

WARNING: Do Not Operate Before Reading Manual

A-SERIES OPERATOR'S MANUAL

Models

A5	A20	A130
A10	A75	A200
A15	A100	A300

Single Stage Series



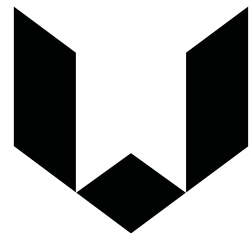
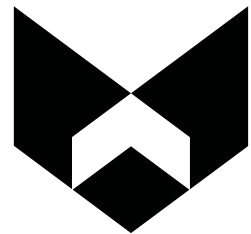
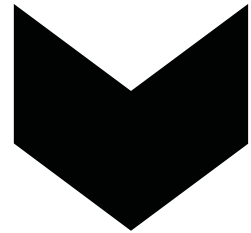
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Tuthill Vacuum & Blower Systems proudly manufactures Kinney® vacuum pumps and M-D Pneumatics™ blowers and vacuum boosters in Springfield, Missouri, USA. We bring 100+ years of engineering experience and solid, hands-on care to help customers keep their processes running. Your satisfaction is important to us so please take time to provide your Tuthill sales representative with performance feedback. We love to hear from our customers!

Tuthill is a family owned business that was started by James B. Tuthill in 1892. At that time, Tuthill manufactured common brick to Chicago construction companies who were fueling the city's rapid expansion. Fast forward to today and Tuthill now serves sustaining, global markets like agriculture, chemical, construction, energy, food and beverage, pharmaceuticals and medical, transportation, and utilities. While the company has changed in what it manufactures, one thing remains throughout every Tuthill line of business – we are a company with HEART. Our slogan is “Pump Your Heart Into It” and everyday our employees do just that as they represent the Tuthill brand and dare to make better.

Thank you for making Tuthill Vacuum & Blower Systems part of your company's process!

A company with heart right from the start.



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INTRODUCTION

CONGRATULATIONS on the purchase of a new A-Series Axial Flow Liquid Ring Vacuum Pump from Tuthill Vacuum & Blower Systems. Please examine the pump for shipping damage, and if any damage is found, report it immediately to the carrier. If the pump is to be installed at a later date, make sure it is stored in a clean and dry location and make sure covers are kept on all openings. If pump is stored outdoors, be sure to protect it from weather and corrosion.

A-Series liquid ring vacuum pumps are built to exacting standards, and if properly installed and maintained, will provide many years of reliable service. We urge you to take time to read and follow every step of these instructions when installing and maintaining your pump. We have tried to make these instructions as straightforward as possible because we realize getting any new piece of equipment up and running as quickly as possible is imperative to production.

WARNING

Serious injury can result from operating or repairing this machine without first reading the service manual and taking adequate safety precautions.

LIQUID RING VACUUM PUMPS – PRINCIPLE OF OPERATION

The liquid ring vacuum pump removes gases by means of an impeller rotating freely in an eccentric casing. The pumping is done by a liquid, usually water, that is fed into the pump and thrown by centrifugal force into a moving ring along the casing or cover wall. When gas or vapor enters the suction port, it is trapped by the whirling impeller blades and a liquid piston that expands in the eccentric lobe of the casing. As the impeller rotates, the liquid is then pushed inward by the narrowing space between the rotor and casing, compressing the trapped pocket of gas. Finally the compressed gas is released through a discharge port as the impeller completes the revolution.

The direct contact between the liquid ring and the gas makes the pump ideal for wet applications and for handling condensibles that are discharged with the gas and liquid. Unlike rotary vane and piston pumps, the operation of a liquid ring vacuum pump is nearly isothermal and without vibration. There is no oil to be changed or pollutant released into the environment. Because there are no valves and no rubbing parts, a liquid ring pump is virtually maintenance free.

With liquids other than water, vapor pressure in the pump can be reduced for high vacuum or compatibility achieved with specific process gases. In some cases, distillate or another fluid is introduced directly into the suction pump inlet and used as the liquid seal.

Liquid ring pumps are also commonly staged with positive displacement blowers and air and steam ejectors for greater capacity and/or deeper vacuum. Tuthill Vacuum & Blower Systems offers many such staged units, including its patented AF two-stage system with rotary blower, liquid ring back up and unique fluid coupling design.

SPECIAL FEATURES

One of the distinguishing features on an A-Series pump is an axial flow design that permits the widest range and highest vacuum of any single-stage liquid ring pump. A fixed port cylinder concentric with the rotor bore directs the gas along the shaft axis, into the suction ports of the rotor, and finally back through the rotor and rear of the pump for discharge.

Because the gas flow is along the motor shaft (and not at right angles), the pump can start in a flooded state without damage and has excellent water handling capacity. The use of a shrouded rotor also increases pumping efficiency for high vacuum and low water consumption. The pump head, close-coupled to a NEMA C-face motor, is extremely compact and requires no interstage manifold as do older style radial flow pumps.

Further advantages to A-Series pumps include the use of modern O-rings and mechanical seals rather than gaskets and stuffing boxes, and a replaceable port cylinder for fast in-the-field repair. Available in all bronze, cast iron, stainless steel and other special materials.

SERVICE AND PARTS

A-Series pumps are 100% designed and manufactured in the United States. All parts are maintained in inventory for immediate shipment from our factory in Springfield, MO. At the back of this manual is a list of parts and recommendations for spares to keep on hand. The reputation of Tuthill Vacuum & Blower Systems is staked on fast service and practical assistance in designing vacuum systems for specific applications. Specializing in the liquid ring field, the company was created by and for engineers.

SAVE WATER, TIME AND MONEY WITH A-SERIES SEALANT RECOVERY SYSTEMS

In applications where water is costly, scarce, or unavailable, A-Series Sealant Recovery Systems provide simple, compact, and environmentally safe options for recirculating seal water and storing waste.

THE BASIC SYSTEM

The standard configuration for recirculating seal water is to pipe the pump discharge into a small separator tank where non-condensed gas is vented into the atmosphere and the water is returned to the pump inlet. By having a tee connection in the inlet piping for the return (rather than through the separate seal water inlet), the pump will draw its own water requirement controlled by a flow restrictor in the return line. **See Figure 4-1 on page 8.**

The basic system offered by Tuthill Vacuum & Blower Systems is a completely self-contained pumping system that fits almost anywhere for intermittent or low vacuum use. The package includes a close-coupled pump, baseplate, and a stainless steel separator tank with complete seal water and discharge piping.

HEAT EXCHANGERS

For continuous high vacuum use, use a heat exchanger to counter the temperature rise from the heat of compression. Higher seal water temperatures will increase the partial vapor pressure inside the pump and limit high vacuum performance. Used in conjunction with water chillers, refrigeration units, fan coils, or cooling towers, a properly sized heat exchanger will maintain seal water temperatures for maximum performance.

Depending on the heat to be removed and cooling system available on location, Tuthill Vacuum & Blower Systems will specify or furnish a heat exchanger sized for your application.

For sealants other than water, be sure to consult Tuthill Vacuum & Blower Systems for assistance with both the pump and recirculation sizing.

OTHER ALTERNATIVES

Among the other options for reusing liquid sealant are partial recirculation systems and specially packaged units using sealants other than water (i.e., oil, solvents, etc.). In a partial recirculation loop, a certain amount of make-up water is fed into the pump to minimize temperature rise, yet allow for substantial water savings.

Tuthill Vacuum & Blower Systems invites you to inquire about specific, practical, and inexpensive methods for reducing your operating costs and for saving that precious natural resource — water.

SPECIFICATIONS

	UNIT	A5	A10	A15	A20	A75	A100	A130	A200	A300
Speed	RPM	3450	3450	3450	3450	1725	1725	1725	1160	1160
Drive	Type	Direct	Direct	Direct	Direct	Direct	Direct	Direct	Direct	Direct
Standard Motor	HP (kW)	1 (0.75)	1.5 (1.1)	2 (1.5)	3 (2.2)	5 (3.7)	7.5 (5.6)	10 (7.5)	15 (11.2)	20 (15)
Sealant Liquid Required (at 60°F w/ no sealant recovery)	GPM (L/min)	2 (7.6)	2 (7.6)	3 (11.4)	3 (11.4)	4 (15.1)	4 (15.1)	5 (18.9)	8 (30.3)	10 (37.9)
Sealant Liquid Connections	NPT	3/8 in.	3/8 in.	3/8 in.	3/8 in.	1/2 in.	1/2 in.	1/2 in.	1 in.	1 in.
Inlet/Outlet Connections	ANSI 150 Class	3/4 in.	1 in.	1 in.	1 in.	2 in.	2 in.	2 in.	3 in.	3 in.
Overall Length (w/ Standard Motor)	in. (mm)	14 (356)	16.6 (422)	17 (432)	18.5 (470)	20.2 (513)	23.1 (587)	25.3 (642)	32.4 (823)	33.7 (856)
Overall Height (w/ Standard Motor)	in. (mm)	7.25 (184)	7.25 (184)	7.25 (184)	7.25 (184)	11.5 (292)	12.25 (311)	12.25 (311)	18.38 (467)	18.38 (467)
Weight, Complete Pump, Dry	lb (kg)	50 (23)	62 (28)	69 (31)	85 (39)	180 (82)	195 (89)	250 (114)	560 (254)	600 (272)

Table 1-1 – Specifications


02

SAFETY

SAFETY INSTRUCTION TAGS

 WARNING

DO NOT OPERATE WITHOUT BELT GUARD

 CAUTION
DO NOT VALVE OR RESTRICT PUMP DISCHARGE OPENING.
USE OIL MIST ELIMINATOR WHEN OPERATING PUMP. ENSURE ADEQUATE VENTILATION WHEN DISCHARGING INDOORS.
REFER TO MANUAL SAFETY INSTRUCTIONS.

NOTICE
<p><i>The above safety instruction tags were permanently affixed to your pump prior to shipment. Do not remove, paint over or obscure in any manner.</i></p> <p><i>Failure to heed these warnings could result in serious bodily injury to the personnel operating and maintaining this equipment.</i></p>

SAFETY PRECAUTIONS FOR LIQUID RING PUMPS

Please read the following safety information on this page before operating your vacuum pump.

- Do not operate the pump without the coupling and belt guard properly attached. Disconnect the pump motor from the electrical supply at the main disconnect before removing the belt guard. Replace the belt guard before reconnecting the power supply to the pump motor. Operating the pump without the belt guard properly installed exposes personnel in the vicinity of the pump to risk from rotating drive components.

 **CAUTION**

Do not operate the pump with oxygen-enriched gas in the suction line, unless the pump has been properly cleaned, inspected and certified to be free of hydrocarbon presence and prepared with an inert fluid suitable for the application.

- Oxygen-enriched gas is defined as gas of which the constituents include by volume (mol. %) an amount of oxygen greater than that of standard atmospheric air (typically 20 – 21% by volume).
- If the oxygen content in the gas stream exceeds the proportions found in standard atmospheric air, then it is considered an oxygen-enriched gas and standard mineral oil. Synthetic hydrocarbon oil or other non-inert fluids should not be used.

 **WARNING**

Pumping oxygen-enriched gases with mineral oil, synthetic hydrocarbon oil or other non-inert fluids can cause fire or explosion in the pump, resulting in damage or serious bodily injury or death.

- Take precautions to avoid prolonged or excessive exposure to oil mist or process materials emanating from the discharge of the pump.
- Do not allow the pump to discharge into a closed, or inadequately ventilated room. Always use a discharge oil mist eliminator unless the pump discharge is discharged to outside atmosphere. Laws and ordinances may pertain to your local area regarding discharge of oil mist or vapor to atmosphere. Check local laws and ordinances prior to operation of the pump with discharge to outside atmosphere.
- Venting of the discharge of an oil mist eliminator to outside atmosphere is highly recommended.

- Do not restrict the pump discharge in any way, or place valves in the discharge line. The vacuum pump is a compressor and will generate high pressures without stalling the motor when operated at low suction pressures. Excessive pressure could cause pump damage or serious bodily injury.
- Disconnect the pump motor from the electrical supply at the main disconnect before disassembling or servicing the pump. Make sure pump is completely reassembled, the belt guard is properly installed, and that all fill and drain valves are installed and closed before reconnecting the power supply. Accidental starting or operation of the pump while maintenance is in progress could cause pump damage or serious bodily injury.
- Lift pump only by the lifting lugs supplied with the pump. **DO NOT** lift equipment attached to pump by the pump lifting lugs.
- Do not touch hot surfaces on the pump. In normal operation at low pressures, surface temperatures will not normally exceed 180°F (82°C). Prolonged operation at 200 Torr (267 mbar a) may cause surface temperatures as high as 220°F (104°C).

03

INSTALLATION

LOCATION

Because of its close-coupled design (**See Figure 3-1 on page 6**), an A-Series pump is ideal for applications where space is critical. Its vibration-free operation permits direct bolting to the floor or mounting on a baseplate anywhere that is convenient for piping. The standard motors furnished by Tuthill Vacuum & Blower Systems on A-Series are Totally Enclosed Fan Cooled (TEFC) suitable for areas where the motor may be exposed to water. Special motors are available for hazardous locations.

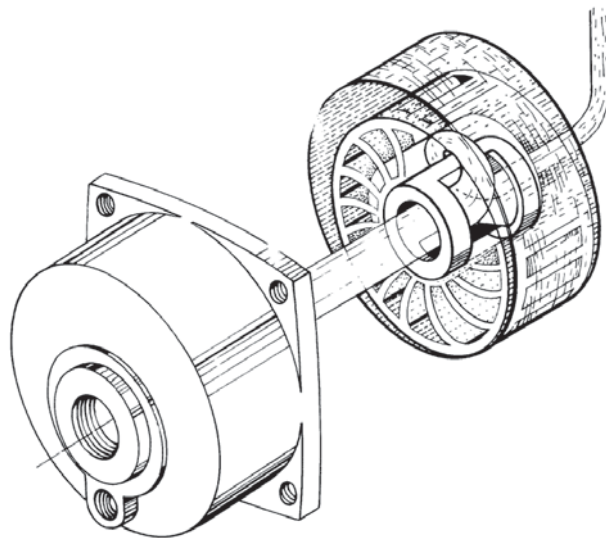


Figure 3-1 – A-Series Axial Flow Design

The pump needs no adjustment, alignment or coupling, guard, etc. Because the pump runs cool, no special ventilation or access for checking sight glasses and oil is necessary. In choosing a location, the main consideration should be the pump's proximity to the vacuum system and convenience for draining discharge and piping the seal water.

GENERAL PIPING INSTRUCTIONS

The inlet, discharge, and seal water piping require observance of three basic rules:

- Piping must be free of all welding shot, slag, and other foreign matter that could damage the pump.
- Piping must be supported independently to avoid stress on the pump casing.
- Piping should be of the same diameter as the pipe connections on the pump.

VACUUM INLET PIPING

Inlet piping is a simple matter of connecting the pump to the vacuum system. Model A5 has a 3/4" NPT connection. Models A10, A15, and A20 have a 1" NPT connection on their covers for direct piping. Models A75, A100, and A130 have 2" flange connections. Models A200 and A300 have 3" flange connections.

The larger pumps feature flange faces. Use an inlet check valve to prevent vacuum loss and backstreaming when the pump shuts down. Avoid using spring-loaded valves not designed for vacuum service. An optional vacuum gauge can be mounted between the pump and check valve to measure inlet vacuum.

DISCHARGE PIPING

Depending on the application, there are a number of ways to handle the discharged liquid and gas. If there are no pollutants, the simplest scheme is to discharge directly into a drain. An A-Series pump can carry up to a 10-foot discharge head providing the piping from that height is pitched toward a drain or other receptacle. **EXCESSIVE BACK PRESSURE CAN ADVERSELY AFFECT PUMP PERFORMANCE.**

A second method is to run the discharge through a mechanical separator, removing water from the gas. Water contaminated by sanitary waste or noxious gas may be recirculated as seal water or discharged into a sanitary sewer or tank. The nature of the contaminant will determine how often recirculated water must be changed.

SEAL WATER PIPING

Unless liquid is pumped directly through the vacuum inlet connection, most applications require separate piping for seal water to enter the pump. The seal water inlet is located directly below the vacuum inlet on the pump's face. **See Figure 3-2 on page 7.**

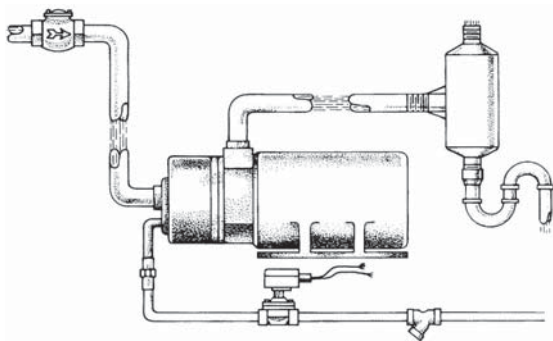


Figure 3-2 – Once-through Seal Water (Minimum Pressure 10 PSIG)

Water, the most widely used liquid seal, can be piped directly from a tap or recirculated from a discharge separator tank. Be sure to specify if seal liquids other than water are to be used and Tuthill Vacuum & Blower Systems will make recommendations regarding compatibility of materials, power requirements, etc.

The following accessories are recommended:

- Flow control valve (*see Seal Water Requirements on page 8*)
- Solenoid valve (to shut off water when pumping stops)
- Strainer (to prevent foreign matter from entering the pump)

For more information about recirculating seal water, consult Tuthill Vacuum & Blower Systems.

ELECTRICAL CONNECTIONS

Refer to the motor label or conduit box for correct wiring. Most motors are three-phase and will be damaged if single-phased. De-rating for 50-cycle operation at different voltages is possible if specified on motor label. Otherwise, refer questions to motor manufacturer or to Tuthill Vacuum & Blower Systems.

NOTE: Be sure to jog motor before starting to ensure correct wiring and rotation.

04

OPERATION

SEAL WATER REQUIREMENTS

A-Series liquid ring pumps, because of their exclusive axial flow design, have the ability to handle large amounts of water and, unlike radial flow pumps, can start in a flooded state without damage. **See Figure 4-1 on page 8.** Seal water flow is not critical and the flow rates can be readily adjusted for a wide variety of applications. For most applications, use the optimum seal water rates in **Table 4-1.**

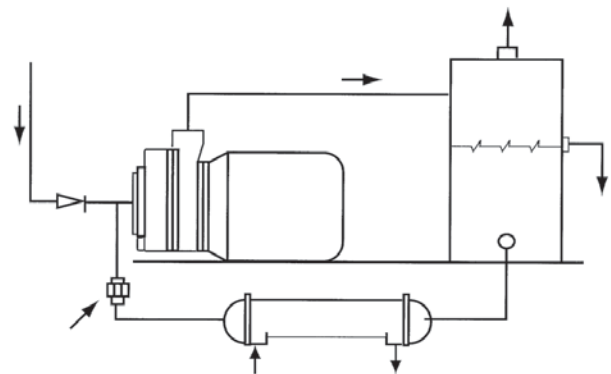


Figure 4-1 – Recirculated Seal Water (Tee into Inlet) (See General Piping Instructions on page xx for additional information.)

SINGLE-STAGE PUMP MODEL	VACUUM RANGE					
	0 – 10 IN. HG (0 – 340 MBAR G)		10 – 25 IN. HG (340 – 840 MBAR G)		> 25 IN. HG (> 840 MBAR G)	
	GPM	L/MIN	GPM	L/MIN	GPM	L/MIN
A5	1	3.8	1.5	5.7	2.0 – 3.0	7.6 – 11.4
A10						
A15	2.0	7.6	2.0	7.6	2.0 – 3.5	7.6 – 13.2
A20						
A75			2.5	7.6	3.0 – 4.0	11.4 – 15.1
A100						
A130	3.0	11.4	4.0 – 5.0	15.1 – 18.9		
A200	3.0	11.4	5.0	18.9	6.0 – 8.0	22.7 – 30.3
A300	4.0	15.1	6	22.7	8.0 – 10.0	30.3 – 37.9

Table 4-1 – Optimum Seal Water Rates

The water supply can be regulated by either a flow restrictor or manually by valve. The object is to balance performance against water consumption and power. **THE PUMP MUST NEVER RUN DRY.** The solenoid valve must be in an open position for pumping.

START-UP

1. Once the pump is fully piped and wired for operation, be sure no foreign matter may enter and possibly damage the pump. Check for welding shot, slag, or other metal bits.
2. Before starting the pump, turn the motor shaft by hand to be sure it is free to rotate. On TEFC motors, you may turn the rear fan. Some resistance during a full rotation is normal.
3. If a hard rub occurs and the motor shaft will not turn, check the pump internally for interference. The pump is operable as long as the shaft turns by hand.
4. Jog the motor, making sure water enters into the pump and that rotation is in accordance with the arrow cast on the pump face. If no flow of air or vacuum reading is immediately apparent, rewire the motor accordingly. **ROTATION SHOULD BE COUNTERCLOCKWISE WHEN YOU ARE FACING THE PUMP INLET.**
5. The pump is now ready for operation.

STOPPING PUMP

Once the power is shut off, be sure water is stopped from entering the pump. Use a solenoid valve in the seal water line to shut off flow simultaneously with cessation of pumping. Use an inlet check valve to prevent vacuum loss or backflow to the system.

05

MAINTENANCE

As a general rule, maintenance is not required for A-Series pumps. Because there are no rubbing parts and with water acting as coolant and lubrication during pumping, wear is minimized. Grease the motor bearings periodically in accordance with NEMA recommendations. For further information, **see *Troubleshooting on page 14.***

To prevent foreign matter from entering the pump, use a strainer for the seal water line and take the usual precautions in the pump inlet piping.

SERVICE AND REPAIR

A-Series liquid ring vacuum pumps are designed to minimize downtime by allowing for fast in-the-field repair. Time- and money-saving features include:

- Shaft-mounted assembly for easy alignment and indicating
- Modern O-rings and mechanical seals for practically zero leakage and easy replacement
- Replaceable port cylinder that unscrews from cover and requires no special shimming or adjustment
- Front-end disassembly for fast access to major internal parts
- American-made stock parts available for immediate shipment

See **Figure 6-1 on page 11** for details.

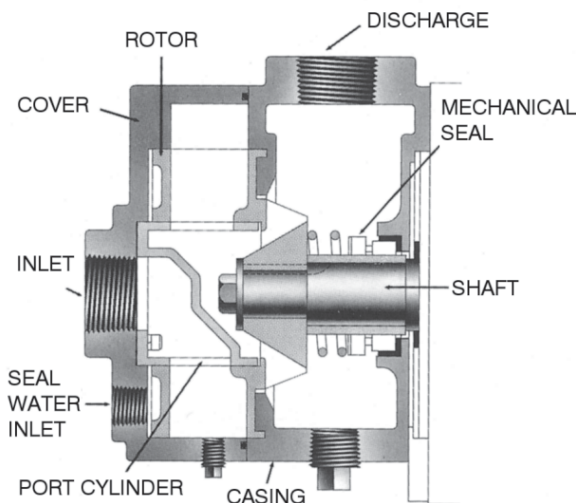


Figure 6-1 – Cutaway View

DISASSEMBLY OF PUMP

The pump may be disassembled while bolted to the baseplate by removing the suction and seal water piping and working from the cover to the motor. Most repair work will not require full disassembly, but refer to the exploded view drawing **on page 16** in following these steps:

1. Shut off all the valves controlling the flow of fluids to and from the pump casing. Disconnect the external piping.
2. Remove the bolts connecting the cover to the casing. The cover and port cylinder assembly will slide straight outward. Dismount the port cylinder from the cover by removing three socket head cap screws.
3. Remove the hex head lock screw and washer from the motor shaft. Use a bearing puller to remove the rotor without damage to the casing. Be sure to protect the threaded shaft bore.
4. Slide the shims and mechanical seal off the shaft.
5. Unbolt the casing from the motor face.
6. Save any and all shims from the shaft and casing assemblies for proper realignment.

ASSEMBLY OF PUMP

Before assembling the pump, carefully inspect all parts for signs of unusual wear, abrasion, and corrosion. Check O-rings for cracks or brittleness and examine the carbon face of the mechanical seal for scratches. Replace all parts as needed and proceed as follows.

NOTE: Numbers in parentheses refer to the exploded view drawing on page 16.

Sleeve and Seal Assembly

1. The mechanical seal is composed of a seal seat (8a), seal (8b), and spring (8c). The seat is a ceramic ring with a rubber boot that is pressed firmly into the rear of the casing. Use lubricant for ease in inserting the rubber boot into the seal housing bore. **BE VERY CAREFUL NOT TO SCRATCH THE CERAMIC FACE DURING HANDLING AND INSERTION.**
2. Once the seal seat is in place, mount the casing (1) on the motor face. The larger pump casings are mounted on four studs extending from the motor face, while the smaller casings (models A5, A10, A15, and A20) are secured by four hex head bolts.
3. The shaft sleeve rarely needs replacement. Polish it using a fine emery cloth. To replace the sleeve, slip the small O-ring (11) over the shaft until it touches the shaft shoulder and place the sleeve/bushing (9) on top so that its chamfered end presses against the O-ring.
4. To complete the assembly, lubricate the sleeve so that the rest of the mechanical seal (8b) can be pressed on and so the carbon face slides over and contacts the ceramic seat. **AVOID SCRATCHING OR TOUCHING THE CARBON FACE.** The spring provides proper tension between the seal faces.

Rotor Assembly and Alignment

5. Secure the rotor to the shaft by means of a key (15), a hex head lock bolt (13), and a washer (14). Lower the rotor onto the shaft key, making sure to align the notch with the shaft key. For the rotor to turn freely, there must be some clearance between it and the casing. On models A5, A10, A15, and A20, this clearance is established by adding washer shims (10) until no rub is felt between the back of the rotor and the casing face. On models A75, A100, A130, A200, and A300, use shims to position the rotor so that the casing face lines up with the inside wall of the rotor shroud. (See exploded view drawing on page 16 and **Figure 6-2 on page 12**).

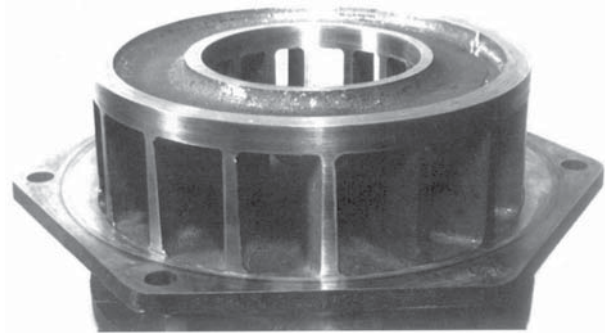


Figure 6-2 – Rotor Assembly

6. Use a bearing puller when removing the rotor to add more shims. Avoid damage to the casing face and to the threaded shaft bore. Once secured, the rotor should spin freely without any interference or rub from the casing.
7. To ensure proper alignment, you may indicate the runout on the front edge of the rotor. Using a dial indicator, measure the runout on the rotor. It should be within 0.003 – 0.005 inches (0.08 – 0.13 mm). Tighten down the rotor using a long bolt and several washers before inserting the lock bolt.

Port Cylinder Assembly and Cover

8. Mount the port cylinder (3) on the cover (4) using three socket head cap screws with nylon patches (6). Use a fiber gasket (5) to seal the surface between the cover and port cylinder and align the tapped holes to ensure correct placement.
9. Grease and stretch the O-ring and then insert it into a greased cover groove. Slide the port cylinder/cover assembly into the rotor bore.
10. The surface where the cover and casing meet will be sealed by the O-ring. When securing the cover to the casing, draw up the cover bolts (19) uniformly. During tightening, turn the rotor by hand to ensure easy rotation when the pump is fully assembled. Loosen the bolts and then tighten again if a hard rub occurs.

NOTE: Models A75, A100, and A130 have two socket head bolts that should be used in the bottom cover holes.

11. After installing the drain plugs (17, 18) with Teflon[®] tape on the threads, the vacuum pump is ready for service.

07

TROUBLESHOOTING

PUMP WILL NOT TURN ON START-UP

1. Check wiring and power to pump.
2. Remove pump cover to check for anything that may be binding the rotor. Be sure that the rotor turns freely by hand.
3. On cast iron pumps, check for internal rust if pump has been left idle for a long period. Rust can build up and close internal clearances. Remove rust and reassemble.
4. In areas where hard water is fed into the pump, check for scale deposits that may hinder rotation. Scale should be removed by acidizing, but consult the factory for recommended procedures.
5. If the motor fails to turn, isolate the motor from the pump and check the motor.

NO PUMPING ON START-UP

1. Check pump rotation. It may be rotating in reverse. Rewire motor to correct.
2. Check seal water. Water must continuously feed into the pump.

POOR PUMP PERFORMANCE AND LOW VACUUM

1. Check vacuum pump while running by sealing off the inlet piping and reading the vacuum at the pump suction. If high vacuum is achieved, look for leaks in the vacuum system. The pump capacity is a function of high vacuum performance and will conform to the published performance curve at standard conditions. High seal water temperatures will lower the vacuum because of the increase in vapor pressure. Altitude, barometric pressure, and gas temperature can also affect high vacuum performance.
2. If high vacuum is not achieved on blank-off, the problem lies in the vacuum pump. Poor pump performance can be caused by the following:
 - Pump may not be getting enough water. Adjust water supply and observe for change in the performance.
 - Internal parts may be worn. Remove cover/port cylinder assembly and check for wear on the port cylinder, rotor, and cover lands. Most wear will be limited to the port cylinder, which should slide easily into the rotor bore. Replace port cylinder if necessary. You may also polish the port cylinder and rotor bore with a fine emery cloth for a smooth fit.

PUMP UNUSUALLY NOISY

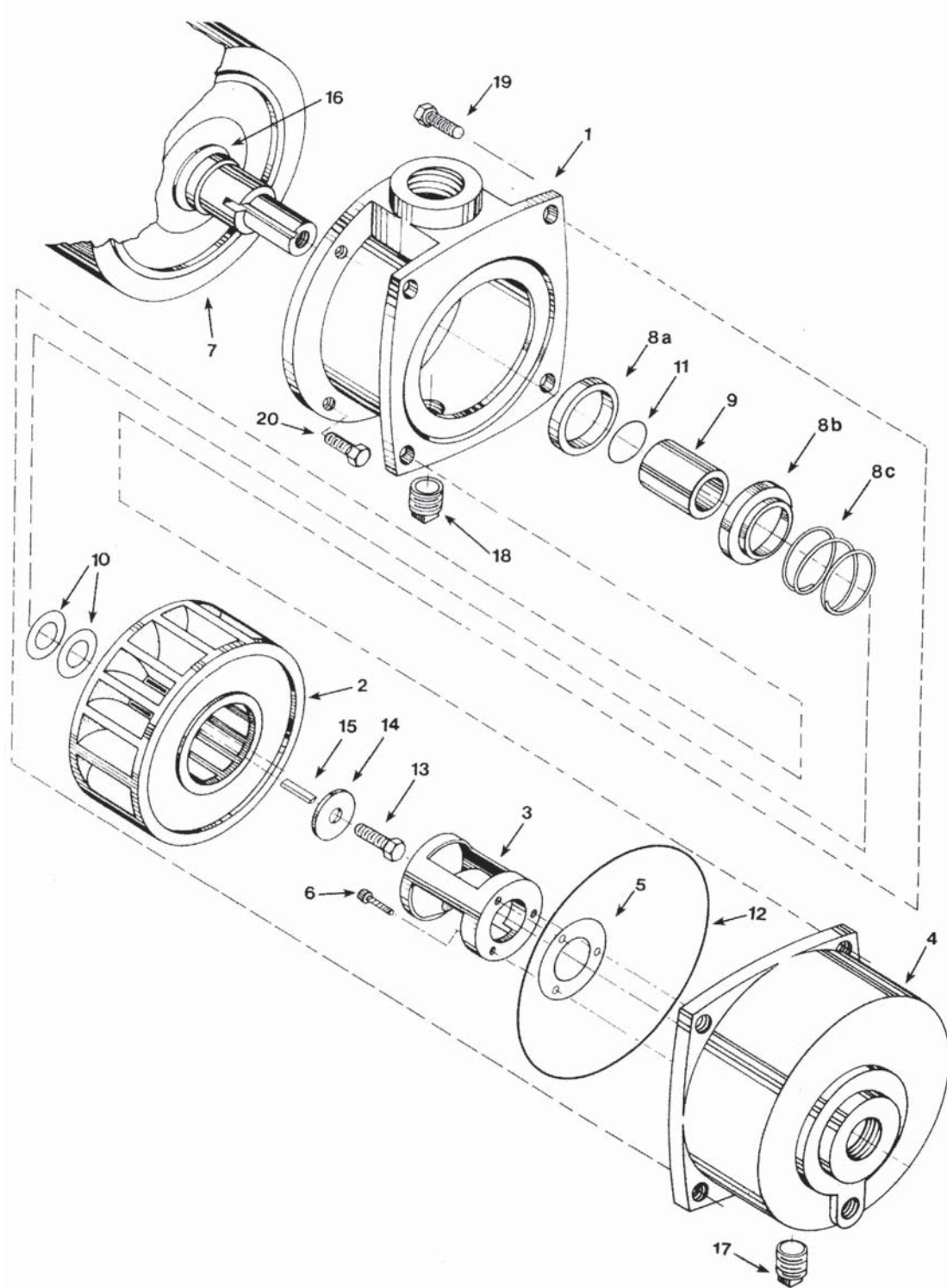
1. Unusual continuing noise from the motor end is probably an indication that the motor bearings are bad. Remove cover and spin rotor by hand. You should be able to detect bearing noise. If indicated, replace motor bearings.
2. Cavitation is possible. The vacuum pump should not be operated on blank suction for any length of time. When liquid ring vacuum pumps are starved for air, a rattling noise and vibration in the pump indicate cavitation. Eliminate cavitation by providing slight air bleed into the vacuum system.

HIGH AMPS

1. Flooding the pump with too much water, particularly at low vacuum, can overload the motor. Adjust seal water supply.
2. Internal rubbing of rotor with stationary parts can cause excessive loading. Shut off pump and rotate by hand (**See Start-up on page 9**) to see if rotor turns freely. Internal rubbing may be due to scale buildup, a galling foreign material, or by misalignment of parts. **See Pump Will Not Turn on Start-up on page 14 and Poor Pump Performance and Low Vacuum on page 14.**

ASSEMBLY DRAWINGS

Close-Coupled Pump Exploded View Drawing



PARTS LISTS – CLOSE-COUPLED MODELS

ITEM NO.	PART DESCRIPTION	QTY
1	Casing	1
2	Rotor	1
3	Port Cylinder	1
4	Cover	1
5	Gasket	1
6	Cap Screws	3
7	Motor	1
8	Mechanical Seal Assembly	1
8a	Seat	1
8b	Seal	1
8c	Spring	1
9	Shaft Sleeve	1
10	Shim	3
11	O-Ring, Shaft	1
12	O-Ring, Cover	1
13	Lock Bolt	1
14	Washer	1
15	Key	1
16	Slinger	1
17	Drain Plug, Cover	1
18	Drain Plug, Casing	1
19	Cover Bolts, Hex Head	**
19a	Cover Bolts, Socket Head	**
20	Casing Bolts	**
20a	Casing Studs	**
20b	Casing Nuts	**

ITEM NO.	A5 – A20	A75 – A130	A200 – A300
19	4	4	6
19a	–	2	–
20	4	–	–
20a	–	4	4
20b	–	4	4

** Quantity differs by model. See following table for quantities required.

ITEM NO.	PART DESCRIPTION	QTY
3	Port Cylinder	1
5	Gasket	1
8	Mechanical Seal Assembly	1
10	Shim	3
11	O-Ring, Shaft	1
12	O-Ring, Cover	1
13	Lock Bolt	1

Service Parts can be ordered from our factory in Springfield, Missouri, USA for immediate shipment. All parts for A-Series pumps are made in USA.

We are happy to assist you with any questions that may arise and to provide advice on applications for your A-Series pump. Please do not hesitate to contact us.

Contact

Parts Department

Tuthill Vacuum & Blower Systems
4840 W. Kearney Street
Springfield, MO 65803

Telephone: 417-865-8715
Toll-free: 800-825-6937
Fax: 417-865-2950

www.tuthillvacuumblower.com

WARRANTY – VACUUM PRODUCTS

Subject to the terms and conditions hereinafter set forth and set forth in General Terms of Sale, Tuthill Vacuum & Blower Systems (the Seller) warrants products and parts of its manufacture, when shipped, and its work (including installation and start-up) when performed, will be of good quality and will be free from defects in material and workmanship. This warranty applies only to Seller's equipment, under use and service in accordance with Seller's written instructions, recommendations and ratings for installation, operating, maintenance and service of products, for a period as stated in the table below. Because of varying conditions of installation and operation, all guarantees of performance are subject to plus or minus 5% variation. (Non-standard materials are subject to a plus or minus 10% variation).

PRODUCT TYPE	WARRANTY DURATION
New (Non-Piston Pumps)	15 months after date of shipment or 12 months after initial startup date, whichever occurs first
New (Piston Pumps)	30 months after date of shipment, on all units sold after June 1, 2014.
Repair	6 months after date of shipment or remaining warranty period, whichever is greater
Remanufactured	9 months after date of shipment or 6 months after initial startup date, whichever occurs first

THIS WARRANTY EXTENDS ONLY TO BUYER AND/OR ORIGINAL END USER, AND IN NO EVENT SHALL THE SELLER BE LIABLE FOR PROPERTY DAMAGE SUSTAINED BY A PERSON DESIGNATED BY THE LAW OF ANY JURISDICTION AS A THIRD PARTY BENEFICIARY OF THIS WARRANTY OR ANY OTHER WARRANTY HELD TO SURVIVE SELLER'S DISCLAIMER.

All accessories furnished by Seller but manufactured by others bear only that manufacturer's standard warranty.

All claims for defective products, parts, or work under this warranty must be made in writing immediately upon discovery and, in any event within one (1) year from date of shipment of the applicable item and all claims for defective work must be made in writing immediately upon discovery and in any event within one (1) year from date of completion thereof by Seller. Unless done with prior written consent of Seller, any repairs, alterations or disassembly of Seller's equipment shall void warranty. Installation and transportation costs are not included and defective items must be held for Seller's inspection and returned to Seller's Ex-works point upon request.

THERE ARE NO WARRANTIES, EXPRESSED, IMPLIED OR STATUTORY WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF, INCLUDING WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS OF PURPOSE.

After Buyer's submission of a claim as provided above and its approval, Seller shall at its option either repair or replace its product, part, or work at the original Ex-works point of shipment, or refund an equitable portion of the purchase price.

The products and parts sold hereunder are not warranted for operation with erosive or corrosive material or those which may lead to build up of material within the product supplied, nor those which are incompatible with the materials of construction. The Buyer shall have no claim whatsoever and no product or part shall be deemed to be defective by reason of failure to resist erosive or corrosive action nor for problems resulting from build-up of material within the unit nor for problems due to incompatibility with the materials of construction.

Any improper use, operation beyond capacity, substitution of parts not approved by Seller, or any alteration or repair by others in such manner as in Seller's judgment affects the product materially and adversely shall void this warranty.

No employee or representative of Seller other than an Officer of the Company is authorized to change this warranty in any way or grant any other warranty. Any such change by an Officer of the Company must be in writing.

The foregoing is Seller's only obligation and Buyer's only remedy for breach of warranty, and except for gross negligence, willful misconduct and remedies permitted under the General Terms of Sale in the sections on CONTRACT PERFORMANCE, INSPECTION AND ACCEPTANCE and the PATENTS Clause hereof, the foregoing is BUYER'S ONLY REMEDY HEREUNDER BY WAY OF BREACH OF CONTRACT, TORT OR OTHERWISE, WITHOUT REGARD TO WHETHER ANY DEFECT WAS DISCOVERED OR LATENT AT THE TIME OF DELIVERY OF THE PRODUCT OR WORK. In no event shall Buyer be entitled to incidental or consequential damages. Any action for breach of this agreement must commence within one (1) year after the cause of action has occurred.

June, 2014

OPERATING DATA FORM / PRODUCT REGISTRATION

It is to the user's advantage to have the requested data filled in below and available in the event a problem should develop in the blower or the system. This information is also helpful when ordering spare parts.

Model No.	<hr/>	V-Belt Size	<hr/>	Length	<hr/>
Serial No.	<hr/>	Type of Lubrication	<hr/>		
Start-up Date	<hr/>	<hr/>			
Pump RPM	<hr/>	Operating Vacuum	<hr/>		
Pump Sheave Diameter	<hr/>	Any Other Special Accessories Supplied or in Use:			
Motor Sheave Diameter	<hr/>				
Motor RPM	<hr/>	HP	<hr/>		

NOTES:

IMPORTANT

All blowers manufactured by Tuthill Vacuum & Blower Systems are date-coded at time of shipment. In order to assure you of the full benefits of the product warranty, please complete, tear out and return the product registration card, or register online at tuthillvacuumblower.com.



Technical Support: 1-877-955-TECH (8324)

Service & Repair or Product Sales:

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