



"VC" Vertical In-Line Pump

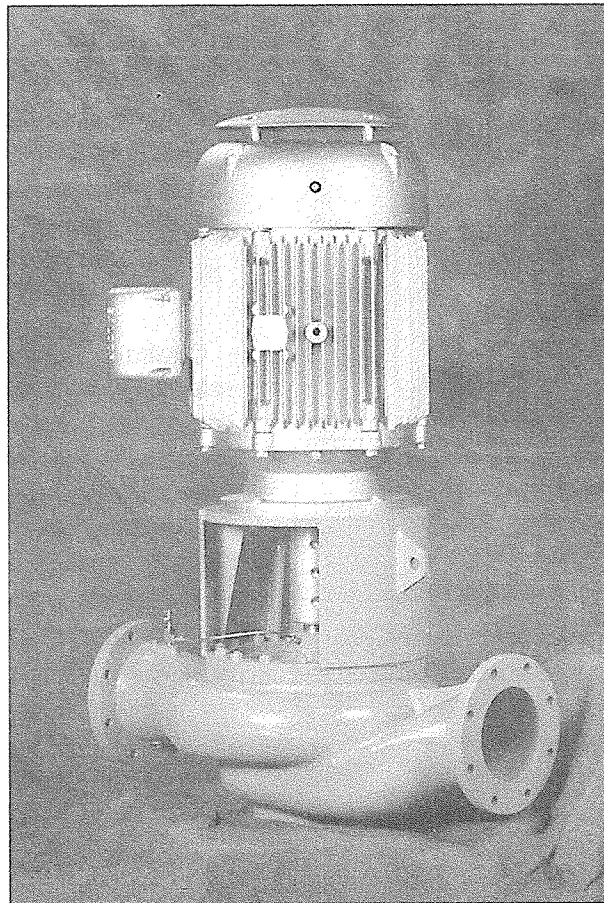
302-030

Installation, Operation & Maintenance Manual

SUPERSEDES: New

EFFECTIVE: June 15, 1999

Plant ID No. 001-1175



**VC Vertical
In-Line Pump**

DO IT ONCE. DO IT RIGHT.

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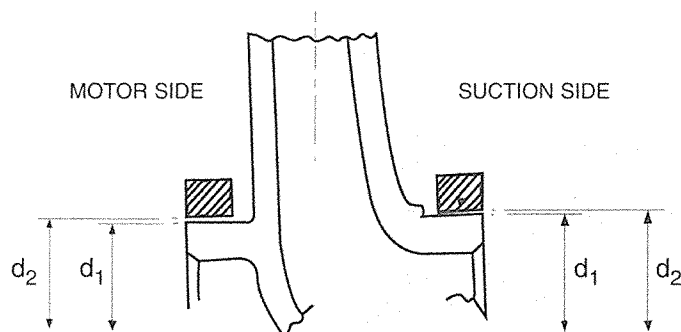
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APPLICATION

1. Working Pressure: 175 psig
Optional Working Pressure: 300 psig
2. Optional Seal: External 8B2
3. Temperature: 250°F Standard
300°F Hi Temperature

CASING/IMPELLER WEAR RING CLEARANCES



VC CASING/IMPELLER WEAR RING CLEARANCE

PUMP SIZE	WEAR RING-SUCTION SIDE				CLEARANCE	
	DIA d ₁		DIA d ₂			
	MAX	MIN	MAX	MIN	MAX	MIN
3013*	3.738	3.736	3.752	3.750	.016	.012
4013*	4.613	4.611	4.627	4.625	.016	.012
6009*	5.861	5.859	5.877	5.875	.018	.014
6011*	5.861	5.859	5.877	5.875	.018	.014
6013*	5.861	5.859	5.877	5.875	.018	.014
8011*	7.234	7.232	7.252	7.250	.020	.016
8013*	7.734	7.732	7.752	7.750	.020	.016

* Wear ring optional

CASING WEAR RING FITTED TO SUCTION SIDE ONLY

INSTALLATION

A. Receiving Pump

1. Inspect for shipping damage. If a shortage or damage occurs, contact carrier immediately.

B. Location

1. Install vertically with motor up. **Horizontal mounting is not recommended.**
2. Pump should be accessible for inspection and repair work, head room must be provided for the use of hoist or tackle as necessary.
3. Lift pump by slinging through motor eye bolts and securing through the motor support.
4. **In no case should any part of motor be covered with insulation.**

C. Foundation

1. The pump must always be supported.
2. Pumps with smaller motors may be suspended in the piping, provided the piping is supported adjacent to the pump.
3. For pumps with larger motors, the pump should be attached to a support utilizing the tapped holes in the bottom of the pump casing. **Note: Piping loads must not be applied to the pump.**
4. Pump must be allowed to move with piping movement. Expansion of piping must be taken into account when piping and suitable devices should be employed.

OPERATION

A. Before operating for the first time check the following:

1. Is motor correctly wired for voltage available.
2. Has pump been primed. Pump should never be run dry. **Extra effort may be required to get the air out of the seal chamber.**

Caution: Make sure power supply to pump motor is locked out before touching motor shaft.

3. All rotating parts turn freely.

B. Starting pump

1. Jog pump to check proper rotation.
2. Start pump with discharge valve closed.
DANGER: MAKE SURE SUCTION VALVE IS OPEN!!
3. When correct pressure has been reached, open discharge valve slowly.
4. **Do not operate pump for prolonged periods with discharge valve closed, so as to avoid overheating and potential damaging loads.**
5. Pump should be stopped if any of the following occur:
 - a. No discharge.
 - b. Insufficient discharge.
 - c. Insufficient pressure.
 - d. Loss of suction.
 - e. Excessive power consumption.
 - f. Vibration.

Check problem analysis further in the manual for help in troubleshooting.

MAINTENANCE

A. Routine Inspections

Routine inspections should be made on a regular basis. Inspections made while pump is running should reveal potential failures.

1. Inspect motor bearings for any sign of temperature rise. Temperature should not exceed 160°F. Temperature rise may indicate the early stages of bearing problems.
2. Listen for any unusual noise.
 - a. Air trapped in pump.
 - b. Hydraulic noise.
 - c. Mechanical noise in motor and/or pump.
3. Check suction gauge reading and confirm that it is normal.
4. Check discharge gauge reading and confirm that it is normal.
 - a. If gauge readings are abnormal find out why.

Note: Suction and discharge gauges should read the same with pump stopped.

B. Split Coupled Pumps

The pump shaft is attached to the motor shaft with a coupling. The pump shaft does not contain bearings that need lubrication.

C. Split Coupled Motors

The motor must be lubricated in accordance with the manufacturer's recommendations. **Do not over lubricate the motor bearings as this could cause premature bearing failure.**

D. Mechanical Seal

The mechanical seal is the "John Crane" Type 21 General Purpose Seal for the 175 psig pressure rating. A "John Crane" Type 2 General Purpose Seal is used for the 300 psig pressure rating. An external seal is available which is a "John Crane" Type 8B2.

DIS-ASSEMBLY AND RE-ASSEMBLY

A. General

If the pump has been maintained and serviced properly, breakdowns which necessitate the pump being dis-assembled should not occur often.

1. If a problem occurs, the cause should be determined, if possible, before dis-assembling. (See "Problem Analysis")
2. If the pump is being dis-assembled, all parts must be carefully handled, avoid heavy blows and shocks.
3. All parts must be carefully cleaned and inspected for wear. Recondition or replace parts where necessary.

B. Dis-Assembly - Impeller Repair

1. Drain liquid from casing by removing drain plug.

Caution: Allow pump to cool and close suction and discharge valves before working on pump!!

2. Remove seal flush line.
3. Remove bolts holding cover/motor adapter to casing. Pry cover/motor adapter and motor assembly from casing or use jack-bolts.
4. Remove impeller bolt in a counterclockwise direction. Remove impeller and key.
5. All parts must be cleaned and inspected for wear. Replace parts where necessary.

C. Dis-Assembly - Seal

Internal seal removal and replacement:

Remove the seal cover and shaft coupling. **Note: the shaft can drop if not properly supported in place or the pump cover is on the pump casing.** The seal rotating element can be drawn off the shaft. **Note: apply silicone grease on the OD of the shaft in the area between the seal and the end of the shaft.** This will help you remove the seal through the opening between the pump shaft and motor shaft. The stationary seal element is to be removed from the seal cover.

External seal removal and replacement:

Loosen the two set screws on the seal rotating element. Remove the shaft coupling. **Note: the shaft can drop if not properly supported in place or the pump cover is on the pump casing.** Remove the seal rotating element. **Note: apply silicone grease on the OD of the shaft in the area between the seal and the end of the shaft.** This will help you remove the seal through the opening between the pump shaft and the motor shaft. The stationary seal element is to be removed from the top of the cover/adapter after the snap ring is removed.

D. Re-Assembly - Impeller

1. Assemble impeller key and impeller on shaft. Refit with impeller washer on impeller bolt and tighten carefully. Be certain that the impeller rotates freely by hand.
2. Apply a few spots of gasket adhesive to gasket surface or cover. Place a new casing gasket against gasket surface and press against adhesive.
3. Assemble cover-adapter complete with motor into casing. Insure that gasket is seated correctly. Install hex-headed cap screws into casing tapings and tighten uniformly.
4. Reconnect seal flush line and drain plug.

E. Re-Assembly - Seal Replacement

Internal seal replacement:

1. Be certain that all parts to be replaced are free from burrs, with screw threads and connecting faces clear and free from damage.
2. Insert stationary element of seal into seal cover. **Note: Do not touch the seal surfaces because this may result in leakage. Do not contaminate seal faces with fingerprints.**

3. Lubricate the pump shaft end on the motor side with silicone grease. **Do not use petroleum oil or grease.**
4. Place spring retainer and spring to abut against retaining ring. Slide rotary seal on shaft until it contacts spring.
5. Make sure the seal cover O-ring is properly seated in groove of seal cover. Place the seal cover back onto the pump cover and bolt in place. Connect pump coupling to set shaft position.
6. Reconnect seal flush line to drain plug.

External seal replacement:

1. Be certain that all parts to be replaced are free from burrs, with screw threads and connecting faces clear and free from damage.
2. Insert stationary element of seal into seal cover.

Note: Do not touch the seal surfaces because

this may result in leakage. Do not contaminate seal faces with fingerprints. Insure the seal cover O-ring is properly seated in groove of the seal cover. Place the seal cover back onto the pump cover and bolt in place.

3. Install retaining ring in seal cover above stationary seal.
4. Lubricate the pump shaft end on the motor side with silicone grease. **Do not use petroleum oil or grease.**
5. Slide rotary seal on shaft. Connect pump coupling to set shaft position.
6. Slide rotating seal into final position and tighten the set screws, which will set proper seal position.
7. Remove the plastic seal retaining clamps.
8. Reconnect seal flush line to drain plug.

PROBLEM ANALYSIS

A. No Discharge

1. Pump not primed.
2. Speed too low.
3. System head too high.
4. Suction lift higher than pump is designed.
5. Impeller completely clogged.
6. Incorrect direction of rotation.
7. Air leak in suction line.

B. Insufficient Discharge Flow

1. Air leak in suction line.
2. Speed too low.
3. System head higher than anticipated.
4. Insufficient NPSH: Suction lift too high. Check gauges, also check for clogged suction line or screen.
5. Impeller partially plugged.
6. Mechanical defects.
 - a. Worn wear rings
 - b. Impeller damaged.
 - c. Incorrect direction of rotation.

C. Insufficient Discharge Pressure

1. Speed too low.
2. System head less than anticipated.
3. Air in system.
4. Mechanical defects.
 - a. Worn wear rings.
 - b. Impeller damaged.
 - c. Impeller diameter too small.
 - d. Incorrect direction of rotation.

D. Loss of Suction

1. Leak in suction line.

2. Suction lift too high.
3. Insufficient NPSH.
4. Air in system.
5. Casing gasket defective.

E. Excessive Power Consumption

1. Speed too high.
2. System head lower than rating.
3. Specific gravity of liquid too high.
4. Mechanical defects.
 - a. Shaft bent.
 - b. Rotating elements bind.
 - c. Worn wear ring.

F. Vibration

1. Air leak in suction line.
2. Air in system.
3. Impeller partially plugged.
4. Foundation not rigid.
5. Mechanical defects.
 - a. Damaged impeller.
 - b. Motor bearings worn.
 - c. Rotor out of balance.
 - d. Shaft bent.

G. Motor Runs Hot

1. Speed too high.
2. Specific gravity of liquid too high.
3. Mechanical defects.
 - a. Shaft bent.
 - b. Rotating elements bind.
 - c. Defective motor.
 - d. Voltage lower than rating.

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