060A	Discharge case O-ring (high temperature only)
	5643	Impeller, steel	15	2-2131A	Foot O-ring (high temperature only)
	5731	Impeller, stainless	16	5645	Foot, standard models
9	5766	Stage imp. sleeve bearing, bronze		5763	Foot, high temperature models
		5696	Stage imp. sleeve bearing, carbon	17	5925
	5730	Stage imp. sleeve bearing, high temp. (prior to and including s/n: 9701448/1)	5764		Seal housing, stainless
	5994	Stage imp. sleeve bearing, high temp. (after s/n: 9701448/1)	18	5901	Bearing bracket
10	5807	Discharge stage case, cast iron, bronze bearing	19	5718	Spacer sleeve
	5806	Discharge stage case, cast iron, carbon bearing	20	5614	Ball bearing, standard
	5805	Discharge stage case, ductile iron, bronze bearing	5687	Ball bearing, high temperature	
	5804	Discharge stage case, ductile iron, carbon bearing	21	5717	Retainer ring
	5803	Discharge stage case, stainless steel, carbon bearing	22	5899	Bearing cover
	Consult F.	High temperature models	23	Consult F.	Cover screw
	11	5714	Suction stage case, cast iron	24	5934
5792		Suction stage case, ductile iron	25	5933	Seal housing hex nut
5791		Suction stage case, stainless	26	5931	Stud bolt
Consult F.		Suction stage case, high temperature	27	5642	Seal housing gasket
12	5877	Shaft assembly, one stage, iron	28	5708	Seal locator ring (unbalanced only)
	5732	Shaft assembly, one stage, stainless	29	5719-XA	Seal locator sleeve with O-ring (balanced only)
	5876	Shaft assembly, two stage, iron	30	Consult F.	Tie rod
	5875	Shaft assembly, two stage, stainless	31	Mechanical seal	
	5874	Shaft assembly, three stage, iron		a) single unbalanced	5616-XA__ ²
				b) single balanced	5616-XB__ ²
		c) double unbalanced	5616-XC__ ²		
		d) double balanced	5616-XD__ ²		

² Refer to the 9th and 10th digit of the pump model number.

Part Details for SC40 Series



¹ Illustration to the left contains single unbalanced seal (part #31-A). Optional seals are shown below.

Single Balanced Seal



31-B

Double Unbalanced Seal



31-C

Double Balanced Seal

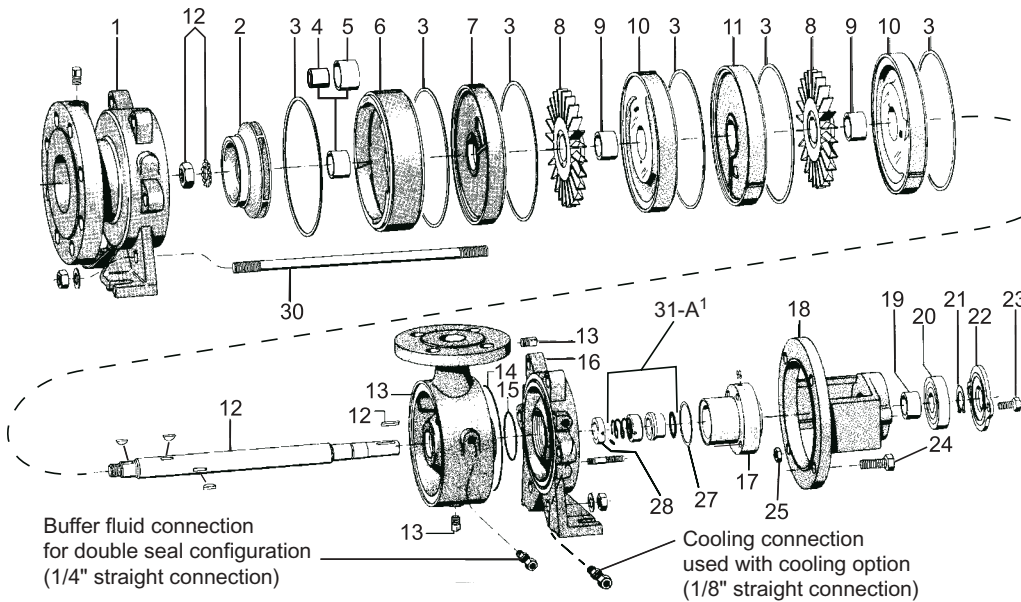


31-D

Item	Part No.	Description	Item	Part No.	Description
1	5738	Suction casing with plug, cast iron	12	5858	Shaft assembly, three stage, stainless
	5737	Suction casing with plug, ductile iron		5857	Shaft assembly, four stage, iron
	5736	Suction casing with plug, stainless		5856	Shaft assembly, four stage, stainless
2	5903	Suction impeller, bronze		5727	Shaft assembly, five stage, iron
	5894	Suction impeller, stainless		5855	Shaft assembly, five stage, stainless
3	5666	Stage gasket		5669	Shaft assembly, six stage, iron
4	5695	Suction impeller shaft sleeve		5854	Shaft assembly, six stage, stainless
5	5694	Suction impeller sleeve bearing		5853	Shaft assembly, seven stage, iron
6	5759	Suction impeller case, cast iron	5852	Shaft assembly, seven stage, stainless	
	5758	Suction impeller case, ductile iron	5851	Shaft assembly, eight stage, iron	
	5756	Suction impeller case, stainless	5850	Shaft assembly, eight stage, stainless	
7	N/A	First stage suction case, cast iron	13	5748	Discharge case, cast iron
	N/A	First stage suction case, ductile		5747	Discharge case, ductile iron
	N/A	First stage suction case, stainless		5746	Discharge case, stainless
8	5667	Impeller, brass	14	2-2060A	Discharge case O-ring (high temperature only)
	5891	Impeller, steel	15	2-2131A	Foot O-ring (high temperature only)
	5892	Impeller, stainless	16	5833	Foot, standard models
9	5668	Stage imp. sleeve bearing, bronze	5832	Foot, high temperature models	
	5726	Stage imp. sleeve bearing, carbon	17	5926	Seal housing, iron
	5922	Stage imp. sleeve bearing, high temp. (prior to and including s/n: 9701448/1)		5927	Seal housing, stainless
	5993	Stage imp. sleeve bearing, high temp. (after s/n: 9701448/1)	18	5728	Bearing bracket
10	5802	Discharge stage case, cast iron, bronze bearing	19	5917	Spacer sleeve
		Discharge stage case, cast iron, carbon bearing	20	5729	Ball bearing, standard
	5801	Discharge stage case, cast iron, carbon bearing	5768	Ball bearing, high temperature	
	5800	Discharge stage case, ductile iron, bronze bearing	21	5910	Retainer ring
	5799	Discharge stage case, ductile iron, carbon bearing	22	5898	Bearing cover
	5798	Discharge stage case, stainless steel, carbon bearing	23	Consult F.	Cover screw
	Consult F.	High temperature models	24	5934	Bearing bracket screw
11	5790	Suction stage case, cast iron	25	5933	Seal housing hex nut
	5789	Suction stage case, ductile iron	26	5932	Stud bolt
	5788	Suction stage case, stainless	27	5642	Seal housing gasket
	Consult F.	Suction stage case, high temperature	28	5973	Seal locator ring (unbalanced only)
12	5863	Shaft assembly, one stage, iron	29	5977-XA	Seal locator sleeve with O-ring (balanced only)
	5862	Shaft assembly, one stage, stainless	30	Consult F.	Tie rod
	5861	Shaft assembly, two stage, iron	31	Mechanical seal	
	5860	Shaft assembly, two stage, stainless		a) single unbalanced	5670-XA__ ²
	5859	Shaft assembly, three stage, iron		b) single balanced	5670-XB__ ²
c) double unbalanced				5670-XC__ ²	
		d) double balanced	5670-XD__ ²		

² Refer to the 9th and 10th digit of the pump model number.

Part Details for SC50 Series



¹ Illustration to the left contains single unbalanced seal (part #31-A). Optional seals are shown below.

Single Balanced Seal



31-B

Double Unbalanced Seal



31-C

Double Balanced Seal

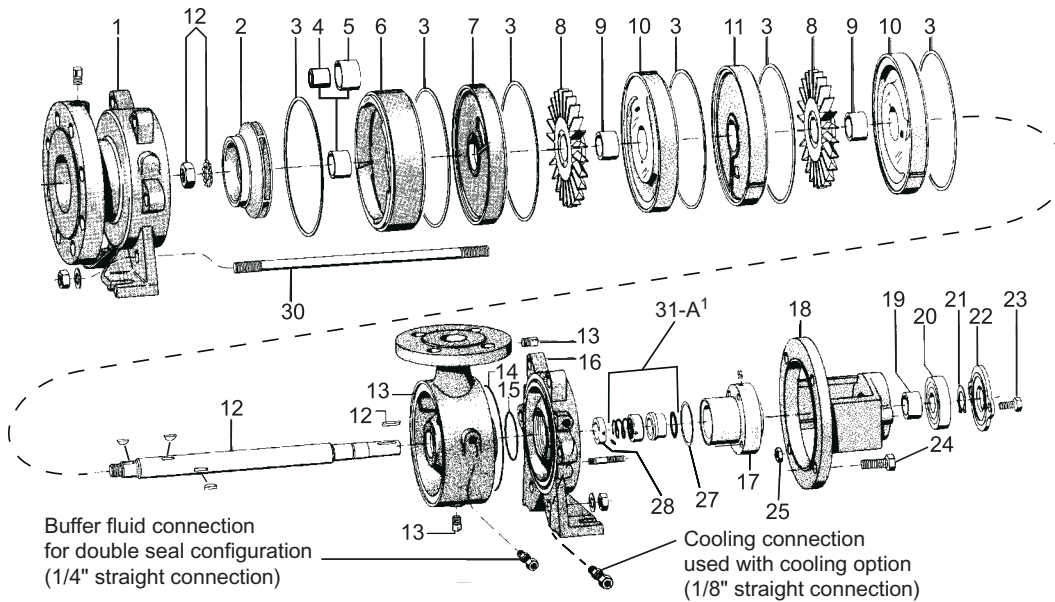


31-D

Item	Part No.	Description	Item	Part No.	Description
1	N/A 5735 5734	Suction casing with plug, cast iron Suction casing with plug, ductile iron Suction casing with plug, stainless	12	5844 5843 5842 5841 5840 5839 5838 5671 5837 5836 5828	Shaft assembly, three stage, stainless Shaft assembly, four stage, iron Shaft assembly, four stage, stainless Shaft assembly, five stage, iron Shaft assembly, five stage, stainless Shaft assembly, six stage, iron Shaft assembly, six stage, stainless Shaft assembly, seven stage, iron Shaft assembly, seven stage, stainless Shaft assembly, eight stage, iron Shaft assembly, eight stage, stainless
2	5893 5689	Suction impeller, bronze Suction impeller, stainless	13	5745 5744 5743	Discharge case, cast iron Discharge case, ductile iron Discharge case, stainless
3	5622	Stage gasket	14	2-2066A	Discharge case O-ring (high temperature only)
4	5918	Suction impeller shaft sleeve	15	2-2131A	Foot O-ring (high temperature only)
5	5767	Suction impeller sleeve bearing	16	5831 5830	Foot, standard models Foot, high temperature models
6	N/A 5757 5686	Suction impeller case, cast iron Suction impeller case, ductile iron Suction impeller case, stainless	17	5928 5929	Seal housing, iron Seal housing, stainless
7	N/A N/A N/A	First stage suction case, cast iron First stage suction case, ductile iron First stage suction case, stainless	18	5900	Bearing bracket
8	5663 5620 5688	Impeller, brass Impeller, steel Impeller, stainless	19	5916	Spacer sleeve
9	5920 5755 5921 5992	Stage imp. sleeve bearing, bronze Stage imp. sleeve bearing, carbon Stage imp. sleeve bearing, high temp. (prior to and including s/n: 9701448/1) Stage imp. sleeve bearing, high temp. (after s/n: 9701448/1)	20	5621 5692	Ball bearing, standard Ball bearing, high temperature
10	5797 5796 5795 5794 5793 Consult F.	Discharge stage case, cast iron, bronze bearing Discharge stage case, cast iron, carbon bearing Discharge stage case, ductile iron, bronze bearing Discharge stage case, ductile iron, carbon bearing Discharge stage case, stainless steel, carbon bearing High temperature models	21	5911	Retainer ring
11	5787 5786 5785 Consult F.	Suction stage case, cast iron Suction stage case, ductile iron Suction stage case, stainless Suction stage case, high temperature	22	5897	Bearing cover
12	5849 5848 5847 5846 5845	Shaft assy, one stage, iron Shaft assy, one stage, stainless Shaft assy, two stage, iron Shaft assy, two stage, stainless Shaft assy, three stage, iron	23	Consult F.	Cover screw
			24	5934	Bearing bracket screw
			25	5933	Seal housing hex nut
			26	5932	Stud bolt
			27	5654	Seal housing gasket
			28	5972	Seal locator ring (unbalanced only)
			29	5976-XA	Seal locator sleeve with O-ring (balanced only)
			30	Consult F.	Tie rod
			31		Mechanical seal a) single unbalanced 5623-XA__ ² b) single balanced 5623-XB__ ² c) double unbalanced 5623-XC__ ² d) double balanced 5623-XD__ ²

²Refer to the 9th and 10th digit of the pump model number.

Part Details for SC60 Series



¹ Illustration to the left contains single unbalanced seal (part #31-A). Optional seals are shown below.

Single Balanced Seal



31-B

Double Unbalanced Seal



31-C

Double Balanced Seal

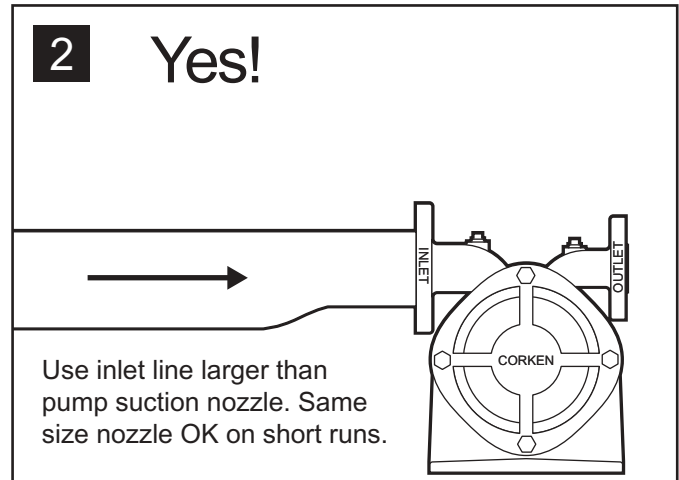
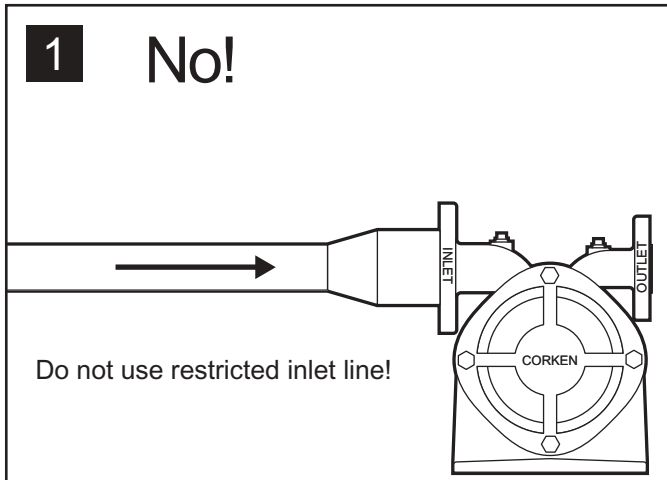


31-D

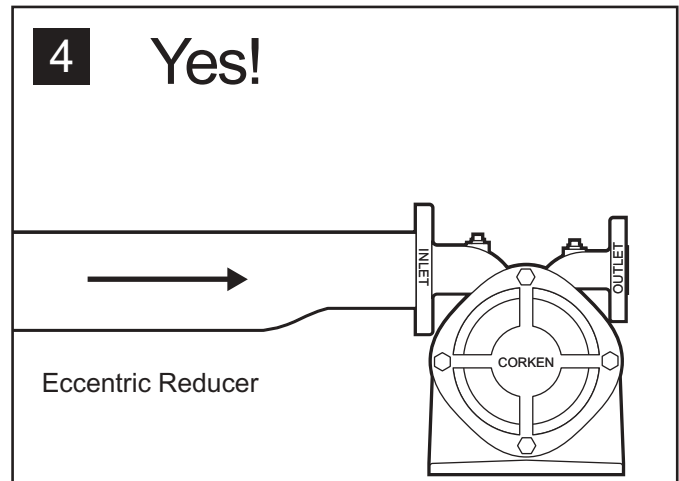
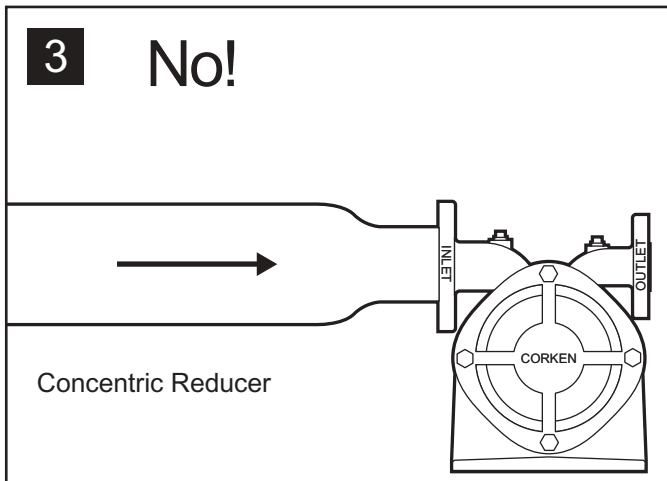
Item	Part No.	Description	Item	Part No.	Description
1	5967	Suction casing with plug, cast iron	12	5945	Shaft assembly, three stage, stainless
	5966	Suction casing with plug, ductile iron		5631	Shaft assembly, four stage, iron
	5965	Suction casing with plug, stainless		5943	Shaft assembly, four stage, stainless
2	5968	Suction impeller, bronze		5942	Shaft assembly, five stage, iron
	5969	Suction impeller, stainless		5941	Shaft assembly, five stage, stainless
3	5629	Stage gasket		5632	Shaft assembly, six stage, iron
4	N/A	Suction impeller shaft sleeve		5939	Shaft assembly, six stage, stainless
5	5673	Suction impeller sleeve bearing		5938	Shaft assembly, seven stage, iron
6	5959	Suction impeller case, cast iron	5937	Shaft assembly, seven stage, stainless	
	5960	Suction impeller case, ductile iron	5633	Shaft assembly, eight stage, iron	
	5961	Suction impeller case, stainless	5936	Shaft assembly, eight stage, stainless	
7	N/A	First stage suction case, cast iron	13	5964	Discharge case, cast iron
	N/A	First stage suction case, ductile		5963	Discharge case, ductile iron
	N/A	First stage suction case, stainless		5962	Discharge case, stainless
8	5970	Impeller, brass	14	Consult F.	Discharge case O-ring (high temperature only)
	5627	Impeller, steel	15	Consult F.	Foot O-ring (high temperature only)
	5953	Impeller, stainless	16	5951	Foot, standard models
9	N/A	Stage imp. sleeve bearing, bronze	Consult F.		Foot, high temperature models
	5672	Stage imp. sleeve bearing, carbon	17	5979	Seal housing, iron
	Consult F.	Stage imp. sleeve bearing, high temperature		5980	Seal housing, stainless
10	N/A	Discharge stage case, cast iron, bronze bearing	18	5940	Bearing bracket
	5957	Discharge stage case, cast iron, carbon bearing	19	N/A	Spacer sleeve
	N/A	Discharge stage case, ductile iron, bronze bearing	20	5628	Ball bearing, standard
	5956	Discharge stage case, ductile iron, carbon bearing		Consult F.	Ball bearing, high temperature
	5955	Discharge stage case, stainless steel, carbon bearing	21	5912	Retainer ring
		Consult F.		High temperature models	22
11	5656	Suction stage case, cast iron	23	Consult F.	Cover screw
	5625	Suction stage case, ductile iron	24	Consult F.	Bearing bracket screw
	5958	Suction stage case, stainless		25	5933
12	Consult F.	Suction stage case, high temperature	26	5930	Stud bolt
	5950	Shaft assembly, one stage, iron	27	5658	Seal housing gasket
	5949	Shaft assembly, one stage, stainless	28	5971	Seal locator ring (unbalanced only)
	5948	Shaft assembly, two stage, iron	29	5975-XA	Seal locator sleeve with O-ring (balanced only)
	5947	Shaft assembly, two stage, stainless		30	Consult F.
	5946	Shaft assembly, three stage, iron	31		Mechanical seal
				a) single unbalanced	5630-XA__ ²
	b) single balanced	5630-XB__ ²			
	c) double unbalanced	5630-XC__ ²			
	d) double balanced	5630-XD__ ²			

²Refer to the 9th and 10th digit of the pump model number.

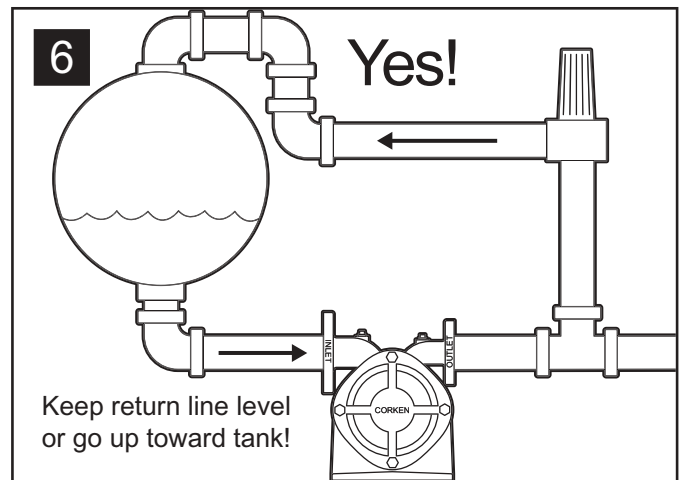
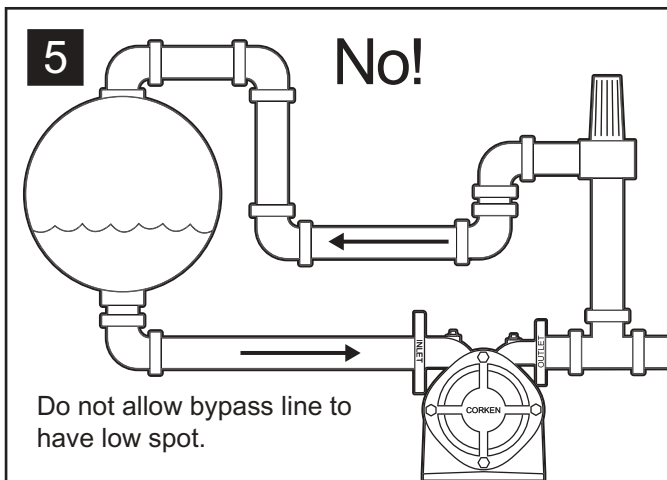
Piping Tips



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

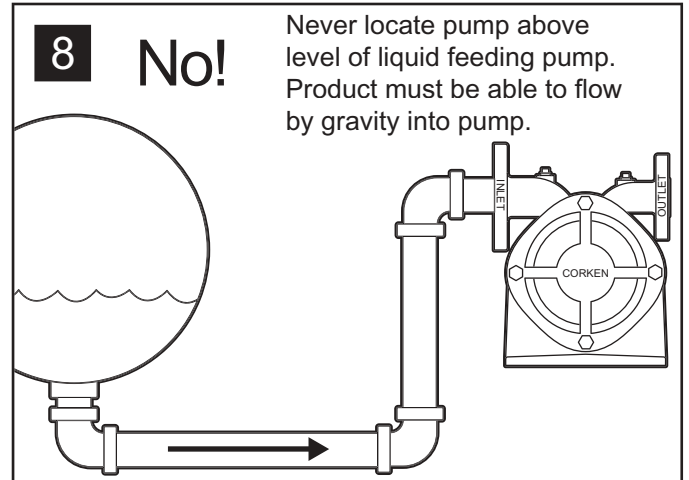
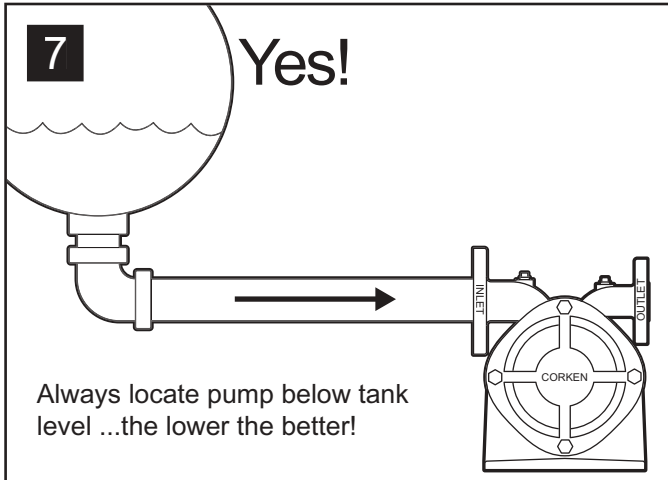


An eccentric reducer should always be used when reducing into any pump inlet where vapor might be encountered in the pumpage. The flat upper portion of the reducer prevents an accumulation of vapor that could interfere with pumping action.

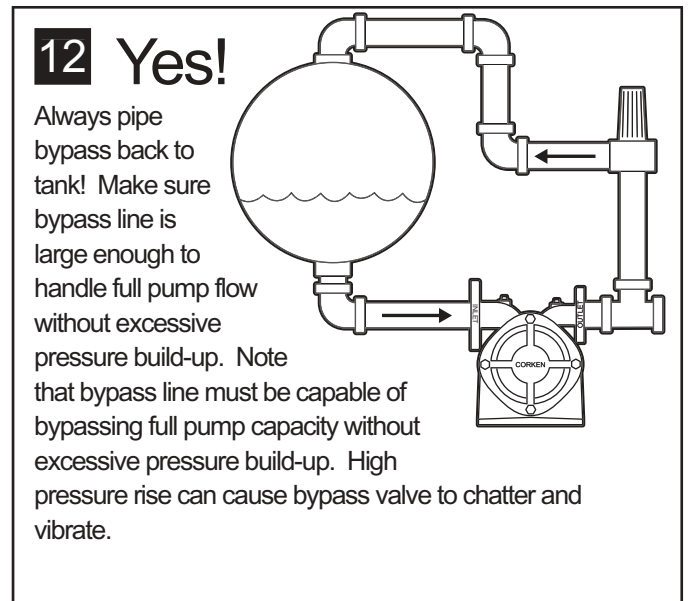
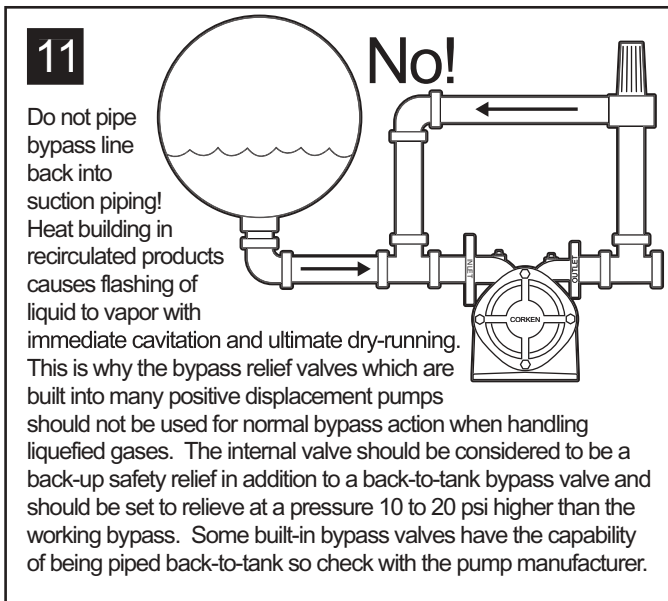
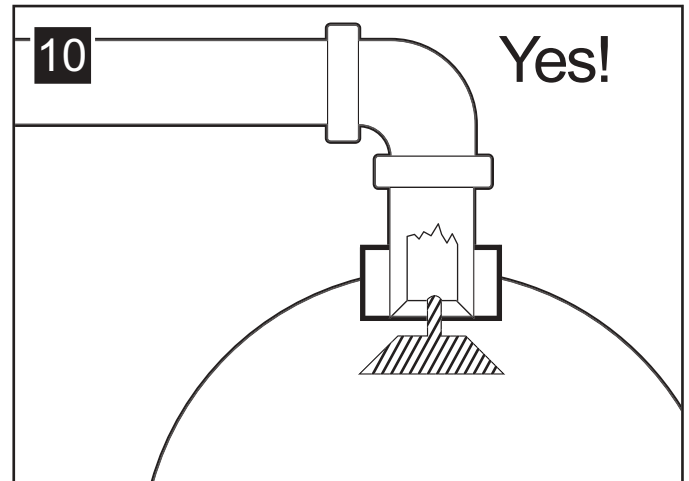
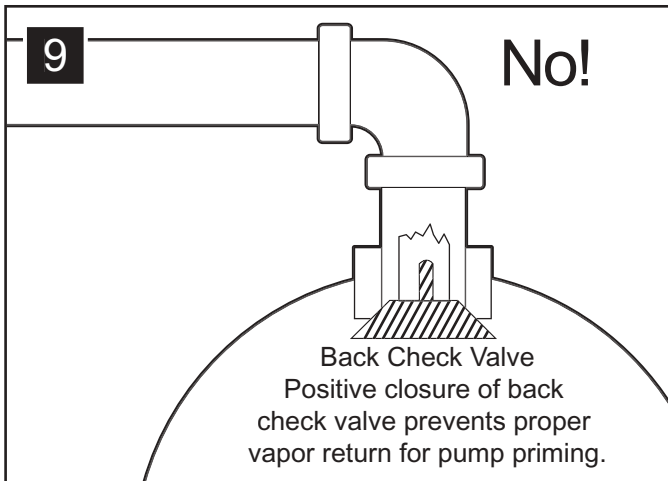


Low spots in bypass line can collect liquid which prevents normal vapor passage for priming purposes just like the P trap in the drain of a kitchen sink. This is not a problem for bypass lines where vapor elimination is not required.

Piping Tips

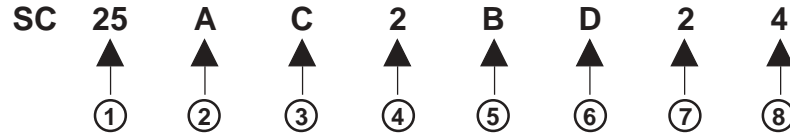


Since liquefied gases boil when drawn into a pump by its own suction, the pump must be fed by gravity flow to give stable, trouble-free operation.



Appendix A

Model Number & Materials Selection Guide for Mechanical Seal Model



① **Basic Model** (first number indicates series while second number indicates number of stages)

② **Flange and Ports**

A–300 lb. ANSI compatible flanges/NPT tapped gauge and drain ports (available for all models except 10 series)

D–DIN flanges/straight thread gauge ports

W–DIN flange with weld neck compatible flanges included with the pump/NPT tapped gauge and drain ports (available for 10 series only)

③ **Sleeve Bearing Material**

B–Bronze (available for all models except 60 series) (only available in pumps with bronze impellers)

C–Carbon (all models)

④ **Temperature Option**

2–Standard for temperatures below 250°F (120°C).

3–Option for temperatures between 250°F (120°C) and 430°F (220°C). Also can be used as heating option for low temperature applications.

Note: This option requires cooling water be supplied to pump.

⑤ **Seal Type**

A–Single Unbalanced (discharge pressure from pump must be less than 230 psig, 16 bar)

B–Single Balanced (good for pressures exceeding 230 psig, 16 bar)

C–Double Unbalanced (discharge pressure from pump must be less than 230 psig, 16 bar)

D–Double Balanced (good for pressures exceeding 230 psig, 16 bar)

E–Quench Unbalanced (discharge pressure from pump must be less than 230 psig, 16 bar)

G–Quench Balanced (good for pressures exceeding 230 psig, 16 bar)

⑥ **O-ring Material**

B–Neoprene®¹

D–Viton®¹

E–Teflon®¹

G–Ethylene Propylene

⑦ **Seal Face / Seal Seat**

1–Carbon Graphite/Aluminum Oxide (standard for unbalanced single seals and all double seals)

2–Aluminum Oxide/Carbon Graphite (standard for single balanced seals)

3–Silicon Carbide/Carbon Graphite (standard for high temp option)

4–Silicon Carbide/Silicon Carbide

1L–Silicon Carbide/Carbon Graphite (unbalanced single seal - LPG only) (pressures below 230 psig, 16 bar)

2L–Carbon Graphite/Silicon Carbide (balanced single seal - LPG only) (pressures below 580 psig)

3L–Carbon Graphite/Silicon Carbide (balanced single seal - LPG only) (pressures below 360 psig)

⑧ **Material- Case/Impeller**

1–Ductile Iron/Bronze

2–Ductile Iron/Steel

3–Stainless Steel/Stainless Steel

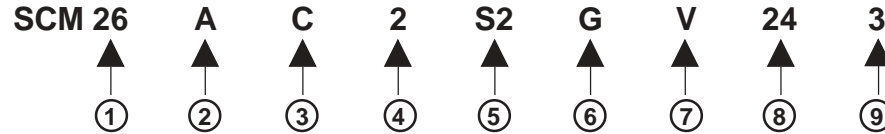
4–Cast Iron/Bronze

5–Cast Iron/Steel

¹Neoprene®, Viton®, and Teflon® are registered trademarks of the Dupont Company.

Appendix A

Model Number & Materials Selection Guide for Magnetic Drive Model

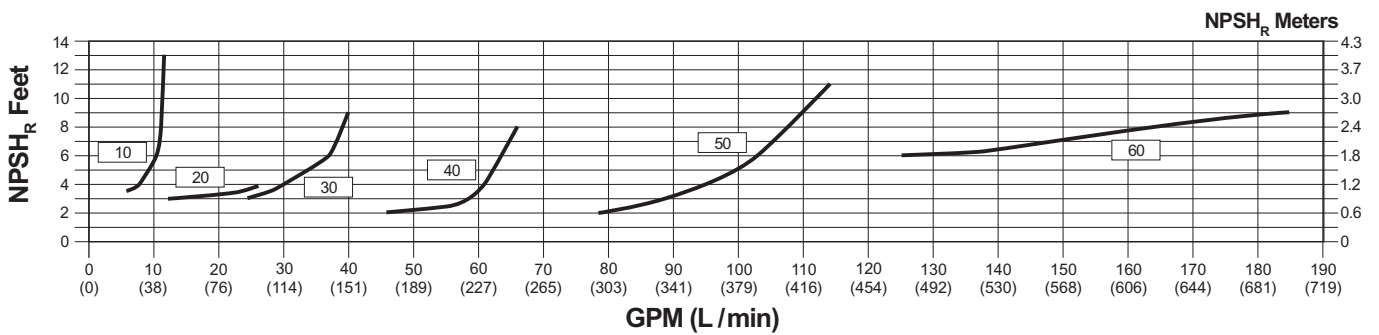
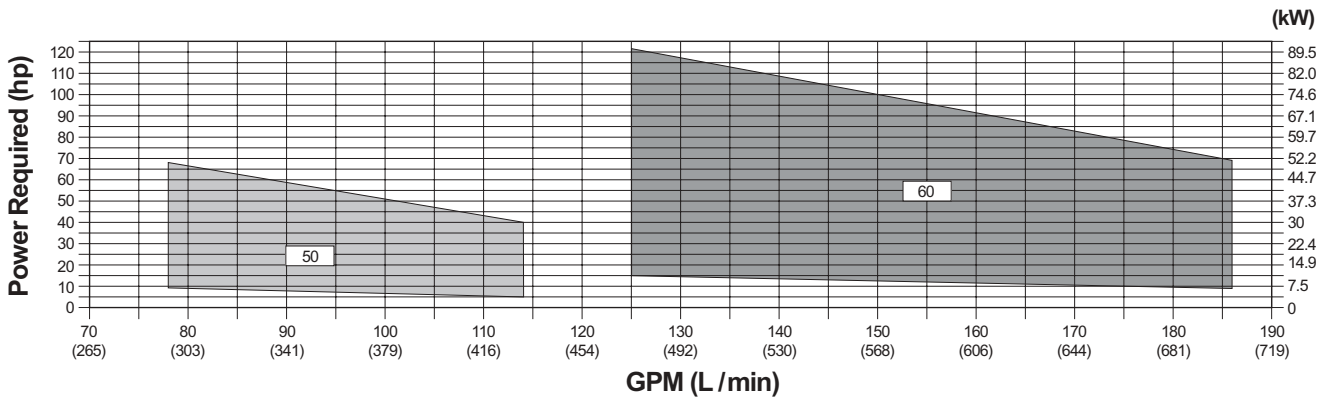
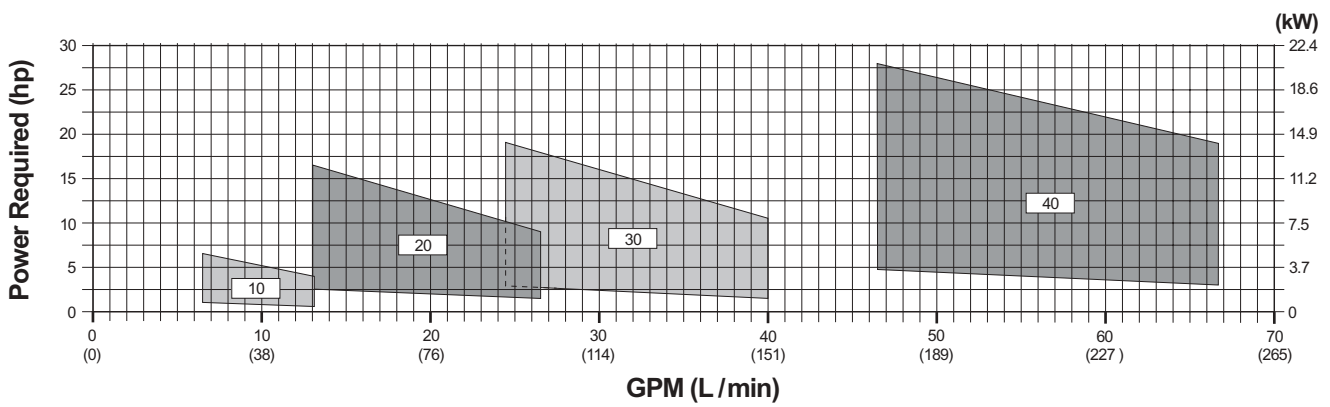
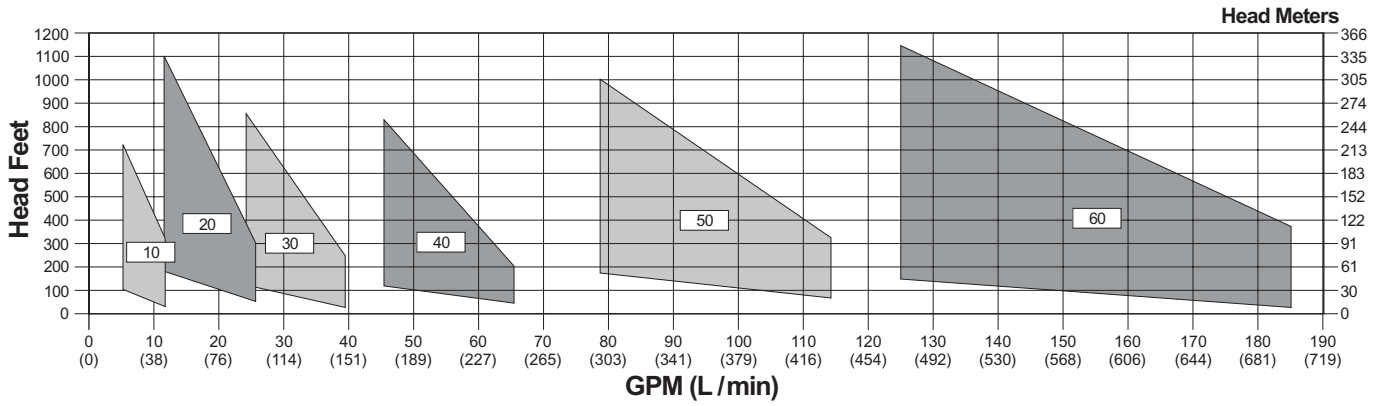


- ① **Basic Model** (first number indicates series while the second number indicates number of stages)
- ② **Flange and Ports**
 - A–300 Lb. ANSI compatible flanges/NPT tapped gauge and drain ports (available for all models except 10 series)
 - D–DIN flanges/straight thread gauge ports
 - W–DIN flange with weld neck compatible flanges included with the pump/NPT tapped gauge and drain ports (available for 10 series only)
- ③ **Sleeve Bearing Material**
 - B–Bronze (only available in pumps with bronze impellers)
 - C–Carbon (all models)
- ④ **Temperature Option**
 - 2–Standard for temperatures below 250°F (120°C).
 - 3–Option for temperatures between 250°F (120°C) and 390°F (200°C). Also can be used as heating option for low temperature applications.
- ⑤ **Bearing Material (magnetic coupling)**
 - S2–Silicon Carbide (pressureless sintered)
- ⑥ **Ball Bearing Lubrication**
 - O–Oil
 - G–Grease (standard)
- ⑦ **Separation Canister Material**
 - V–Stainless Steel
 - H–Hastelloy
- ⑧ **Magnetic Coupling Size**
 - 12–1.1 Hp (10-30 Series)
 - 14–2.6 Hp (10-30 Series)
 - 16–3.8 Hp (10-30 Series)
 - 22–2.6 Hp (20-50 Series)
 - 24–7.6 Hp (20-50 Series)
 - 26–11.3 Hp (20-50 Series)
 - 36–16.8 Hp (40-50 Series)
 - 38–28.5 Hp (40-50 Series)
- ⑨ **Material for Case/Impeller**
 - 1–Ductile Iron/Bronze
 - 2–Ductile Iron/Steel
 - 3–Stainless Steel/Stainless Steel
 - 4–Cast Iron/Bronze
 - 5–Cast Iron/Steel

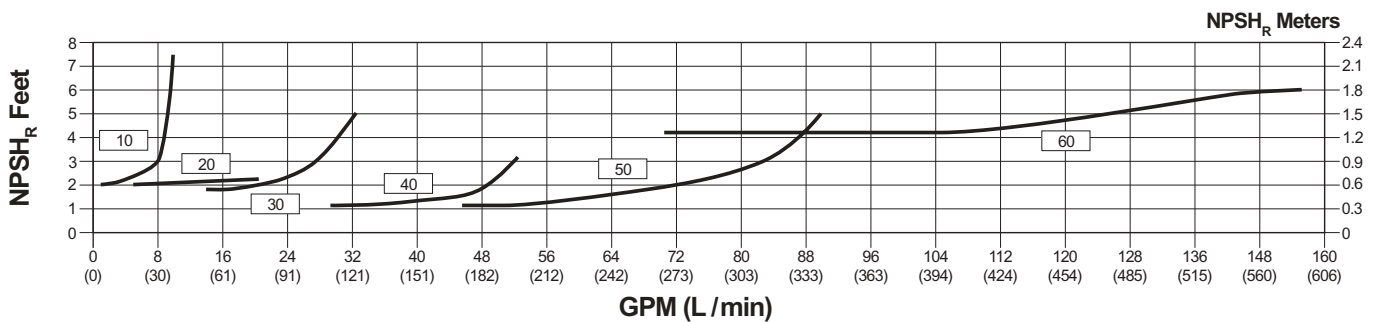
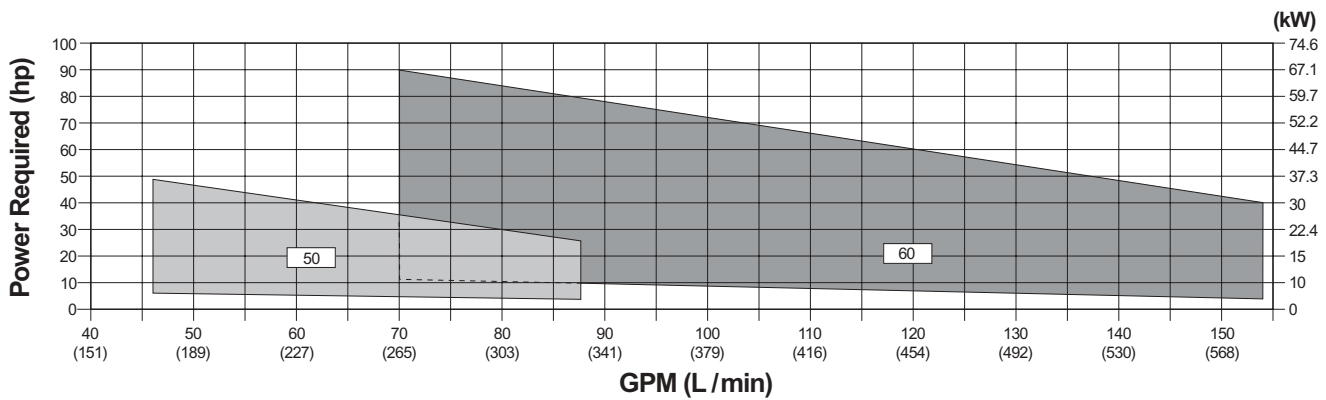
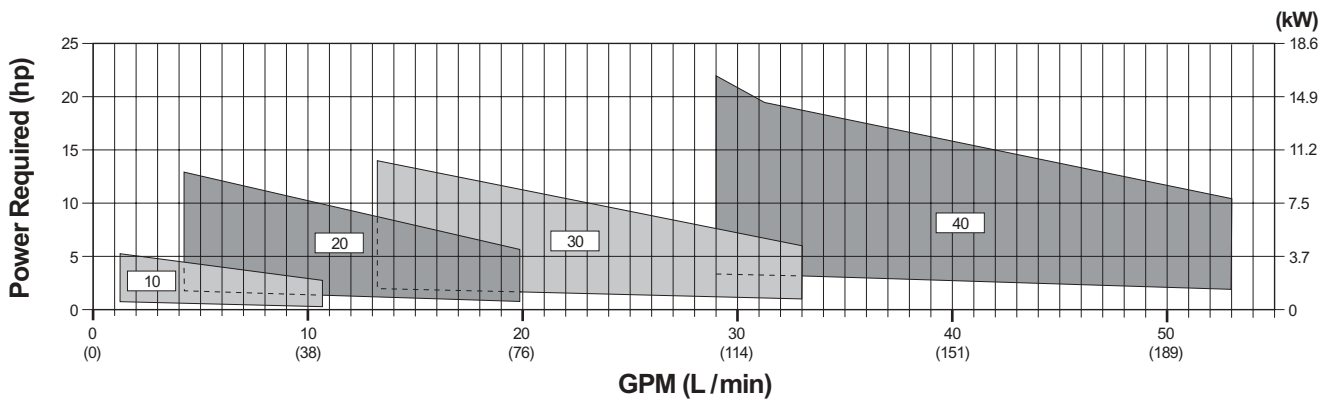
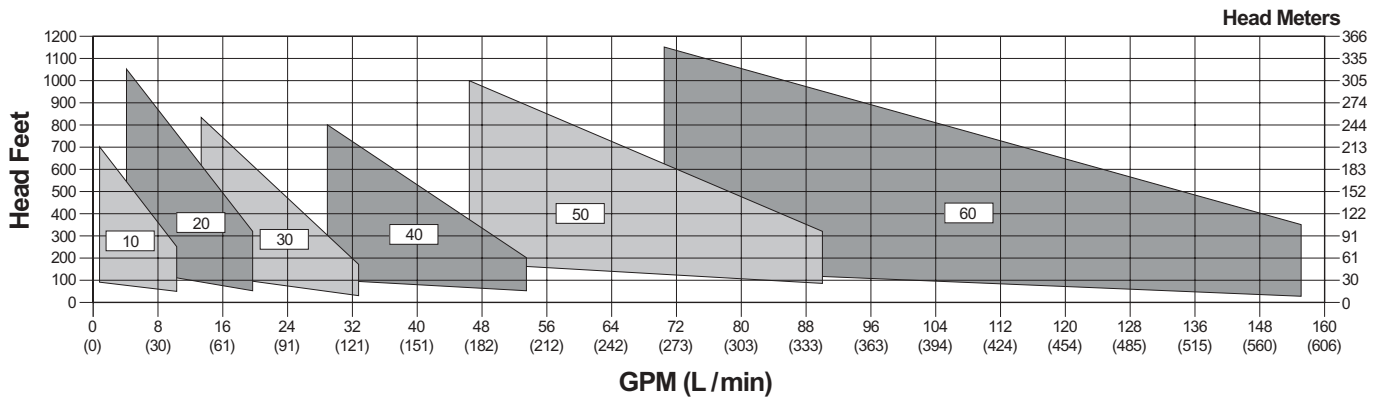
Appendix B—Technical Specifications

Series number	10	20	30	40	50	60
Number of stages	1 to 8					
Inlet flange inches (mm)	1-1/2 (40)	2-1/2 (65)	2-1/2 (65)	3 (80)	4 (100)	4 (100)
Outlet flange inches (mm)	3/4 (20)	1-1/4 (32)	1-1/4 (32)	1-1/2 (40)	2 (50)	2-1/2 (65)
Maximum RPM	1750					
Minimum RPM	900					
Maximum working pressure psi (bar)	580 (40)					
Differential range head feet (m)	50–690 (15–210)	65–1050 (20–320)	30–820 (10–250)	30–805 (10–245)	30–950 (10–290)	30–1150 (10–350)
Minimum temperature °F (°C)	-40° (-40°)					
Maximum temperature °F (°C)	428° (220°)					
NPSH _R range feet (m)	1.6–13 (.5–4)	2–3.3 (.6–1)	1.6–6.6 (.5–2)	1.3–8.2 (.4–2.5)	1.3–12 (.4–3.5)	4.6–8.2 (1.4–2.5)
Maximum viscosity SSU (cSt)	1050 (230)					
Maximum proportion of gas allowable	50%					

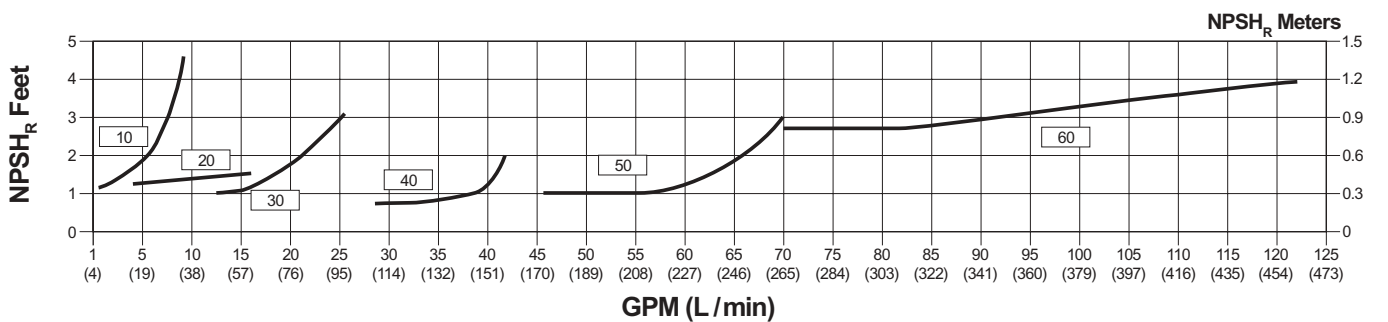
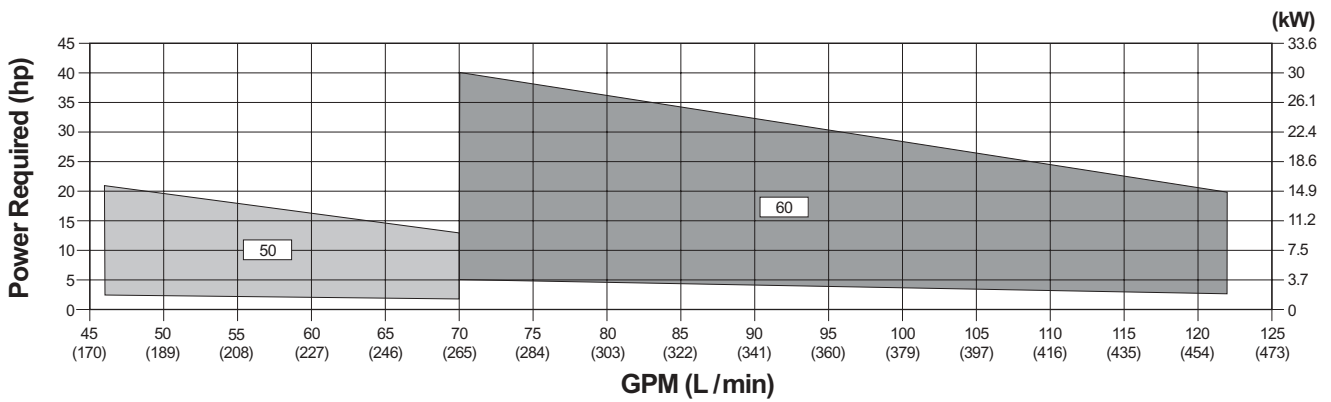
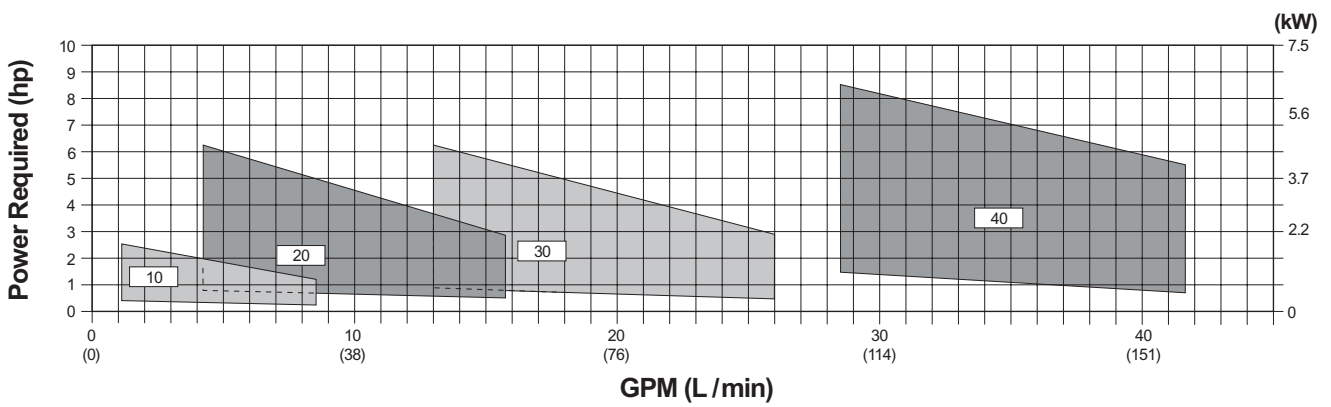
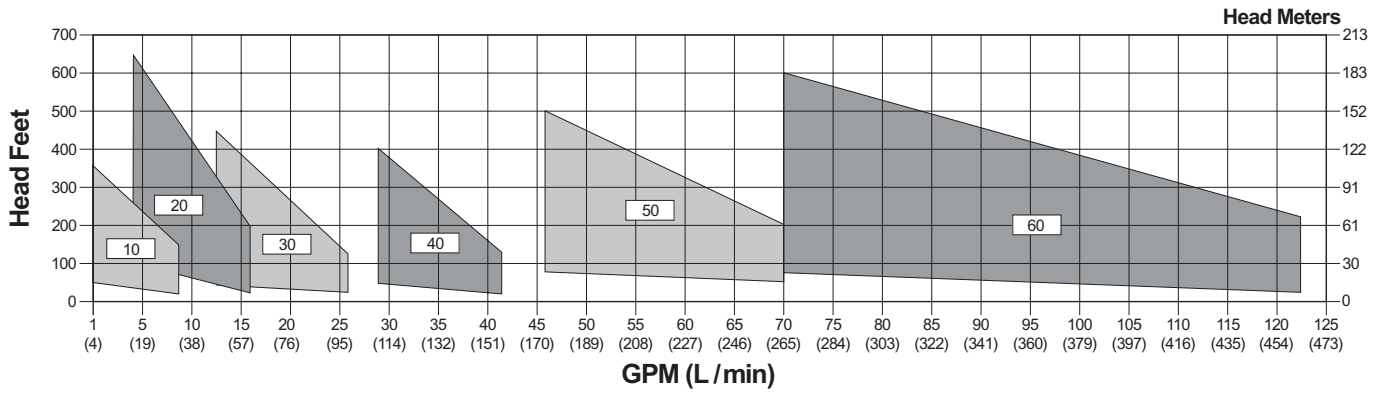
Appendix C—Performance Curves @ 1750 RPM



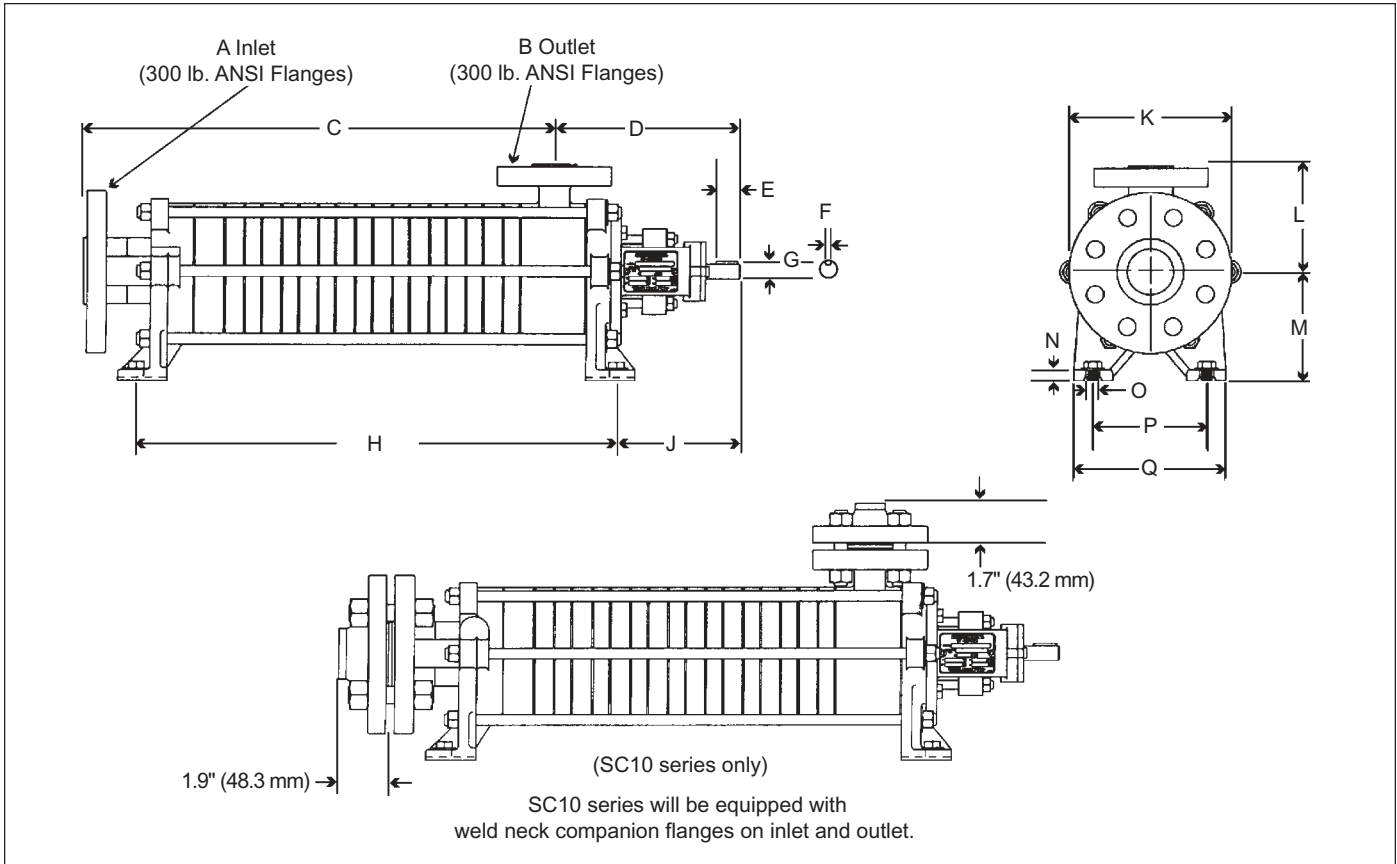
Appendix C—Performance Curves @ 1450 RPM



Appendix C—Performance Curves @ 1150 RPM



Appendix D—Outline Dimensions for SC Pumps



Series	Inlet A*	Outlet B*	D	E	F	G	J	K	L	M	N	O	P	Q
SC10	1-1/2	3/4	6.73	**	**	**	4.45	5.91	3.94	3.94	0.39	0.51	4.13	5.51
	40	20	171	25	5	14	113	150	100	100	10	13	105	140
SC20 and 30	2-1/2	1-1/4	7.91	**	**	**	5.28	7.28	5.20	4.41	0.51	0.55	5.31	6.69
	65	32	210	40	6	19	134	185	132	112	13	14	135	170
SC40	3	1-1/2	7.68	**	**	**	5.59	7.87	5.51	5.20	0.59	0.59	6.10	7.68
	80	40	195	45	8	24	142	200	140	132	15	15	155	195
SC50	4	2	9.33	**	**	**	6.26	9.25	6.50	6.30	0.71	0.59	6.69	8.46
	100	50	237	50	10	28	159	235	165	160	18	15	170	215
SC60	4	2-1/2	10.31	**	**	**	6.77	9.25	7.09	7.09	0.79	0.59	7.68	9.65
	100	65	262	65	10	32	172	235	180	180	20	15	195	245

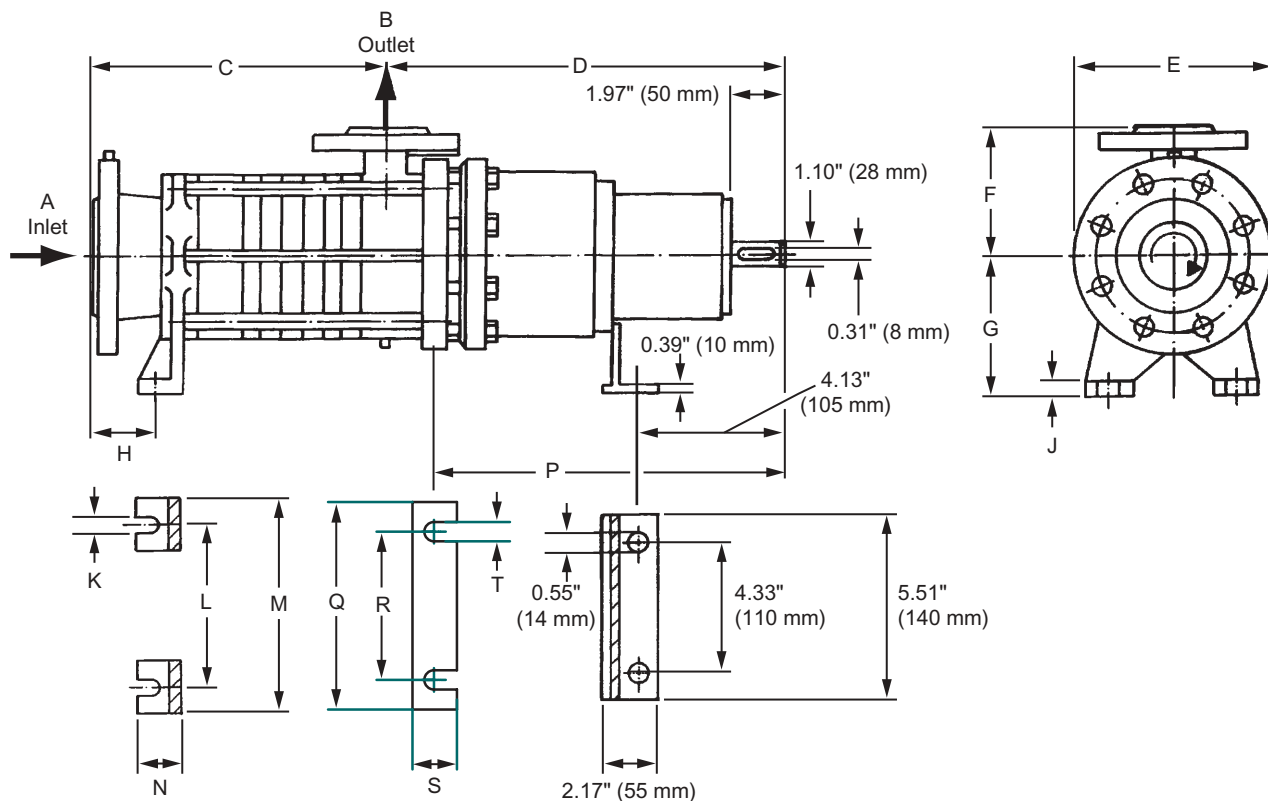
*Inlet and outlet flanges are per DIN spec (PN40 DIN 2501). Flanges can be drilled per ANSI for 300 lb. flanges, except for SC10 series.

**These dimensions are available in metric only. U.S. couplings must be machined before use.

Series	1 Stage		2 Stage		3 Stage		4 Stage		5 Stage		6 Stage		7 Stage		8 Stage	
	C	H	C	H	C	H	C	H	C	H	C	H	C	H	C	H
SC10	7.68	8.03	9.02	9.37	10.35	14.65	11.69	12.05	13.03	13.39	14.37	14.72	15.71	16.06	17.05	17.40
	195	204	229	238	263	372	297	306	331	340	365	374	399	408	433	442
SC20 and 30	8.39	8.94	9.96	10.51	11.54	12.09	13.11	13.66	14.69	15.24	16.26	16.81	17.83	18.39	19.41	19.96
	213	227	253	267	293	307	333	347	373	387	413	427	453	467	493	507
SC40	10.55	10.20	12.72	12.36	14.88	14.53	17.05	16.69	19.21	18.86	21.38	21.02	23.54	23.19	26.89	25.35
	268	259	323	314	378	369	433	424	488	479	543	534	598	589	653	644
SC50	12.01	12.32	14.96	15.28	17.91	18.23	20.87	21.18	23.82	24.13	26.77	27.09	29.72	30.04	32.68	32.99
	305	313	380	388	455	463	530	538	605	613	680	688	755	763	830	838
SC60	13.31	13.90	16.85	17.44	20.39	20.98	23.94	24.53	27.48	28.07	31.02	31.61	34.57	35.16	38.11	38.70
	338	353	428	443	518	533	608	623	698	713	788	803	878	893	968	983

Dimensions shown in grey area are millimeters while non-shaded areas are inches.

Appendix D—Outline Dimensions for SCM Pumps



NOTE:

- 1) SCM10 series will be equipped with weld neck companion flanges on inlet and outlet.
- 2) For pumps containing four to eight stages, a middle foot is required. For dimensions see the chart on page 34.

Series	Inlet A ¹	Inlet B ¹	D ²	E	F	G	H	J	K	L	M	N	P ²
SCM10	1.5	0.75	14.33	5.91	3.94	3.94	1.93	0.39	0.51	4.13	5.51	1.73	11.54
SCM20 and 30	2.5	1.25	13.97 / 14.76	7.28	5.20	4.41	2.09	0.51	0.55	5.31	6.69	1.89	11.85 / 12.64
SCM40	3	1.5	14.09 / 15.16	7.87	5.51	5.20	2.48	0.59	0.59	6.10	7.68	2.17	11.10 / 12.17
SCM50	4	2	14.56 / 15.35	9.25	6.50	6.30	2.83	0.63	0.59	6.89	8.66	2.13	11.54 / 12.44

¹Inlet and outlet flanges are per DIN spec (PN40 DIN 2501). Flanges can be drilled per ANSI for 300 lb flanges, except for SC10 series.
²Depends on the magnetic coupling selected.

Series	C Number of stages							
	1	2	3	4	5	6	7	8
SCM10	7.68	9.02	10.35	11.69	13.03	14.37	15.71	17.05
	195	229	263	297	331	365	399	433
SCM20 & 30	8.39	9.96	11.54	13.11	14.69	16.26	17.83	19.41
	213	253	293	333	373	413	453	493
SCM40	10.55	12.72	14.88	17.05	19.21	21.38	23.54	25.71
	268	323	378	433	488	543	598	653
SCM50	12.01	14.96	17.91	20.87	23.82	26.77	29.72	32.68
	305	380	455	530	605	680	755	830

Dimensions shown in grey area are millimeters while non-shaded areas are inches.

Appendix D—Outline Dimensions for SCM Pumps (continued)

Dimensions for Extra Foot on SCM Series Pumps (for stages 4-8 only)					
Pumps	SCM10	SCM20	SCM30	SCM40	SCM50
Coupling sizes	12,14,16	12,14,16	12,14,16	22,24,26	22,24,26
		22,24,26	22,24,26	36,38	36,38
Dimension	6.69	7.87	7.87	7.87	7.87
	170	200	200	200	200
Q	5.51	6.69	6.69	6.69	6.69
	140	170	170	170	170
R	1.81	0.79	0.79	1.81	1.81
	30	20	20	30	30
S	0.51	0.51	0.51	0.59	0.59
	13	13	13	15	15
T					

Appendix E—Troubleshooting Guide

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

1. Pump model and serial number
2. Horsepower and RPM of electric motor
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.

Appendix E—Troubleshooting Guide (continued)

Problem	Cause	What To Do
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 and clean filter screen. The suction pipe might be too small or restricted. Remove restrictions and/or increase pipe size.
	By-pass valve set too low	Set the valve for higher pressure (see valve's instructions).
	Too much impeller clearance	Do a performance test on the pump.
Noise or vibration the pump	Cavitation from poor suction conditions	Make sure all valves are open, look for restrictions in 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.
	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 of the 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 start'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 gets 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—Stage Arrangement

NOTE!: Position of the markings on stages are as seen from the drive side.

Number of Stages	Stage One	Stage Two	Stage Three	Stage Four	Stage Five	Stage Six	Stage Seven	Stage Eight
One								
Two								
Three								
Four								
Five								
Six								
Seven								
Eight								

Appendix G—Extended Storage Procedures for Mechanically Sealed Models

If your side channel pump is not going to be put into immediate service or is going to be removed from service for some time, the pump must be protected, as most industrial fluids 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 and NOT filled with oil, placing some desiccant packets inside the pump will provide some protection against rust.
2. Plug all pump openings.

3. Store in a dry location.
4. Rotate pump by hand every two weeks.
5. Before placing the pump back into service, drain the oil and remove any desiccant packets.

Appendix H—Magentic Drive Technical Specifications

Technical Specifications

Maximum operating pressure:	363 psi (25 bar)
Maximum operating temperature:	482°F (250°C)
Maximum shaft speed:	1750 RPM
Minimum shaft speed:	900 RPM

Materials

Samarium-Cobalt

Cautions

Warning! Strong magnetic fields present. Only trained personnel may operate and/or repair equipment.
No pacemakers within 6.5 ft (2 m).
No loose metal objects within 2 ft (0.61 m).
No magnetic media (credit cards, film, disks, etc.) within 3 ft (1 m).
Coupling must be stopped and unit de-pressurized before any work may be done on the pump.
Use a 100 mesh strainer on the suction side to prevent abrasives entering the pump.

Storage

Area must be as follows:
Dust free
Moderately ventilated
Temperature controlled: 59–77°F (15–25°C)
65% or less relative humidity
A nitrogen pad, or blanket, is recommended

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