IMPORTANT!

Read all instructions in this manual before operating pump.
As a result of Crane Pumps & Systems, Inc., constant product improvement program,
product changes may occur. As such Crane Pumps & Systems reserves the right to
change product without prior written notification.

Self-Priming Centrifugal Pumps
Series: DFS4-1-1/2-P
SAFETY FIRST!

Please Read This Before Installing Or Operating Pump. This information is provided for SAFETY and to PREVENT EQUIPMENT PROBLEMS. To help recognize this information, observe the following symbols:

IMPORTANT! Warns about hazards that can result in personal injury or indicates factors concerned with assembly, installation, operation, or maintenance which could result in damage to the machine or equipment if ignored.

CAUTION! Warns about hazards that can or will cause minor personal injury or property damage if ignored. Used with symbols below.

WARNING! Warns about hazards that can or will cause serious personal injury, death, or major property damage if ignored. Used with symbols below.

- Hazardous fluids can cause fire or explosions, burns or death could result.
- Biohazard can cause serious personal injury.
- Rotating machinery. Amputation or severe laceration can result.
- Hazardous voltage can shock, burn or cause death.
- Extremely hot - Severe burns can occur on contact.
- Hazardous fluids can cause Hazardous pressure, eruptions or explosions could cause personal injury or property damage.

Only qualified personnel should install, operate and repair pump. Any wiring of pumps should be performed by a qualified electrician.

WARNING! To reduce risk of electrical shock, pumps and control panels must be properly grounded in accordance with the National Electric Code (NEC) or the Canadian Electrical Code (CEC) and all applicable state, province, local codes and ordinances. Improper grounding voids warranty.

WARNING! To reduce risk of electrical shock, always disconnect the pump from the power source before handling or servicing. Lock out power and tag.

WARNING! Operation against a closed discharge valve will cause premature bearing and seal failure on any pump, and on end suction and self priming pump the heat build may cause the generation of steam with resulting dangerous pressures. It is recommended that a high case temperature switch or pressure relief valve be installed on the pump body.

CAUTION! Never operate a pump with a plug-in type power cord without a ground fault circuit interrupter.

CAUTION! Pumps build up heat and pressure during operation - allow time for pumps to cool before handling or servicing.

WARNING! Do not pump hazardous materials (flammable, caustic, etc.) unless the pump is specifically designed and designated to handle them.

CAUTION! Do not block or restrict discharge hose, as discharge hose may whip under pressure.

WARNING! Do not wear loose clothing that may become entangled in moving parts.

WARNING! Keep clear of suction and discharge openings. DO NOT insert fingers in pump with power connected.

Always wear eye protection when working on pumps.

Make sure lifting handles are securely fastened each time before lifting. DO NOT operate pump without safety devices in place. Always replace safety devices that have been removed during service or repair. Secure the pump in its operating position so it can not tip over, fall or slide.

DO NOT exceed manufacturers recommendation for maximum performance, as this could cause the motor to overheat.

DO NOT remove cord and strain relief. DO NOT connect conduit to pump.

WARNING! Cable should be protected at all times to avoid punctures, cuts, bruises and abrasions. Inspect frequently. Never handle connected power cords with wet hands.

WARNING! To reduce risk of electrical shock, all wiring and junction connections should be made per the NEC or CEC and applicable state or province and local codes. Requirements may vary depending on usage and location.

WARNING! Pumps are not approved for use in swimming pools, recreational water installations, decorative fountains or any installation where human contact with the pumped fluid is common.

WARNING! Products returned must be cleaned, sanitized, or decontaminated as necessary prior to shipment, to insure that employees will not be exposed to health hazards in handling said material. All Applicable Laws And Regulations Shall Apply.

Bronze/brass and bronze/brass fitted pumps may contain lead levels higher than considered safe for potable water systems. Lead is known to cause cancer and birth defects or other reproductive harm. Various government agencies have determined that leaded copper alloys should not be used in potable water applications. For non-leaded copper alloy materials of construction, please contact factory.

Crane Pumps & Systems is not responsible for losses, injury, or death resulting from a failure to observe these safety precautions, misuse or abuse of pumps or equipment.
GENERAL INFORMATION

To the Purchaser:

Congratulations! You are the owner of one of the finest pumps on the market today. Burks® Pumps are products engineered and manufactured of high quality components. Over eighty years of pump building experience along with a continuing quality assurance program combine to produce a pump which will stand up to the toughest pumping projects.

This manual will provide helpful information concerning installation, maintenance, and proper service guidelines.

Receiving:

Upon receiving the pump, it should be inspected for damage or shortages. If damage has occurred, file a claim immediately with the company that delivered the pump. If the manual is removed from the crating, do not lose or misplace.

Storage:

Short Term - Burks Pumps are manufactured for efficient performance following long inoperative periods in storage. For best results, pumps can be retained in storage, as factory assembled, in a dry atmosphere with constant temperatures for up to six (6) months.

Long Term - Any length of time exceeding six (6) months, but not more than twenty four (24) months. The units should be stored in a temperature controlled area, a roasted over walled enclosure that provides protection from the elements (rain, snow, wind blown dust, etc..), and whose temperature can be maintained between +40 deg. F and +120 deg. F.

If extended high humidity is expected to be a problem, all exposed parts should be inspected before storage and all surfaces that have the paint scratched, damaged, or worn should be recoated with a water base, air dry enamel paint. All surfaces should then be sprayed with a rust-inhibiting oil.

Service Centers:

For the location of the nearest Burks Service Center, check your Burks representative or Crane Pumps & Systems, Inc., in Piqua, Ohio, telephone (937) 778-8947.

WARNING ! - DO NOT work on this pump until you are sure the pump and associated piping are totally depressurized, and if pumping hot liquids that the temperature is safe to handle.

WARNING ! - Be sure that electricity to the motor is shut off and locked out, or if the motor is to be tested while running that test is conducted by a qualified person and safe electrical procedures are followed.

WARNING ! - DO NOT start pump until it has been filled with water.

WIRING:

1. Motor wiring should conform to national, state and local electrical codes.

2. Use wire of adequate size to prevent voltage drop.

3. Pump should be on a branch or separate circuit, fused or circuit breaker, protected, with a manual disconnect.

4. Connect the electrical supply from the switch to the motor terminals, following the wiring diagram on the motor nameplate or terminal coverplate. NOTE: Be sure that the connections to the motor terminals correspond with the voltage to be applied.

Checking wiring and fuse charts before connecting wires to service line. Make sure the voltage and frequency of the electrical current supply agrees with that stamped on the motor nameplate. If in doubt, check with power company.

Some pumps are equipped with three phase motors. Three phase motors require magnetic starters, and can run in either direction, depending on how they are connected to the power supply.

ROTATION:

The rotation is indicated by an arrow on the casing, and the correct rotation of three phase motors should be established before assembling the coupling on base mounted units. The pump should not be operated backwards or in reverse rotation. If the motor operates in the wrong rotation, interchange any two of the lead wires and the correct rotation will result.

GROUNDING MOTOR:

Wiring to this pump must be installed and maintained in accordance with the National Electrical code or your State and local electrical code.

It is required that a permanent ground connection be made to the unit using a conductor of appropriate size from a metal underground water pipe or a grounded lead in the service panel. DO NOT connect to electric power supply until unit is permanently grounded. Connect the ground wire to the approved ground and then connect to the terminal provided.

IMPORTANT ! - Centrifugal pumps should never be started or run dry. Operating a pump dry will cause scoring of the mechanical seal, resulting in premature seal failure. to prevent the pump from being run dry, it should be primed before starting.

FLOODED SUCTION PRIMING:

This method of priming a pump is relatively simple. The liquid source is located above the pump and all that is necessary to prime the pump is to open the air vent valve or plug in the pump casing and to crack the gate valve in the suction line. The suction line and pump should be filled slowly until a steady stream of liquid is observed flowing from the air vent. After the pump is operating, it is recommended that the air vent valve or plug be opened again to insure that all air has been expelled from the pump casing.
SUCTION LIFT PRIMING:
A foot valve should be used for priming on suction lift applications. The foot valve, located at the end or foot of the suction piping, functions as a check valve and allows flow in one direction only, toward the pump. Otherwise, all the liquid will drain from the pump and suction piping back into the sump after shutdown.

Initial priming is accomplished by completely filling the suction piping and pump casing with the liquid to be pumped. This can be done by removing the air vent valve or plug at the top of the pump casing, and inserting a pipe nipple in the orifice with an appropriate increaser to accommodate a hose connection. A priming line can also be inserted in the discharge piping between the check valve and the pump, or the priming can be done with a bucket and funnel. The important thing is to completely fill the suction pipe and pump casing with liquid.

When the pump is started, the vacuum created by pumping the priming fluid, combined with atmospheric pressure in the liquid well, forces liquid into the suction piping, thus opening the valve and keeping it open until the pump is shut down. When the pump is shut down, the liquid being pumped reverses its flow causing the valve to close. The liquid is now trapped in the suction piping and pump casing, thus maintaining a prime on the pump.

VACUUM PRIMING:
Vacuum priming consists of removing air from the pump casing and suction piping and drawing liquid into them by means of a vacuum creating device. The types of vacuum equipment range from a simple hand pump to a complex central priming system. Your specific priming requirements will govern what type of vacuum primer you use.

STARTING:
For initial starting, the gate valve in the discharge line should be closed, and opened gradually as the motor approaches full speed, usually in five to ten seconds. After the pump has once been in operation so that the discharge line has been completely filled, it is then unnecessary to close the gate valve in starting.

SEASONAL SERVICE:
To take out of service;

1. Drain the liquid from the pump to prevent freezing and damage to the pump body. It is recommended that a good rust inhibitor be put into the liquid end to prevent excessive corrosion. Keep the motor dry and covered.

2. To drain, remove the drain plug which is located below the suction inlet of the pump. Drain the suction pipe to a point below the frost line. All other pipes, which may be exposed to freezing temperatures, should also be drained.

3. Remove the priming plug. This will help the pump body to drain by permitting air to enter the case.

DISSASSEMBLING & REASSEMBLING

1. Remove pump from system, disconnect plumbing to suction and discharge. Disconnect electrical connection; make sure that power is turned off to the pump before disconnecting the electrical wiring.

2. Remove the twelve screws (#10-32 UNF) from cover and volute.

3. Remove shaft end cover from back of motor.

4. Insert large flat blade screw driver into motor slot.

5. With rag turn impeller in counter-clockwise direction. Be careful as shims may be removed with impeller.

6. At this point, carefully remove rotating part of mechanical seal being careful with shims.

7. Take count of what shims were installed on the pump from factory. The same shims may be reused when reassembling pump. The same stack-up is important as to return pump to same operating condition as supplied by factory.

8. Remove four screws (3/8"-16 UNC) from volute and motor. There are three screws 3/4” in length and one 1” in length. The one inch screw is used to assemble the mounting bracket to pump.

9. Remove volute from motor.

10. Remove gasket from casing.

11. Place a clean cloth or paper on work surface and set casing with mechanical seal facing down.

12. Using your thumbs push stationary part of mechanical seal out of casing.

13. Turn casing right side up.

14. With new stationary part of mechanical seal, place o-ring on mechanical seal. Be careful not to touch mechanical seal mating surfaces. These surfaces are polished to provide a sealing surface when pump is operating. Any surface scratches will allow pump to leak and the mechanical seal must be replaced. Lub o-rings with a non-abrasive liquid soap.
FIGURE 1
15. With seal pusher on steel flange of mechanical seal, press seal until fully seated into casing. See figure 2.

16. Replace casing onto motor mounting face with four 3/8-16 UNC screws; three 3/4" long and one 1" long. Note: one inch long screw is for mounting base to pump. Use new screws with pre-applied thread lock. Torque screws to 19 foot-pounds.

17. Replace shims with number and thickness as removed.

18. Replace rotating face of mechanical seal. See figure 3.

19. Replace impeller; turn impeller clockwise to hand tighten onto motor shaft. Use large flat blade screw driver in motor shaft slot to keep shaft from rotating while assembling. When impeller is tight, stop. Impeller will not back off shaft (single phase operation). For three phase operation, replace the 1/4-20 screw and washer to the end of the shaft using Loctite 242 on the screws. Torque screw to 50 in. lbs.

20. Replace motor end plug.

21. Replace gasket into casing.

22. Replace cover onto casing with 12 #10-32 UNF washer head screws. Use new screws with pre-applied thread lock. Torque screws to 34 inch-pounds.

23. If plugs were removed from cover; replace plugs.

24. Reassemble pump into system, reconnect power (double checking that motor is configured per name plate for your wiring system voltage), and double check to make sure everything is properly connected.

25. Start system and verify that there are no leaks.

To Place Pump Back into Service:

1. Replace all drain plugs previously removed.

2. Make sure suction and discharge lines have been reconnected and tightened.

3. Check to be certain that the pump shaft turns freely.

4. Verify with name plate that motor has been configured for your system voltage requirements.

5. If system has a valve on discharge side; make sure valve is closed. Valve to be gradually opened as the motor approaches full speed; usually from five to ten seconds.

6. **DO NOT START THE PUMP UNTIL IT IS FILLED WITH WATER.**

Mechanical Seal Information:

With the exercise of a few precautions a mechanical seal will furnish very satisfactory operation in pumps. Precautions which should be observed are:

1. Do not run the pump dry. The flat faces of the seal are lubricated by the liquid being pumped.

2. Vent the seal housing if it is the highest point in the pump.

3. Purge the system thoroughly to remove scale or dirt which may injure the seal prematurely due to the abrasive condition of the liquid.

REPLACEMENT PARTS

ORDERING REPLACEMENT PARTS:

When ordering replacement parts, ALWAYS furnish the following information:

1. Pump serial number and date code.
2. Pump model number.
3. Pump part number.
4. Part description.
5. Item part number.
6. Quantity required.
7. Shipping instructions.

**IMPORTANT ! When Ordering Parts, ALWAYS Provide The Complete Part Number, Serial Number and Model Number. INFORMATION SUBJECT TO CHANGE WITHOUT NOTICE.**
# TROUBLE SHOOTING

**CAUTION!** Always disconnect the pump from the electrical power source before handling.
If the system fails to operate properly, carefully read instructions and perform maintenance recommendations.

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>POSSIBLE CAUSE(S)</th>
<th>ACTION</th>
</tr>
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<tbody>
<tr>
<td>Little or no discharge and unit will not prime</td>
<td>1. Casing not filled with water&lt;br&gt;2. Total head too high&lt;br&gt;3. Suction head higher than pump designed for&lt;br&gt;4. Impeller partially or completely plugged&lt;br&gt;5. Hole or leak in suction line&lt;br&gt;6. Foot-valve too small&lt;br&gt;7. Impeller damaged&lt;br&gt;8. Foot-valve or suction line not submerged deep enough in water; pulling air&lt;br&gt;9. Insufficient inlet pressure or suction head&lt;br&gt;10. Suction piping too small&lt;br&gt;11. Casing gasket leaking&lt;br&gt;12. Suction or discharge line valves closed&lt;br&gt;13. Piping is fouled or damaged&lt;br&gt;14. Clogged strainer or foot-valve</td>
<td>1. Fill pump casing. Using a foot-valve will extend pump life and facilitate immediate priming&lt;br&gt;2. Shorten suction head&lt;br&gt;3. Lower suction head, install foot-valve and prime.&lt;br&gt;4. Disassemble pump and clean out impeller&lt;br&gt;5. Repair or replace suction line&lt;br&gt;6. Match foot-valve to piping or install one size larger foot-valve&lt;br&gt;7. Disassemble pump and replace impeller&lt;br&gt;8. Submerge lower in water&lt;br&gt;9. Increase inlet pressure by adding more water to tank or increasing back pressure by turning gate valve on discharge line partially closed position&lt;br&gt;10. Increase pipe size to pump inlet size or larger&lt;br&gt;11. Replace&lt;br&gt;12. Open&lt;br&gt;13. Clean or replace&lt;br&gt;14. Clean or replace</td>
</tr>
<tr>
<td>Loss of suction after satisfactory operation</td>
<td>1. Air leak in suction line&lt;br&gt;2. When unit was last turned off, water siphoned out of pump casing&lt;br&gt;3. Suction head higher than pump designed for&lt;br&gt;4. Insufficient inlet pressure or suction head&lt;br&gt;5. Clogged foot-valve, strainer, or pump&lt;br&gt;6. Defective wearplate(s)</td>
<td>1. Repair or replace suction line&lt;br&gt;2. Refill (reprime) pump casing before restarting&lt;br&gt;3. Lower suction head, install foot-valve and primer&lt;br&gt;4. Increase inlet pressure by adding more water to tank or increasing back pressure by turning gate valve on discharge line to partially closed position&lt;br&gt;5. Unclog, clear or replace as necessary&lt;br&gt;6. Replace</td>
</tr>
<tr>
<td>Pump overloads driver</td>
<td>1. Total head lower than pump rating, unit delivering too much water&lt;br&gt;2. Specific gravity and viscosity of liquid being pumped different than the pump rating</td>
<td>1. Increase back pressure on pump by turning gate valve on discharge line to partially closed position that will not overload motor.&lt;br&gt;2. Consult factory.</td>
</tr>
<tr>
<td>Pump vibrates and/or makes excessive noise</td>
<td>1. Mounting plate or foundation not rigid enough&lt;br&gt;2. Foreign material in pump causing unbalance&lt;br&gt;3. Impeller bent&lt;br&gt;4. Cavitation present&lt;br&gt;5. Piping not supported to relieve any strain on pump assembly</td>
<td>1. Reinforce.&lt;br&gt;2. Disassemble pump and remove.&lt;br&gt;3. Replace impeller.&lt;br&gt;4. Check suction line for proper size and check valve in suction line if completely open, remove any sharp bends before pump and shorten suction line.&lt;br&gt;5. Make necessary adjustments.</td>
</tr>
<tr>
<td>Pump leaks at shaft</td>
<td>1. Worn mechanical seal&lt;br&gt;2. Replacement seal not installed properly</td>
<td>1. Replace&lt;br&gt;2. Follow Maintenance instructions carefully</td>
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Limited 24 Month Warranty

Crane Pumps & Systems warrants that products of our manufacture will be free of defects in material and workmanship under normal use and service for twenty-four (24) months after manufacture date, when installed and maintained in accordance with our instructions. This warranty gives you specific legal rights, and there may also be other rights which vary from state to state. In the event the product is covered by the Federal Consumer Product Warranties Law (1) the duration of any implied warranties associated with the product by virtue of said law is limited to the same duration as stated herein, (2) this warranty is a LIMITED WARRANTY, and (3) no claims of any nature whatsoever shall be made against us, until the ultimate consumer, his successor, or assigns, notifies us in writing of the defect, and delivers the product and/or defective part(s) freight prepaid to our factory or nearest authorized service station. Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply.

THE SOLE AND EXCLUSIVE REMEDY FOR BREACH OF ANY AND ALL WARRANTIES WITH RESPECT TO ANY PRODUCT SHALL BE TO REPLACE OR REPAIR AT OUR ELECTION, F.O.B. POINT OF MANUFACTURE OR AUTHORIZED REPAIR STATION, SUCH PRODUCTS AND/OR PARTS AS PROVEN DEFECTIVE. THERE SHALL BE NO FURTHER LIABILITY, WHETHER BASED ON WARRANTY, NEGLIGENCE OR OTHERWISE. Unless expressly stated otherwise, guarantees in the nature of performance specifications furnished in addition to the foregoing material and workmanship warranties on a product manufactured by us, if any, are subject to laboratory tests corrected for field performance. Any additional guarantees, in the nature of performance specifications must be in writing and such writing must be signed by our authorized representative. Due to inaccuracies in field testing if a conflict arises between the results of field testing conducted by or for user, and laboratory tests corrected for field performance, the latter shall control. RECOMMENDATIONS FOR SPECIAL APPLICATIONS OR THOSE RESULTING FROM SYSTEMS ANALYSES AND EVALUATIONS WE CONDUCT WILL BE BASED ON OUR BEST AVAILABLE EXPERIENCE AND PUBLISHED INDUSTRY INFORMATION. SUCH RECOMMENDATIONS DO NOT CONSTITUTE A WARRANTY OF SATISFACTORY PERFORMANCE AND NO SUCH WARRANTY IS GIVEN.

This warranty shall not apply when damage is caused by (a) improper installation, (b) improper voltage, (c) lightning, (d) excessive sand or other abrasive material, (e) scale or corrosion build-up due to excessive chemical content. Any modification of the original equipment will also void the warranty. We will not be responsible for loss, damage or labor cost due to interruption of service caused by defective parts. Neither will we accept charges incurred by others without our prior written approval.

This warranty is void if our inspection reveals the product was used in a manner inconsistent with normal industry practice and/or our specific recommendations. The purchaser is responsible for communication of all necessary information regarding the application and use of the product. UNDER NO CIRCUMSTANCES WILL WE BE RESPONSIBLE FOR ANY OTHER DIRECT OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO TRAVEL EXPENSES, RENTED EQUIPMENT, OUTSIDE CONTRACTOR FEES, UNAUTHORIZED REPAIR SHOP EXPENSES, LOST PROFITS, LOST INCOME, LABOR CHARGES, DELAYS IN PRODUCTION, IDLE PRODUCTION, WHICH DAMAGES ARE CAUSED BY ANY DEFECTS IN MATERIAL AND/OR WORKMANSHIP AND/OR DAMAGE OR DELAYS IN SHIPMENT. THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER EXPRESS OR IMPLIED WARRANTY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

No rights extended under this warranty shall be assigned to any other person, whether by operation of law or otherwise, without our prior written approval.
IMPORTANT!
WARRANTY REGISTRATION

Your product is covered by the enclosed Warranty.
To complete the Warranty Registration Form go to:

http://www.cranepumps.com/ProductRegistration/

If you have a claim under the provision of the warranty, contact your local Crane Pumps & Systems, Inc. Distributor.

RETURNED GOODS
RETURN OF MERCHANDISE REQUIRES A “RETURNED GOODS AUTHORIZATION”.
CONTACT YOUR LOCAL CRANE PUMPS & SYSTEMS, INC. DISTRIBUTOR.

Products Returned Must Be Cleaned, Sanitized, Or Decontaminated As Necessary Prior To Shipment, To Insure That Employees Will Not Be Exposed To Health Hazards In Handling Said Material. All Applicable Laws And Regulations Shall Apply.