



Enriching Lives

Instructions on Installation, Operation & Maintenance for Kirloskar Pump Type – Small Vertical Turbine Pump - VEP



KIRLOSKAR BROTHERS LIMITED

Established 1888

A Kirloskar Group Company

DECLARATION OF CONFORMITY

We **Kirloskar Brothers Ltd**

Of

Kirloskarvadi- 416 308

Tal:- Palus

Dist: - Sangli

Maharashtra

India

Declare that:

Equipment: Vertical Turbine Pump
Model/Type: VEP Series- 20C, 21C, 24A, 24C, 26C, 32C, 34C
Serial Number: as shown on the Pump Nameplate

We hereby declare that pump supplied by KBL is free from defect and faulty workmanship. Pump warranty holds for period of 12 months or 18 months from date of despatch from KBL, whichever is earlier. Our Liability in respect of any complaint is limited to replacement of part / parts only to the extent that such replacement/ repairs are attributable to or arise solely from faulty workmanship Or defective material. This warranty holds only for the products Manufactured by KBL.

For Pumps supplied without motors:

We hereby declare that this equipment is intended for incorporation into, or assembled with other machinery to constitute relevant machinery to comply with the essential health and safety requirements of the Directive.

The machinery covered by this declaration must NOT be put into service until the relevant machinery into which it is to be incorporated has been declared in conformity with the provisions of the Directive.

Signed:

Name: Mr. Prasad Kulkarni

Position: Head- Engineering- Authorised to sign on behalf of Kirloskar Brothers Limited

Date: 26 DEC 2017

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1. INTRODUCTION

This manual covers the KBL VEP Vertical Turbine Pump. These pumps are supplied in 3 Discharge Head sizes 150 mm, 200 mm and 250mm having flow rates from 90 - 800 m³/h

The discharge head is of the above the floor type.

Screwed type couplings are fitted to connect all shafts, these provide for easy disassembly with minimal risk of damage.

VEP pumps are supplied with soft packed glands.

Pumps will be specified to match customer's installation requirements for length, discharge type and duty.

Standard column pipes are 1.5 M and 3.0 M long and special pipes having length between 1.5 M to 3.0 M are provided to achieve the required pump length. *Non-standard column lengths less than 1.5 M can also be supplied to suite with sump depth at the site.*

Shafts are designed to operate well below their first critical speed to allow for safe variable speed operation. The shaft bearings are normally lubricated by the pumped liquid.

Hollow shaft motors or hollow shaft right angle drive gearboxes when using a diesel engine are used with VEP Pumps.

Discharge branch flanges are drilled ANSI 250. as a Standard supply. Special flange drilling, as per site requirement, can be provided. Refer Pump General Arrangement drawing for actual flange drilling of the discharge head.

Full details of the pump specification will be supplied on a pump data sheet together with a pump general assembly and pump section drawing. Further details will be provided on request from KBL.

1.1 Safety

The products supplied by KBL (Kiloshare Brother Ltd.) have been designed with safety in mind. Where hazards cannot be eliminated, the risk has been minimised by the use of guards and other design features. Some hazards cannot be guarded against and the instructions below **MUST BE COMPLIED WITH** for safe operation. These instructions cannot cover all circumstances: ***YOU are responsible for using safe working practices at all times.***

KBL products are designed for installation in designated areas, which are to be kept clean and free of obstructions that may restrict safe access to the controls and maintenance access points.

A pump nameplate is fitted to each unit and must not be removed. Loss of this plate could make identification impossible. This in turn could affect safety and cause difficulty in obtaining spare parts. Should accidental loss or damage occur, contact KBL immediately.

Access to the equipment should be restricted to the personnel responsible for installation, operation and maintenance and they must be trained, adequately qualified and supplied with the appropriate tools for their respective tasks. KBL requires that all personnel that are responsible for installation, operation or maintenance of the equipment, have access to and study the product instruction manual **BEFORE** any work is done and that they will

comply with all local and industry based safety instructions and regulations.

Throughout this manual the words **WARNING**, **CAUTION**, and **NOTE** are used to indicate procedures or situations which require special operator attention:



Hazard
This symbol refers to general mechanical aspects of safety.



Hazard
This symbol refers to electrical safety.

ATTENTION

This symbol gives warning of a hazard to the pump itself, which in turn, could cause a risk to personal safety.

1.1 General Precautions

Ear defenders should be worn where the specified equipment noise level exceeds locally defined safe levels. Safety glasses or goggles should be worn where working with pressurised systems and hazardous substances. Other personal protection equipment must be worn where local rules apply.

DO NOT wear loose or frayed clothing or jewellery that could catch on the controls or become trapped in the equipment.

Check and confirm that the manual is the relevant copy by comparing the serial number on the identification plate with that on the manual.

Note any limits to the pump application specified in the contract documentation.

Operation of the equipment outside these limits will increase the risk from hazards noted below and may lead to premature and hazardous pump failure.

Clear and easy access to all controls, gauges and dials etc. MUST be maintained at all times. Hazardous or flammable materials must NOT be stored in pump rooms unless safe areas or racking and suitable containers have been provided.

NEVER apply heat to remove impeller. It may explode due to trapped liquid.

NEVER use heat to disassemble pump due to risk of explosion from trapped liquid.

NEVER operate pump without coupling guard correctly installed.

NEVER operate pump beyond the rated conditions to which the pump was sold.

NEVER start pump without proper prime (sufficient liquid in pump casing).

NEVER run pump below recommended minimum flow or when dry.

ALWAYS lock out power to the driver before performing pump maintenance.

NEVER operate pump without safety devices installed.

NEVER operate pump with discharge valve closed.

NEVER operate pump with suction is closed.

DO NOT change conditions of service without approval of an authorised KBL representative.

2. TRANSPORT, CHECKING, HANDLING, LIFTING AND STORAGE

2.1 Transport

Vertical pumpsets are assembled complete and tested prior to dispatch and they are usually disassembled for packing and transport, but by agreement with the customer, shorter pumps may be dispatched as one unit but with the motor and strainer removed to prevent damage. This will enable quicker and easier installation, but the length and weight of the pump, as well as lifting equipment and headroom must be suitable for installation of the pump as one unit.

Pumps are protected against corrosion and packed for transport by normal road, rail and sea carriers.

2.2 Checking

The pump should be carefully supported prior to unloading from the carrier. Handle all components carefully. Inspection for damage of the shipping crate should be made prior to unpacking the pump.

2.3 Handling



Crushing Hazard

When lifting the pump unit, use lifting equipment having a safe working load rating suitable for the weight specified. Use suitable slings for lifting any item not provided with lifting points.

The use of suitable forklift truck and four-chain crane sling equipment is recommended but locally approved equipment of suitable rating maybe used.

2.4 Unpacking and Lifting

Unpacking of all equipment should be undertaken with extreme care, notice should be taken of any requirement for the reuse of all cases, bags and packaging material. After unpacking, visually inspect the pump and check the following:

1. Contents of the pump assembly against the packing list.
2. All components against damage.
3. All shafting for straightness and damage, should the crate be broken or show careless handling. Any shortages or damages should be immediately called to the attention of the local freight agent of the carrier by which the shipment arrived and proper notation made on the bill.

This will prevent any controversy when claim is made and facilitate prompt and satisfactory adjustment.

The headpiece has lifting points suitable for lifting the assembled pump complete.

WARNING - Eyebolts and lifting lugs on individual items that are mounted on the headpiece (i.e. motor) are for lifting that item only and should not be used to lift or assist the lifting of a larger assembly.

CAUTION - Slender parts or assemblies can be rendered inoperative by use of inappropriate lifting techniques. Even slight distortions during handling can give rise to assembly and running problems.

2.5 Storage

Pumps may be stored in their original packing for a short time before installation, provided that they are placed in a dry, covered location that is well ventilated with low humidity.

For extended storage periods or for exposed storage or in tropical or cold locations, refer to KBL for recommendations.

The equipment prior to shipment had been inhibited for transportation and short-term storage. For prolonged storage of the unit, consult KBL for recommendations.

A full inspection is to be carried out at least every twelve months to check for exhaustion of desiccant, condensation and any signs of rust or damage. Take the appropriate remedial action as necessary.

After storage, test the motor insulation resistance between phases and to earth, and if necessary dry out in accordance with manufacturer's instructions.

Considering probabilities at site and for simplicity Storage of pump is distinguished in two categories.

A] Before installation - Short term storage (Less than 3 months)

After receipt of the pump, visual inspection should be carried out to determine if any damage occurred during transit or handling. The main items to look for are:-

1. If any Broken or cracked equipment, including base, pump & motor feet, flanges, coupling and coupling guard etc.
2. Shaft bending if any & check free rotation of the pump shaft.
3. Stuffing box Or Mechanical seal quenching flexible hose, air release valve, and other accessories damaged, if any.
4. Broken motor end bells, bent eyebolts or damaged terminal boxes of motor
5. Missing parts if any with respect to packing list available with the pump.

6. Confirm that no water entered into the package.

Parts or accessories are sometimes wrapped individually or fastened to the equipment. If any damage or losses have been incurred; promptly instruct to KBL representative or KBL Dealer or the transport company who delivered the pump, **within one month only. After one month from receipt date, no claim will be applicable.**

During unloading of the pump-set, lift it equally. Do not lift only driver or pump. Don't use shaft end position to lift the pump unit, it can cause damage to the pump parts badly.

Steps should be taken to protect the pump from moisture, dust, dirt, and foreign bodies.

For this we recommend following procedure:-

1. Pump set is supplied with wooden package and that is not water proof to protect from any rain water or storm. Pump set should be stored in the warehouse. If warehouse is not available at site then make appropriate arrangements to ensure that no water enters into the packages being stored and cover it by 0.15mm thick clear polythene sheet. Importantly, Storage location should be free from fire Hazard.
2. The pump should be stored at least 150 mm above the ground on anti -termite wooden beams. Avoid direct exposure to sun heat, rain, sand storms etc. Storage place should be clean & dry having slow, moderate changes in ambient temperature.
3. Ensure that suction and discharge of the pump and all other openings are covered properly, to prevent foreign objects entering the pump.
4. Remove the glands, gland packing's from the stuffing box if the pump is equipped with Assembled Stuffing box. Gland packing should be wrapped with lubricant and

stored it in a clean and dry place. Gland should be refitted with wrapping grease inside and outside stuffing box with the same manner without after receipt of pump.

5. Motor terminal box should be open once in a month to check Megger value and if it is on higher side then use hot air to remove moisture to reduce the Megger.
6. Pump should be covered with at least 0.15mm thick clear polyethylene sheet which should be fixed to resist winds; and should be with sufficient ventilation underneath. If the packaging or suction and discharge covers are removed for inspection purposes, replace afterwards to protect the pump and maintain the safety.

B] Before installation - Long term storage (More than 3 months)

If the pump is to be stored for more than three months before installation work begins, please follow above short term storage procedure, in addition to that please note following instructions:-

1. Check individually wrapped parts & accessories for signs of deteriorations. If necessary, clean, apply preservatives like rust preventive oil (Texaco: - Preservative oil SAE 10 W or 30, Volvo-line:-Gr.506, Shell: - ensis engine oil Gr. 20) & renew wrapping for interval of 3 months.
2. Flanged & threaded openings shall be checked for proper closure to prevent entry of dirt & water.
3. Coat all the exposed & corrosion prone parts with an anti-rust agent for interval of 3 months.
4. Replenish the moisture absorbent bags every three months which are inside the packing box.
5. Check whether polythene sheet inside / outside the package is damaged, if so replace it.

6. Unused gland packing life will be expired due to long term storage and needs to replace with new gland packing during pre-commissioning. Life of gland packing will be 4 months after receipt of pump.
7. Remove Pump & Motor, apply rust preventive on base plate pad and pump-motor feet pad to avoid any rust which may disturb the alignment for interval of 3 months.
8. Pump and motor along with base plate should be stored properly to avoid any deformation of base plate due to uneven plane.
9. Remove all holding down bolts from motor and pump feet, apply grease and retighten the bolts again after every 3 months.
10. Foundation bolts should be preserved from moisture if not installed with applying rust preventive.

A full inspection is to be carried out at least every twelve months to check for exhaustion of desiccant, condensation and any signs of rust or damage. Take the appropriate remedial action as necessary.

C] After installation till commissioning -

If the pump has been in storage and then prepared for installation but still is in state of before commissioning stage, steps should be taken to protect the pump from moisture, dust, dirt, and foreign bodies. It is recommended following procedure:-

1. If pump storage time is more than four months after receipt date, please replace gland packing with new one before pre-commissioning.
2. If the pump is equipped with mechanical seal, put few drops of oil in between stationary and rotary faces through flushing connection. This procedure has to be followed every two months.

3. Before installation please check pump & motor mountings along with base plate pads are without rust and remove rust if any.
4. Every month check motor terminal box megger value.
5. After tightening the foundation bolts, repaint it to prevent from rusting.
6. Please ensure that no foreign particles will enter into the pump from suction and discharge branches of the pump and all other openings during installation. Please be aware from welding flux while installing piping at site which can damage pump internal parts badly, if enter into the pump.
7. If pump set is not under shelter. Pump set should be covered with at least 0.15mm thick clear polyethylene sheet which should be fixed to resist winds; and should be with sufficient ventilation underneath.
8. For first start up, follow all the instruction manually for every two weeks to avoid damage to pump shaft & Bowl bearings.
4. In case of Partial assembled pump, follow the instructions discussed in above sections. And Pump Shaft shall be rotated manually for every two weeks to avoid damage to pump shaft & Bowl bearings.

Attention: -

1. Pump is dispatched either in **Full Assembled Form Or In Loose [Dismantle Form] Or Partially Assembled Form [Only Pump unit is in Assembled Form]**.
2. In case of Full assembled Pump, it is recommended to store pump in Vertical Position in a similar manner when it would be installed on the foundation. Pump shall not be stored in horizontal position more than three month after receipt of the same at Site. Pump shall be rotated manually for every two weeks to avoid damage to shaft & Bearing assembly.
3. If due to the restrictions at site, fully assembled pump cannot be stored in a vertical position, then dismantle column and Head assembly from Pump unit assembly. Store Pump unit assembly and components separately as discussed in above sections. Pump Shaft shall be rotated

3. INSTALLATION

General Description

The model VEP pump is a vertical turbine pump, which is designed to meet many wide ranges of service.

Drivers

When packed stuffing boxes are used with open line shaft pumps, hollow or solid shaft motors or right angle gear drives are often used with a separate driveshaft through the driver or bearing housing and connected to the pump by a threaded shaft coupling.

Discharge Head

The cast discharge head is of the surface type. Ports are provided for connecting the discharge gauge, venting line and stuffing box bypass return. The discharge head is designed with large hand holes for easy access to stuffing box adjustment. *For special requirements sometimes fabricated discharge head will be supplied, refer general arrangement and cross section assembly drawing for more details.*

Column

Flanged column construction provides positive shaft and bearing alignment. Bearings are spaced to provide vibration free operation. This will ensure long bearing life and reduced shaft wear. The lineshaft is supported within the column by bearing spiders.

Bowl Assembly

The bowls are of flanged construction for accurate alignment and ease of assembly and disassembly. Impellers are enclosed type, keyed to the shaft and held in place by impeller locking collet.

3.1 Special Tools and Materials

The material and equipment necessary for installation of the pump will vary with the size of the pump and the type of installation.

The following list of standard tools and supplies is offered only as a guide. Special tools required for pump may be supplied with pump if are included in scope of supply. Refer Packing List for the details.

Bulk Material

- Anti-Galling lubricant
- Thread Compound
- Lubrication Oil *[Refer Motor Details for Grade of Oil]*
- Grease

Rigging Equipment

- Mobile power hoist, traveling crane, or derrick.
- Drag line and blocks.
- Lifting tools, if unit is unassembled.
- Clevises – for use with eyebolts.
- Timbers – size, length, and quantity to support long pump parts on the floor.
- I-Beams or timbers to support pump over installation.
[Refer Pump GA drawing for the details]

Hand Tools

- Pipe wrenches
- Feeler gauges
- Set of mechanics tools including: files, wire brush, pliers, wire cutters and pocket knife
- Clean rags
- Set of spanner *[Suitable for M6 – M24 Hex Nuts]*

Optional Tools to Facilitate Pump Assembly and Disassembly

- Dial indicator to assist in motor and pump alignment

3.2 Foundations

Sub Base and Sole Plate are terms in common use to describe a general class of solid steel plates mounted in grout (or bolted to steel structures) at the pump-foundation interface.

1. Remove the sole plate from the Pump Discharge Head, when shipped assembled.
2. Completely clean the underside of sole plate.
3. Remove the rust preventative solution from the machined topside with an appropriate solution.

Site with concrete foundation

1. A pump should have adequate space for operation, maintenance, and inspection.
2. Sole plate mounted pumps are normally grouted on a concrete foundation, which has been poured on a solid footing. The foundation must be able to absorb any vibration and to form a permanent, rigid support for the pumping unit.
3. The foundation must be of adequate strength to support the complete weight of the pump, plus the weight of the liquid passing through it. A typical installation will have bolts, sized and located in accordance with the dimensions given on the Certified Pump Outline Drawing, if provided. **See Figure 2.**
4. Remove water and/or debris from anchor bolt holes/sleeves prior to grouting. If the sleeve type bolts are being used, fill the sleeves with packing or rags to prevent grout from entering.

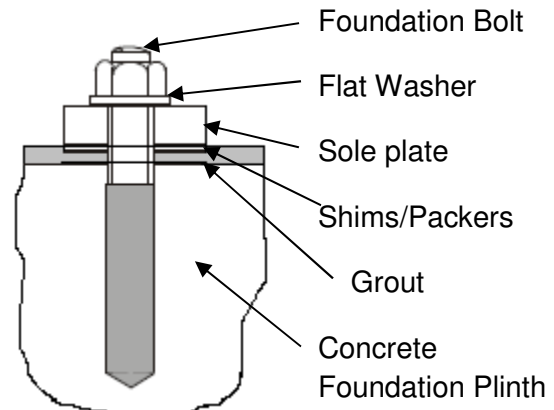


Fig 2

5. Carefully lower the sole plate onto the foundation bolts. Hand tighten the bolt nuts.
6. Levelling the sole plate may be done by several methods.

Two common methods are:

- A. Levelling the wedges. This is shown in **Figure 3.**
- B. Levelling nuts on the anchor bolts.

Regardless of the method, a machinist level must be used for levelling.

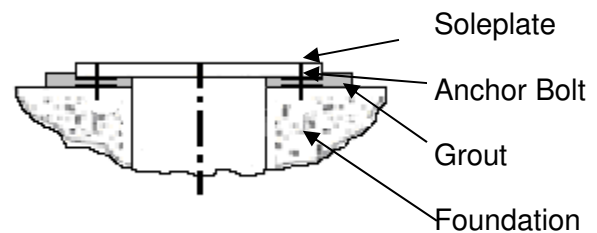


Fig 3

NOTE: When using a machinist level, it is important that the surface being levelled is free of all contaminants, such as dust, to ensure an accurate reading.

9. Level the sole plate in two directions at 90 degrees on the machined surface. The levelness tolerance is (0.005) inches per foot for commercial.

Sole plate grouting

1. Inspect foundation for dust, dirt, oil, chips, water, etc and remove any contaminants. Do not use oil-based cleaners as grout will not bond to it. Refer to grout manufacturer's instructions.
2. Build dam around foundation. Thoroughly wet foundation.
3. Pour grout between sole plate and concrete foundation, up to level of dam. Remove air bubbles from grout as it is poured by puddling, Non-shrink grout is recommended.
4. Allow grout to set at least 48 hours.
5. Tighten foundation bolts.

Site with Structural Steel Foundation

1. When the pump is mounted directly on a structural steel frame, pumps shall be located directly over, or as near as possible to the main building members, beams, or walls be bolted to the support to avoid distortion, prevent vibration, and retain proper alignment.
2. If a sole plate is being bolted to a structural steel foundation, or the sole plate is not grouted to the concrete foundation, use shims for levelling the plate.

3.3 Piping

WARNING- Never draw piping into place by forcing at the flange connections of the pump. Pipe strain will adversely effect the operation of the pump resulting in physical injury and damage to the equipment.

1. Carefully clean all pipe parts, valves and fittings, and pump branches prior to assembly.
2. All piping must be supported independently of, and line up naturally with, the pump flange.

3. DO NOT connect piping to pump until grout has hardened and pump hold down bolts have been tightened.
4. It is suggested that expansion loops or joints, if used, be properly installed in discharge line when handling liquids at elevated temperatures, so linear expansion of piping will not draw pump out of alignment.
5. Isolation and check valves should be installed in discharge line. Locate the check valve between isolation valve and pump; this will permit inspection of the check valve. The isolation valve is required for regulation of flow, and for inspection and maintenance of pump. The check valve prevents pump or seal damage due to reverse flow through the pump when the driver is turned off.
6. Increases, if used, should be placed between pump and check valves.
7. Cushioning devices should be used to protect the pump from surges and water hammer if quick-closing valves are installed in the system.

Final Pump Check

Rotate shaft several times by hand to be sure that there is no binding and all parts are free.

3.4 Pump Installation

Refer to the Certified Pump Outline drawing for the applicable base plate plan for location of anchor bolt holes.

1. If a baseplate was supplied, install as described in Foundations in **section 3.2**.
2. Clean the plate mounting flange and clean bottom surface of discharge head mounting flange.
3. Sling through discharge hand holes or thread two eyebolts through bolt holes in

mounting flange and hoist unit into position over foundation.

NOTE: Eyebolts or sling should be rated to handle in excess of the pump weight (see Order Outline Drawing, if provided).

4. Lower the unit and carefully guide it so that unit does not strike the sides of the base plate. Continue to lower unit until the discharge head base flange engages and rests firmly on the plate, and then secured with hexagonal screws provided.
5. When a lineshaft is shipped separately check shaft for straightness; average total runout should not exceed 0.005" T.I.R. (0.127mm) for every 10 feet (3m). Shaft straightness must be within tolerance prior to installation.
6. Remove stuffing box / seal housing (if installed), and carefully slide shaft through top column bearing retainer and thread into coupling after re-placing stuffing box or seal housing. Use extreme care not to damage bearing retainer.
7. Refer to the remainder of this manual for complete assembly, startup, maintenance, disassembly, and recommended lubricants for the pump.

3.5 Installing Bowl Assembly

The following bowl installation instructions apply to pumps shipped disassembled.

WARNING- Do not work under a heavy suspended object unless there is positive support and safe guards that will protect personnel should a hoist or sling fail.

CAUTION: Do not attempt to lift bowl assembly by the pump shaft. This can result in damaging the pump shaft.

1. Prior to installing the bowl assembly, check that all hexagonal screws are tight and any integral piping is installed.
Remove all accumulated dust, oil, or other foreign material from the external surfaces.
2. Place two I-beam supports or column clamps across the base plate opening, strong enough to safely support the weight of the entire pump assembly. These holders should be connected by threaded rods and nuts, so as to clamp them firmly together for the portion to be supported.
(See Figure 4).
3. Put in place a suitable hoist or derrick over base plate opening. Place the lifting tool just below the discharge bowl flange or install two threaded eye bolts through bolt holes in flange 180° apart.
4. Attach sling to lifting tool or eye bolts and hoist into position over foundation opening
(See Figure 4).
5. Carefully lower bowl assembly, guiding the unit so it does not strike the sides of the opening. Continue to lower bowl assembly until the lifting tool or discharge bowl flange rests firmly on the supports of column holders.
6. Place a cover over the discharge bowl opening to prevent entrance of dirt or other foreign matter.

CAUTION: Do not drop any foreign object into the bowl assembly. Such an object can cause serious damage to the pump and any downstream components, Any foreign object dropped into the bowl assembly must be retrieved prior to continuing assembly.

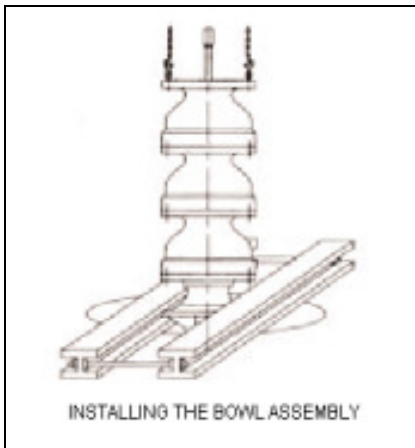


Fig 4

3.6 Installing the Column Line shaft

Pump lineshafts are connected with threaded couplings. When provided, see the Certified sectional arrangement drawing for the number of column and shaft sections required:

1. Check the headshafts A & B (1850101 & 1850201) and line shafts (1840201 & 1840101) for straightness. Average total runout should be less than 0.0005" TIR (0.013 mm) per foot (0.305 m), not to exceed 0.005" T.I.R. (0.127 mm) for every 10 feet (3 m) of shafting.
2. Apply a thin film of oil on threads of line shaft and screwed coupling (3950101) threads (in non-galling material, or Molykote if galling material). Start threads manually until resistance is felt. A fine wire inserted in the drill hole at the centre of the coupling can be used as a gauge to determine when the coupling is correctly positioned on the shaft. Run the upper lineshaft into the coupling until it is hand tight. Remove the wire after installing the coupling. Complete the joint using a pair of chain wrenches, one on the top of impeller/pump shaft (1860101) and the other on the coupling (3950101).

CAUTION: Use "MOLYKOTE" Dow-Corning or equal for all galling material such as SS416 stainless steel.

3. Use chain wrenches (clamp type) attached to the shaft to tighten the two shafts, using care not to damage any bearing journal areas.

NOTE: Shaft threads are left-handed.

4. Fit and fix Adapter Flange Bowl (4610101) with Top Bowl with suitable fasteners. For flanged column, install two eyebolts diametrically opposite in the upper flange of the bottom column pipe (1330101 or 1330201). Attach a sling to the eyebolts and to the hoist hook.

Lower column section until the flange engages the flanged bowl adapter flange. Insert as many bolts through both flanges as possible. Lift column assembly high enough to allow rotation of the supports. Install and tighten remaining hexagonal screws gradually in diametrically opposite pairs until all are uniformly tight.

5. Lift the assembly and remove the lifting tool or supports and slowly lower the bowl and column assembly. Place supports on the base plate and continue to lower the assembly until column flange comes to rest on the supports. Place a lifting tool under the column pipe.
6. For flanged columns normally bearings retailers, will fit into the female registers in the flanges on both ends of the column flanges. **Apply carefully liquid gasket (preferably Anabond) on Female register of column pipes**

For metal bearings, pour a small amount of oil between the bearing and shaft. Install threaded coupling on protruding end of line shaft.

7. Repeat the preceding procedures until all column sections and line shafts required have been installed.
8. Now fix Head shaft A to last line shaft with threaded coupling
9. Similarly assemble distance pipe with top column pipe with hexagonal screws for flanged pipe.
10. Lift adapter flange discharge head (4610201) and assemble with distance pipe with hexagonal screws for flanged pipe.

3.7 Installing Discharge Head

1. KBL Pumps are provided with a cast discharge head as a standard supply. Install the discharge head as follows:
2. If the stuffing box / seal housing is assembled to the discharge head, remove it and all attached piping. **See Figure 5** for the stuffing box provided for the KBL Pump being assembled.
3. Insert studs in all tapings provided on discharge head bottom for discharge head adapter flange.
4. Remove coupling guard if provided. Attach a sling through windows (hand holes) or to lifting boss provided on discharge head and hoist discharge head over the protruding headshaft.

CAUTION: Do not bend or scrape the shaft protruding above the column. This could result in bending or damaging the shaft.

5. Orient the discharge head in the required position and lower the head, centering the vertical hole with the head shaft A. Lower the discharge head until it engages with adapter flange for discharge head. Discharge head bottom flange will have female register; engage it properly with male register of adapter flange, with studs of discharge head being passed through clearance holes of adapter flange. Tighten

- all hex nuts gradually in diametrically opposite pairs
6. Lift pump assembly high enough to allow rotation of the supports. Realign and lower assembly. Install and tighten remaining hexagonal nuts. Repeat rotation and tightening procedure, until all hexagonal nuts are uniformly tight.
7. Using a device with the capacity to support the weight of the entire pump assembly, hoist bowl, column, and head assembly and remove supports.

NOTE: Eyebolts or sling should be rated to handle in excess of the pump weight.

8. Lower bowl, column and head assembly, until discharge head mounting flange engages base plate. Secure discharge head to mounting plate. Check that the discharge head is level in all directions, utilizing a spirit level across the driver mounting surface of the discharge head. Fit the discharge head firmly with grouted sole plate using suitable screws.

3.8 Stuffing Box / Mechanical Seal Installation

Assemble stuffing box in accordance with **Figure 5**,

Standard Construction

1. Position Liquid gasket on discharge head. Slide stuffing box (2380101) / Seal housing (2540101) down over shaft and into position on the gasket. Secure stuffing box / Seal housing with studs and hexagonal nuts.
2. For mechanical seal refer Seal drawing and read seal manual to understand assembly procedure of mechanical seal. Taking proper care slide the mechanical seal slowly along the head shaft A and fit with seal housing.

3. For stuffing box, apply grease to the packing rings (4300101) for easier installation.
4. Twist the packing ring sideways to get it around the shaft easily. Start the first ring into the stuffing box. When the entire ring is worked in using the fingers, tamp it down using a split wood bushing (or equal) and push the packing ring down firmly. It must seal on the shaft and bore of the stuffing box. Install all rings in this manner. Stagger ring joints 90° apart. The split gland may be used as a tamper for the top ring.
5. Install the split gland (2290101) with clamping plate (2240101) and threaded nuts on the split gland studs. Tighten nuts then relieve the nuts and tighten finger tight. Attach bypass line to tube fitting in the stuffing box.
6. Final adjustment of the stuffing box must be made at pump start up. This final adjustment applies to all stuffing box styles.
7. A properly packed stuffing box should be loose enough to allow the shaft to be turned manually.

CAUTION: Check that the split gland is square in the stuffing box. Cocking can cause uneven compression of packing and damage to the shaft.

CAUTION: Do not over tighten packing or excessive wear can occur on the shaft.

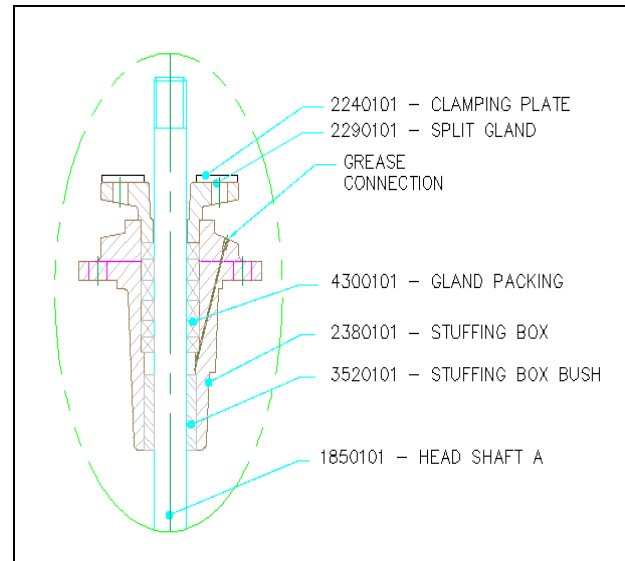


Fig 5

3.9 Installing the Driver

Installation of a Hollow Shaft Driver

This refers to either Vertical Hollow Shaft (VHS) type electric motors or hollow shaft type gear drives, supplied with a non-reverse ratchet.

WARNING: Do not work under a heavy suspended object unless there is a positive support and safeguards that will protect personnel, should a hoist or sling fail.

1. Fit head shaft B with head shaft A using screwed coupling properly as per procedure detailed above.
2. The driveshaft projecting through the quill or hollow-shaft of the driver is separate from the pump shaft and connected to it by a threaded coupling.
3. Hollow shaft drivers have a non-reverse ratchet or pins, manually turn the driver shaft clockwise viewed from the top until the non-reverse ratchet or pins fully engage.

4. Lubricate motor bearings in accordance with instructions given on lubrication plate attached to the driver case.
5. Remove top cover and driver coupling (Fig.6) slowly from the driver. Take out ratchet pins if are coupled with driver coupling.
6. Attach a sling to the lifting lugs of motor, hoist motor, inspect the mounting surface, register, shaft and clean these surfaces thoroughly. If any burrs are found, remove burrs with a smooth mill file, cleaning thoroughly afterward.
7. Orient the motor conduit box / horizontal input shaft for gear drive in the required position. Align the driver mounting holes with the mating tapped holes on the discharge head. Lower the driver till it rests on the discharge head. Secure driver with studs and hexagonal nuts provided.

NOTE:- For Discharge heads where ever necessary adapter plate is required to match mounting face of driver with Top flange of discharge head, which will be supplied as assembled with discharge head. Fit driver face with this adapter plate using studs and hexagonal nuts.

8. The driving mechanism of all hollow shaft drives is shown on Figure 6. The head shaft B (1850201) extends up through the quill or hollow shaft of the driver and is held in place by an adjusting/coupling nut (3320101), which not only carries all the static and hydraulic thrust of the impellers and shaft but also provides the adjustment for the impeller clearances.
9. Apply a suitable thread compound to the threads of coupling nut.

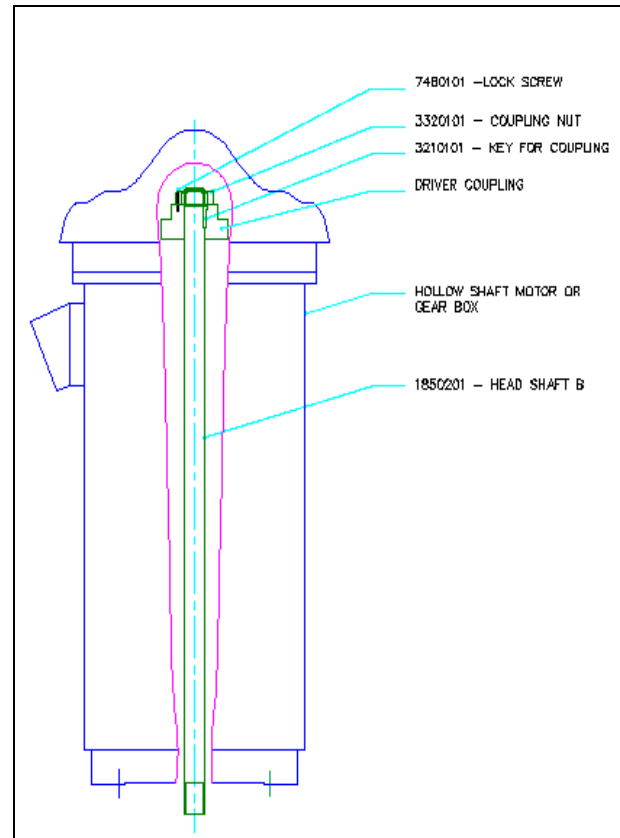


Fig 6

Completion of Installation of a Hollow Shaft Driver

1. Remove lifting sling and see if driveshaft centres inside the driver quill shaft within [.06" (1.5mm)], If it does not, misalignment is indicated.
2. Any driveshaft misalignment with driver quill shaft can be caused by a bent driveshaft, burrs, or foreign matter between shaft ends or any of the mounting flanges: driver, discharge head or adapter plate. If the latter, shimming between it and discharge head base, will correct it. Also, check concentricity of driver-to-driver stand to discharge head.
3. With the motor in place and the head shaft B projecting through the motor quill shaft, connect up the electricity and check motor rotation. This should be counter-clockwise

when viewed from the top. See arrow on pump nameplate. If motor does not rotate counter-clockwise, you can change the rotation by interchanging any two leads (for three phase only, for single phase motors see motor manufacturer's instructions.)

CAUTION: Never check motor rotation with the drive coupling in place. The bore clearance between the drive coupling and the pump shaft O.D. is so close that should the motor spin with this shaft stationary, galling and locking together is very likely to take place.

4. Install drive coupling, insert the ratchet pins if a non-reverse ratchet is used. Match the coupling lugs with corresponding holes in driver. Tighten down hold down bolts evenly; making sure drive coupling is properly seated in the register fit.
5. Fit gib key (3210101) into keyway, by filing if necessary, to where there is a snug but sliding fit. This key must be able to be removed by gentle leverage with a screwdriver under it.
6. Be careful that the gib key (3210101) is not too high so as to hold up the adjusting nut (3320101) from seating on the drive coupling. If it is, cut off some of it.
7. Install adjusting nut (3320101) to hand tight.

Gear Drives with Engines

1. The procedure for installing a hollow shaft right angle gear drive is exactly the same as for the motor.
2. Checking pump rotation is very simple matter. Check the arrows of rotation on the engine. Throw out the clutch, take a bar and jack over the flexible driveshaft in direction of engine rotation, and note if it turns the pump shaft in the proper direction.

Note: engines almost invariably turn clockwise when looking toward the gear drive.

3.10 Impeller Adjustment

Impeller Adjustment for all Hollow Shaft Drives

NOTE: Shaft adjustment up or down is accomplished by turning the adjusting/coupling nut (3320101) Figure 7.

NOTE: There are three holes in the coupling nut and normally four in the driver coupling. See Figures 7.

CAUTION: The Impellers must be adjusted before any attempt is made to start the pump.

Impellers

1. The pump should run with its impellers in the mid-position approximately 5mm (1/8" to 3/16") above the bowl wear rings. See sectional drawing (if available) for this setting.

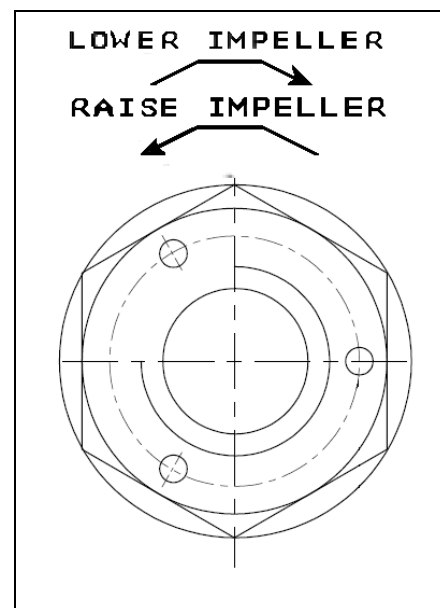


Fig 7

2. Before any adjustments are made, the impellers will be resting on the bowl wear rings, and considerable resistance due to frictions can be felt when turning the shaft by hand. To set the impellers to the mid position, proceed as follows:

Screw down the top shaft nut, while restraining the top shaft from turning, until the impellers just clear the seals and the shaft can be turned freely by hand. Scribe a line on the thread of the top shaft flush with the top of the nut. Continue to down the nut until the distance from the scribe line to the top of the nut is 5mm (1/8" to 3/16").

3. Turn the nut an additional few degrees, if necessary to align one of the holes in the top shaft nut with the tapped holes in the top drive coupling.
4. Install the lock screw (7480101) in the top shaft nut **Fig 8**.

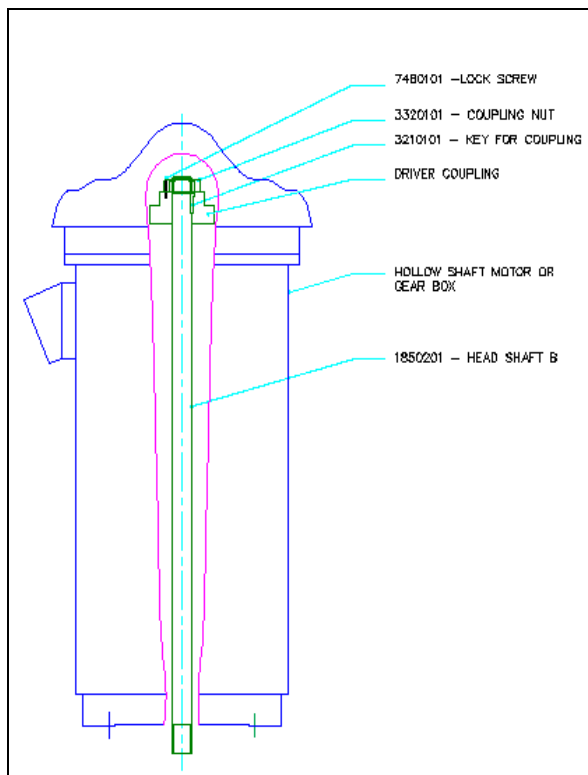


Fig. 8

WARNING: The driver cover must be in place when the pump is in operation. Rotating parts below this cover could cause grave personal injury if exposed.

3.11 Installing Solid Shaft Motor

This refers to installing solid shaft motor on the discharge head along with pump-motor coupling.

WARNING: Do not work under a heavy suspended object unless there is a positive support and safeguards that will protect personnel, should a hoist or sling fail.

1. Fit head shaft B with head shaft A using screwed coupling properly as per procedure detailed above.
2. Slide fan cum deflector from top through head shaft B and fit firmly on screwed coupling using two qty. of locking screws.
3. Fit the thrust bearing housing (2470101) on discharge head. Take thrust collar (3630101), clean it thoroughly. Apply appropriate grease to the angular contact ball bearings (2610101). Fit angular contact ball bearing with thrust collar. Check certified cross sectional drawing of the pump for qty. of the bearings; it can be one or two numbers depending on application. For two bearings installation arrangement should be tandem arrangement Refer Fig.9.
4. Fit the keys (3280101) on head shaft B Slide thrust collar (3630101) along with bearing on the head shaft till bearing rest in thrust bearing housing.
5. Apply a suitable thread compound to the threads of bearing nut (3350101). Install bearing nut through threads of head shaft B and hand tight against thrust collar.
6. The pump should run with its impellers in the mid-position approximately 5mm (1/8" to 3/16") above the bowl wear rings. See sectional drawing (if available) for this setting.
7. Before any adjustments are made, the impellers will be resting on the bowl wear rings, and considerable resistance due to frictions can be felt when turning the shaft

by hand. To set the impellers to the mid position, proceed as follows:

Screw down bearing nut while restraining the top shaft from turning, until the impellers just clear the seals and the shaft can be turned freely by hand. Scribe a line on the thread of the top shaft flush with the top of the nut. Continue to down the nut until the distance from the scribe line to the top of the nut is 5mm (1/8" to 3/16").

8. Turn the bearing nut an additional few degrees, if necessary to align one of the holes in bearing nut with the tapped holes in the thrust collar.
9. Install the lock screw (6570101) in the bearing nut and fit with thrust collar.
10. Fit the protection cover (4710101) in thrust bearing housing.
11. Pump coupling is normally sent with fitting the ratchet pin housing (4750101). If it is not fitted then fix the ratchet pin housing on pump coupling with keys in between and locking grub screws. Ensure ratchet pins are in position in ratchet in housing.
12. Insert key (3210101) in head shaft B and fit for pump coupling along with ratchet pin housing with head shaft. Ensure sufficient gap is maintained between ratchet pin housing and non-reverse ratchets of thrust bearing housing.
13. Lift the motor stool (2900101) fit with top flange of discharge with head hexagonal nuts and screws provided.
14. Attach a sling to the lifting lugs of motor, hoist motor, inspect the mounting surface, register, shaft of motor and clean these surfaces thoroughly. If any burrs are found, remove burrs with a smooth mill file, cleaning thoroughly afterward. Then fit the driver coupling (3910101) on motor shaft and fix locking grub screw in place in case motor coupling supplied in loose.
15. Orient the motor conduit box in the required position. Align the motor mounting holes with the mating holes on

Motor stool (2900101). Lower the driver till it rests on the motor stool. Align the motor shaft centerline with pump shaft centerline by dial gauge. Check the alignment both radial and vertical on coupling faces. It should be within ± 0.050 mm. Then secure motor with motor stool using hexagonal nuts and screws provided.

16. Remove coupling pins from pump-motor coupling. Ensure gap of 6-8 mm is maintained between faces of pump and motor couplings. Connect the electrical supply to the motor, momentarily switch on motor and check direction of rotation. This should be counter clockwise when viewed from top.
17. For three phase electric motors, if the direction of rotation is incorrect, disconnect the supply and change over two of three supply wires. For two phase motors check with motor manual.
18. Once direction of rotation is reviewed and confirmed re assemble coupling pins between pump and motor couplings.

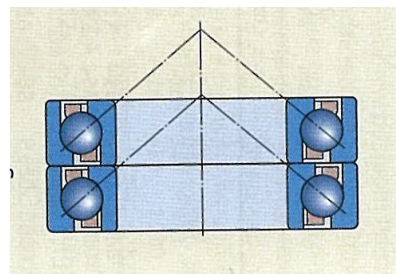


Fig. 9

4. OPERATION

Pre-start Procedure

Consult the applicable manufacturer's instructions for detailed information for the prime mover (electric motor, engine), coupling, driveshaft, gear head or mechanical seal. When applicable to the pump and prior to startup, check the following.

1. Confirm that the following procedures described in the "Installing the Drivers" sections have been performed:

A. Wiring of Driver.

B. Driver must rotate counter-clockwise (CCW) when viewed from above.

WARNING: Do not check motor rotation unless motor is bolted to pump and drive coupling for hollow shaft driver and coupling pins for solid shaft motor are removed.

C. Check alignment between pump and driver.

D. Impeller adjustment has been made.

2. Make sure gland packing / mechanical seal is correctly installed as instructed in section (3.8). Also, check that all cooling, heating and flushing lines are operating and regulated.
3. All connections to driver and starting device match wiring diagram.
4. Voltage, phase, and frequency on motor nameplate agree with line current.
5. Rotate shaft manually to ensure impellers are not binding.
6. Verify that driver bearings are properly lubricated and check oil / grease provided wherever required.
7. Check that auxiliary seal components are properly vented.
8. Inspect discharge piping connection and pressure gauges for proper operation.

4.1 Pre-Commissioning Checklist

Under no circumstances should the pump operate without an adequate supply of water.

The pump inlet must be submerged to the recommended minimum submergence level (refer to the pump General arrangement drawing). Even short periods of running without water can cause serious damage to the pump.

4.2 Pump

The unit is ready for operation when:

- a) It has been correctly installed and securely bolted to its mounting.
- b) The impeller clearance setting has been checked and all rotating parts turn readily and evenly when tried by hand.
- c) The stuffing box is packed / mechanical seal is installed as per instructions in section 3.8
- d) Discharge pipework is connected and adequately supported and the discharge gate valve is closed.
- e) Sufficient liquid is available to cover the pump bowls and sustain an acceptable proving run.
- f) All guards are fitted and secured.

4.3 Motor

The unit is ready for operation when:

- a) The unit has been installed in accordance with manufacturer's instructions.
- b) The direction of rotation has been verified as correct in relation to pump direction of rotation.
- c) The coupling has been installed correctly.
- d) Earth connections have been made.
- e) All guards and terminal box covers are fitted and secure.

4.4 Engine

The unit is ready for operation when:

- a) The unit has been installed in accordance with manufacturer's instructions.
- b) The coupling has been installed correctly.
- c) Earth connections of controller have been made.

- d) All guards and covers are fitted and secure.
- e) Lubrication levels have been checked.
- f) The fuel tank has a sufficient supply.

4.5 Pump Start-up

1. Partially close valve in discharge line.
2. Vent system when the pump surface temperature has reached equilibrium.
4. Start pump.
5. When pump is operating at full speed, slowly open discharge valve. If driver overheats or there is excessive vibration or undue Noise, stop the pump.

NOTE: If the impellers have not been finally adjusted, due to extreme liquid temperature, they should be adjusted prior to startup and after pump surface temperatures have reached equilibrium.

The unit should be shut down immediately if any trouble is suspected or if the unit is operating at its rated speed and is found to have any of the following defects:

- No liquid delivered after opening valve.
- Not enough liquid delivered.
- Not enough pressure.
- Loss of liquid after starting.
- Vibration.
- Overloading of driver.
- Thrust bearing overheating.
- Exceptionally noisy operation.
- Excessive leakage from packing gland.

4.6 Stuffing Box

With the pump in operation, there should be some leakage at the stuffing box packing. The correct leakage is a rate which keeps the shaft and stuffing box cool approximately one drop per second). Check the temperature of the leakage as well as the discharge head. If the pump runs hot and the leakage begins to choke off, stop the pump and allow it to cool down.

A few light taps with a hammer on the gland will upset the packing sufficiently to resume leakage. After pump has cooled, restart pump and follow preceding procedure.

Run the pump for 15 minutes, check leakage, if it exceeds two drops per second; adjust packing as described in "Packing Adjustment and Replacement" (section 5.3).

5. MAINTENANCE

Preventive maintenance includes periodic inspection of oil level in gearboxes and diesel engines and the re-lubrication of electric motors, thrust bearing for solid shaft motors. Systematic inspection of the pump and its components shall be made at regular intervals. The frequency required depends upon the operating conditions of the pump and its environment. Consult the applicable manufacturer's instructions for detailed information on maintenance for the prime mover, driveshaft, electric motors and gear drives. Any deviation in performance or operations from what is expected can be traced to some specific cause. Variances from initial performance will indicate changing system conditions, wear, or impending breakdown of the unit.

5.1 Preparation for Maintenance

The following hazards may arise during maintenance work:

Fluid Pressure Jet Hazards

Check and ensure that the pump operates at below the Maximum Working Pressure specified in the manual or on the pump nameplate and before maintenance, ensure that the pump is drained down.

Hazardous Materials

Wear a suitable mask or respirator when working with packing or gasket components that contain fibrous material, as these can be hazardous when the fibrous dust is inhaled. Be cautious, if other supplier's components have been substituted for genuine KBL parts, these may then contain hazardous materials.



Electric Shock & Accidental Starting Hazard

ISOLATE the equipment before any maintenance work is to be done. Switch off the mains supply, remove fuses, apply lock-outs where applicable and affix suitable isolation warning signs to prevent inadvertent reconnection.

Special tools are required for dismantling and re-assembling these pumps. Suitable lifting equipment must be available and it is recommended that maintenance requiring disassembly of the pump unit is done in a clean area.

5.2 Lubrication

Refer to motor, gearbox or engine literature as required.

5.3 Stuffing Box

Where a soft packed gland seal is fitted it will be necessary to replace the packing rings periodically when the gland can no longer be tightened to reduce leakage to the normal level, or if the gland is overheating.

Packing Removal Procedure

1. Stop the prime mover. Close the discharge valve and release any pressure from the pump, remove the gland retaining nuts clamping plate (2240101) and pull the split gland (2290101) clear of the stuffing box.
2. Separate and withdraw the two halves of the gland.
3. If necessary move the liquid deflector (2360101) up the lineshaft to allow more movement around the stuffing box.
4. Carefully withdraw the old packing using a pair of extractor tools of the correct size placed on opposite sides of the head shaft A (1850101).

5. Clean shaft, the bore of stuffing box and the split gland with a clean oily cloth.

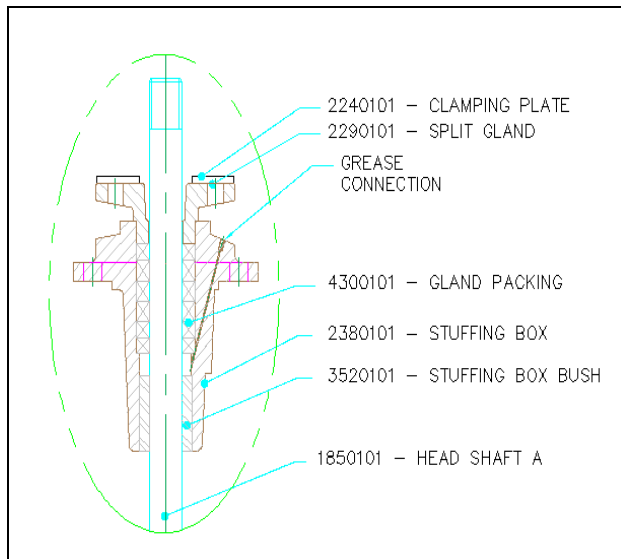


Fig 10

6. Check the shaft for concentricity with the stuffing box bore and that the surface under the packing rings is free from scores, pitting or grooves.
7. Examine the gland for general condition and replace if damaged.

Packing Preparation

If the packing is to be cut from a coil or long length, the size, number of rings and length is specified on the Pump Section drawing.

1. Wrap the packing around a dummy shaft, of the same diameter as of head shaft.

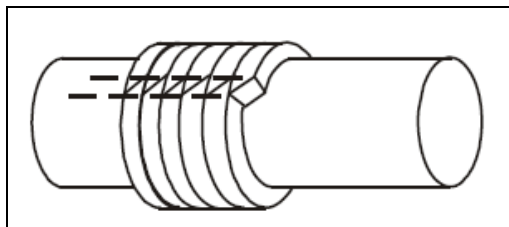


Fig 11

2. To assist in cutting rings, two guide lines parallel to the shaft axis and separated by a distance equal to the packing section may be drawn on the spiral.
3. Cut each ring from the spiral at an angle of 45° diagonally across the guidelines.

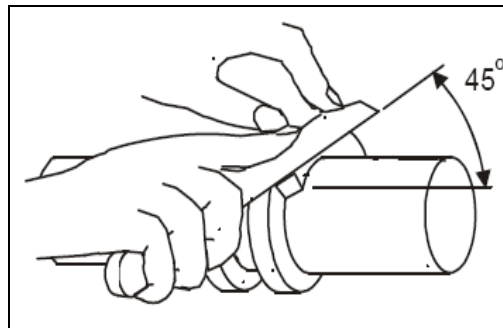


Fig 12

Repacking Procedure

1. Insert the first ring and tap it to the bottom of the stuffing box. Each following ring should be installed in the same manner and positioned in the stuffing box so that the "split" is advanced 120°.
2. When all the rings have been inserted, the last packing ring should not protrude from the stuffing box face.
3. Slide the gland into the stuffing box and ensure that it sits squarely against the last packing ring. Fit the gland retaining nuts on the studs and tighten evenly to finger pressure.
4. Turn the shaft to ensure it does not bind on the bore of the stuffing box bush.
5. Start the pump as detailed in section 4, allow pressure to increase to normal level and ensure that air is not trapped in the pump casing.
6. A soft packed gland must have slight steady leakage (ideally one drop per second), and this should start soon after the pump reaches its normal operating pressure.
7. If gland leakage stops, the pump will overheat leading to seal damage or

premature pump failure. If overheating is detected, the pump must be stopped and allowed to cool and when restarted, gland leakage should start.

- 8 If the pump overheats again, stop the pump restart it again, do not slacken the gland retaining nuts.
- 9 After the pump had been running for 10 minutes with steady leakage, tighten the gland nuts by (1/6) of a full turn.
- 10 Continue to adjust at 10-minute intervals, each time evenly, by one sixth of a full turn, until leakage is reduced to the acceptable level.

ATTENTION

Excessive gland pressure will cause damage by cutting off lubrication to the packing, and the packing will burn and damage the shaft.

5.4 Maintenance Schedule

INSPECTION	REMARKS
Daily Checks:	
Soft packed: Adjust gland as necessary to maintain slight leakage and check that gland drains are clear.	When gland is fully compressed, change or add more packing. Refer to soft packed seal adjustment instructions in section (5.3).
Check the pump for noise & vibration.	Refer to Fault Finding Chart in Section 5.5.
Check the gauges and instruments.	If pump performance falls off this may indicate the need for further inspection and remedial action.
6 Weekly Checks:	
Drain the old oil / grease if has turned black from the bearing housings & replace with new one.	Use recommended oil / grease as per Section (7) or equivalent. Do not overfill the bearing housing, as the bearings will overheat if overfilled.
6 Monthly Checks:	
Check coupling alignment. Check coupling pins and bushes for wear.	Refer to maintenance instructions and Renew as necessary.
Check holding-down bolts for tightness.	Tighten loose bolts as necessary.
Overhaul:	
An overhaul is to be carried out when pump performance falls below an acceptable level.	

5.5 Trouble Shooting

POTENTIAL FAULT OR DEFECT (Remedial actions are listed on the following page)									
No liquid delivered									
Insufficient liquid delivered									
Liquid delivered at low pressure									
Loss of liquid after starting									
Excessive vibration									
Excessive noise for pump cavitation									
Pump bearings run hotter than normal									
Excessive gland leakage									
Motor runs hot									
Stuffing box overheats									
PROBABLE CAUSES - INDICATING ACTION									
X									Pump not primed
X	X								Pump inlet plugged
	X	X							Fluid viscosity greater than rating
X	X	X							Speed too low
					X			X	Speed too high
		X	X	X	X				Air or gas in liquid
X	X	X			X			X	Discharge head too high (above rating)
X	X		X	X	X				Air leak on suction
X	X	X	X	X	X				Inlet bell mouth not sufficiently submerged
			X						Suction lift too high
	X	X							Excessive wear ring clearance
	X	X	X	X					Damaged impeller
X	X		X	X	X				Insufficient net inlet head
						X			Lubricant dirty or contaminated
								X	Defects in motor
			X	X					Foundation not rigid
			X	X		X		X	Misalignment of pump/gearbox to driver
			X	X					Bearing worn
			X	X					Rotor out of balance
								X	Voltage / frequency lower than rating
			X	X		X		X	Bent shaft
							X		Defective gland packing
								X	Gland too tight

Remedial Actions

CAUSES	ACTION
Pump inlet blocked	Clear inlet strainer.
Fluid viscosity greater than rating	Check against specification.
Air or gas in liquid	Check air release valve. Consult KBL. It may be possible to increase the pump performance to provide adequate pumping.
Discharge head too high (above rating)	Check that valves are fully open and check for pipe friction losses. An increase in pipe diameter may reduce the discharge pressure. Consult KBL.
Inlet bell mouth not sufficiently submerged	If the pump inlet cannot be lowered, provide a baffle to smother the inlet vortex and prevent air entering the liquid.
Excessive wear ring clearance	Replace wear rings when clearance exceeds the specified maximum.
Damaged impeller	Replace impeller.
Line shaft bearings not lubricated	Contaminated water supply. Make sure that water supply is clean.
Foundation not rigid	Make sure that the foundation bolts are tight; check that foundations match KBL recommendations.
Misalignment of pump/gearbox to driver	Realign the pump/gearbox and driver as specified.
Bearing worn	Remove the bearings, clean and inspect for damage and wear, replace as necessary.

Rotor out of balance	Check impeller for damage, replace as necessary.
Bent shaft	Check shaft run-out and replace if needed.
Defective gland packing	Investigate, tighten or repack.
Gland too tight	Repack and re-adjust.
Pump not primed	Fill pump and suction pipe completely with fluid.
Speed too low	Check that the motor is correctly connected and receiving the full supply voltage also confirm that the supply frequency is correct.
Speed too high	Check the motor voltage.
Air leak in suction pipe work	Check each flange for suction draught, rectify as necessary.
Suction lift too high	Check for obstruction of pump inlet. Measure the static lift, if above rating, raise the liquid level or lower the pump.
Lubricant dirty or contaminated	Dismantle the pump, clean the bearings, reassemble the pump and fill with new lubricant.
Defects in motor	Refer to manufacturer's instructions.
Voltage / frequency lower than rating	Instigate inspection and test of power supply and verify that it conforms to the motor nameplate.

6. DISASSEMBLY AND REASSEMBLY

6.1 Disassembly

WARNING: Before starting, lock out driver power to prevent accidental start up and physical injury.

NOTE: Pump components should be match-marked prior to disassembly to ensure they are reassembled in the correct location.

Head and Column

1. On pumps, which are driven through a gear drive, remove the driveshaft between the gear box and the prime mover.
2. On pumps, which are electric motor driven, remove the electrical connections at the conduit box and tag the electrical leads, so they can be reassembled the same way they were disassembled.
3. Disconnect discharge head from the discharge piping.

WARNING: Never try to lift entire pump assembly by the lifting lugs or eyebolts furnished for the driver only.

4. For hollow shaft driver remove the locking screw (7480101) and coupling nut (3320101) on the driver from pump shaft and lift off by the lifting lugs or eyebolts as furnished.
5. For Solid shaft motor, dismantle motor from motor stool (2900101). Remove motor stool from discharge head (1170101). Lift pump coupling with ratchet pin housing carefully.
Lift thrust collar along with thrust bearing from head shaft B and dismantle thrust bearing housing (2470101).
Remove fan cum deflector from screwed coupling.
5. Remove all hold down bolts and integral piping. Remove screwed coupling, gland

packing, stuffing box / seal housing and proceed with disassembly down to the bowls by reversing the procedures described in detail for assembling the unit.

[Dismantle discharge head, adapter flange discharge head (4610201), column joints including line shafts, bearing inserts and adapter flange bowl (4610101)].

Bowl Assembly

The bowl assembly is composed of a suction bell, pump bowls, discharge bowl, impellers and securing hardware, bearings, and pump shaft. Impellers are secured to the shaft by a key and collet.

NOTE: Match mark bowl assembly in sequence of disassembly to aid in the reassembly procedure.

Keyed Construction Bowl

1. Remove hexagonal screws that secure the top pump bowl (1210101) to adjacent pump bowl (1200101).
2. Slide the top pump bowl off the pump/impeller shaft (1860101).
3. Remove hexagonal screws, collet ring (2640101) and collet (2640201) from pump/impeller shaft.
4. Slide impeller off the pump/impeller shaft and remove the key (3200101).
If impeller is seized to the shaft, strike impeller with a fibre mallet and drive impeller off the pump shaft.
5. Repeat the above procedures until the bowl assembly is completely disassembled.

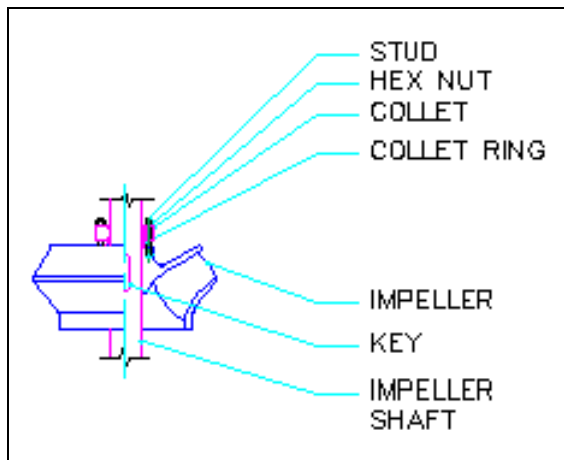


Fig 13
(Impeller to shaft locking arrangement)

Pump Bowl- Wear Ring Removal

1. Remove set screws.
2. Utilizing a diamond point chisel, cut into wear ring at the location of the setscrews. Use extreme care not to damage the wear ring seat.
3. Pry the ring out using the chisel.
4. On special materials such as chrome steel, set up the bowl in a lathe and machine the wear ring off using extreme care not to machine or damage the ring seat.

Bowl, Suction Bell and Line shaft Bearing Removal

1. Utilizing an arbor press and a piece of pipe or sleeve with an outside diameter slightly smaller than the diameter of the bowl or lineshaft bearing housing bore, press the bearing out.
2. Remove suction bell bearing by setting the suction bell in a lathe and machine the bearing off. The suction bell bearing can also be removed by using bearing pullers to pull the bearing out.

NOTE: Bowl bearings are press fit. Do not remove unless replacement is necessary.

6.2 Inspection and Reassembly

Inspection

1. Clean all pump parts thoroughly with a suitable cleaner.
2. Check bearing retainers for deformation and wear.
3. Check shafts for straightness and excessive wear on bearing surfaces. Check deflection of shafts, average total runout shall not exceed 0.005" (0.13mm) T.I.R. for every 10 feet (3m) of shaft length.
4. Visually check impellers and bowls for cracks and pitting.
Check all bowl bearings for excessive wear and corrosion.
5. Replace all badly worn or damaged parts with new parts.
In addition, replace all gaskets and packing as required.

Reassembly

Pump Bowl Wear Ring Installation

1. Place chamfered face of the bowl or impeller wear ring towards the ring seat and press the ring into the seat. Use an arbor press or equal, making sure the ring is flush with the edge or the wear ring seat.

Bowl, Suction Bell and Line Shaft Installation

1. Press transmission bearing (3570101) into spider bearing (2450101) using an arbor press or equal.
2. Press bell mouth bearing (3540101) into bell mouth (2110101) using an arbor press or equal.
3. Press bowl bearings (3540101) into pump bowl (1200101) Place the bowl with the flange downward and press bearing through chamfered side of bowl hub until the bearing is fully engaged with the hub using an arbor press or equal.

Taper Collet Construction Bowl Assembly

1. For ease in reassembly apply a thin film of turbine oil to all mating and threaded parts.
2. If the sand collar (2680101) is not assembled to the shaft, install the sand collar. The larger diameter of the counter bore of the sand collar goes toward the suction bell bearing. Insert sand collar in shaft and position it so that the bottom of the sand collar is set according to the "X" dimension, before it cools. See Figure 10. See Table 1 for the "X" dimensions. Slide the pump shaft into the suction bell bearing until the sand collar rests against the suction bell.

WARNING: Wear protective gloves and use appropriate eye protection to prevent injury when handling hot parts.

3. Hold the shaft in this position by inserting a cap screw with an assembly jig into the hole in the end of the suction bell and then into the threaded hole in the end of the shaft.
4. Insert impeller key (3200101). Slide the first impeller over the shaft until it seats on the suction bell.

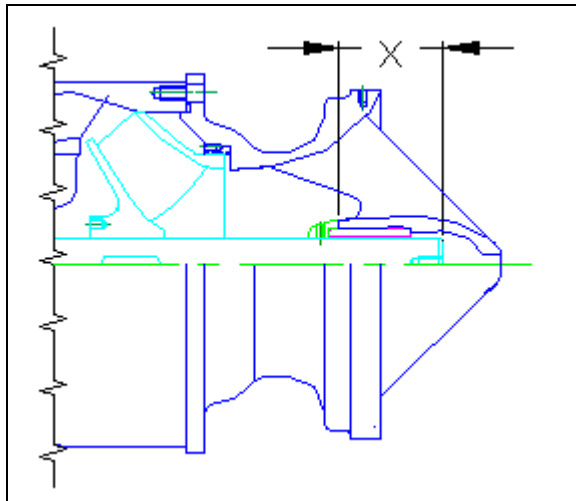


Fig 14

Pump Shaft Set Up Dimensions	
Pump Model.	X Dim
VEP20C	2.638"
VEP21C	3.425"
VEP26C	3.937"
VEP32C	4.685"
VEP24C	3.425"
VEP24A	3.425"
VEP34C	4.330"

5. Insert a screwdriver into the slot in the taper collet spread the slot and slide the collet (2640201), large outside diameter first, over the pump/impeller shaft (1860101).
6. Ensure the larger end on collet butts up against the impeller (1510101).
7. Slide the collet ring (2640101) over to engage on the taper collet.
8. Insert hexagonal screws and tighten.
9. Slide pump bowl (1200101) onto pump/impeller shaft and secure with hexagonal screws provided.
10. Repeat preceding procedure for number of stages required.
11. Remove cap screw from end of shaft and check that the shaft rotates freely without dragging or binding. Also check for adequate lateral endplay.

Final Assembly

After bowl assembly, reassemble pump as described in Section 3, Installation.

Refer to Section 4, Operation for start up and adjusting procedures.

7. LUBRICATION DETAILS FOR THRUST BEARING

In case where solid shaft motors are supplied with the pump, thrust bearing is supplied separately at it fits on the top of discharge head in thrust bearing housing.

For hollow shaft drivers (hollow shaft motor / right angle gear box) thrust bearing is inbuilt within the driver and bearing lubrication details are to be referred in the manual supplied with hollow shaft driver.

7.1 LUBRICATION GREASE FOR THRUST BEARING

For the pumps supplied with solid shaft motor, grease lubricated thrust bearings are provided. Specifications for grease to be used for thrust bearing are given below.

Soap Type	Di-urea complex
Colour	Blue
NLGI consistency class	2-3
Penetration	At 25° C worked (60 Strokes) , Range 245 – 275
Dropping point	240° C

Recommended Grease refilling period – every 1000 running hours.

Recommended Grease: SKF - LGHP2

8. SPARES AND SERVICES

8.1 Spares

Ordering Parts

When ordering spare or replacement parts. The pump serial number and size and type of pump must be given. This can be found on the nameplate furnished with the unit. Give the complete name and reference number of each part as indicated on the applicable sectional drawings and the quantity required.

Stocking Spare Parts

Spare parts to be kept in inventory will vary according to service, field maintenance, allowable down time and number of units. A minimum inventory of one complete set of bearings and one spare of each moving part is suggested.

8.2 Services

Telephone: +91 20 2721 4444

For spare parts, supply only.



Ask for - Spares Dept.

For breakdowns, spare parts and

On-site fitting, pump installation and

Commissioning, and service contracts. Ask for - Service Dept.

You may enter details from your pump nameplates on following page for quick reference.

 Enriching Lives	
PUMP TYPE:	
SERIAL NO.:	
O/A NO. :	
RATED HEAD : m	RATED FLOW : m ³ /hr
RATED SPEED : rpm	RATED POWER : kW
IMPELLER DIA : mm	HYDROTEST PR: kg/cm ²
PRIME MOVER: kW	SIZE : mm
DO NOT RUN BELOW/ABOVE m PUMP TOTAL HEAD	
<p align="center">- IMPORTANT -</p> <p align="center"></p> <p align="center">DIRECTION OF ROTATION</p>	
<p align="center">® REGD. USERS - KIRLOSKAR BROTHERS LIMITED UDYOG BHAVAN, PUNE-411002, (INDIA), WORKS- KIRLOSKARVADI.</p>	

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