VS4/SL Series

Installation, Operation and Maintenance Manual

Model VS4/SL, Vertical Slurry Pump, Acc. to Factory STD.

ARYA SEPEHR KAYHAN

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1. General Information

1.1. Principles

This manual is supplied as an integral part of the type series and variants indicated on the front cover. This manual describes the proper and safe use of this equipment in all phases of operation.

The name plate indicates the type series and size, the main operating data, the order number and the order item number. The order number and order item number clearly identify the pump (set) and serve as identification for all further business processes. In the event of damage, immediately contact your nearest ASK Service center to maintain the right to claim under warranty.

1.2. Installation of partly completed machinery

To install partly completed machinery supplied by ASK, please refer to the subsections under Servicing/Maintenance.

1.3. Target group

This manual is aimed at the target group of trained and qualified specialist technical personnel.

2. Warranty

LIMITED WARRANTY: Arya Sepehr Kayhan warrants products of its own manufacture to be free from defects in material and workmanship under normal use and service for a period of six months after the date of startup or one year after shipment, whichever comes first. The company's obligation under this warranty is limited to repairing or replacing the defective parts without charge, F.O.B. its plant.

The limited warranty shall not apply to machine work, labor charges or other expenses incurred on products later found to be defective, or for normal wear and tear, equipment or parts thereof which have been altered or repaired other than by Arya Sepehr Kayhan representative, or damaged by improper installation or application, or subjected to misuse, abuse, neglect or accident.

Arya Sepehr Kayhan will not approve or accept returns or back charges for labor, materials or other costs incurred by the Purchaser or others in modification, adjustment, service or repair of equipment furnished by Arya Sepehr Kayhan unless such returns or back charges have been previously approved in writing by an authorized representative of Arya Sepehr Kayhan.

For more detailed information concerning the limited warranty and any remedy between parties refer to Terms and Conditions of Sale in the other word any conflict between this manual and Terms and Conditions of Sale exists, the Terms and Conditions of Sale will prevail.

3. Safety

3.1. Definition

This pump has been designed for reliable and safe operation. Pumps are pressure containing vessels with rotating parts that could be hazardous. Operators and maintenance personnel must follow the necessary safety measures. ARYA SEPEHR KAYHAN (ASK) will not be liable for damage or delays caused by a failure to observe the instructions in this manual. The information in this manual has been checked and believed to be accurate and reliable. HOWEVER, NO RESONSIBILITY IS ASSUMED BY ARYA SEPEHR KAYHAN FOR ITS USE OR FOR ANY INACCURACIES. Specifications are subject to change without notice. ARYA SEPEHR KAYHAN DOES NOT ASSUME ANY LIABILITY ARISING OUT OF USE OR OTHER APPLICATION OF ANY OF ITS PRODUCTS.

3.2. Key to safety symbols/markings

Throughout this manual the words **WARNING**, **CAUTION**, and **Note** are used to indicate procedures and areas of maintenance and operations which require special operator attention and focus:

Warning: An operating procedure or practice which, if not followed could result in personal injury or loss of life.
Example: Pump shall never be operated without a coupling or belt guard correctly installed.

CAUTION: An operating procedure or practice which if not correctly followed, could result in damage or destruction of equipment and property.
Example: Proper alignment of pulleys and/or couplings is essential for long equipment life.

Note: Operating procedure, condition which is essential to observe.
Example: Never valve down the suction line to control the pump flow. This can cause significant damage to the pump.

3.3. General Safety Precautions

Centrifugal pumps can be dangerous if used improperly. Disregarding any of the following precautions may result in a pump which does not function properly and which could cause damage or injury. Operation and maintenance instructions must be read before starting the pump.

The following list is not comprehensive, but is provided as examples of actions that can damage a pump and cause injury.

1. Check motor rotation before installing belts or couplings. Pump must rotate in the direction indicated on the pump and equipment tags.

2. Do not work on a pump unless the drive system is locked out and the pump is disconnected from the drive system.
3. Do not operate a pump when the bearing temperature measured on the outside of the housing exceeds 105° C (220° F).

4. Do not continue to operate a pump when there are indications of internal rubbing, binding or knocking.

5. Do not operate a pump with the belt or coupling guard removed.

6. Do not operate the pump with the discharge line restricted or plugged or against a closed or partially closed discharge valve.

7. Do not insert fingers, hands, arms, legs or any other objects into the rotating components of the pump or motor. Loose clothing should not be worn when working with rotating equipment.

8. Wear parts should be inspected regularly to prevent damage to other components and to avoid personal injury. Insure that all wear parts are in good working order. Worn parts should be replaced with new O.E.M. parts.

9. Do not weld attachments to the pump.

10. When the top screen of the vertical pump is exposed while pumping, it is normal for splashing of the sump fluid to occur. Proper splash protection should be provided.

11. Lubrication water, when required, must be turned on before starting the pump.

12. Do not operate the pump if solids have settled in the casing and the rotating element does not turn freely.

13. Check all fasteners to insure they are the proper material, properly sized and tightened to the torque ratings of the fasteners and/or specifications.

14. Do not apply heat to the impeller to assist in removing it from the shaft.

15. Do not feed very hot or very cold liquid into the pump. This can cause thermal shock and break parts in the pump.

4. Introduction

This instruction manual is to be used to assist those involved with installation, operation and maintenance of VS4/SL slurry pumps. It is recommended that this manual be reviewed in detail prior to installing, operating, or performing any work on the pump or driver.

The "VS4/SL" pumps are heavy duty, end suction, grease lubricated, vertical cantilever centrifugal pumps, designed for pumping abrasive and corrosive slurries. They are widely used in mining, power, coal, sand and gravel, tar sands and other industrial pumping applications.

Nameplates are attached to the pump. The pump serial number and Model number are stamped on the nameplate. The Pump Model indicated the following:

Model designation is as follows:

EXAMPLE:
Model VS4/SL 50-315 / 15 4 R1 NA 150 A / 0.9
"VS4/SL" indicates the pump series for a vertical cantilever sump pump.
"50" indicates the Discharge size, for this pump is 50mm.
"315" indicates the impeller size, for this pump is 315mm.
"15" indicates the motor power, for this pump is 15kW.
"4" indicates the motor's number of poles, for this electro-pump is 4 poles.
"R1" indicates the material of Liners and impeller, R1 refers to NBR.
"NA" indicates the shaft seal type and plan, for this pump NA means no sealing required
"150" indicates the pump length, for this pump is 150cm.
"A" indicates the pump options, for this pump A refers to no option is utilized.
"0.9" indicates the pump/motor speed ratio.

Importance of Instructions

VS4/SL pumps are designed for trouble-free service. The life expectancy and satisfactory service of this and any mechanical device is enhanced by periodic inspection and a carefully designed preventive maintenance process. This manual has been prepared to assist operators in understanding the construction and correct methods of installing, operating, and maintaining these pumps.

Study this manual thoroughly, and follow the instructions carefully for installation, operations and maintenance. Keep this manual for reference in a place accessible by all.

Special Warning

Arya Sepehr Kayhan Company will not be liable for any damages or delay caused by failure to comply with the provisions of this instruction manual. This pump is not to be operated at speeds, working pressures, discharge pressures, or temperatures higher than, nor used with liquids other than, stated in the original order acknowledgement without written permission of Arya Sepehr Kayhan Company.

5. Receiving, Transport and Storage

5.1. Receiving and Inspection-Shortages

All pumps are inspected and documented prior to leaving the assembly plant. Check that the pump is the correct model and size in accordance to what has been ordered. If all is correct, then install the pump in accordance to this manual and all other technical and safety requirements.

Thoroughly inspect all cartons and wrapping for parts prior to discarding. Parts are sometimes wrapped individually or fastened to the crate. Match all items to the packing documents provided with the shipment.

If all parts are there installation can proceed. After comparison of the parts on hand with the packing documents there seem to be parts missing or damaged report the deviations to the transportation company's local agent immediately.

5.2. Transport

Proper lifting and safety practices must be observed at all times. Lifting the pump assembly requires extreme care, since the center of gravity is not located in the physical center of the unit, but is usually closer to the bearing housing.

Remove motor prior to lifting. Never lift by a single point and do not use the pump wet end or exposed shaft as a lifting point. Four eyes are provided on the mounting plate for shackles. For vertical lift or raising from the horizontal position, it is recommended that all five points be utilized. For horizontal transport, use at least two of the lift points and a chocker strap around the pump end of the support tube and one around the bearing housing for stability. Drain holes in the tube may be used as hook points. Follow recommended facility procedures using multiple connections as far apart as practical to stabilize the load. Always ensure that the unit remains in the correct position during transport and cannot slip out of the suspension arrangement. At least four (4) connections are recommended to stabilize the load, and they should be as far apart as practical. Avoid excessive side loads on cast lifting eyes. Note that certain lift points on the motor support are intended for use in handling the motor support alone and are not necessarily optimum balance points for the pump assembly. Always make sure that the unit remains in the horizontal position during transport and cannot slip out of the transport suspension arrangement.

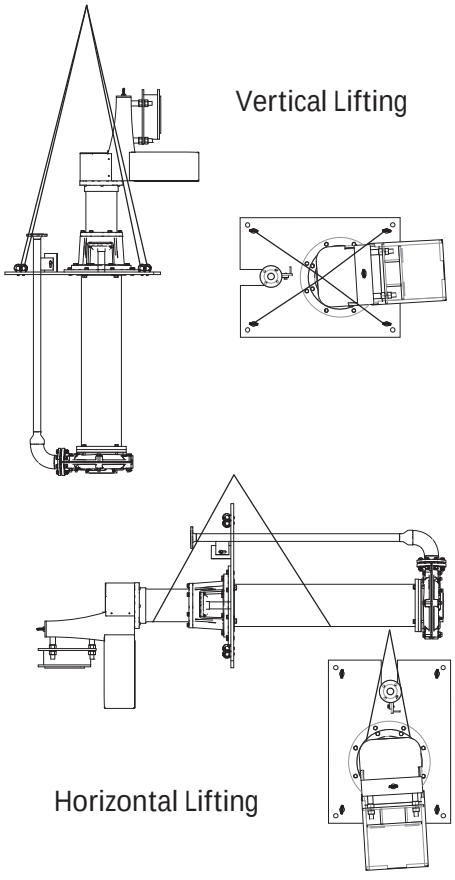


Figure 3.2-1 Transport of the Pump

5.3. Preservation and Storage

To properly protect the pumps, elastomer parts, bearings and motors during storage, the following precautions must be taken.

5.3.1. General Storage Requirements (For all Methods of Storage)

1. Store all pumps indoors, especially if ambient temperatures are in excess of 100°F.
2. If pumps have to be stored outside, whether boxed or not, they must be kept dry and marked “keep dry". Do Not store pumps in direct sunlight. Note: Standard painting system is not recommended for outdoor storage.
3. A sump pump may be stored on its side, supported by the edge of the mounting plate and wood blocking under the pedestal at the casing end. Do Not store the pump with the edge of the casing resting on the floor. The cantilevered end of the sump pump shaft must be supported with blocking just above the impeller (casing end) when the pump is stored on its side, Do Not rely on the shipping bands around the pump shaft to support die shaft
4. If a horizontal type motor (designed for vertical mount on sump pumps) is supplied with a sump pump, it must be stored up-right (feet down) when the pump is stored on its side.
5. Do not store pumps or elastomer parts near operating electrical equipment (generators, etc.) where high ozone levels are present
6. The shaft must be completely protected from nicks, dents, etc.
7. All labels must be protected from the weather, abrasives and corrosives in the air so they will be legible for start-up.
8. Do not store pumps in areas where vibration can be felt
9. Keep pumps and elastomer lined parts away from any type of oil or grease.
10. Store in areas of little dust and no harmful fumes.
11. The discharge opening should be covered to prevent entry of foreign material.

5.3.2. Short Term Storage 3 months or less

1. When it is necessary to store a pump for a short time before it can be installed, place it in a dry location (indoors is preferred).
2. Rotate the shaft a few turns every 2 weeks.
3. Protect the equipment from moisture, dust, vibration and physical damage.
4. Any protection provided by the factory should not be removed.
5. Indoor storage and protection from heat, ozone and light is recommended for the elastomer lined pumps.

5.3.3. Long Term Storage of Pumps (Longer Than 3 Months)

1. Controlled environment, Indoor—controlled for temperature, humidity, dust and free from temperature extremes.
    a. Fully grease the bearings and seals at the time of extended storage. Additional grease should be added every two months purging some of the grease in the cavity.
    b. Remove the shipping tape on the shafts and apply a rust preventative. Renew the rust preventative when necessary on all external machined surfaces.
    c. Rotate the shaft 10 to 15 revolutions every 2 weeks. Use a spanner wrench to rotate shaft Do not use a pipe wrench.
    d. Discharge pipe and screen openings must be securely covered to prevent entry of foreign material.
    e. If motor is supplied with pump, see section on motors.

2. Uncontrolled environment, Indoor/outdoor—uncontrolled for temperature, humidity, dust and temperature extremes. All instructions for indoor storage apply with the following additional requirements.
   a. Seal all openings and shaft entrances with a waterproof vinyl tape.
   b. Remove the tape every two weeks and rotate the shaft 10 to 15 times. Re-tape shaft entrances.

5.3.3. Motors Stored with Pumps

1. The motor bearings must be fully greased at the time of going into extended storage. Motor shafts must be rotated manually every 6 months, 10 to 15 revolutions and additional grease added by purging some from the cavity. Rotate the motor shaft by hand before putting into service. Position of the motor during storage must permit operation of the drains and breathers.
2. During storage windings should be protected from excessive moisture absorption by a safe and reliable method of heating. Space heaters, if supplied, may be used for this purpose. The temperature of the windings should always be maintained a few degrees above the temperature of the surrounding air. For more complete information on proper motor storage procedures contact the motor manufacturer, especially if the

6. Installation Instructions

6.1. Pump Location

The pump should be placed so that it is easily accessible for inspection during operation, while giving due attention to the desirability of simplifying the discharge piping layout. There should be ample head room to allow the use of an overhead crane or lifting device with sufficient capacity to lift the heaviest part of the unit.

6.2. Foundation

The foundation may consist of any material that will afford permanent rigid support to the full area of the pump base plate and will absorb expected strains and vibrations that may be encountered in service.

Concrete foundations are preferred. Foundation bolts of the adequate sizes should be selected and located according to elevation drawings. Each bolt should be surrounded by a pipe sleeve two or three times the diameter of the bolt. The sleeves should be held rigidly yet allowing the bolts to be moved to conform to the holes in the baseplate.

The pump should be located directly over or as near as possible to the main load carrying members, beams or walls when it is mounted directly to structural steel framing. The baseplate should be bolted to the steel supports to avoid distortion, prevent vibration and retain proper alignment.

6.3. Leveling

Pumps are generally shipped together with the baseplate. It is usually unnecessary to remove the pump or driver from its baseplate when leveling with units of moderate size. The unit should be placed on the foundation supported by shims and wedges close to the foundation bolts to allow for grouting from three quarters to two inches between the bottom of the baseplate and the top of the foundation.

If the unit is direct connected to a motor; disconnect the coupling halves before leveling the unit and alignment of coupling halves.

Level the pump and base with a spirit level. Where possible, place the level on some exposed part of the pump shaft, sleeve or planed surface of the casing. Adjust the wedges under baseplate until the pump shaft is level and flanges of both the suction and discharge nozzles are at the specified height, and location.

After leveling of the pump and base, align the coupling halves between the pump and driver shafts by an acceptable method. (See Instructions below)

6.4. Grouting

The pump needs to be grouted into place. The purpose of grouting is to prevent lateral shifting of the baseplate, not to take up irregularities in the foundation. The following procedure is recommended:

A typical mixture for grout is one part pure Portland Cement and two parts building sand, with sufficient water to cause the mixture to flow freely. The top of the rough concrete foundation should be cleaned and saturated with water prior to starting the grouting process. A wood form is usually constructed around the outside of the baseplate to contain the grout. In some cases, this form is placed tightly against the edge of the baseplate. After grouting in the baseplate fill the base with concrete and add concrete until the entire space under the base is filled including the space between the pump and motor supports and between the pump and driver mounts. A stiff wire can be used to work the grout and release any air pockets.

After the grout and concrete is poured, cover the exposed surfaces with wet burlap to slow the hardening process. This will help prevent cracking.

6.5. Discharge Piping

Satisfactory operation cannot be maintained when piping loads are applied to the pump flanges. Pumps can be sprung and pulled out of position by connecting the pump to located pipe flanges. Flanges must be correctly aligned prior to tightening the flange bolts.

Discharge piping and associated equipment must be supported and anchored near but independent of the pump such that no strain will be transferred to the pump. It is recommended that an expansion joint and independent pipe support be used so that the pump will not have to support the weight of the discharge piping. Never force discharge piping onto the pump flange.

The selection of the pipe size is determined by pipe friction tables, critical sedimentation velocity, and other related issues specific to the application. The velocity of slurry is determined by the critical sedimentation velocity is normally between 5 and 10 ft/Second (1.5 ~3 Meters/Second).

It is recommended that provisions be made to supply clear water to allow flushing out the casing and piping after pumping settling type solids.

Where pipe diameters change, tapered sections of pipe are preferred to sudden changes of section. This can provide smoother operation and reduce wear. Valve inside diameters should never be less than that of the pipe. A check valve should be utilized in cases where the pumpage is pumped vertically.

Diameter: The diameter of discharge pipeline is normally larger than the discharge size of pump, and sized to the flow, properties of slurry, and sedimentation rate. A discharge valve should be installed to provide flow control of the pump and isolate the pump (in conjunction with the suction valve) from the piping system. A discharge gauge must be installed in a vertical section of pipe between the pump discharge nozzle and the first valve on the discharge line. This gage will be an indicator of the pump performance. Without this gage it is difficult to determine how the pump is performing under load.

6.6. Recommended Sump Design

ASK recommends that the customer consult with a professional engineering firm prior to design of a sump. The following is not intended to be a design manual for sump design only a discussion of some of the common practices sometimes utilized in sump design.

There are several important considerations in the design of a suction supply tank or sump. It is imperative that the amount of turbulence and entrained air be kept to a minimum. Entrained air will cause reduced capacity and efficiency as well as vibration, noise, shaft breakage, loss of prime, and/or accelerated corrosion.

The free discharge of liquid above the surface of the supply tank at or near the pump suction can cause entrained air to enter the pump. All lines should be submerged in the tank, and baffles should be used in extreme cases as shown in Figure 5.5-1.

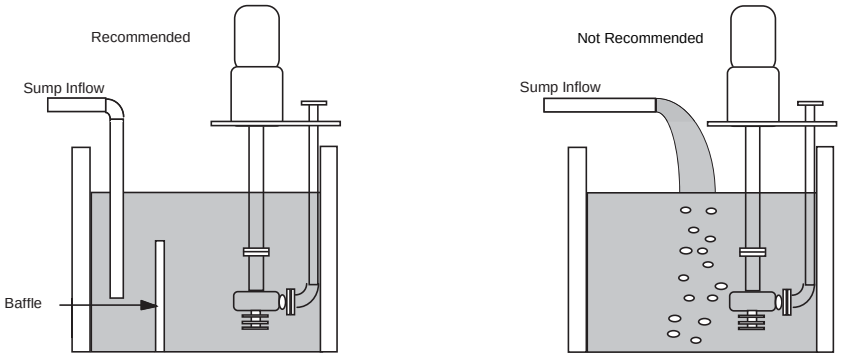


Figure 5.5-1 Keeping Air out of Pump

Improper submergence of the pump suction line can cause a vortex which is a swirling tunnel of air from the surface directly into the pump suction pipe. In addition to submergence, the location of the pipe in the sump and actual dimensions of the sump are also important in preventing creation of vortex and/or excess turbulence.

Air Entrainment:

Entrained Air in vertical pumps is inherently a product of sump design. If the inlet piping or the inflow of water into the sump is directed in such a way that air is introduced into the sump, then air binding can occur. As we observed, some of the sumps had the flow directed very close to the pump, and there was a large amount of turbulence. If the flow enters the sump above the water level, then air is introduced. Once the air enters the pump, an air bubble is created, and will probably not leave the pump. Flow from the pump can actually be reduced due to the air bubble. Air entrainment, even when bubbles do not build up and stay in the pumps causes vibration problems in most pumps. At the Vaughan test facility when they test a pump by recirculating flow immediately back to the pit above the liquid level so that the water is being aerated, the pump vibrated. On the other hand, if the discharge is introduced back to the pit below the water line. where there is no longer any aeration, the pump immediately quiets down.

Also, discharging large flows into a pit immediately over the top of a wet-well pump caused trouble,

especially if the flow coming into the pit is a large percentage of the flow the pump is producing. During testing under these conditions the pump has been observed to stop pumping altogether.

In this condition there seems to be so much downward velocity entering the pit that the pump is incapable of producing enough vacuum to draw fluid into the pump. In this condition the pump seems to go into gross cavitation and the head/flow curve falls off rapidly. Vibration in this condition is not as severe as that observed while pumping highly aerated water. But, they have observed large pump column movement under this condition, indicating that the unbalanced flows are causing large side loads on the impeller, shaft, mechanical seals and bearings.

The following is a list of several good sump design practices we would like you to incorporate in your existing and future sump designs:

1. Locate the sump inlet as far from the pumps as possible.

2. Turn the flow downward with a 90-degree elbow and terminate the pipe below the water surface.

3. If the inlet is a trough or flume, then a baffle should be installed to disperse the flow in the pit. The baffle should reduce the introduction of air to the sump fluid.

All centrifugal sump pumps will experience problems in a poorly designed sump. These are elementary design changes and hopefully do not require major modifications.

6.7. Alignment:

Units must not be operated without proper drive guards in place. Failure to observe this warning could result in personal injury to operating personnel.

Do not attempt to connect either belts or the coupling prior to checking motor rotation. Severe damage to the pump will result.

DO NOT INSTALL BELTS OR COUPLING PRIOR TO ROTATION CHECK.

NOTE: Accurate alignment of the pump shaft and driving unit shaft or pulley is essential for satisfactory operation.

6.7.1. V – Belt Drive Alignment

The following installation process is required for a reliable and efficient drive installation:

1. Disconnect and “Lock Out” the power from the pump drive using safety procedures set up at the installation site.
2. Bolt the drive motor to the slide base.
3. Using the four jacking bolts, move the slide base into its bottom position.
4. Install sheaves on shafts and align sheaves faces using a straight edge.
5. Connect the power to the motor and check motor rotation to insure it conforms to the arrow located on the front of the pump casing.
6. Install belts and set belt tension by adjusting slide base with jack bolts. horizontally. V-belts should then be adjusted so that the belts have from ½” to ¾” play when depressed midway between sheaves. Excessive belt tension will cause unnecessary load on the bearings and excessive belt wear. Recheck the sheave face alignment.
7. Lock the four jack bolts with the adjustable lock nuts.

8. Rotate the sheaves by hand to ensure that the pump impeller is free to move in the pump casing.
9. Install sheave/belt guard
10. Check belt tension after the pump is shut down.

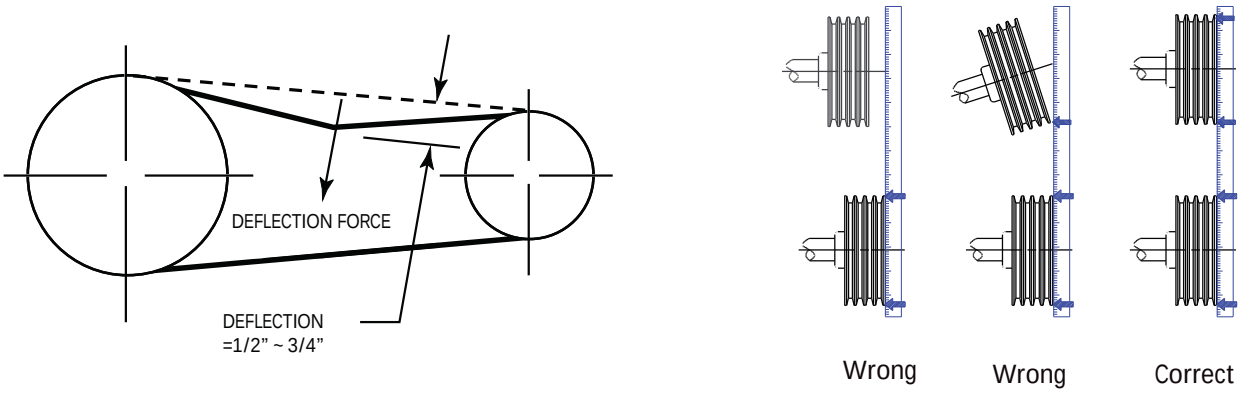


Figure 6.7-1 Correct Belt Tension & Sheave Alignment

NOTE: Misaligned pulleys will cause excessive V-belt wear.

6.7.2. Direct Connect Drive – Alignment

If the pump assembly is provided as direct connected, then the coupling has been shipped unassembled to prevent starting the pump until rotation has been checked.

Important: The motor must be bumped and checked for the correct rotation, the piping connected to the pump, and the pump mounted on the foundation prior to aligning the couplings and connecting the pump with the motor. The correct pump rotation arrow is cast pump.

If the rotation is incorrect and the pump is started the impeller can come off the shaft possibly causing catastrophic failure of the unit. The motor rotation must be correct prior to connection of the coupling.

Spaces between faces of couplings and the ends of shafts should be set that they cannot touch, rub or exert a pull on either pump or driver. The amount of this clearance may vary with the size and type of coupling used. The best rule to follow is to allow sufficient clearance for unhampered endwise movement to the limit of its gearing clearance. On motor driven units, the magnetic center of the motor will determine the running position of the motor half coupling. It is recommended that the magnetic center position be checked by operating the motor while disconnected from the pump. At this time, check also the direction of rotation of the motor. If current is not available, move motor shaft in both directions as far as the bearings will permit then adjust shafts centrally between these limits, thereafter assembling the unit with the correct gap between coupling halves. A flexible coupling will not compensate for misalignment of pump and drive shafts.

7. Operating and Servicing Recommendations

7.1. Pre-Starting Recommendations

1. Visually check all main and auxiliary piping to insure that all connections have been properly made.
2. Check voltage, fuse size, starter, heater amperage ratings and frequency of the electrical supply against the motor nameplate.
3. Visually inspect all the electrical connections to the motor and the control circuit.
4. Check to be sure that the wood blocking has been removed between the pump shaft and the support tubes and that the upper screen is secured to the coverplate.
5. With the motor disconnected from the pump assembly, check the motor direction of rotation by momentarily starting the motor. Direction of rotation must be as shown on the name-tag on the pump (clockwise looking toward the impeller from the motor end of the shaft).

STARTING AND RUNNING THE PUMP BACKWARD WILL CAUSE DAMAGE TO INTERNAL PARTS.

6. All pumps have been properly greased before shipping. For initial start-up and subsequent servicing, we recommend using a superior general purpose grease with good high temperature characteristics or equal for the pump bearings, seals and motors.

   Note: To be informed about lubricant data and Lubrication intervals refer to corresponding Lubrication List.

7.2. Startup and Stop Procedure

1. After all other instructions in this manual have been completed the pump is ready to start.
2. Rotate shaft by hand to insure that impeller and shaft rotate freely. If it is necessary, adjust impeller clearance.
3. Initially start the pump on clean water if possible.
4. Open the Suction valve all the way open.
5. Open the discharge valve to ¼ open. Check discharge pressure and set to design pressure.
6. Start the motor. Be sure it is running in the direction indicated by the arrow on the pump casing. Stop the pump immediately should it be running backwards.
7. Open the discharge valve until the design flow is reached.
8. Check the discharge pressure, flow rate and motor amperage.
9. Periodically check bearing temperatures while pump is in operation. An infrared temperature indicator works well for this application. If bearing becomes hot when pump shortly after the pump starts; stop the pump until the bearing cools, then restart it. If the bearing continues to heat up, then the bearing assembly should be inspected.
10. In general, bearing heating is caused by contaminated lubrication. The bearing lubricant should be clean.
11. Pump performance and efficiency will reduce as the clearance between impeller and liner increases. Therefore, the clearance between impeller and liner should be adjusted from time to time to keep the pump operating at maximum efficiency. Wearing parts should be replaced when the pump performance cannot meet the requirement.
12. IT IS A HAZARDOUS CONDITION TO OPERATE THIS PUMP WHEN THE IMPELLER, OR INTAKE STRAINERS AND DISCHARGE PIPE ARE BLOCKED. HEAT IS GENERATED WHICH CAN VAPORIZE THE LIQUID BEING PUMPED. THIS CAN CAUSE THE PUMP TO EXPLODE AND POSSIBLY CAUSE SEVER DAMAGE AND PERSONAL INJURY OR EVEN DEATH. If there is any potential for the pump to become blocked, then preventative measures to prevent this blockage must be adopted.

13. If the discharge pipe becomes blocked the usual reason is that the velocity of the fluid is lower than the required carrying velocity for the solids being carried in the fluid. Consequently, the solids stay in the discharge pipe. Normally the motor amps will be below normal.
14. Insure that the level of the sump does not allow air entrainment. Look in recommended sump design parameters for possible causes.
15. After the pump has run for a few hours check the following parameters:
    a. Drive alignment. If the drive is a V Belt Drive check the belts and tighten as required.
    b. Check hold down bolts to insure they are tight.
    c. Check pump bolts are tight
    d. d. Inspect upper and lower strainers and clean as required.
    e. Grease pump bearings according to recommended intervals.
    f. Purge the drive end bearing seal with grease on a weekly basis for normal operations. Increase to 2 times weekly for very dirty environments.
    g. Monitor the pump daily for excessive vibration, noisy bearings, motor amperage, high temperature at bearing locations, cavitation, air entrainment and discharge pressure. One sign of cavitation or air entrainment is severe fluctuations of the discharge gage or excessive vibration.

7.3. Pump Shutdown Procedure:

1. If possible, clean water should be flushed through the pump 30 minutes prior to shutdown to clear the slurry out of the pump and line which will prevent settling and possible blockage of the line.
2. Turn off motor.
3. Close discharge valve
4. Close the valve supplying the pump if possible. This isolates the pump from the system and if pump was flushed with fresh water insures clean water inside the pump. Disconnect power from pump if necessary.

8. Pump Assembly and Disassembly

For pump assembly and disassembly refer to corresponding sectional drawing and part list.

9. Motor

It is recommended that the motor be well ventilated when in operation. Please refer to the motor manufacturer for recommended service instructions.

10. Periodic Servicing

The following table contains recommended service checks, which should be performed on a periodic basis.

	Period		
	Start Up	Every Week	Every Month
Head	X	X	
Flow	X	X	
Temperature	X	X	
Visual	X	X	
Noise	X	X	
Vibration	X	X	
Grease Bearings	X		X

11. Troubleshooting

Symptom	Possible Cause	Remedy
Failure to Prime	- Air leak at suction - Incorrect rotation of pump or impeller - Suction pipe blockage	- Seal air leak. - Confirm direct of rotation. - Remove blockage.
Excessive Power Consumption	- Rubbing in pump, mechanical defects. - Worn Bearings. - Over tighten belts. - Misalignment or unparalleled shafts - Speed too high - Total system head lower than pump rating - Pumpage has higher Sp. Gr. than rated	- Adjust impeller clearance - check for bent shaft, impeller rub, worn bearings, worn impeller and other wet end parts. - Replace bearings and properly tighten belts Re-align motor and pump shafts - Measure rotation speed and modify drive Control flow with discharge valve - Recalculate total system head - Measure Sp. Gr.
High Bearing Temperatures	- Lubricant level too high or low - Impurities in the lubrication - Worn Bearings - Misaligned or unparalleled shafts - Rubbing in pump, impeller unbalance (in metallic impeller) - Improper bearing assembly	- Adding grease(oil) as requirement - Replace with clean new lubricant - Replace bearings - Realign motor and pump shaft - Remove rubbing, balance impeller (if impeller is metallic) or replace impeller (if impeller is rubber lined) - Replace bearing or refitting the bearing
Insufficient Capacity	- Pump Not Primed - Speed too low - Total piping system head higher than pump rating - Impeller passages partially blocked - Suction line partially blocked - Wrong direction of rotation - Mechanical defects: impeller worn or damaged - Defective gasket causing leakage on suction side - Pumpage viscosity too high	- Check for Air leaks in suction line - Measure actual pump speed - Recalculate total system head & adjust discharge flow - Visually inspect impeller Measure suction pressure - Visually Inspect and compare to arrow on pump - Inspect impeller - Seal areas of concern - Check viscosity of pumpage
Excessive vibration & noise	- Worn Bearings - Impeller imbalance - Air or blockage in suction line - Impeller is partially blocked or worn - Foundation not sufficiently rigid - Misalignment - Bent Shaft Insufficient NPSHa	- Replace bearings - Replace impeller or repair - Bleed air out of line and/or remove blockage Remove blockage. - Strengthen base rigid - Re-align motor and pump shafts - Replace shaft - Raise liquid level or reduce pump's mounting height

12. Recommended Spare Parts

To ensure against possible long and costly downtime periods, especially on critical services, it is advisable to carry in the user's inventory some spare parts. ASK suggests liners, impeller, bearings and bearing seals be kept on site and quantity determined by pump usage.

In place of the individual items, a complete bearing housing and shaft assembly may be substituted

SPECIAL NOTE: IN CASES WHERE PUMPS ARE FURNISHED WITH SPECIAL MATERIALS, DELIVERIES ARE QUITE LENGTHY, IT IS THEREFORE ADVISABLE TO ANTICIPATE YOUR REQUIREMENTS SEVERAL MONTHS IN ADVANCE SO THAT POSSIBLE LONG DELIVERIES WILL NOT HANDICAP YOUR OPERATION.

13. Ordering Replacement Parts

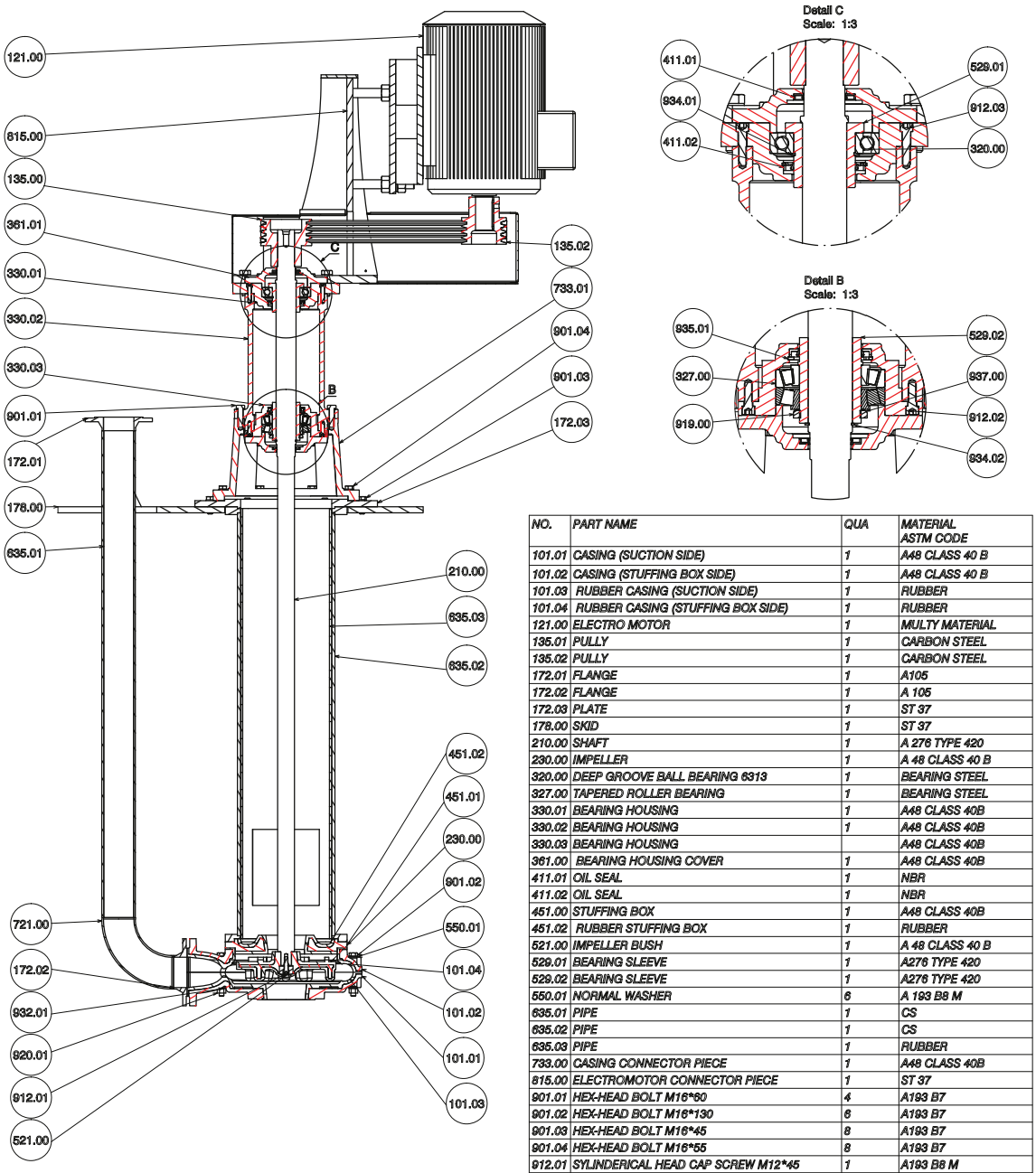
Several copies of the Installation, Operation and Maintenance Manual are provided with each pump. A specific sectional drawing with detailed descriptions of all of the pump components are provided with every pump shipped and should be used in conjunction with this manual. These drawings should always be referred to when ordering replacement parts.

For ordering spare parts call your local ASK representative. Repair orders will be handled with a minimum of delay if the following directions are followed:

1. Provide the model number, pump size and serial number at the time of order. This information can be obtained from the nameplate on the pump.
2. Write plainly the item description, type of material and part number, of each part required. These names and numbers should agree with those on the sectional drawing.
3. Provide the quantity of parts required.
4. Provide complete shipping and billing instructions.

Note: If the general assembly drawing supplied with the pump is not available, refer to the pump serial number and use the item numbers on the General Assembly Drawing at the end of this manual when ordering parts.

14. General Sectional Drawing and Part List



NO.	PART NAME	QUA	MATERIAL ASTM CODE
101.01	CASING (SUCTION SIDE)	1	A48 CLASS 40 B
101.02	CASING (STUFFING BOX SIDE)	1	A48 CLASS 40 B
101.03	RUBBER CASING (SUCTION SIDE)	1	RUBBER
101.04	RUBBER CASING (STUFFING BOX SIDE)	1	RUBBER
121.00	ELECTRO MOTOR	1	MULTY MATERIAL
135.01	PULLY	1	CARBON STEEL
135.02	PULLY	1	CARBON STEEL
172.01	FLANGE	1	A105
172.02	FLANGE	1	A 105
172.03	PLATE	1	ST 37
178.00	SKID	1	ST 37
210.00	SHAFT	1	A 276 TYPE 420
230.00	IMPELLER	1	A 48 CLASS 40 B
320.00	DEEP GROOVE BALL BEARING 6313	1	BEARING STEEL
327.00	TAPERED ROLLER BEARING	1	BEARING STEEL
330.01	BEARING HOUSING	1	A48 CLASS 40B
330.02	BEARING HOUSING	1	A48 CLASS 40B
330.03	BEARING HOUSING		A48 CLASS 40B
361.00	BEARING HOUSING COVER	1	A48 CLASS 40B
411.01	OIL SEAL	1	NBR
411.02	OIL SEAL	1	NBR
451.00	STUFFING BOX	1	A48 CLASS 40B
451.02	RUBBER STUFFING BOX	1	RUBBER
521.00	IMPELLER BUSH	1	A 48 CLASS 40 B
529.01	BEARING SLEEVE	1	A276 TYPE 420
529.02	BEARING SLEEVE	1	A276 TYPE 420
550.01	NORMAL WASHER	6	A 193 B8 M
635.01	PIPE	1	CS
635.02	PIPE	1	CS
635.03	PIPE	1	RUBBER
733.00	CASING CONNECTOR PIECE	1	A48 CLASS 40B
815.00	ELECTROMOTOR CONNECTOR PIECE	1	ST 37
901.01	HEX-HEAD BOLT M16*60	4	A193 B7
901.02	HEX-HEAD BOLT M16*130	6	A193 B7
901.03	HEX-HEAD BOLT M16*45	8	A193 B7
901.04	HEX-HEAD BOLT M16*55	8	A193 B7
912.01	SYLINDERICAL HEAD CAP SCREW M12*45	1	A193 B8 M
912.02	SYLINDERICAL HEAD CAP SCREW M12*35	4	A193 B8 M
912.03	SYLINDERICAL HEAD CAP SCREW M12*50	4	A193 B8 M
919.00	CHAK NUT	1	A 193 B8 M
920.01	HEX-HEAD NUT M16	4	
932.01	SPRING WASHER A16	4	A193 B8 M
934.01	SPRING KEY SHAFT	1	A 193 B7
934.02	SPRING KEY SHAFT	1	A 193 B7
937.00	CHAK NUT WASHER	1	A 193 B7

How did we measure up?

It is our sincere intention to exceed our customer's expectations on every order. Tell us if we achieved our goal on your order.

We appreciate you taking the time to provide your feedback. Thank you for buying ASK pumps, parts, and Electro-power systems.

Visit our Web site for the latest version of this document and more information

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