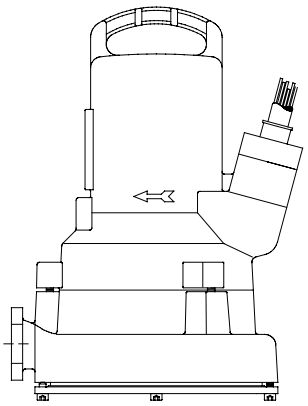
We know how water works

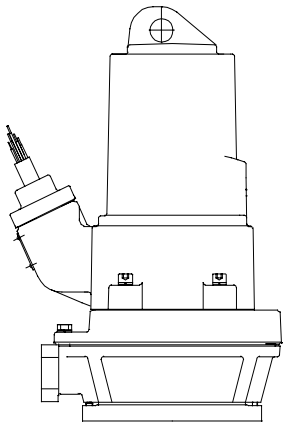
Installation Operation & Maintenance Manual

PIRANHA “S” Series
S10/4, S16/2, S18/2, S26/2W, S30/2D

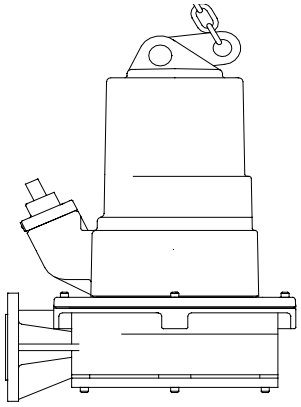
PIRANHA “M” Series
M25/2,M35/2, M46/2D, M50/2W, M70/2D, M80/2D, M100/2D, M125/2D



PIRANHA S10/4-S30/2



PIRANHA M25/2-M50/2



PIRANHA M70/2-M125/2

READ THIS MANUAL CAREFULLY BEFORE ATTEMPTING TO ASSEMBLE, INSTALL, OPERATE OR MAINTAIN THE PRODUCT DESCRIBED. PROTECT YOURSELF AND OTHERS BY OBSERVING ALL SAFETY INFORMATION. FAILURE TO COMPLY WITH INSTRUCTIONS COULD RESULT IN PERSONAL INJURY AND/OR PROPERTY DAMAGE! RETAIN INSTRUCTIONS FOR FUTURE REFERENCE.

(4) 15975076US 07/06

SECTION I
INTRODUCTION

ABS PIRANHA grinder type submersible pumps are designed to operate in installations handling raw sewage, industrial wastes, or other liquids where suspended solids and fibrous materials are found within the medium being pumped. The function of the pump is to reduce solids to small particles which pass through small diameter contour piping. It is important that the installation, operation and maintenance of the equipment be done in accordance with the instructions outlined in this manual for the pump to provide years of trouble-free service.

WARNING

The major material of construction of PIRANHA pumps is cast iron. They should not be used to pump corrosive liquids.

CAUTION

Three~phase only, "**CAUTION:** Risk of Shock. Do not remove cord and strain relief. Do not connect conduit to pump", and **"INSTALLER**: This pump is not provided with a supply connection, therefore one of the following means must be provided by the installer: (1) A suitably rated, grounding-type attachment plug must be provided for connection to the branch circuit supply, or (2) A Listed junction box, Listed outlet box, or Listed wiring compartment and their associated fittings must be provided by the installer for supply connection. This provision must reduce the likelihood of water entry during temporary, limited submersion. See Instruction Manual for Further Details. Only qualified personnel shall install the pump.

CAUTION

Single ~ phase only, **WARNING:** Risk of electrical shock-this pump is supplied with a grounding conductor and grounding-type attachment plug. To reduce the risk of electrical shock, be certain that it is connected only to a properly grounded, grounding receptacle, motor is thermally protected. To reduce risk of electrical shock, pull plug before servicing this pump. This pump has not been investigated for use in swimming pools.

1-1 INSPECTION UPON RECEIPT OF PUMP

The shipping container shall be immediately inspected for damage that may have occurred during shipment. Exercise care in opening the shipping container to avoid damage to the pump. Remove any blocking and packaging material from within the container. Check all packaging material for spare parts before discarding. Visually check the pump and any spare parts for damage, including damage to inlet and outlet port threads, flanges, and electrical wires - - especially where they exit the pump housing. Report any damage or shortage of parts to your supervisor, or directly to the carrier.

1-2 STORAGE BEFORE USE

ABS PIRANHA grinder pumps are shipped from the factory ready for installation and usage. They may be held in storage if the pump station is not completed. If storage is necessary, the pump should be left in the shipping container, as received. It should be stored in a warehouse or storage shed that has a clean, dry temperature-stable area where the pump and its container may be further covered to protect it from water, dirt, dust, etc. Check that the ends of the electrical wires are protected against moisture.

CAUTION

At no time shall the pump be "stored" in an incomplete pump station wet pit. The pump shall not be placed into the pit until it can be fully installed and operated.

1-3 MOUNTING BASE

ABS pumps may be guide rail mounted, or vertical mounted, or horizontal mounted. The foundation for each must be rigid enough to absorb any induced vibrations and stress normally generated during pump operation. A portable vertical or horizontal pump will simply sit on the foundation, therefore, it must be level. The guide rail mounted pump will have the guide rail base bolted to the foundation. The mounting bolts will be imbedded in the foundation with size and location defined by the ABS installation drawing.

WARNING

The guide rail base must be plumb with the upper guide bracket (mounted to the pit access cover).

1-4 INSTALLATION

Mechanical - there are many possible ways of mechanically installing the submersible grinder pumps. They can be installed in concrete sumps, fiberglass or steel basins.

CAUTION

Prior to installing the pump in the base of the wet well, refer to paragraph 4-4 entitled "initial start-up". Be sure the pump is running with the correct impeller rotation.

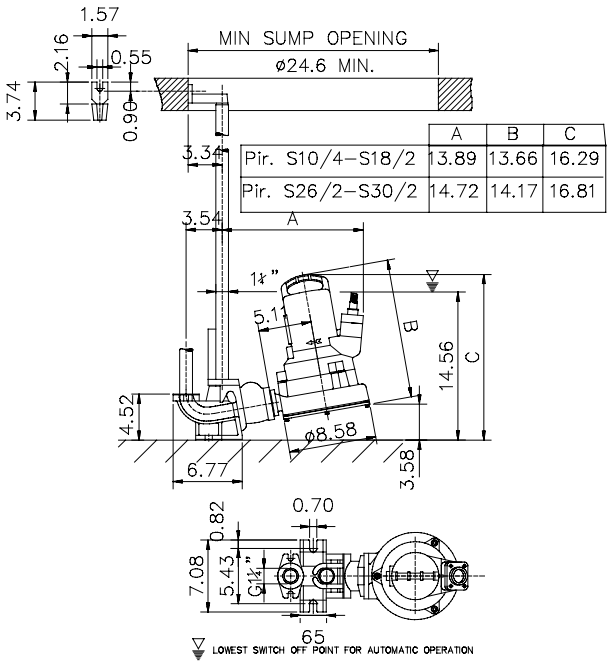
The four methods of installing the pumps in these sumps or basins are as follows:

1-4-1 Guide Rail

Occasionally, ABS will be supplying the access cover for the pump installation wet well. This access cover should be cast either into the concrete roof of the wet well or mounted on the top of an ABS or contractor supplied fiberglass basin in the position shown on the particular job specification engineering drawings and ABS installation drawings. At the same time the guide rail base anchor bolts should be cast in the

bottom of the wet well, again per the job specification engineering drawings and ABS installation drawings.

Typical Installation on Guide Rail Assembly



	A	B	C
Pir. S10/4–S18/2	13.89	13.66	16.29
Pir. S26/2–S30/2	14.72	14.17	16.81

Fig 1

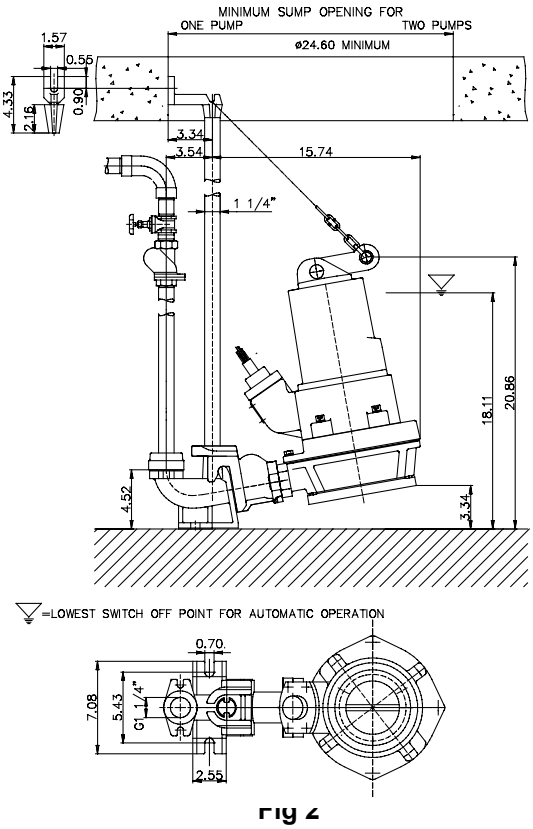
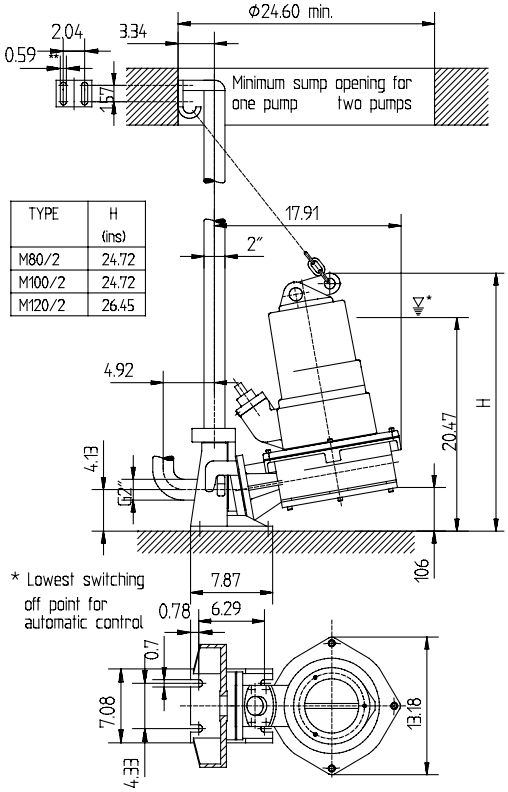


Fig 2

WARNING

The foundation bolts must be suitably grouted with a good commercial grade grout. The grout should be properly installed to prevent air bubble inclusion and completely encase and seal the area around the bolt.



TYPE	H (ins)
M80/2	24.72
M100/2	24.72
M120/2	26.45

Fig 3

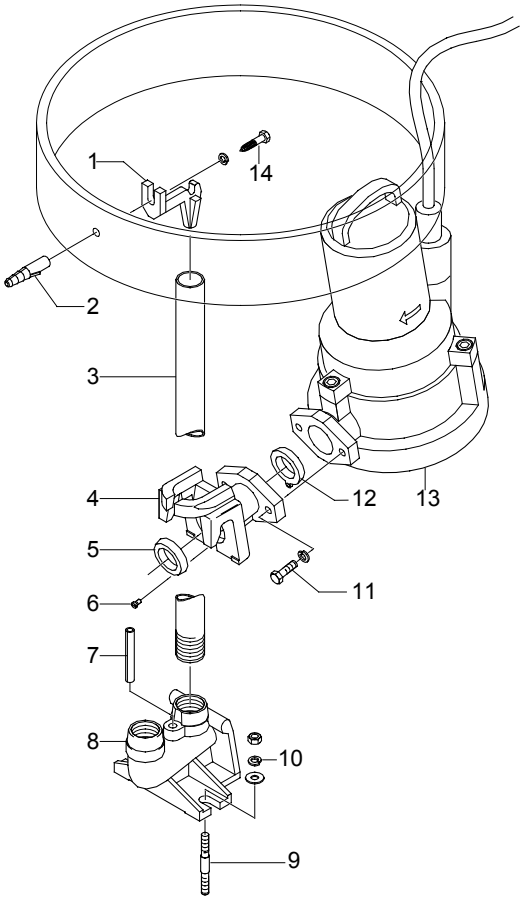


Fig 4

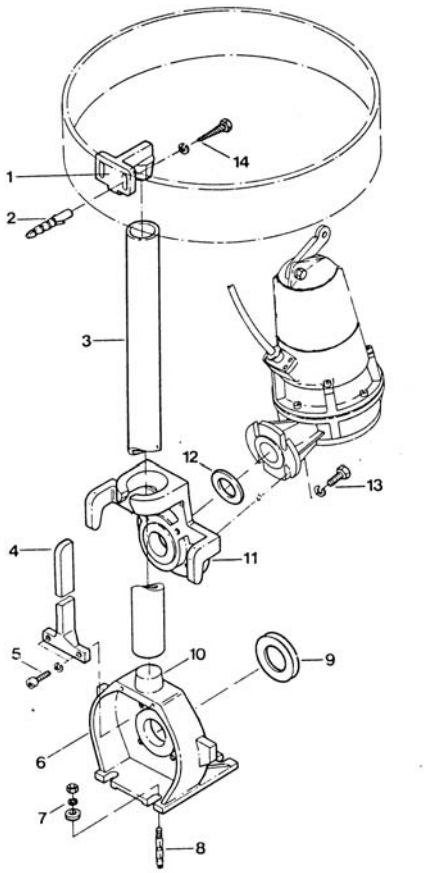


Fig 5

Determine the position of the guide pipe bracket (1) on the inner side of the sump entry opening and fit the pipe retainer using masonry plugs and screws. The screws (14) should not yet be fully tightened.

Note The guide pipe bracket (1) must be positioned vertically above the guide tube location on the guide rail base.

Place the guide rail base (6 or 8) with fixing cone (10) or threaded pipe location for the guide tube on the sump floor vertically below the guide pipe bracket (1).

The guide rail base should be fixed so that it is fully horizontal and fastened to a clean surface.

Place guide tube (3) alongside the locating cone (10) or tapped hole on the guide rail base (8) and determine the final guide tube length (note extra length required for threading into the guide rail base (8). The length is determined by making a measurement to the upper edge of the cone on the guide pipe bracket (1).

Shorten guide tube (3) to the correct length.

ATTENTION Max. guide tube length 20ft.

Place or screw the guide tube between the cone on the guide rail base (10) and guide pipe bracket (1). Ensure that it is vertical and then drill the fixing holes for the masonry bolts (8 or 9) on the guide rail base which should now be in the correct position.

NOTE Masonry bolts with at least ⅝" diameter should be used.

Wear safety glasses!

Blow out the dust from the drilled holes, and then place the untensioned masonry bolts (8 or 9) in the hole to a depth level with the washers.

Ensure that the masonry bolts cannot turn by using a screwdriver and finally tighten the guide rail base using Hex nuts (7 or 10).

ATTENTION In order to ensure secure vibration-free running of the pump it is essential that the masonry bolts are a tight fit. For this it is essential that adequate floor thickness and concrete quality is present.

Press the guide pipe bracket (1) into the guide tube so that there is no play in a vertical direction, and fix using Hex screws (14).

Screw the guide piece (4) using socket head screws (5) to the guide rail base (6), or insert the guide pin (7) into guide rail base (8).

Screw bracket (11 or 4) including seal (12) to the flange of the submersible pump using socket head screws (11 or 13) including spring washers.
Screw the seal (5) with socket head screws (6) to the bracket (4), or in the case of brackets for PIRANHA M80-2 to M120-2 place seal (9) in bracket (11).

Fix the chain for lowering the pumps by means of a shackle to the head of the pump.

NOTE the lifting device must be adequately dimensioned to suit the weight of the pump.

Slide pump with bracket along the upper pipe retainer and lower it down along the guide tube into the sump.

Care should be taken that the claws of the bracket locate themselves on the cast-on projections on the side of the pedestal. By this means the pump reaches its correct operating position automatically, and seals on the discharge outlet of the guide rail base automatically by means of its own weight. This automatic coupling process can be repeated as often as desired. Finally, take the tension off the chain and hang it in the hook of the upper pipe retainer.

CAUTION
All discharge piping and valves should be supported in such a manner that no load is carried by the pump discharge elbow.

1-4-2 Vertical Pedestal
The vertical pedestal base mounted pump can be used for permanent or portable service. The pump attaches to a fully assembled pedestal base and discharge elbow. Either rigidly mounted permanent 1¼" (2" M80/2-M120/2) discharge piping or hoses with quick disconnect couplings may be installed. Refer to CAUTION and WARNING notes of the preceding section. This configuration can be utilized in a concrete sump, steel, or fiberglass basin.

1-4-3 Horizontal Cradle
The horizontal cradle mounted pump can be used for permanent or portable service. The pump, as supplied, attaches to a fully assembled cradle base and 1¼" (2" M80/2-M120/2) discharge fitting for rigid pipe or flexible hose. Refer to CAUTION and WARNING notes of the preceding section. This configuration can also be utilized in either concrete sump, steel or fiberglass basin.

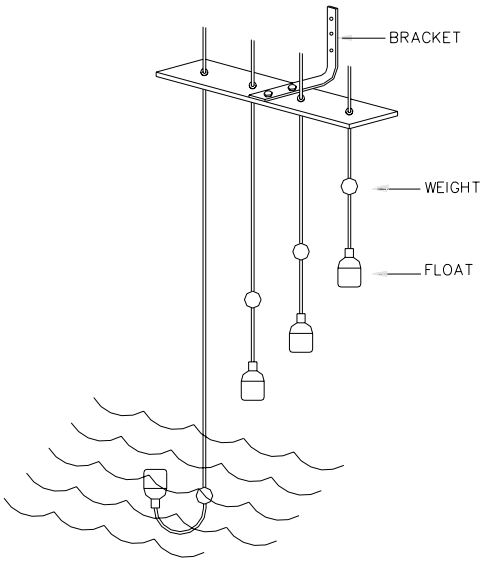
1-4-4 CHAIN HUNG
Using chains the submersible grinder pump can also be installed by hanging the unit from the top of the sump or basin. The unit can be hung either in a vertical or horizontal position. For this installation 1 ¼" (2" M80/2-M120/2) discharge fittings or quick disconnects for flexible hose connections must be installed. Refer to CAUTION and WARNING notes of the preceding section.

1-5 FLOAT SWITCHES & FLOAT SEQUENCE

1-5-1 Float Switches

The fluid levels at which the pumps start or stop are normally controlled by mechanical float switches. The float switches are free hanging into the wet well. Special brackets mounted to the access cover frame hold the cables. The clamps are designed to hold the cables without pinching or damaging them.

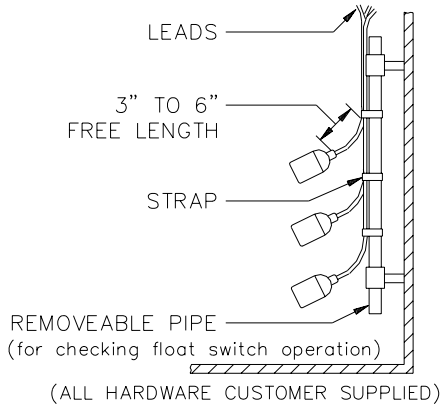
WARNING
The float switches shall never be mounted in direct line of the influent flow.



Float switches supported by bracket

The level switch consists of a mechanical switch sealed within an air-filled polyethylene ball and a ballast weight. A special mounting bracket is supplied for mounting either two or three level switches.

If the sewage within the wet well produces flow patterns that cause the float switches to:
tangle with each other
or
catch on pipes, ladders or brackets
or
register erroneous ON and OFF signals...
an alternate method of switch mounting is suggested.



Alternate Method of Switch Mounting

1-5-2 Float Sequence

SIMPLEX STATION

As the level of influent rises "PUMP OFF" float is tilted - nothing is activated. As influent continues to rise inside the basin, "PUMP ON" float is activated. This starts the grinder pump. It will pump until "PUMP OFF" float deactivates the pump. Should the liquid level continue to rise to a specified point above the "PUMP ON" float, the "ALARM" float is activated and energizes the high-level alarm light on the control panel.

DUPLEX STATION

As level of influent rises "PUMP OFF" float is tilted - nothing is activated. As influent continues to rise inside the basin, the "LEAD PUMP ON" float is activated and starts the lead grinder pump. It will pump until "PUMP OFF" float deactivates the pump.

On the next start, the opposite pump will be activated by the "LEAD PUMP ON" float. The pumps will then continue to alternate on each start. Should the fluid level continue to rise a specified point above the "LEAD PUMP ON", float, the "LAG PUMP ON" float will activate the lag (non-operating) pump and run both pumps until the "PUMP OFF" float deactivates both pumps.

Should the liquid level continue to rise to a specified point above the "LAG PUMP ON" float the "ALARM" float is activated and energizes the high level alarm light on the bottom of the control panel.

WARNING

No pump on/off float switch differential should be set that will exceed 10 starts per hour per pump.

SECTION II
OPERATION

CAUTION

Prior to placing the pump into operation a product start-up procedure shall be accomplished by authorized personnel. Failure to complete the "product start-up report" and return to the factory may void the warranty. A copy of this report is furnished with each pump.

2-1 PERMANENT INSTALLATIONS

When the electrical service has been properly connected, all control float switches checked, and the pump mechanically mounted in position, the operation of the pump is completely automatic. No operational procedures are required except to apply rated power to the pump. There are also no specific shutdown procedures beyond disconnecting the electrical power supply.

2-2 PORTABLE USAGE

When using the ABS grinder pump for portable service, special care must be taken to prevent undue wear or damage. When using the pump on a soft muddy bottom, place a flat plate beneath the pedestal base to prevent the pump from burrowing itself into the mud or sand.

SECTION III
PERIODIC MAINTENANCE

ABS grinder pumps are designed for long lasting, efficient and reliable service with a minimum number of preventive maintenance checks. These checks are few but will add years of satisfactory service to the life of the pump. Maintenance checks should be performed at approximately the intervals stated (the actual time interval will depend on the operating environment).

3-1 MAINTENANCE NOT REQUIRING REMOVAL OF THE PUMP

3-1-1 Pump Wash-Down

The accumulated build-up of fats, grease and sludge around the pump and motor housing reduces the transfer of normal operational motor heat to the surrounding ambient. This increasing internal heat (heat rise) shortens stator-winding life and may cause the motor contactors to trip out for no apparent reason. It is, therefore recommended that at six (6) month intervals the pump be washed down with a pressure hose, after pumping down the pit influent to a level at the base of the pump.

3-1-2 Float Switch Cleaning

The build-up of fats, grease, and sludge on the float switches may cause them to function improperly. The float switches should be checked for sludge build-up at three (3) month intervals. They may be lifted from the pit and cleaned, or cleaned in place if they are anchored to structural parts of the station. After cleaning they should be visually inspected and worked in sequence to check pump operation.

3-2 MAINTENANCE REQUIRING REMOVAL OF THE PUMP

CAUTION

No repairs shall be made to pump during warranty period without prior factory approval. To do so may void the warranty. An authorized service representative should make any repairs.

To accomplish pump removal for periodic maintenance the following procedures are recommended:

CAUTION

It is extremely important that under no circumstances the pump be lifted using the cable.
Under no circumstances should tools be applied to the pump and motor without the power to the control box being disconnected and locked out.

Guide rail

The pump as installed will be resting on the guide rail base. There will be a gate and check valve in the discharge line. To remove pump, cable disconnection is not necessary; close the gate valve-then using lifting chain, raise pump along guide rail out of the well. If pump is to be moved away from the wet well, junction box and/or control box - cables must be disconnected.

Pedestal, cradle, or chain hung

The pump as installed will be resting on the pedestal base, horizontal cradle or hanging by a chain in the wet well. There will be a gate and check valve with a 1 ¼" / 2" union in the discharge line. To remove pump, cable disconnection is not necessary; close the gate valve, disconnect the union and lift pump out of the wet well. If pump is to be moved away from the wet well, junction box and/or control box cables must be disconnected.

3-2-1 Seal Oil Check

The seal oil in the oil chamber should be checked at intervals of one (1) year, unless an ABS Sealminder is in the control panel. The recommended procedure is to place pump in a horizontal position with the oil fill plug screw facing upward, clean around plug, remove plug and fiber washer.

WARNING

Replace fiber washer after every plug removal.

Check the level of the oil in the oil chamber. The fluid should be approximately 1.0" or 25mm from the counter bore of the oil plug screw. Drain off a small amount of oil, if the oil is free from discoloration, no further checks will be necessary for one (1) year. Replenish oil and install plug and new washer. If chamber oil appears white or milk-like, then it must be completely drained from pump. Refill using new 10WW HD (High Detergent) motor oil.

WARNING

Multi-viscosity is not acceptable.

WARNING

If the oil is discolored, another check of the seal oil is required after an interval of three (3) weeks. If the oil is discolored again, then the mechanical seal must be replaced.

Testing Mechanical Seal (Authorized Service Center)

1. Install impeller and impeller bolt to hold seal in place.
2. Attach test pieces (1/2" threaded air hose adapters) to motor housing and oil chamber (remove oil plug screw).
3. Pressurize oil chamber 1.5 atmospheres (7.5 PSIG)
4. Connect "U" tube to test piece in housing (this test is to check the lip seal in flange assembly).
5. Disconnect "U" tube from housing.
6. Pressurize housing 1.5 atmosphere (7.5 PSIG).
7. Submerge pump in water and check for leaks (6 seconds minimum)
8. Disconnect air hose from housing and replace plug screw.
9. Disconnect air hose from oil chamber and replace plug screw.

To remove mechanical seal

1. Remove oil plug screw and fiber washer.
2. Drain off oil.
3. Remove bottom plate.
4. Remove cutting rotor and impeller. (To remove cutting rotor and impeller - first remove Allen screw with washer. Insert two (2) M6 screws into tapped hole provided in impeller, screw inwards to force impeller off shaft.
5. Remove impeller key from the shaft.
6. Remove volute by unfastening Allen screws 10mm
7. Remove seals. The lip seal requires removal of Allen screws and oil chamber after removal of mechanical seal. Lip seal must be removed using pliers or screwdriver. Once the lip seal is removed a new seal should be installed. ***Do not reuse lip seal.***

Fitting replacement mechanical seal

CAUTION

Lip seal should be installed at a slight angle to extend seal life and ensure proper lubrication.

Installation of mechanical seal to rotor shaft assembly must be done with the utmost care. It is important, therefore, to follow the instructions explicitly:

WARNING
Never use a damaged mechanical seal

1. Clean shaft and surrounding area thoroughly.
2. Remove wrapping from seal, wipe seal with tissue.
3. Submerge inner lip seal in clean oil and press into position using both thumbs or by lightly tapping with a small hammer.
4. Secure oil chamber to motor housing.
5. Submerge stationary seat of mechanical seal in clean oil and press into position using both thumbs (never put a sharp or hard tool against a seal face).
6. Dip rotating seal in oil. Wet the o-ring in clean water. Push same along shaft.
7. Using circlip pliers, fit securing ring against seal, then push ring into position.

Fitting hydraulic parts after seal replacement
Fit key on to shaft. Fit O-ring to oil chamber. Fit volute to oil chamber. When fitting fixing screws, fit the longest screws at right angles to the discharge to facilitate cradle mounting. Take bottom plate fitted with adjusting screws, introduce to volute face, secure locking screws with washers to volute and tighten. Introduce cutting rotor to shaft and fasten impeller screw and alignment. Mount cutting ring to bottom plate and fasten with screws. Rotate impeller cutting rotor clockwise by inserting an Allen wrench in cutter rotor bolt, listening for possible interference between impeller and bottom plate. If rubbing occurs, slacken bottom plate off in area of interference.

3-2-2 TOLERANCE CHECK

With the pump out of the pit, check the gap distance between the impeller and the bottom plate. This should be done with a standard feeler gauge. The recommended gap distance is between .015" and .045".

To accomplish this, first remove the cutting system's stationary cutter by removing its holding screws. Use the feeler gauge to determine clearance between impeller vane and spiral bottom plate. Start with a .045" size. If it does not fit, the clearance is correct. If the feeler gauge indicates a larger than .045" gap, the spiral bottom plate must be adjusted as follows:

Back off on the holding screws. It is not necessary to completely remove the screws. Next, turn the Allen adjusting screws counter-clockwise for one half turn. Retighten the holding screws and recheck the clearance with the feeler gauge. If the desired clearance is not yet reached, repeat the procedure as many times as necessary making only a half turn on the adjusting screws each time until the desired clearance is obtained. Finally, replace the stationary cutter by reinstalling the holding screws making sure it is seated on the bottom plate.

3-2-3 AMP Draw Check

On a yearly basis an amp draw should be performed according to the steps outlined in the "Initial Start-Up" section (ref. Paragraph 4-4). Results of this test should be within 15% of the recorded initial start-up amp draw reading from first installation.

3-2-4 Bearing Removal

To remove housing

Remove M10 Allen screws and washers which secure motor housing to oil chamber. Remove oil plug screw and washer from housing; gently pry motor housing from oil chamber. Lift motor housing approximately six (6) inches; disconnect seal monitor lead using needle nose pliers.

To remove bearing lid from oil chamber

Follow seal removal procedure of paragraph 3-2-1. Support oil chamber. Slowly apply pressure to shaft impeller lid assembly from oil chamber.

To remove bearing from bearing lid

Remove lip seal, support washer, and circlip; apply pressure to shaft forcing rotor from bearing. Remove both circlips; apply pressure to outer race of bearing forcing bearing upward and out of bore. Place hand tool (SKI-243) into bore and apply pressure.

3-2-5 Cable Disconnection

Remove M10 Allen screws, washers, from motor housing. By means of hoist and tackle, slowly lift motor housing clear of oil chamber bearing lid assembly.

Rest motor housing on workbench and loosen M6 Allen screws, washers releasing clamp on cable. Remove M8 Allen screws, washers and cable cap from motor housing. Push cable approximately 2" or 50mm into motor housing making leads easier to work on. Cut wire splices approximately 3/16" or 4-5mm from each end. Disconnect ground connections on motor body.

3-2-6 Stator Removal From Motor Housing

Remove securing screw(s) and sealing washer(s) fixed to side of housing.
Externally heat housing body with flame torch moving torch evenly around housing. Heat for about 1-2 minutes to a temperature of approximately 100°C. Using asbestos hand glove, gently tap lower part of housing against soft material such as wood. Keep tapping until stator can be removed by hand.

3-2-7 Cable Rewiring

Replace cable seal. Place existing washer and new cable seal over cable. Make cable lead wires about 6" long and connect exposed wires to the stator leads with an insulated butt-splice. Tuck excess lead wire behind the stator crown and secure with tie-wraps.

WARNING
If leads are not tied and tucked, damage may occur to the wire if near rotor cooling fins.

Refasten cable cap and cable clamp to motor housing. Be careful in fastening the cable clamp that the clamp is snug but not too tight. Over tightening of the cable clamp could shear cable jacket, causing water intrusion into the cable leads.

SECTION IV
ELECTRICAL CONTROLS

CAUTION
Only a licensed electrician should service electrical faults

4-1 GENERAL INFORMATION

Electrical control panels are usually supplied with the pumps, although pumps can be provided and connected to customer supplied panels. If a control panel other than that supplied by ABS is used, the panel must be wired so that the built-in ***safety features*** of the pump are utilized. These safety features are the warning probe in the oil chamber and thermal overloads in the motor windings.

WARNING
It is to the customer's benefit to incorporate the safety feature's to ensure long trouble-free life and validate the pump warranty.

The following paragraphs describe the pump's internal wiring and its correct electrical connections into a control panel.

CAUTION
Under no circumstances shall any motor lead be spliced at a submerged point or in any wet location that *will allow wicking.*

4-2 PUMP INTERNAL WIRING

Motor voltage ratings are shown on the pump nameplate. Each pump is connected at the factory for the voltage called for on the specific order.

NOTE: Wiring diagrams are located at the back of the Manual.

When initially running the pump, the current draw, under no load, should be checked to ascertain that the pump is wired properly. The current draw, at no load, across each of the three phases shall be approximately 49% of the full load current indicated on the pump nameplate. This current draw should be noted on the panel door for future reference.

CAUTION
Prior to installing the pump permanently, refer to paragraph 4-4 entitled "INITIAL START-UP" to be sure the pump is running with the correct impeller rotation.

4-3 CONTROL PANEL WIRING

There are many variations of control panels and it is impractical to include instructions for each and every variation. The normal panel supplied by ABS is equivalent to a NEMA 3R Door-In-Door enclosure. All connections to this panel are made at the terminal strips. When control panels other than ABS are used, refer to that manufacturer's wiring diagrams and instruction manuals for proper wiring connections.

Mounted on the inside of the ABS control panel door is a complete wiring diagram and terminal strip diagram. The terminal strip diagram indicates how to electrically connect the float switches, water warning electrode lead, thermal overload leads and power leads.

4-4 INITIAL START-UP

4-4-1 IMPELLER ROTATION

Upon completion of the electrical service power connections to the pump, it is very important to be sure that the direction of the pump rotation is correct. This is determined by a quick initial start-up procedure. The **"M" Series** pump motor housing top cover contains a cast-in arrow and the words "START REACTION' which indicates the direction in which the pump should kick when it is started. This is the starting reaction. *The impeller rotates in the opposite direction of the arrow for proper operation.*
The **"S" Series** pump contains a cast-in arrow on the side of the motor housing which indicates the proper direction in which the impeller should operate. *However, the pump should kick in the opposite direction to the arrow when it is started*

Stand the pump on a hard surface. Jog the pump by momentarily turning the HAND-OFF-AUTO switch to the HAND position and returning to the OFF position. The pump should react, "twist", in the direction of the arrow on top of the pump with the **"M" Series** and in the opposite direction to the arrow with the **"S" Series.** If the pump should twist incorrectly, the pump is now running backwards. To change direction on a three phase pump, switch any 2 of the power leads going to the pump (at the terminal strip). For a duplex station, if both pumps are turning backwards, the leads must be switched at the terminal strip for both pumps. Do not switch power leads coming into the control panel.
Note if a single-phase pump should run backwards, consult the ABS Service Department immediately. Do not operate the pump.

CAUTION

Do not switch the incoming power supply line leads, as this will affect all pumps in a multiple installation.

4-4-2 Current Unbalance

Upon ascertaining that the pump(s) is rotating in the correct direction, the amount of current unbalance between phases must be calculated. Run the pump under water, checking that all valves are open in the discharge lines to simulate normal operating load conditions.

CAUTION

Current unbalance between phases shall not exceed 4%. Consult the factory when current unbalance exceeds 4%. The percent of current unbalance is defined and calculated per the following example:

$$\text{Max current unbalance \% current} = \frac{\text{difference from average} \times 100}{\text{average current}}$$

Example:

(1) Current readings in amps shall be taken on each phase at the control panel terminal strip.

$T_1 = 10$ amps, $T_2 = 10.5$ amps, $T_3 = 10.5$ amps

(2) The average current $= \frac{10 + 10.5 + 10.5}{3} = 10.33$ amps

(3) The maximum current difference from average
10.33 - 10.00 = 0.33 amps

(4) The % current unbalance $= \frac{0.33 \times 100}{10.33} = 3.2\%$

Therefore, the % current unbalance for this particular three-phase hookup is 3.2%. ***If your unbalance between phases should exceed 4% consult factory immediately***. The results of this current unbalance calculation shall also be entered on the "Product Start-Up Report".

4-5 WATER WARNING PROBE

If too much moisture is inside the oil chamber, the SEAL ALARM light will be ON. To check this function, a jumper wire may be placed between terminal 12 (Simplex) or 12 and 13 (Duplex) and ground; this will simulate water in the oil chamber.

4-6 FLOAT SWITCH CHECK

Immediately following float switch level adjustments and electrically connecting the float switch leads to the control panel terminal board, the float switches should be checked to ensure correct operation. Physically check all float switches for damage. Suspend all floats just over the edge of the access to the basin.

4-6-1 Simplex Controller

(1) Turn the RESET-OFF-ON to the ON position.
(2) Operate float 1 & hold = No action.
(3) Operate float 2 & hold = Pump starts.
(4) Operate float 3 & hold = High level alarm activates.
(5) Re-suspend float 3 = High level alarm de-activates.
(6) Re-suspend float 2 = No action.
(7) Re-suspend float 1 = Pump stops running.

4-6-2 Duplex Controller

(1) Turn both the No. 1 and No. 2 RESET-OFF-ON switches to their ON positions.
(2) Operate float 1 & hold = No action.
(3) Operate float 2 & hold = Pump No. 1(lead) pump starts.
(4) Re-suspend float 2 = No action.
(5) Re-suspend float 1 = Pump No. 1 stops running.
(6) Repeat steps (2) & (3) = Pump No. 2 (now lead pump) starts.
(7) Operate float 3 & hold = Pump No. 1 starts. (Pumps No. 1 & No. 2 are both running.)
(8) Operate float 4 & hold = High level alarm activated.
(9) Re-suspend float 4 = No action.
(10) Re-suspend float 3 = High level alarm de-activates.
(11) Re-suspend float 2 = No action
(12) Re-suspend float 1 = Both pumps stop running.

TROUBLE-SHOOTING CHART

SYMPTOM	POSSIBLE CAUSE	REMEDY
1. PUMP WILL NOT START	A. Power supply failure.	A. 1. Check power supply. 2. Check out electrical system for loose connections. 3. Check line voltage. a. 230V between terminal s L1 and L2. b. 115V between terminals L1 and L2 and neutral.
	B. Burned-out fuse or tripped circuit breaker.	B. Check circuit protectors-replace Fuse(s), reset circuit breaker(s). NOTE: If repeated tripping occurs see Symptom 2. (Check cause of fuse burnout or tripping breakers).
	C. Damaged power or control cable.	C. Check all external cables for Damage - repair.
	D. Level switch failure	D. Check level switches per remedy 5A.
	E. Jammed impeller.	E. Inspect and remove jamming object.
	F. Water /oil inside motor.	F. Refer to Symptom 10.
	G. Foreign matter build-up.	G. Clean floats.
2. REPEATED TRIPPING	A. Motor protective breaker is tripped to OFF position due to an overload or short circuit.	A. Reset breaker. If breaker is tripping instantly check system for short circuit condition. If breaker is Tripping on overload, check out pump and electrical system as follows Switch selector to “Hand” position. If contactor (2 and 3 HP-“M”), (5HP “1M and 2M”) does not energize check: 1. Control circuit fuse “FU”. 2. Control voltage 24V between terminals X1 and X2 at control transformer. 3. Line voltage 230V at terminal H1 and H2 at control transformer. 4. If “2” and “3” don’t check out - replace control circuit transformer. 5. If “1”, “2” and “3” don’t check out - replace contactor “M” - (“1M, 2M”). If above check out, replace: - Start Capacitor - Run Capacitor - Start Relay
	B. Circuit protection under rated	B. Check rating and replace with proper size.
	C. Phase current unbalance.	C. Check amp draw.
	D. Pump connected to incorrect voltage.	D. Verify connections. See wiring Diagram.

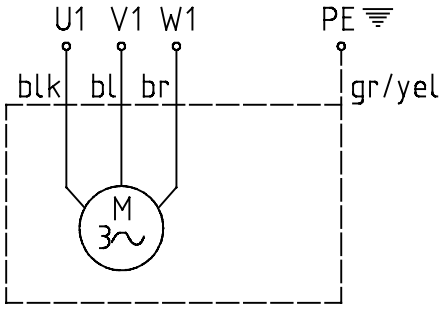
SYMPTOM	POSSIBLE CAUSE	REMEDY
2. REPEATED TRIPPING (CONTINUED)	E. Wet or damaged wiring. F. Obstruction in pump. G. Damaged stator or rotor assembly. H. Reverse pump rotation.	E. Inspect external cable and replace if worn or damaged. F. Remove obstruction. G. Inspect and repair, or replace. H. Check rotation per paragraph 4-4-1
3. PUMP STARTS BUT DOES NOT RUN switch	A. Start capacitor is getting hot and motor protective breaker will trip. Pump is running rough. B. Start relay “CRS” does not energize.	A1. Voltage sensing start relay “CRS” must energize (above 334V) and open N/C contact in order to off the start capacitor in less than 1 second. 2. At the 5HP control panel the start relay “CRS” must energize (above 334V), open N/C contact, de-energizes contactor “2M” and switch off the start capacitor in less than 1 second. B. Voltage at terminals “S” and “C” Must be above 334V during starting. If voltage checks out - replace start relay. Check out opening of start relay “CRS” contact at 5HP panel; see Possible Cause A, Remedy 2. If above check out replace; - Start Relay - Capacitor - Run Capacitor
4. PUMP RUNS IN “HAND”A. BUT NOT IN AUTOMATIC MODE	Bad “OFF” float switch. B. Bad “ON” float switch.	A. Install wire jumper between terminals “1” and “3”. If pump starts to run, replace the “OFF” float switch. B. Install wire jumper between terminals “3” and “4”. If pump starts to run replace the “ON” float switch.
5. PUMPS RUN SEPARATELY BUT NOT TOGETHER (DUPLEX OPERATION.	A. Faulty lead pump float switch. B. Faulty lag pump float switch. C. Foreign matter build-up on floats.	A. With power off, invert each float switch to check leads for continuity. B. Same as Remedy A. C. Clean floats.

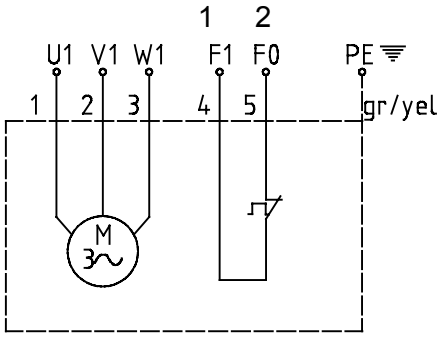
SYMPTOM	POSSIBLE CAUSE	REMEDY
6. PUMP WILL NOT SHUT OFF	A. Level switch failure. B. Level control panel failure.	A. With power off check float switch hanging for continuity. B. Check control panel schematic drawing.
7. HIGH LEVEL ALARM LIGHT DOES NOT COME ON	A. Light bulb burnout. B. Alarm relay burnout.	A. Replace light bulb. B. Install wire jumper between terminals “1” and “2” (alarm relay “CR” must energize). Replace high level alarm relay “CR”.
8. LOW FLOW.	A. Reverse pump rotation. B. Liquid level in pit too low - air bound. C. Obstruction in pump or piping. D. Partially closed valve(s).	A. Check rotation per paragraph 4-4-1. B. Check liquid level and location of level switches. C. Remove obstruction. D. Check and adjust valve(s).
9. CLOGGING WITH RAGS	A. Worn cutting rotor.	A. Replace rotor as stated in “To Remove Mechanical Seal” of paragraph 3-2-1.
10. WATER IN OIL CHAMBER	A. Loose or damaged oil plug or Sealing washer, etc. B. Mechanical seal failure.	A. Check plug and washer-replace. B. See paragraph 3-2-1.
11. OIL/WATER INSIDE MOTOR CASING (in all cases dry and clean rotor and stator, megger leads)	A. Damaged upper lip. B. Damaged O-ring between oil chamber and motor casing. C. Cut power cable (wicking occurs).	A. Replace seal as stated in “To Remove Mechanical Seal” of Paragraph 3-2-1. B. Replace O-ring. C. Inspect and repair or replace cable.

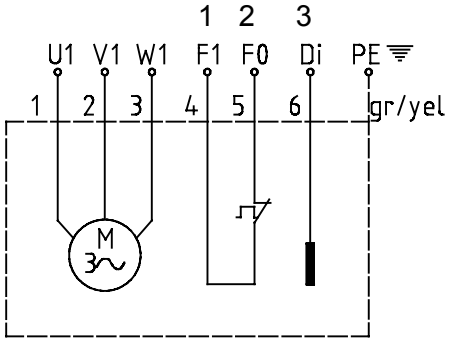
Wiring Diagrams

Three Phase

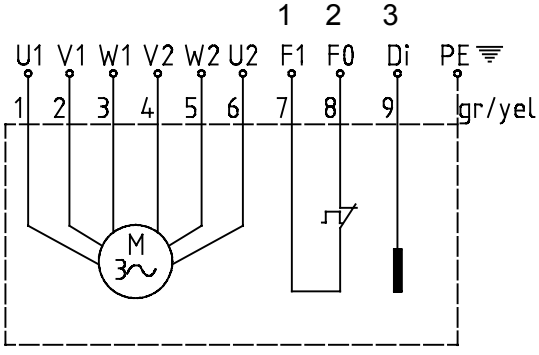
S10/4 D, S16/2 D, S18/2 D, S30/2 D





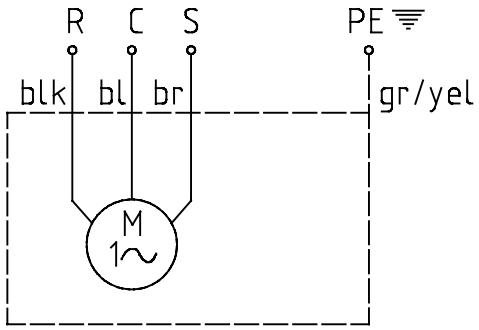


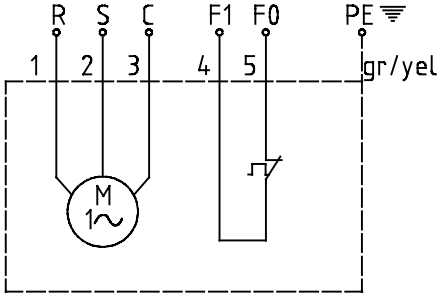
M70/2 D, M80/2 D, M100/2 D M125/2 D

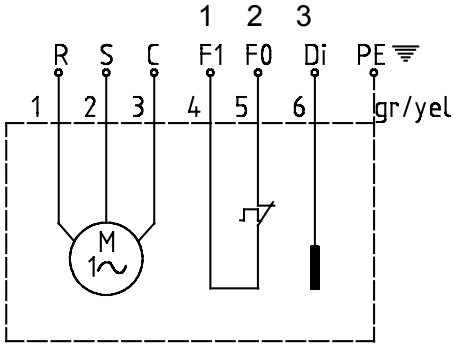


Single Phase

S10/4 W, S16/2 W, S18/2 W, S26/2 W, M25/2 W, M35/2 W, M50/2 W







blk	=	black	U1	=	T1
bl	=	blue	V1	=	T2
br	=	brown	W1	=	T3
gr/yel	=	green/yellow	FO	=	1
Di	=	Seal monitor	F1	=	2
F1/FO	=	Thermal sensor	Di	=	3
PE	=	Ground	U2	=	T2
			V2	=	T3
			W2		T1

ATTENTION Explosion-proof pumps may only be used in explosive zones with the thermal sensors fitted (Leads: FO, F1).

We know how water works

We reserve the right to make alterations in the furtherance of technical development.

Installation, Maintenance and Service by

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