



# CSO / CP PUMPS Vertical Spindle Type Installation, Operation and Maintenance Manual

## **SAM**engineering

Customised Pump Solutions



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### NOTE:

The information contained in this book is intended to assist operating personnel by providing information on the characteristics of the purchased equipment.

It does not relieve the user of their responsibility of using accepted engineering practices in the installation, operation, and maintenance of this equipment.

Any further questions, contact SAM Engineering (Pty) Ltd +27 (0) 11 823-4250.

## INTRODUCTION

This manual is furnished to acquaint you with the easiest and most practical way to install, operate and maintain a Vertical Spindle CSO/CP pump for reference. Additional information can be obtained from your nearest SAM Engineering Sales Representative.

Equipment cannot operate well without proper care. To keep your unit operating at top efficiency, correct installation and maintenance must be followed. SAM Engineering can assist in the installation of equipment to ensure that maximum machine life can be attained with minimum downtime.

The information contained in this book is intended to assist operating personnel by providing information on the characteristics of the purchased equipment. It does not relieve the user of the responsibility of using accepted engineering practices in the installation, operation and maintenance of this equipment.

## LOCATION OF UNIT

This pump is designed to be mounted directly in a tank or sump supported by the mounting plate.

The pump should be placed so that it is accessible for maintenance and inspection during operation. A clear space and ample head room should be allowed for the use of an overhead crane hoist or A-frame sufficiently strong enough to lift the heaviest part of the unit.

## INSTALLATION OF THE UNIT IN THE TANK

The pump and motor are shipped completely assembled; however, control equipment and discharge piping beyond the flange above the mounting plate is not supplied.

- a. Before the unit is installed, check all bolts and nuts on the entire unit to assure that they are securely tightened.
- b. Mount the discharge pipe and support its weight with a locking collar at the top of the mounting plate.
- c. Lower the unit into the tank and secure the mounting plate. Brace the discharge piping to prevent excessive loads and vibration being transmitted to the pump.
- d. Hook up the bearing lubrication piping through a strainer. Include a control valve to regulate the flow.
- e. Make electrical connections. Check for rotation by observing the coupling. Correct rotation is clockwise as seen from the motor facing the top of the unit.
- f. Check the tank level to ensure suction is flooded. The entire casing should be submerged in the liquid to remove air pockets in the pump.
- g. Complete the assembly of the discharge piping including a control valve and pressure gauge, if possible

## ADJUSTMENT

The correct running clearance of the impeller has been set prior to leaving the factory.

When wear takes place between the impeller and the casing / wear plate (CP models), adjustment can be made as follows:

- a. Slacken off the four set screws holding the bearing housing to the frame
- b. Insert two jacking set screws into the two tapped holes in the bearing housing
- c. Gradually raise the bearing housing by screwing in the jacking screws
- d. Lower the complete rotating element by slackening back the two jacking screws until the impeller strikes the casing
- e. Raise the complete rotating element by means of the jacking screws to give an impeller clearance of 0,3mm
- f. Withdraw the two jacking screws and tighten the four bearing housing set screws
- g. Check that the rotating element rotates freely

## CAUTION

Sleeve bearings and pipe columns between bearings must be filled with water before starting pump.

To ensure that the water pressure in the bearing lubrication pipe is maintained, a pressure switch must be installed in the fresh water supply which will switch off the motor in the event of the pressure dropping below 100kPa.

The pressure does not have to be high – 250kPa to 275kPa is sufficient to lubricate the bearings and force the flow towards the pump.

A caution plate on the pump starter will serve as a warning to keep the bearings lubricated at all times with fresh, clean water.

This is a requirement even when the whole column is submerged and the pump is not running.

## START-UP PROCEDURE

- a. After the bearing lubricating water has been turned on for several minutes, long enough to fill the pipe column with clean water, the pump may be started.
- b. It is advisable to close the discharge valve to near shut off in order to keep the load requirement on the motor to a minimum.
- c. Open the valve slowly until the rated capacity is reached.
- d. Constantly watch the power required by the motor to make certain it does not overload.
- e. When the pump has reached its rated head and capacity, note the power reading and check it against the motor nameplate rating.
- f. If the power drawn is high, open the valve to the bearing lubrication line. It is possible that the friction caused by inadequately lubricated bearings is adding power to the motor load.
- g. After the pump has been started, check the power reading, head and capacity plus the temperature of the motor, motor bearings and bearings in bearing bracket assembly two and four hours after start-up.
- h. Periodic checks on performance should be made during the operating period.
- i. Check for bearing wear. The sleeve bearings will stand a certain amount of abrasive wear as long as they are lubricated, but they should be thoroughly inspected for wear.
- j. If records are kept at each shutdown and repairs noted, the optimum running time between services may be determined from the results of a series of repeated tabulations of performance, wear and life of critical parts.

## GREASE LUBRICATED CARTRIDGE ASSEMBLY – cantilever units

Grease lubricated ball or roller bearings are packed with grease at the factory and ordinarily will require no attention before starting, provided the pump has been stored in a clean, dry place prior to its first operation.

The bearings should be watched in the first hour or so after the pump has been started to check that they are operating properly. The importance of proper lubrication cannot be over-emphasised. It is difficult to say how often a bearing should be greased, since this will depend on the conditions of operation.

It is advised that one ounce of grease is added at regular intervals; however, it is equally important to avoid adding too much grease. Excess grease is the most common cause of overheating. For average conditions, it is recommended that one ounce of grease be added at intervals of three to six months using only clean grease. The housing should be kept perfectly clean – any foreign matter invading the bearing housing will destroy the bearing in a short time. When cleaning bearings, flush with paraffin and use clean tools and cloths – do not use waste.

A regular ball bearing grease should be used, but a standard commercial Vaseline can be substituted if necessary. Do not use graphite. A number 1 or 2 grease is generally satisfactory for operation at high speed or low room temperature. Mineral greases with a soda soap base are recommended.

Greases made from animal or vegetable oils are not recommended due to the danger of deterioration and forming of acid.

Most of the leading oil companies have special bearing greases which are satisfactory. The maximum desirable operating temperature for ball bearings is 90°C. Should the temperature of the bearing housing rise above 90°C, the pump should be shut down to determine the cause.

## DISMANTLING PROCEDURE

1. Disconnect the power source
2. Disconnect the discharge piping and the bearing lubrication piping
3. Disconnect the coupling
4. Unbolt and remove the motor from the motor support
5. Unbolt the mounting plate holding down fasteners
6. Pull the pump out of the tank
7. Unbolt the discharge piping at the casing (discharge) flange
8. Remove the bearing lubrication piping
9. Unbolt the casing and the lower pipe section flange
10. Hold the shaft with a wrench at the upper end near the coupling and unscrew the impeller by turning in a counter-clockwise direction
11. Unbolt the casing back cover from the lower column section and remove
12. Break the column joint at the intermediate joints by removing the flange bolts
13. Pull the intermediate bearing assembly off the shaft
14. Press out seals from the upper and lower bearing housings
15. Disconnect the shaft coupling
16. Remove the frame assembly from the frame support

## DISMANTLING PROCEDURE FOR FRAME ASSEMBLY

1. Remove the half coupling from the shaft
2. Remove the deflector inboard
3. Loosen and remove the four cap screws securing the bearing housing to the frame

4. Remove the shaft key
5. Pull out the complete shaft assembly including the shaft, bearing housing and ball bearings
6. Insert two 8mm set screws into the tapped holes in the grease retainer. The grease retainer can then be pulled out from the bearing housing
7. Remove retaining ring (snap ring) from the bearing housing, using a pair of snap ring (circlip) pliers
8. Slide the bearing housing free of shaft
9. Remove O-ring from the outside bearing housing
10. Knock out the bearing cap and press out the bearing seal
11. Press out the inboard bearing cover and press out the bearing seal
12. Remove bearing lock nut and lock washer from shaft.
13. Use a standard bearing puller to remove bearings from both ends of shaft.

## REASSEMBLY OF FRAME ASSEMBLY

1. Slide grease retainer, Item 42, onto the shaft with trapped holes from the coupling end
2. Heat bearings in clean oil to 100°C
3. Quickly slip each bearing onto the shaft before the shaft becomes heated and expands
4. Replace the lockwasher and locknut, and screw the nut tightly against the bearing. A few sharp knocks with a spanner wrench will ensure that the nut is tightened sufficiently. After bearings have cooled, tighten the nut again and bend the lock-tab of the lockwasher into place in the nut.
5. Slide the bearing housing over the bearings
6. Insert snap ring into the bearing housing
7. Tap the grease retainer so that it enters and fits into the bearing housing
8. Fit new O-ring around the bearing housing

9. Insert the complete shaft assembly (with bearings and bearing housing) into the frame
10. Fit a new bearing seal into the bearing cap and press the assembly into the bearing housing
11. Assemble the cap screws which secure the bearing housing to the frame, but do not tighten
12. Fit the half coupling to the shaft
13. Press the new bearing seal into the bearing cap and tap the assembly into the frame
14. Slide the new deflector over the shaft and locate in the bearing cap

## PUMP ASSEMBLY PROCEDURE

Assemble the pump unit in the reverse order of disassembly, referring to assembly section drawing.

- a. Replace all gasket
- b. Be sure that all locking screws and nuts are properly locked
- c. A total impeller clearance (suction side clearance plus back clearance) of 0,3mm should be held
- d. To be sure that the pump is properly assembled, check it against the assembly section
- e. When the pump is completed, reassembled and mounted, follow the same start-up procedure as previously outlined
- f. Do not attempt to adjust impeller clearance until the unit is in the final operating position

The correct clearance between the impeller and the casing / wear plate (CP models) is 0,3mm. This may be established after the unit is installed in the operating position by following the adjustment procedure set out under the heading "Adjustment".

## RECOMMENDED SPARE PARTS

The pumps covered by this manual have been designed and built with certain replaceable wearing parts.

The recommended inventory of spare parts depends on the installation and importance of continued operation. For critical service requiring minimal downtime, a complete or “quick change” rotating element is recommended.

Parts should be ordered as far in advance of their use as possible, since circumstances beyond the control of the company may reduce existing stocks. Not all parts are stocked and must be manufactured for each order.

To facilitate the efficient handling of your order for spare parts, be sure to include the following instructions:

1. Serial No. of the pump
2. Quantity of each part
3. Item number of each part
4. Name of part
5. Material desired

We would recommend you hold the following spares for each size of pump:

### SPINDLE

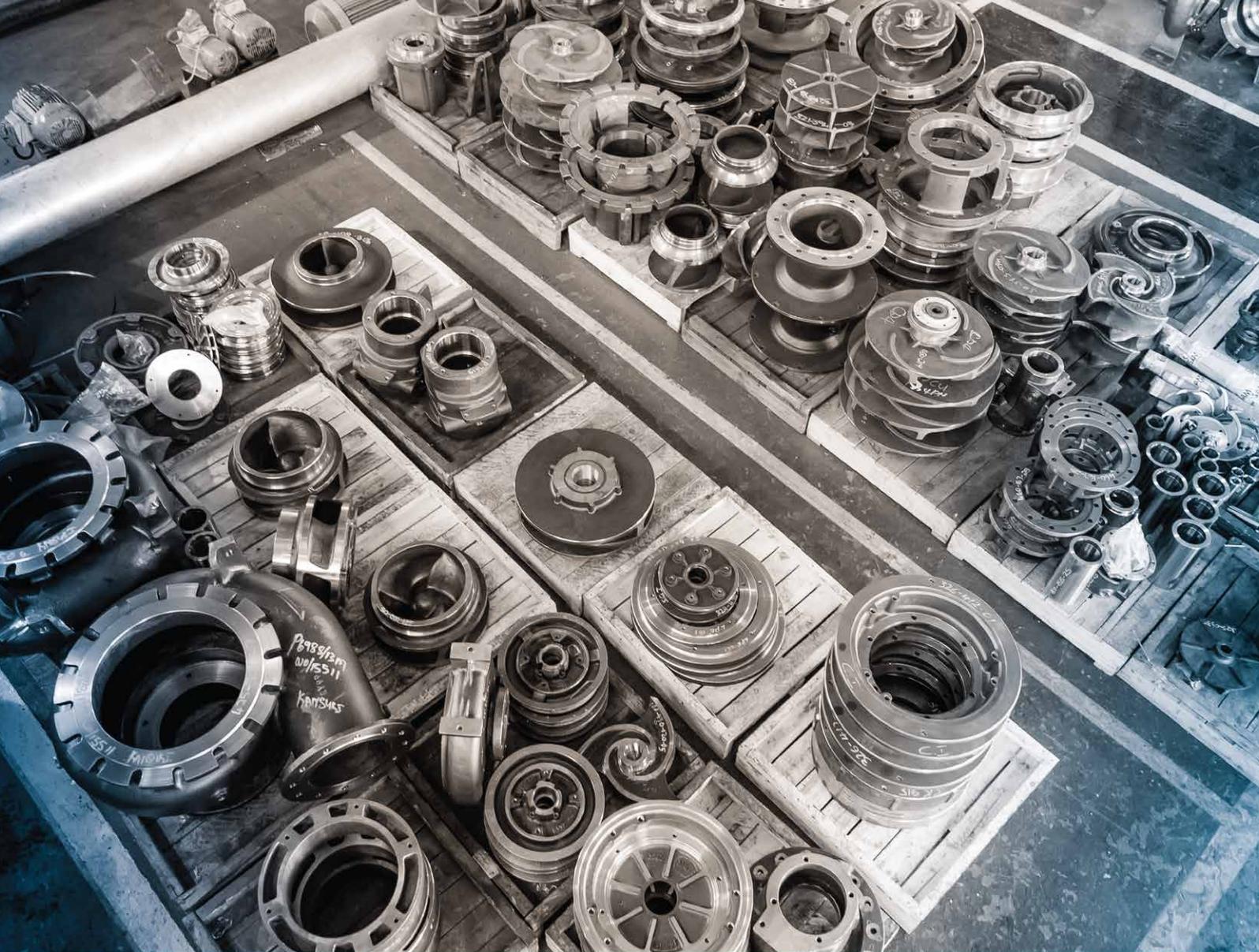
#### Description

Casing gasket (3 off)  
 Impeller  
 Impeller O-ring  
 Shaft sleeve  
 Throttle bush  
 Thrust bearing  
 Grease seal PE  
 Grease seal CE  
 Lineshaft bearing (no. off as built)  
 Lineshaft brg. seal (no. off as built)  
 Wear plate (CP pump)  
 Wear plate gasket (CP pump)

### CANTILEVER

#### Description

Casing gasket (3 off)  
 Impeller  
 Impeller O-ring  
 Shaft sleeve  
 Throttle bush  
 Deflector PE  
 Deflector CE  
 Grease seal  
 Bearing PE  
 Bearing CE  
 O-ring deflector  
 Bearing locknut  
 Bearing lockwasher  
 Wear plate (CP pump)  
 Wear plate gasket (CP pump)



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