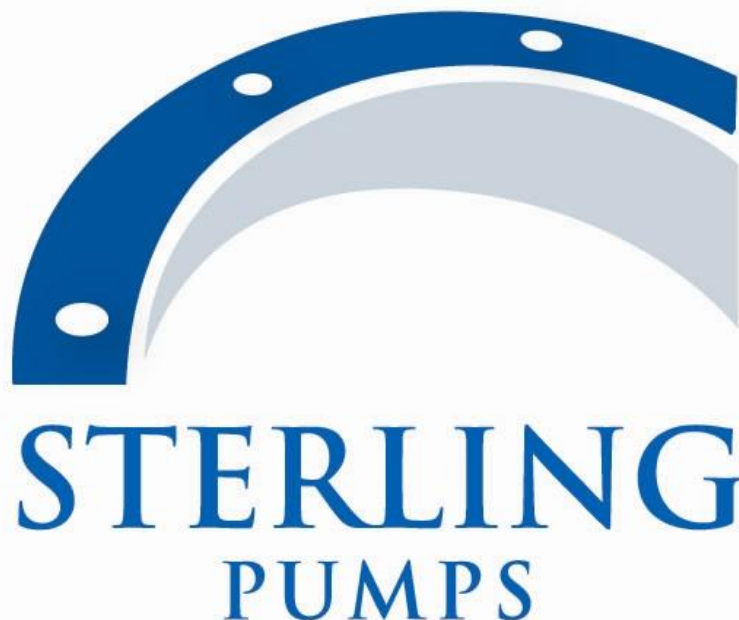


# OPERATING AND MAINTENANCE MANUAL

## Turbine Pump MANUFACTURED BY



**Sterling Pumps Pty Ltd**  
14 Sharnet Circuit  
Pakenham, Victoria 3810 Australia

Telephone: (03) 5941 3400  
Fax: (03) 95940 2645  
[www.sterlingpumps.com.au](http://www.sterlingpumps.com.au)

# **TABLE OF CONTENTS**

## **SECTION 1**

<b>1. INTRODUCTION .....</b>	<b>4</b>
<b>1.1 GENERAL.....</b>	<b>4</b>
<b>1.2 GUARANTEE.....</b>	<b>4</b>
<b>1.3 TAKE OVER .....</b>	<b>4</b>
<b>1.4 DESCRIPTION OF THE PUMP .....</b>	<b>5</b>
<b>2. TRANSPORTATION AND STORAGE .....</b>	<b>6</b>
<b>2.1 TRANSPORTATION.....</b>	<b>6</b>
<b>2.1.1 Schedule of Transportation.....</b>	<b>6</b>
<b>2.1.2 Caution for Transportation.....</b>	<b>6</b>
<b>2.1.3 Check the lifting equipment .....</b>	<b>6</b>
<b>2.1.4 Check on Received Shipment (Including Package) .....</b>	<b>7</b>
<b>2.1.5 Transportation and Safekeeping of package .....</b>	<b>7</b>
<b>2.1.6 Work Step for Transportation.....</b>	<b>7</b>
<b>2.2 STORAGE .....</b>	<b>8</b>
<b>2.2.1 Caution for Handling.....</b>	<b>8</b>
<b>2.2.2 Handling and Safekeeping of Package .....</b>	<b>8</b>
<b>2.2.3 Shipping Marks .....</b>	<b>9</b>
<b>2.2.4 Packing List .....</b>	<b>9</b>
<b>2.2.5 Unloading and Handling .....</b>	<b>9</b>
<b>2.2.6. Requirements for storage .....</b>	<b>9</b>
<b>3. TOOLS AND EQUIPMENTS .....</b>	<b>10</b>
<b>3.1 RECOMMENDED TOOLS AND INSTRUMENTS FOR PUMP SET ERECTION..</b>	<b>10</b>
<b>3.2 MEASURING DEVICES FOR INSTALLATION.....</b>	<b>11</b>
<b>4. TORQUE DATA .....</b>	<b>12</b>
<b>5. INSTALLATION.....</b>	<b>13</b>
<b>5.0 INSTALLATION.....</b>	<b>13</b>
<b>5.1 CONFIRMATION BEFORE WORK START.....</b>	<b>Error! Bookmark not defined.</b>
<b>5.1.1 Matter to be agreed upon .....</b>	<b>Error! Bookmark not defined.</b>

<b>5.2</b>	<b>PREPARATION OF TOOLS, EQUIPMENTS AND MATERIALS FOR ERECTION</b>	<b>13</b>
<b>5.3</b>	<b>PREPARATION OF INSTALLATION DRAWINGS .....</b>	<b>13</b>
<b>5.4</b>	<b>GENERAL PROCEDURE ITEMS FOR PUMP INSTALLATION.....</b>	<b>14</b>
<b>5.1.1.</b>	<b>5.4.1 Make sure Foundation and Marking Elevation and Position on the Foundations: .....</b>	<b>14</b>
<b>5.5</b>	<b>CHIPPING FOUNDATION .....</b>	<b>14</b>
<b>5.6</b>	<b>common working problems for assembly and installation .....</b>	<b>14</b>
<b>5.7</b>	<b>LAYOUT OF PUMP PARTS FOR ERECTION .....</b>	<b>15</b>
<b>5.8</b>	<b>PUMP INSTALLATION .....</b>	<b>16</b>
<b>6.</b>	<b>INSTALLATION OF TBH, MOTOR STAND, MOTOR.....</b>	<b>19</b>
<b>7.</b>	<b>ALIGNMENT OF PUMP AND MOTOR.....</b>	<b>20</b>
<b>8.</b>	<b>INSTALLATION OF VERTICAL HOLLOW SHAFT MOTOR .....</b>	<b>21</b>
<b>9.</b>	<b>ACCESSORIES .....</b>	<b>22</b>
<b>10.</b>	<b>OPERATION .....</b>	<b>23</b>
<b>10.1</b>	<b>ADJUSTMENT FOR START UP OF PUMP .....</b>	<b>23</b>
<b>10.2</b>	<b>STARTING UP.....</b>	<b>24</b>
<b>10.3</b>	<b>OPERATING INSTRUCTIONS .....</b>	<b>25</b>
<b>11.1</b>	<b>INSUFFICIENT PRESSURE .....</b>	<b>26</b>
<b>11.2</b>	<b>NO LIQUID DELIVERED.....</b>	<b>26</b>
<b>11.3</b>	<b>VIBRATION.....</b>	<b>26</b>
<b>11.4</b>	<b>INSUFFICIENT CAPACITY .....</b>	<b>27</b>
<b>11.5</b>	<b>USE TOO MUCH POWER.....</b>	<b>27</b>

# **1. INTRODUCTION**

## **1.1 GENERAL**

Sterling Pumps Pty Ltd has been building pumps for many years. With proper maintenance this pump will give you trouble free service with a minimum of maintenance and repair costs.

This Operating and Maintenance Manual of vertical turbine pumps is directed to the engineering and maintenance personnel to give the most important details for installation, starting up and maintenance of the pumps in an effort to avoid complications and reduce operating costs to a minimum.

This Instruction Manual contains a description and guide lines for Sterling Pumps Pty Ltd and the most special versions of this type. We have tried to make this installation as complete as possible, but we could not go into every detail of construction within the scope of this Instruction Manual. Therefore, if you require further information which is not contained in the manual please contact the Sterling Pumps Pty Ltd sales office.

## **1.2 GUARANTEE**

See Sterling pumps terms and conditions of sale

## **1.3 TAKE OVER**

After equipment is received please check immediately that the order is in accordance with the shipping papers and that no damage has occurred whilst product was in transit. Be sure to check the box thoroughly as parts and accessories may be packed separately or attached to the side wall of the packaging.

## **1.4 DESCRIPTION OF THE PUMP**

The Vertical Turbine pumps supplied to you consist of four major constituents;

1. Bowl Assembly: Generally supplied in an assembled condition and boxed up to certain sizes.
2. Column Assembly: Column pipes, line shafts, couplings etc. Column pipes are usually packaged loose. The shafts, couplings, bearings and so forth will be supplied in boxes.
3. Discharge Elbow Assembly: Discharge head and packing box assembly. The discharge heads are boxed up to certain sizes with all fabricated discharge heads generally packaged loose.
4. Thrust Bearing and Motor Stand: Thrust bearing housing assembly generally packaged in a box, the motor stand is supplied loose.

Please Note: Always refer to the general arrangement and cross-sectional drawings of your pump for particular constituents and design features.

## **2. TRANSPORTATION AND STORAGE**

### **2.1 TRANSPORTATION**

#### **2.1.1 SCHEDULE OF TRANSPORTATION (PACKING LIST)**

The schedule must be studied carefully. The above TRANSPORTATION schedule and the number of persons required for the work must be constantly maintained until the job is complete. In circumstances where a time difference occurs between the schedule and actual progress, arrangements must be made in sufficient time to ensure appropriate measures are taken, thus ensuring the original schedule is met.

#### **2.1.2 CAUTION FOR TRANSPORTATION**

In transportation of the delivered equipment the following general cautions should be observed:

1. Attention shall be carefully paid to the CARE MARKS in the handling of packages. Lifting wires are to be attached at the positions shown by the SLING MARK, paying close attention to the CENTRE MARK which indicated the centre of gravity.
2. Utmost care shall be taken during transport to minimise shock, impact and vibration to packages labelled FRAGILE. Wooden skids will pallets shall be positioned under the packages by firmly fixing with bolts.
3. A suitable waterproof cover sheet shall be used to cover the equipment in rainy and uncertain weather conditions. If the cargo carries specific markings cautioning KEEP DRY, OPEN INDOOR etc. cargo is to be covered regardless of weather conditions.
4. Wire rope to suspend the load shall be of adequate thickness and sufficient length.
5. When lifting and fixing the equipment, pads shall be applied at appropriate positions to prevent damage.

#### **2.1.3 CHECK THE LIFTING EQUIPMENT**

Lifting equipment (overhead travelling crane, truck crane, etc) need to undergo a full check-up to ascertain their capacity, power, elevation height and transportable range. This ensures that the pump and associated equipment can be brought correctly into place. All equipment and supplied parts must be handled with care to ensure no damage occurs in result of shock.

#### **2.1.4 CHECK ON RECEIVED SHIPMENT (INCLUDING PACKAGE)**

A shipment on receipt at the landing port or relevant work site shall be investigated for any damage, soaked condition and quantity. Any abnormalities or damage found on shipments must be immediately reported to the Sterling Pumps Pty Ltd supervisor so suitable counter measures can be put into place and records can be made of damaged equipment.

#### **2.1.5 TRANSPORTATION AND SAFEKEEPING OF PACKAGE**

The transportation and safekeeping of a package shall be undertaken carefully following the statement of care marks.

Each package shall be treated with appropriate regard to its caution markings such as THIS SIDE UP, HANDLING WITH CARE, DO NOT WET, SLING HERE, CENTRE OF BALANCE and other weight markings which may be found printed on or attached to the packaging.

#### **2.1.6 PROCEDURE FOR TRANSPORTATION**

##### **A. Step (1) for Loading work**

1. Select size of wire rope which will be used for loading work with reference to
2. Sling rope angle should not be more than 60°.
3. Check the caution marks such as 'Fragile', 'Keep Dry', 'Sling Position' etc. for respective package.
4. Confirm the damage condition for each package before loading work.
5. Take wire rope on the assigned sling line printed on the surface of the package.
6. Avoid if possible using a forklift to lift up crate.
7. Loading work should be done carefully to prevent any damage or distortion.
8. Take the rain and dust proof cover on the shipments to prevent any rain or dust exposure to packaging during transport to site.

### **B. Step (3) for Un-loading**

1. After arriving at site check for any damage to packages. If any is noticed inform the Sterling Pumps Pty Ltd engineer of the nature of the damage.
2. Set timber wooden blocks (if required) onto the unloading platform and unload packages to these to prevent any water damage.
3. Unloading work should be performed carefully to prevent damage distortion.

### **C. Step (4) for Confirmation**

1. After unloading is complete perform check that all package numbers correspond with the picking list. If anything is found missing report to the Sterling Pumps Pty Ltd engineer.
2. Check setting condition of the wooden blocks under packaging.

## **2.2 STORAGE**

### **2.2.1 CAUTION FOR HANDLING**

Handle all equipment with care. Pads need to be applied to appropriate portions when lifting to prevent damage. Use wire rope which is of adequate length and sufficient thickness to suspend load and ensure the rope is suspended at the centre of gravity of the load. Avoid any undue shock and vibration to equipment.

### **2.2.2 HANDLING AND SAFEKEEPING OF PACKAGE**

The handling and safe keeping of the packages needs to be in accordance to the care marking printed or attached to the packaging as discussed in 2.1.5.



### **2.2.3 SHIPPING MARKS**

In order to give proper information for the handling of equipment each package shall be marked by the main shipping mark, care markings and corner.

· Main Shipping Mark

The main shipping mark shown below shall be printed on two sides of each package. In cases where package is a skid, drum or bundle metal tags shall be printed with the mark.

### **2.2.4 PACKING LIST**

The packing list contained in a waterproof envelope shall be securely attached to each package with a metal cover. The packing list shall only be taken out when unpacking the equipment on-site.

### **2.2.5 UNLOADING AND HANDLING**

The equipment shall be delivered to site by the CLIENT. Necessary arrangement shall be made by the CLIENT to ensure following requirements are met;

1. The packages shall be identified correctly as to the destinations according to the shipping marks.
2. Attention shall be carefully paid to all care markings when unloading and handling packages. Lifting wires shall be attached to relevant positions as indicated by SLING MARK and CENTRE MARK.
3. Utmost care shall be taken to minimise any shock, impact and vibration to packaging. With packaging labelled FRAGILE, wooden skids with pallets shall be positioned under the packages firmly with bolts.
4. Should any damage be found in the appearance of packages or any accident be encountered during the unloading and handling, immediately report to Sterling Pumps Pty Ltd.

### **2.2.6. REQUIREMENTS FOR STORAGE**

Please refer to storage manual / field quality plan of individual equipment in regards to the storage procedure (provided separately).

### **3. TOOLS AND EQUIPMENTS**

#### **3.1 RECOMMENDED TOOLS AND INSTRUMENTS FOR PUMP SET ERECTION**

<b>Sl.No.</b>	<b>Tools &amp; Materials</b>	<b>Quantity</b>	<b>Remarks</b>
01.	Electric Welding Equipment	1 Set	For welding
02.	Gas Cutter equipment	1 Set	For fabrication of pipe line
03.	Electric Portable Grinder	1 Set	For assembly
04.	Washing Oil, Kerosene	1 Set	For washing of parts
05.	Emery Cloth (Paper)	1 Set	For cleaning of parts
06.	Molycote (Anti-seizing grease)	1 Set	For assembly
07.	Sealing tape for pipe	1 Set	For auxiliary piping
08.	Line Marker	2 Sets	For alignment of foundation
09.	Chisel	3 Sets	For preparation of foundation
10.	Wire Rope Sling 5 Tons	2 Nos.	For installation
11.	Wire Rope Sling 7.5 Tons	2 Nos.	For installation & rigging
12.	Wire Rope Sling 10 Tons	2 Nos.	For installation & rigging
13.	Wire Rope Sling 1 Ton	2 Nos.	For installation
14.	1Lb Hammer	2 Nos.	For assembly
15.	10Lbs Hammer	2 Nos.	For assembly
16.	File Set	2 Sets.	For assembly
17.	Screw Driver	2 Each	For assembly
18.	Adjustable Wrench	1 No.	For assembly
19.	Pipe Wrench	2 Nos.	For auxiliary piping / line shaft
20.	Allen Key	1 Set	For assembly
21.	Wire Brush	2 nos.	For assembly
22.	Single ended / Double ended Wrench	2 Each	For assembly
23.	Plumb Bob with String	1 No.	For installation
24.	Wooden Hand Hammer	2 nos.	For installation
25.	1-Bolt of various sizes	2 Each	For rigging
26.	D-Shackle of various sizes	1 Set	For rigging
27.	Socket Wrench	1 Set	For assembly
28.	Position Marker Punch	1 Set	For assembly
29.	Gap Gauge (Feeler Gauge)	2 Sets	For erection
30.	Striking Box Wrench	2 nos.	For assembly
31.	Scraper	2 Sets	For assembly / cleaning surface
32.		2 Nos.	For assembly / demarcation
		1 No.	For assembly / disassembly of impeller (wherever applicable)
33.	Lock Collet Hammer		

### **3.2 MEASURING DEVICES FOR INSTALLATION**

<b>Sl.No.</b>	<b>Description</b>	<b>Quantity</b>	<b>Remarks</b>
01.	Precision Class Level (Accuracy 0.02mm/m)	1 No.	For checking levelling
02.	Steel Tape Measure (5, 10m,,)	1 Each	For measurement of foundation for centring
03.	Dial Gauge (Minimum Division 0.001mm with magnet holder)	1 Set	For checking alignment
04.	Gap Gauge (Feeler Gauge)	2 Sets	For assembly
05.	Straight Bar (0.5m Long)	1 No.	For alignment
06.	Straight Steel Scale (1m 30cm)	1 Each	For assembly
07.	Normal Class Level	1 No.	For checking of foundation
08.	Straight edge (t-beam Type)	1 No.	For checking levelling

**(Please Note: Length of the straight edge depends upon the diameter of the top flange of the Motor stool.)**

## **4. TORQUE DATA**

Torque data

Maximum tightening torque for threaded fasteners.

Kgt-M

Material 304ss

Size mm	Torque	
	Kgf-m	NM
6	0.45	4.41
8	1.11	10.8
10	2.2	21.56
12	3.84	37.6
14	6.15	60.3
16	9.6	94.08

Maximum tightening torque for threaded fasteners.

Kgt-M

Material: Steel Gr. 8.8

Size mm	Torque	
	Kgf-m	NM
6	1.19	11.7
8	2.9	28.4
10	5.74	56.2
12	10	98
14	16	156.8
16	25	245

## **5. INSTALLATION**

### **5.0 INSTALLATION**

#### **General Precautions for installation:**

Quality installation of the pump is very important to ensure a long and satisfactory service of the equipment. Therefore, utmost care should be taken in carrying out the installation work.

### **5.1 PREPARATION OF TOOLS, EQUIPMENTS AND MATERIALS FOR ERECTION**

Tools, equipment and materials for erection work shall be checked as per lists 3.1 and 3.2 before setting out work.

Quantities are estimated approximately and depend upon the installation schedule.

### **5.2 PREPARATION OF INSTALLATION DRAWINGS**

Collect and arrange the drawings such as foundation drawing, installation dimensional drawing, functional unit layout and piping diagram.

Make sure you are aware of the method of installation in these documents before setting to work.

## **5.4 GENERAL PROCEDURE ITEMS FOR PUMP INSTALLATION**

### **5.1.1. 5.4.1 MAKE SURE FOUNDATION AND MARKING ELEVATION AND POSITION ON THE FOUNDATIONS:**

1. Determine the reference point
2. Check the foundation  
Before Installation, check the position and elevation for associated units to be installed on the foundation. Make sure that they are free from cracks, cavities, honeycomb and improper composition of grout (cement materials), other foreign matters and any other defects. If there are any defects a proper counter measure shall be taken by the responsible party.
3. Centre Line  
Mark a centre line indicating the centre position of the pump axis direction on the foundation surface or wall according to the installation drawing and the reference point.

## **5.5 CHIPPING FOUNDATION**

Chip the surface of concrete to check & ensure that the 2nd layer of concrete has bonded securely with the first layer.

## **5.6 COMMON WORKING PROBLEMS FOR ASSEMBLY AND INSTALLATION**

1. Be sure to rig with the wire ropes at the centre of gravity of the load.
2. It is necessary to check rust, burrs, gouges or damage caused by hitting on the machined surface of the part such as the fitting portions and the mounting surfaces.
3. For the fitting parts where seal gaskets are to be inserted, be particularly careful about the dimensions of the gaskets.
4. Tightening the bolts on the fitting parts should be performed symmetrically and uniformly.
5. Rust-preventive compound shall be removed by the white kerosene or suitable solvent, before installation and assembly.
6. Tightening the bolts, nuts and screws.
  - a) Use the proper spanners wrench to tighten the bolts, nuts and screws.
  - b) Tightening torque of bolts, nuts and screws is indicated on Table. However it's not necessary to apply torque wrench for this type of pump.

7. Illumination and Ventilation
  - a) It is important to provide sufficient illumination facilities.
  - b) Work must be done in a location with air ventilation for the health of the working personnel.
8. Cleaning of the working area.
9. Where work is to be conducted at a place higher than 2 metres from ground level, adequate scaffoldings are needed for safety reasons. It should provide the set with a permanent stiffness and rest on foundations sufficiently compensating for vibrations.

## **5.7 LAYOUT OF PUMP PARTS FOR ERECTION**

- Open all boxes and compare with Packing List at store.
- Bring all the materials at Pump House.
- Clean all the metal parts by brush with Kerosene Oil.
- Clean rubber bearing by soap water.
- Great care should be taken for Shaft Assembly. Remove line shafts and head shafts from box and keep on wooden sleeper in such a manner that the shafts are supported in three places to avoid bending of the shaft.
- Bowl Assembly consisting of parts as per cross sectional drawing. Check Bowl Assembly for axial play and free rotation. Rotate pump shaft by hand to ensure that rotating assembly is free to rotate properly. Clean Bowl Assembly with water from top to bottom. The pump shaft should move freely if there is no damage or obstruction to the rotating assembly.
- Column pipes should be checked and cleaned at faces and diameters of assembly joints / flanges.
- Discharge Head, Motor Stand, Packing Box, Thrust bearing Housing Assembly should be checked and cleaned at faces and diameters of assembly joints / flanges.
- All small components and fasteners should be separated assembly wise as per cross-sectional drawing & checked for corrections and cleanliness.
- Line Shaft Bearings, if supplied loose, should be assembled in bearing retainers (spiders) supplied loose or integral with column pipes.
- Lightly brush with special MO-Sulphide grease all the shaft threading and couplings.
- If possible, check on V-blocks the straightness of the shafts (0.05 mm/meter length of shaft).

## **5.8 PUMP INSTALLATION**

### **ASSEMBLY AND INSTALLATION OF THE PUMP SET**

The installation of pumps at site; supplied as separate components or as an assembled unit presents no difficulty for skilled fitters. However it requires certain care and strict compliance with the directions enumerated below in order to obtain a rectilinear shafting indispensable for accurate running. In particular if precautionary steps are not taken to keep the assembly faces clean and to check the fastenings of the delivery pipe this will inevitably lead to immediate trouble or future troubles (vibrations, jamming, and premature wear of the bearings).

### **SUMP AND ELEVATION LEVEL CHECKS**

- Measure the depth of pump and cross check with dimensions indicated in the G.A.drawing.
- Check water level and evaluate submergence available.
- Measure the total length of pump assembly and check with G.A.Drawing
- Mark the centre line of pump foundation.
- Mark the reference level elevation of pump.
- Measure the foundation bolt pocket and check with G.A.Drawing.

### **GROUTING OF FOUNDATION BOLTS**

- Chip the foundation area of sole plate by chisel. Place the Taper Wedge on foundation and then place sole plate on taper wedges. Match the centre line of sole plate with the centre line of pump foundation.
- Level the sole plate by straight-edge and precision level cross-wise. Accurate levelling is not required for grouting the foundation bolts of sole plate.
- Remove all dust from foundation pockets.
- Pour water inside the pocket and keep for half an hour.
- Remove all water from pockets.
- Keep 3 to 4 threads of foundation bolts above nuts.
- Prepare concrete mixture with the ratio proportion of 2:1:1.1/2" size stone chips, coarse sand, ordinary port land cement and sufficient water. Use one teaspoon full of non-shrinking powder in each bag of cement.
- Pour concrete mixture inside the pocket holes till it reaches up to floor level. While pouring concrete please ensure that no air pocket is left inside the holes.
- Allow the grout to set for 72 hours. The grouted area must be watered according to Civil Engineering practice.



## **COUPLING, SLEEVE & LINE SHAFT - PRE- ERECTION CHECKS**

The threaded type coupling and sleeve can be very easily fitted with shaft. Before assembling the same, each coupling and sleeve should be checked with shaft. In case it is found tight the coupling and/or sleeve should be removed and the threading of the shaft should be checked. There is every possibility for the threading to get damaged during transit or bad handling. The thread is to be filed by a small triangular file to make it smooth and easy to fit. Slight tapping by small hammer/mallet is always advisable instead of applying undue force by pipe wrench. Each sleeve should be fitted with shaft before starting the assembly.

Keyed type coupling should also be checked with shaft & key together for each joint. In case it's found tight, the coupling should be removed & key areas filed. Key may also be filed for easy fit. It is also advisable to check two shafts assembly with complete coupling including keys and split half thrust rings. If required split half thrust ring may also be filed for easy fitment. Refer to sectional drawing for type of Sleeves & Shaft Couplings provided in your pump.

**IMPORTANT: NEVER FIT A COMPONENT RECOGNIZED AS DAMAGED OR TWISTED**

**PUMP INSTALLATION: REFER TO SECTIONAL DRAWING OF PUMP**

**FITTING OF BOTTOM COLUMN ASSEMBLY WITH BOWL ASSEMBLY**

- Keep the bowl assembly horizontal & check the end play by pushing & pulling the pump shaft. Normally the end play is kept 6 mm to 25 mm or more depending on design of pump.
- Rotate the pump shaft by hand and make sure the impellers are free and pump is rotating freely.
- Fit pump shaft coupling with shaft. Fit bottom line shaft by threading and tighten by two pipe wrench and be sure that each shaft butt on to one another. The gripping area should be filed to remove tight spot. For keyed couplings see Note -3.
- Fit bottom column pipe to discharge case with gasket. Use grease on every joint of gasket. Tighten Cap Screws of the joints with proper torque as per size of the cap screw.
- Lift the pump and make it vertical and prepare for lowering.
- Keep 2 nos. supporting beams (ISMB) near to the foundation. Lower the pump assembly and rest column flange on ISMB.

**NOTE:**

1. The assembly of first column pipe (bottom column pipe) with bowl assembly may be fitted in vertical position also; it depends on Erector's decision.
2. The threaded type line shaft should get butt on to another & no gap is allowed between two joints.
3. For keyed type line shaft couplings, fit coupling with bottom line shaft at its top most position; assemble bottom line shaft to pump shaft with split half thrust ring retainers. Slide down the coupling by unscrewing the retainer screws and positioning it through the key in Pump Shaft.

## **ASSEMBLY OF INTERMEDIATE COLUMN PIPE**

Fit line shaft coupling with line shaft and assemble it with bottom line shaft. Lower the column pipe and assemble with bottom column pipe at next line shaft or bottom head shaft. Lift next column pipe and lower to fit with other column pipe.

## **DISCHARGE HEAD ASSEMBLY**

Lower gasket on top column flange, lift discharge head and lower on to top column flange and tighten by cap screw. Lift the complete assembly and lower the same on sole plate. Tighten cap screws between the sole plate to discharge head. Lower packing box through head shaft and fit with discharge head by cap screw. Lower Packing formed rings and Lantern Ring inside packing box. Fit Split Packing Gland. Fit shaft coupling and then top head shaft (if applicable). Fit water slinger.

## **PLEASE NOTE:**

Do not tighten the Split Packing Gland too much. For initial starting of pump the gland nuts should be tightened by hand. After starting the pump the gland nuts should be tightened by proper spanner uniformly.

## **6. INSTALLATION OF TBH, MOTOR STAND, MOTOR**

- Check the free rotation of NRR / TBH (thrust bearing housing assembly). In case of any doubt the TBH may be dismantled before erecting the same on to pump. For dismantling and refitting of TBH refer TBH disassembly procedure.
- Lift NRR / TBH assembly and lower on to discharge head and tighten by cap screw. Fit jib head key between head shaft and NRR. Fit adjusting nut by anti-clockwise threading and match with the threaded holes of TBH spindle and tighten for adjustment of pump. For proper adjustment follow the instruction under **Adjustment start-up of pump**. After adjustment rotate the pump and be sure the pump is free. Fit top head shaft key & lower half coupling of pump.
- Lift motor stand and fit with Discharge head.
- Check final levelling on motor stand by precision level & straight edge crosswise in two directions. Do not check the level directly on Motor Stand base as it may create confusion regarding proper levelling because of machining error. The maximum permissible limit is 0.5 mm/ metre. Grout sole plate. For grouting sole plate follow the grouting procedure of foundation bolts.
- Remove motor from box and keep it on wooden sleeper. Fit upper half coupling with motor shaft. If the key is very tight that may be slightly filed. Fit 2 nos. screws of upper coupling to avoid slipping down of the same from motor shaft.

### **PLEASE NOTE:**

All the keys and coupling are slide fit, no interference fitment is allowed. Sometimes keys and coupling may require slight filing and or rubbing by emery cloth for removal of light spot or scratches. But they should in no case be fitted very loose. The clearance between key and keyway should be allowed .002" to .004" only.

Lift the motor and erect on motor stand and tighten nuts & bolts between motor to motor stand.

For alignment of pump & motor follow alignment procedure. For dismantling of pump reverse procedure to be followed.

## **7. ALIGNMENT OF PUMP AND MOTOR**

Fix magnetic base of dial indicator on motor half coupling. Keep the pointer of dial indicator on pump half coupling, rotate the motor & check the concentricity of coupling one in respect to other.

In cases where it is not concentric the motor has to be shifted accordingly towards required direction. In this case the motor has to be lifted once again and warping concentricity checks should be done.

1. Keep the gap between upper half & lower half coupling by 3 to 8 mm only  
The gap between two couplings can be adjusted by lifting of lowering the motor coupling.
2. The gap between the couplings can be adjusted by lifting & lowering the upper half coupling wherever the pump is supplied without locating nut arrangement.
3. For axial alignment checking with filler gauge between lower half coupling and upper half coupling is to be used in both of the above two conditions.
4. Tolerance of alignment :-

ALIGNMENT	PERMISSIBLE TOLERANCE
A. Radial alignment	0.10 mm
B. Axial alignment	0.35 mm

## **8. INSTALLATION OF VERTICAL HOLLOW SHAFT MOTOR**

Remove the top cowl of the motor and then the motor clutch. Lift the motor using motor hooks to lift and slowly lower the motor over the head shaft. (In the hollow shaft motor application the head shaft provided is longer than the normal and no motor stand is provided. The motor sits directly on the discharge head, utmost care must be taken to ensure that the motor does not rest on the shaft or damage the shaft in any way. Match motor holes with those on top of discharge head and tighten with help of nuts and bolts provided. In this condition, the power cables should be connected and the direction of rotation to be checked by supplying electric power. Check concentricity of the pump shaft with the hollow shaft of motor.

Slip on motor clutch over the top shaft into place on the hollow shaft. This must be a sliding fit. If necessary file, dress and scrap, but do not use force. Now slide down the jib head key between the clutch and the head shaft through the key way and key slot. The key should be a slide fit and should not be too tight or too loose. Install adjusting nut through the threads of the head shaft at its top and rotate it anti-clock-wise until it touches and sits on the upper face of the clutch assembly. Rotate the adjusting nut some more so that the head shaft along with whole rotating assembly and impellers are lifted from lowest position. Adjust the lift of the impeller as required. There are two numbers lock screws provided which should be used to lock the adjusting nut through the holes at the nut and the taped hole on the clutch assembly. Refit the cowl again after completion of the exercise.

### **RIGHT ANGLE GEAR DRIVE AND FLEXIBLE SHAFT FOR DIESEL ENGINE DRIVEN PUMP**

- a. Remove dome and clutch (or non-reverse ratchet clutch if non-reverse ratchet is used). Clean the gear drive bottom flange and the horizontal shaft. Rotate it by hand to see that it rotates freely. Lift gear drive by eye hook provided. Lower carefully over head shaft. Register it in position and fasten it to discharge head by the cap screw / bolts and nuts provided. Now install the jib head key and then clutch with non-reverse ratchet pin. Fit the adjusting nut on the head shaft. Head shaft configuration for the gear drive application is same like hollow shaft motor application. Now adjust the impeller lift in the same way as that of hollow shaft motor. After adjustment of the impeller lift. lock the adjusting nut by the cap screws provided and then refit the dome.

#### **Caution:**

When gear drive is directly connected to a diesel engine through flexible shaft with no clutch arrangement, it's essential to disconnect non-reverse ratchet (if provided) by removing the pins. This will prevent damage due to backfire of the diesel engine.

- b. Slip on the coupling flange supplied on 10 the gear drive horizontal shaft with its key. Lock the flange in position with the help of set screw provided. The key should be a slide fit. File and dress the key if necessary. Install the special flange / flexible coupling on the engine fly wheel if there is no clutch provided. If the PTO clutch is provided then another coupling flange is to be slipped onto the horizontal output shaft of the clutch with its key. Connect both the couplings to the flex shaft flanges with help of cap screws / bolts and nuts. If the PTO clutch is not provided, then one end of the flex shaft flanges is to be fastened directly with the special flange / flexible coupling, which is already fitted on the engine fly wheel. Length of the flex shaft can be adjusted slightly by moving the prime mover in forward and backward direction, with the help of the spline provided in the flex shaft.

While installing the flexible shaft watch for two points: (1) Driving and Driven unit must be parallel and (2) Lugs must be in line.

The shafts to be connected do not necessarily have to be aligned perfectly but the centre lines should be parallel to each other and those should be in the same vertical plane. The permissible limit for the offset of driving and driven shaft should be kept within  $\frac{1}{2}^{\circ}$  to  $5^{\circ}$  generally. A minimum joint angle of  $\frac{1}{2}^{\circ}$  is to be maintained deliberately for the better lubrication and performance of the universal joints. The maximum permissible limit of the joint angle depends upon the operating speed and the type of the carbon shaft.

## **9. ACCESSORIES**

- a. Connect the pre-lubrication line with the system.
- b. Pour oil or add grease relevant to bearing supplied, in the Thrust Bearing assembly up to the specified level  
(Ref. Thrust Bearing Drg.).
- c. Connect the cooling water inlet and outlet line with the Thrust Bearing Assembly with necessary pipe line & accessories.

## **10. OPERATION**

### **10.1 ADJUSTMENT FOR START UP OF PUMP**

The impeller resting on the suction bell seat should be raised and made free while screwing the adjusting nut. The amount of lift depends upon the total end play and size of the pump.

The adjustment would not make too much difference in the performance of a closed type Impeller.

However adjust the impeller from the impeller seat to half its total lift. The gap between the coupling should be adjusted by lifting or lowering the motor half coupling / locating nut. Fix the coupling together.

For semi-open impellers lift the rotor by maximum 1/8" or slightly more only from its bottommost positions. For the long setting pump, the stretch of whole shaft is also to be considered at the time of impeller lift.

#### **CAUTION**

- a. Do not run the pump with impeller dragging or rubbing against impeller seat. A loud rubbing noise and drawl of excessive current by motor will be noticed if the pump is operating in such a condition.
- b. Some marginal improvement in performance is possible by adjusting the impeller down or up. This may be done on a trial basis if required.

#### **IMPORTANT**

The pump is not guaranteed for working with foreign materials in water (other than what is specified in the order). This is likely to cause excessive wear and tear to the pump and it's advised that you do not run the equipment in such a condition.

#### **START UP CHECKS:**

1. Check the direction of rotation of motor. This operation should be done before coupling motor to pump.
2. Follow motor instruction manual for checks to be made before starting motor.
3. Lubrication checks for greasing / oil levels for thrust bearing housing, packing glands and any other component specified in drawings / lubrication schedule.
4. Cooling circuits for bearing cooling and also fresh water lubrication for line shaft bearings if specified.

## **10.2 STARTING UP**

### **START-UP OPERATION**

1. All steps of the Erection should be done carefully and all bolts & nuts should be tightened. The adjustment and start-up checks are to be ensured.
2. Check the pump for easy rotation manually.
3. Set the Discharge Valve near the pump to 90% of the closed position for closed impeller. Ensure that all air release valves along the entire pipe line are fully opened. Be careful before starting up Mixed or Axial Flow pump. You can not start this pump with valve in closed condition. Check the recommendation & accordingly open the valve partially before starting the pump. Otherwise the drive motor may get overloaded.
4. Once the water flows through the pipe line and all the system air are released, the valve should be slowly opened to its full open position.
5. Check bearing and packing box for overheating. Adjust cooling line circuit, water flow, if required.

### **CAUTION:**

All foreign materials should be removed from the pump before start up. The pump is not capable of pumping blocks of wood, pieces of iron, welding scales etc.

In cases where it is likely that some small foreign matter will enter pump the best way to avoid damage is:

- a. The pump should be kept running until all foreign materials have been pumped out. In cases where it is stopped before there is a risk of the suspended materials setting into the seal ring, bearing etc which may cause the pump to seize.
- b. The pump should be stopped only after the liquid has been cleared.
- c. If any undue sounds and vibrations are observed during the pumping of such debris, it's recommended that the pump is pulled out for inspection.

### **PLEASE NOTE:**

The pump is not covered under warranty where pumping of foreign materials occurs. Any repairs of parts, including costs of pulling the pump out and re-erection, will be the clients' responsibility. Sterling Pumps Pty Ltd will not be held liable for any loss in such instances.

### **IMPORTANT**

1. In no case should the pump be allowed to run dry. To ensure this does not occur a minimum water-level trip should be installed.
2. When the pump is stopped suddenly the water starts flowing in the reverse direction and there is a load on shafting. The pump should not be started again when the reverse flow is occurring. The valve should be fully closed. When no reverse flow is occurring then the pump can be restarted. This will help in reducing severe strain to the shafting, which may otherwise break or damage the shafts.
3. The discharge pipe must never be entirely supported by the elbow. It must have a separate concrete or steel structure support so that no strain is posed on the pump.
4. An air release valve of double way should be provided on the pipe line between the pump outlet and discharge valve. The air release valve must be opened to vent air when the pump is started and allow air in when the pump stops. This is to ensure that the pipes don't collapse due to a vacuum condition.



### **10.3 OPERATING INSTRUCTIONS**

Do not operate this equipment in excess of its rated capacity, speed, pressure and temperature as stated within the instructions of this manual. This equipment has been shop-tested and found satisfactory for the condition for which it was sold. But its operation in excess of these conditions will subject it to excessive stresses and strains for which it was not designed.

If the pump is required to operate in a condition other than which is specified please inform Sterling Pumps Pty Ltd of the alterations and we will investigate if the pump is suitable for such use.

Bearings - the bearings should be carefully watched for signs of overheating.

#### **Lubrication of Drive Units**

**1) Electric Motor.**

**See electric motor manufacturers manual for motor lubrication.**

**2) Gear Box.**

**See gear box manufacturers manual for lubrication.**

**3) Motor stool assembly for solid shaft motors.**

**The main thrust bearing is pre packed with Castrol ELP 2 grease at the factory. Prior to starting the pumps grease should be added via grease nipple and then added every 200 hours running**

## 11. TROUBLESHOOTING

### **11.1 INSUFFICIENT PRESSURE**

1. Speed too slow (Check voltage & frequency)
2. Impeller loose
3. Wear ring worn out
4. Entrapped air in pump
5. Leaking column joints or bowl casing
6. Insufficient submergence

### **11.2 NO LIQUID DELIVERED**

1. Pump suction broken
2. Impeller clogged
3. Strainer clogged
4. Wrong rotation
5. Impeller loose

### **11.3 VIBRATION**

1. Motor imbalance
2. Motor base Flange not seated properly
3. Motor Coupling out of balance
4. Motor misaligned due to improper mounting or transfer of pipe line strains
5. Bent shafting
6. Pump bearing worn out
7. Clogged Impeller
8. Improper Impeller Adjustment
9. Vortex problem in sump
10. Resonance system frequency near pump speed
11. Impeller worn out and unbalanced
12. Flexible / Propeller shaft not fitted properly

## **11.4 INSUFFICIENT CAPACITY**

1. Speed too low
2. Impeller loose
3. Impeller bowl partially clogged
4. Leaking joint
5. Strainer partially clogged
6. Lower water level
7. Wrong rotation

## **11.5 USE TOO MUCH POWER**

1. Speed too high
2. Improper Impeller adjustment
3. Improper Impeller trim
4. Lubrication oil too heavy
5. Pumping sand, silt or foreign materials

