Enriching Lives

INSTRUCTIONS ON INSTALLATION OPERATION AND MAINTENANCE FOR

KIRLOSKAR PUMP
TYPE SCT

KIRLOSKAR BROTHERS LIMITED
UDYOG BHAVAN, TILAK ROAD, PUNE - 411 002

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WARRANTY

We warrant that the pump supplied by us is free from defective material and faulty workmanship. This warranty holds good for a period of 12 months from the date of commissioning of the equipment or 18 months from the date of despatch from our factory, whichever is earlier. Our liability in respect of any complaint is limited to replacing part/parts free of charge ex-works or repairs of the defective part/parts only to the extent that such replacement / repairs are attributable to or arise solely from faulty workmanship or defective material.

The warranty holds good only for the products manufactured by us.

KIRLOSKAR BROTHERS LIMITED

1. GENERAL

1.1 This booklet covers instructions for following type of SCT pumps :

INTRODUCTION

SCT pumps are arranged in groups known as modules and the following sections will be based on these module numbers . To identify the relevant module number use the chart below .

PUMP TYPE	MODULE NO .
65/24	1
80/24	1
100/24	1
125/24	1
150/24	1
125/29	1
80/30	1
100/30	1
125/30	1
80/38	1
50/38	1
150/30	2
200/30	2
250/24	2
250/30	2
100/38	2
125/38	2
150/38	2
200/38	3
250/38	3
150/48	3
200/48	3

1.2 These are horizontal split casing type pumps with suction and discharge nozzles and their supporting feet integrally cast in the lower half casing . This construction enables to remove the rotating unit for inspection and repairs by just removing upper half casing , bearing caps and without disturbing alignment or pipe connection or primemover .

1.3 Pumps when properly installed and given due care in operation and maintenance, should operate satisfactorily for a longer period .

1.4 When the pump is received , sometime before the actual use it should be inspected and located in a dry place . The coupling should be rotated once in a month to prevent pitting of bearing surfaces .

1.5 Generally all the SCT pumps mentioned above are similar in construction with minor changes of some parts . :

1.6 PUMP IDENTIFICATION

All pumps are designated by serial number, model number, size and type . This information is stamped on an identification plate which is mounted on the pump .

2. INSTALLATION

2.1 RECEIVING PUMP

Upon receipt of the pump , a visual check should be made to determine if any damage has been incurred during transit or handling . The main items to look for are :-

a) Broken or cracked equipment,including base, motor or pump feet and flanges.

b) Bent shaft .

c) Broken motor end bells , bent eyebolts or damaged boxe of motor .

d) Missing parts .

Part of accessories are sometimes wrapped individually or fastened to the equipment . If any damage or losses have been incurred , promptly notify your KBL representative and the transit company who delivered the pump .

When unloading pump units, lift equally at four or more points on the baseplate . DO NOT LIFT ON THE DRIVER OR PUMP .

Shafts are in alignment when unit is despatched . However ,due to transit , the pumps may arrive misaligned and therefore alignment must be re-checked and corrected during installation.

2.2 TEMPORARY STORAGE

If the pump is not to be installed and operated soon after arrival , store it in a clean dry place having slow , moderate changes in ambient temperature . Steps should be taken to protect the pump from moisture, dust, dirt and foreign bodies . It is recommended that the following procedure is taken :-

a) Ensure that the bearings are packed with the recommended grease ,to prevent moisture from entering around the shaft .

b) Remove the glands, packing and lantern rings from the stuffing box if the pump is equipped in this manner . If the pump is equipped with mechanical seal , dismantle and coat the seal with light oil .

c) Ensure that suction and discharge branches of the pump and all other openings are covered with cardboard , wood or masking tape or prevent foreign objects entering the pump .

d) If the pump is to be stored where there is no protective covering , it is advisable to cover the unit with a tarpaulin or other suitable covering. .

e) The shaft should be rotated periodically to prevent pitting of the bearing surfaces by moisture.

2.3 PREPARATION

Before installing the pump, clean the suction and discharge flanges thoroughly, Remove the protective coating from the pump shaft.

If the pump has been in storage and prepared for storage in the manner outlined previously, remove all the grease from the bearings. The bearings should then be flushed with carbon tetrachloride or kerosene and relubricated.

2.4 LOCATION :

The pump should be installed as near the liquid source as possible, with the shortest and most direct suction pipe practical.

The pump should be installed with sufficient accessibility for inspection and maintenance. Ample space and headroom should be allowed for the use of an overhead crane or hoist sufficiently strong to lift the unit.

Make sure there is a suitable power source available for the pump driver. If motor driven, electrical characteristics should be identical to those shown on motor data plate.

2.5 FOUNDATION :

The foundation should be sufficiently substantial to reduce vibrations and rigid enough to avoid any twisting or misalignment.

The foundation should be poured without interruptions to within ½ to 1.1/2 inches of the finished height. The top surface of the foundation should be well scored and grooved before the concrete sets : this provides a bonding surface for the grout. Foundation bolts should be set in concrete as shown in fig. 1. Allow enough bolt length for grout, shims, lower baseplate flange, nuts and washers. The foundation should be allowed to cure for several days before the baseplate is shimmed and grouted.

2.6 BASEPLATE SETTING

Use blocks and shims under base for support at foundation bolts and midway between bolts, to position base approximately 1" above the concrete foundation with studs extending through holes in the baseplate.

By adding or removing shims under the base, level the pump shaft and flanges. The baseplate does not have to be level.

Draw foundation bolt nuts tight against baseplate and observe pump and motor shafts or coupling hubs for alignment.

Check to make sure the piping can be aligned to the pump flanges without placing pipe strain or either flange.

Grout baseplate in completely and allow grout to dry thoroughly before attaching piping to pump (24 hours is sufficient time with approved grouting procedure).

2.7 GROUTING PROCEDURE

Grout compensate for uneven foundation, distributes weight of unit and prevents shifting. Use an approved, non-shrinking grout as follows, after setting and levelling unit :

a) Build strong form around foundation to contain grout.

b) Soak top of concretes foundation thoroughly, then remove surface water.

c) Base plate should be completely filled with grout and, it necessary, drill vent holes to remove trapped air.

d) After the grout has thoroughly hardened, check the foundation bolts and tighten if necessary.

e) Check the alignment after the foundation bolts are tightened.

f) Approximately 14 days after the grout has been poured or when the grout has thoroughly dried, apply an oil base paint to the exposed edges of the grout to prevent air and moisture from coming in contact with the grout.

2.8 ALIGNMENT PROCEDURE

The pump driver, if supplied, is correctly aligned on its baseplate at the factory. A certain amount of deformation of the baseplate is possible during transit and it is therefore essential to check alignment, prior to final grouting.

A flexible coupling will only compensate for small amount of misalignment and should not be used to compensate for excessive misalignment of the pump and driver shafts. Inaccurate alignment results in vibration and excessive wear on the bearings, sleeve or shaft and wear rings.

There are two forms of misalignment :-

a. Angular - Shafts with concentric axis but not parallel.

b. Parallel - Shafts with axis parallel but not concentric.

To check for angular alignment, insert a pair of inside callipers or taper gauge at four points at 90^{o} intervals around the coupling. Angular alignment is achieved when the measurements show that all points around the coupling faces are within 0.003" of each other. See Fig. 2

To check for parallel alignment, place a straight edge across both coupling rims at the bottom and at both sides (See Fig. 3). Parallel alignment is achieved by shimming under the driver mounting feet. After each adjustment, it is necessary to recheck all features of alignment. To check coupling alignment by measuring wedge and straight edge is shown in fig. 4.

Alignment should be performed after the baseplate has been properly set and grout has dried thoroughly according to instructions. Final alignment should be made by shimming driver only. Alignment should be made at operating temperatures.

After final alignment, it is necessary to dowel pump and driver feet to the baseplate. Drill and ream diagonal feet of both for dowels.

2.9 SUCTION AND DISCHARGE PIPING (See Fig. 5(a) to 5 (c) and Fig. 6)

When installing the pump piping, make sure to observe the following precautions:-

Piping should always be run to the pump. Do not move pump to pipe. This could make final alignment impossible.

Both suction and discharge piping should be supported independently and close to pump so that no strain is transmitted to the pump when the flange bolts are tightened. Use pipe hangers or other supports at necessary intervals to provide support. When expansion joints are used in the piping system, they must be installed beyond the piping supports closest to the pump. It is advisable to increase the size of both suction and discharge pipes at the pump connection to decrease the loss of head from friction.

Install piping as straight as possible, avoiding unnecessary bends. Where necessary, use 45 degree or long sweep 90 degree fitting to reduce friction losses.

Make sure that all piping joints are air tight. Provide pipe expansions when hot fluids are to be pumped. Where reducers are used eccentric reducers are to be fitted in suction lines and straight taper reducers in discharge and vertical lines. Undulations in the pipe runs are also to be avoided. This or misuse of reducers may cause the formation of air pockets in the pipe and thus preventing the correct operation of the pump.

The suction pipe should be as short and direct as possible. Where suction lift is not very high, it is advisable to use a foot valve. Horizontal suction line must have a gradual rise to the pump.

The discharge pipe is usually preceded by a non-return valve or check valve and a discharge gate valve (See Fig. 6). The check valve is to protect the pump from excessive back pressure and reverse rotation of the unit and to prevent back flow into the pump in case of stoppage or failure of the driver. The discharge valve is used in priming, starting and when shutting down the pump.

3. OPERATION

3.1 BEFORE STARTING THE PUMP

Check the following -

3.1.1 The pump rotates freely by hand.

3.1.2 Sealing connections are porperly tightened and adjusted.

3.1.3 Fill in the grease for bearings if not done earlier.

3.1.4 The direction of rotation of motor corresponds to the direction of rotation of the pump.

3.1.5 Never run the unit dry :

The liquid in the pump serves as a lubricant for close running, fits within the pump and the pump may be damaged if operated dry. The pump may be primed by using an ejector, exhauster or vacuum pump. If a foot valve is sued in the suction line, the pump may be primed by venting and filling the casing with liquid.

3.1.6 Valve on the delivery side is closed.

3.1.7 Stuffing box packing is properly tightened/Mechananical seal has been fitted.

3.1.8 The cock for pressure gauge connection is closed.

3.2 STARTING THE PUMPS

3.2.1 Start the pump. Let the prime mover pick up its full speed.

3.2.2 Open the valve on delivery side slowly to reduce the starting load on the motor.

3.2.3 Open the cock for pressure gauge connection.

Do not operate pump for prolonged periods with closed discharge valve, so as to avoid overheating.

3.3 DURING RUNNING OF THE PUMP

Check the following and regulate, if necessary.

3.3.1 The pump is running smooth.

3.3.2 The flow of sealing liquid.

3.3.3 Leakage through stuffing box is normal, there should be leakage of 60 to 80 drops per minute.

3.3.4 The bearing not getting heated up excessively.

3.3.5 Head and capacity developed by the pump is as specified.

3.3.6 Power consumption is within the limit.

3.3.7 Ensure that there is no mechanical friction in the pump.

3.3.8 OPERATING AT REDUCED CAPACITIES

Do not operate the pump at greatly reduced capacities or with the delivery valve closed. Operating the pump in such condition may be dangerous as the pump will get heated up due to churning of liquid. To guard against possible damages protective devices such as liquid temperature relay, bearing temperature relay, low suction pressure control etc. should be used.

3.3.9 If motor driven pumpset operates at considerably reduced load, the discharge increases and motor consumes higher current than the normal resulting in heating up of the motor. In such conditions arrangements should be made to throttle the valve on delivery side either manually or automatically to build head to safe value.

3.3.10 Stop the pump immediately if any defects are noticed. Do not start the pump unless defects are rectified. Report immediately to the supplier, if it is not possible to rectify the defects.

3.4 DURING STOPPING THE PUMP

3.4.1 Close the valve on delivery side.

3.4.2 Stop the motor

3.4.3 Close the sealing liquid connections.

3.4.4 If the pump is not required to be operated for long time, drain the casing completely.

4. TECHNICAL DATA CHART

PUMP TYPE	PACKING SIZE				SIZE OF RING		BEARINGS		Amount of Grease for each bearings in gms
	Square Section		Approx Length of one ring		I/D x O/D				
	Inch	mm	Inch	mm	in x in	mm x mm	DE	NDE	
I 65/24 80/24 125/24 150/24 125/29 80/30 100/30 125/30 50/38 80/38	3/8	10	67/8	175	1 3/4 x 11/2	45 x 65	6306	6306	200

PUMP TYPE	PACKING SIZE				SIZE OF RING		BEARINGS		Amount Grease for each bearings in gms
	Square Section		Approx Length of one ring		I/D x O/D				
	Inch	mm	Inch	mm	in x in	mm x mm	DE	NDE	
II									
100/24									
250/24									
150/30									
200/30									
250/30	1/2	12	9	230	2 3/8 x 3 3/8	61 x 85	6309	6309	200
100/38									
125/38									
150/38									
III									
200/38									
250/38	1/2	12	11	280	3 X 4	76 X 100	6312	6312	200
150/48									
200/48									

4.2 DIRECTION OF ROTATION

The standard direction of rotation is clockwise when viewed from driving side. The pumps with reverse direction of rotation (anticlockwise) can be supplied against request. Ref. Fig. No. 8.

4.3 LUBRICATION

4.3.1 Type of lubrications - Grease

4.3.2 Specification of Grease - Servogem 3 or eq.

4.3.3 Refilling period- Approximately after every 5000 hours.

4.3.4 Bearing Temperature - Allowable bearing temperature is 40^{o}C above ambient.

4.4 Quantity of grease

Please refer to Technical Data Chart.

4.5 PAPER PACKING

Dalmia Duplex paper packing of 0.8 mm thickness to be used between upper and lower half casing.

5. MAINTENANCE

5.1 ROUTINE MAINTENANCE

a) General

Routine maintenance is essential to maintain the pump in a serviceable condition.

Routine maintenanec is a sound insurance against a forced shutdown, because of failure at a most inconvenient time.

A high degree of cleanliness of the equipment and surrounding area should be maintained during all maintenance procedures.

b) Frequency of Inspections

Inspections should be carried out in accordance with routine maintenance chart (5.3).

Depending on operation and environmental conditions together with a comparison of previous inspections, the frequency of inspections may be altered to maintain satisfactory operation of the plant to suit established operating procedures.

5.2 BEARINGS

These instructions do not supercede any information issued by the bearing manufacturers, to whom application should be made for more comprehensive literature by personnel responsible for bearing care who wish to make a detailed study.

For type of bearing fitted refer to Technical data chart.

Care and maintenance to bearing is a matter of ensuring that they are :-

a) Correctly lubricated at intervals as laid down in routine maintenance chart.

b) Removed, cleaned and refitted with care.

c) Tools used and work areas should be clean.

To remove a bearing, use correctly suited withdrawal equipment. If other means are not available, a hammer and soft metal drift may be used to tap evenly around the circumference of the inner ring.

CAUTION : Damage can be caused by exerting force against the outer ring of a ball bearing.

Ball bearing should not be dismantled.

Clean bearings thoroughly with an approved fluid.

Dry the bearings by spinning with dry compressed air or by hand. Do not spin a clean dry bearing.

Pack both sides of bearing with grease.

Recharge with grease to a maximum of two thrids full.

Refit the bearing onto the shaft and press or tap into position.

5.3 ROUTING MAINTENANCE CHART

EVERY WEEK	Visually check for leaks
	Check for vibration.
	Adjust gland as necessary to maintain slight leakage.
	Hand test bearing housing for any sign of temperature rise.
EVERY MONTH	Check bearing temperature with a thermometer.

EVERY 3 MONTHS	Check grease lubricated bearings for saponification.
EVERY 6 MONTHS	Check the packing and replace if necessary.
	Check shaft or shaft sleeve for scoring.
	Check alignment of pump and motor.
	Check holding down bolts for tightness.
	Check coupling for wear.
EVERY YEAR	Check rotating element for wear.
	Check wear ring clearances.
	Clean and regrease bearings.
	Measure total dynamic suction and discharge head.

6. OVER HAULING

6.1 DISMANTLING PROCEDURE

1. Drain the pump by operating air vent valve (450) and remove drain plug (601)
2. Remove all casing main joint nuts (580.1) and dowel pins (611). Remove flushing piping.
3. Insert a screwdriver or peg bar into the slots between the upper and lower casing halves and separate the halves, lifting off the upper half casing.
4. Tap the stuffing box inserts (979) with a soft headed hammer to break the seal between the stuffing box insert and the lower half casing and lift the rotating element out of the lower half.
5. Remove four hex. head screws (571) from each bearing housing (240.1 & 2) and remove the bearing housing from the bearings.
6. Remove bearing retaining nut (336) and lock washer (415) from the outboard end of the shaft and using a puller remove the bearing (260) from the shaft. Remove the drive end bearing (260) in the same manner. NOTE : Retaining nut and lock washer are not used on drive and bearing.
7. Remove shoulder rings (199) from the shaft. Remove oil seals (500) from the supporting frame (220).
8. Remove four nuts (500.2) from each supporting frame (220) off the shaft, working glands (223) off the shaft at the same time.
9. Slide stuffing box inserts (979) off the shaft. Remove packing (430), lantern rings (227) and stuffing box spacer rings (207) from each stuffing box insert.
10. Remove casing rings (190) from the impeller (159).
11. a. Clockwise Rotation : Unscrew shaft sleeve (310) from the non-drive end and slide it off the shaft.

b. Anti-Clockwise Rotation : Unscrew shaft sleeve (310) from the drive end and slide it off the shaft.

12. Remove impeller (159), slide back impeller key (320) and remove the other shaft sleeve (310) from the drive end. Remove impeller key.

6.2 ASSEMBLY PROCEDURE

Module 1 & 2 Pumps Soft Packed Stuffing Box. **Clockwise rotation**.

1. Wipe shaft (180) with clean light oil. Screw shaft sleeve (310) onto shaft at drive end per dimension 'A' given on page.
2. Place impeller key (320) into key weyway and tap milled-down end right home under sleeve.
3. Check the impeller for correct rotation (Page 29) and slide onto shaft from nondrive end.
4. Screw second shaft sleeve (310) onto shaft at nondrive end and lock up tight against impeller hub and first sleeve.
5. Slide the casing rings (190) onto the impeller.
6. Block up mechanical seal flushing line in each insert (979) with st. steel pin and araldite (Page 26, Fig. 12).
7. Check 'O' rings for cuts or flaws, discard if faulty. Lubricate and roll 'O' ring into the groove in each insert (979).
8. Slide insert (979) over shaft with guide vane at top position.
9. Slide stuffing box spacer ring (207) into insert bore and install stuffing box packing per instruction given on 6.3. Slide gland (223) and supporting frame (220) onto the shaft simultaneously and secure supporting frame to each insert with four studs/nuts (580.3/580.2) Secure and tighten gland with two studs/nuts (582/582) as described in the packing instructions.
10. Fit shoulder ring (199) onto shaft, then press oil seal (500) into insert.
11. Heat the ball bearing (260) to approximately 100^{o}C (212^{o}FC) using bearing hot plate or oil and water solution (10 to 15% soluble).
    NOTE : Do not exceed Temp. 120^{o}C
12. Slide the heated bearing onto the shaft upto shoulder ring (199) (non drive end). Place locking washer (415) onto shaft and screw bearing retaining nut (360) using hook spanner. Lock up tight against bearings.
13. Cool the bearing to room temperature and coat both sides with recommended grease.
14. Coat the inside of the bearing housing (240.2) with grease and slide into place over bearing. Secure bearing housing (240.2) to the support frame (220) with four hex. head screws (571).
15. At coupling end : heat the bearing (280) to approximately 100^{o}C (212^{o}C) using bearing hot plate or oil and water solution.

NOTE : Do not exceed 120^{o}C (250^{o}F)

16. Slide the heated bearing onto the shaft to about shoulder ring (199) (coupling end).

17. Cool the bearing to room temperature and coat both sides with recommended grease.

18. Coat the inside of the bearing housing (240.1) with grease and slide into place over bearing. Secure bearing housing (240.1) to the support frame (220) with four hex. head screws (571).

19. Set the rotating element in the pump casing bottom half (123). Locate both insert tongues in their respective casing grooves. Locate pins 610.2 and 610.3 in their respective slots. Correct any excesive 'O' ring bucking. Check that the impeller is centralised in the casing ± 2.5 mm and that there is no rubbing.

20. Install casing gasket (519) with a light coat of commercial cup grease on both gasket surfaces. Carefully align the inner edge of the gasket with the insert 'O' rings.

21. Lower the upper half casing (122) into place and install casing joint nuts.

    Note : When installing upper half casing make sure that the 'O' rings are not cut or pinched and that the gasket is hard against the 'O' rings.

22. Insert casing joint dowels (611) and drive them home. Tighten the joint nuts (500.1) per instructions on page 27.

23. Install stuffing box flushing piping (560).

24. Rotate the shaft by hand to assure smooth turning and that it is free from rubbing or binding.

6.3 INSTALLING STUFFING BOX PACKING :

1. Refer to stuffing box data to ascertain size and number or rings required, and Fig. No. 7.

2. If the packing is to be cut from a coil or long length :-

   a) Wrap the packing aroung a dummy shaft, equal to the shaft sleeve diameter.

   b) 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.

   c) Cut the rings from the spiral at an angle to 45^{o}C diagonally across the guide lines-no gap is left between the ends.

3. Insert the first ring and tap it to the bottom of the stuffing box so that the "Split" is advanced 90^{o}.

   Install the lantern ring in its proper position to align with the sealing connection allowing for movement of the ring deeper into the box as the packing is compressed.

4. When the correct number of rings have been inserted, the last packing ring should not protrude past the stuffing box face, so that the gland may be properly seated in the stuffing box bore.

5. Bring the gland follower up squarely against the last packing ring and tighten the nuts evenly to finger pressure.

6. Turn the shaft to ensure, it does not bind on the bore of the gland follower.

7. Pressurise the stuffing box, ensuring air is not trapped. A packed gland must leak and leakage should take place commencing soon after the stuffing box is pressurised.

8. Until steady leakage takes place, the pump may overheat. If this happens, the pump must be stopped and allowed to cool and, when restarted, leakage should take place. If it does not, this operation should be repeated. Gland nut should not be slackened.

9. After the pump has been running for 10 minutes with steady leakage, tighten the gland nuts by the sixth of a full turn. Continue to adjust at ten minute intervals, each time evenly by one sixth of a full turn, until leakage is reduced to an acceptable level. There should be leakage of 60 to 80 drops per minute.

   CAUTION : Excessive gland pressure will cause damage by cutting off lubrication to the packing and packing will burn and damage the sleeve.

6.5 REVERSING ROTATION OF PUMPS :

Reversing rotation of pumps put suction and discharge opening on opposite sides with respect to the coupling end.

Changes in assembly procedure :-

1. Screw impeller locking nut (330) - mechanical seal pumps or shaft sleeve (310)- Soft packed pumps onto shaft (180) at non-drive and per dimension 'Z' given on page.

2. Place impeller key (320) into keyway and tap milled-down end right home under non-drive end impeller locking nut (mechanical seal) or shaft sleeves (soft packed).

3. Check impeller for correct rotation page 29 and slide onto shaft from drive end.

4. Screw second impeller locking nut (330) or shaft sleeve onto shaft at drive end and, using hook spanner, lock up tight against the impeller hub.

   From step 5 the assembly procedure is the same as for clockwise rotation pumps.

7.0 TROUBLE SHOOTING CHART

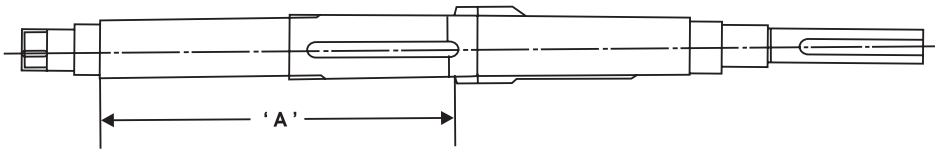
7.1 FAULT FINDING CHART

CAUSES	FAULTS									
	No Liquid delivered	Not enough liquid delivered	Not enough pressure	Loss of liquid after starting	Pump operates short time, then stops	Pump takes too much power	Motor runs hot	Vibration	Cavitation - noise	Pump bearing overheat
Pump not primed/lack of prime/incomplete priming	•				•					
Loss of prime	•									
Suction lift too high	•	•		•	•					
Discharge head too high	•	•								
Speed too low	•	•	•							
Wrong direction of rotation	•					•				
Impeller plugged up/Impeller partially plugged	•	•								
Air leak in suction		•	•	•	•				•	
Air leak in stuffing box		•		•	•					
Insufficient net inlet head		•		•		•			•	
Damaged impeller		•	•			•				
Defective packing		•	•			•				
Foot valve too small or partially obstructed		•								
Inlet pipe not submerged enough		•		•		•			•	
Impeller too small		•	•							
Obstruction in liquid passages			•							
Air or gas in liquid			•	•	•				•	
Head lower than rating						•				
Liquid heavier than rating						•	•			
Viscosity of liquid greater than rating						•	•			
Shaft bent						•	•	•		•
Bearing warn						•		•		•
Misalignment of pump and driver						•		•		•
Defects in motor						•	•			
Voltage and/or frequency lower than rating						•	•			
Rotor bearing							•			
Speed too high							•		•	
Foundation nut rigid								•		
Lubricating oil/grease dirty, contaminated										•

7.2

CAUSES	CURES
Pump not primed-lack of prime	Fill pump and suction pipe completely with liquid.
Loss of prime	Check for leaks in suction pipe joints and fittings : vent casing to remove accumulated air.
Suction lift too high	If no obstruction at inlet, check for pipe friction losses.
	Static lift may be too great, measure with vacuum gauge while pump operates. If static lift is too high, liquid to be pumped must be raised or pump lowered.
Discharge head too high	Check pipe friction losses. Larger piping may correct condition. Check that valves are fully open.
Speed too low	Check whether motor is directly across-the-line and receiving full voltage. Frequency may be too low. Motor may have an open phase.
Wrong direction of rotation	Check motor rotation with directional arrow on pump casing.
Impeller plugged up-Impeller partially plugged	Dismantle pump and clean Impeller.
Air leak in suction	If pumped liquid is water or non-explosive, test flanges for leakage with flame. For such liquid as gasoline, suction line can be tested by shutting off or plugging inlet and putting line under pressure. Gauge will indicate a leak with a drop in pressure.
Air leak in stuffing box.	Increase seal lubricant pressure to above atmosphere.
Insufficient net inlet head	Increase positive suction head on pump by lowering pump.
Damaged Impeller	Inspect impeller. Replace if damaged or vane sections badly eroded.
Defective packing	Replace packing and sleeves if badly worn.
Foot valve too small or partially obstructed.	Area through ports of valve should be at least as area of suction pipe-preferably 1 1/2 times. If strainer is used, net clear area should be 3 to 5 times area of suction pipe.
Inlet pipe not submerged enough	If inlet cannot be lowered, chain a board to suction pipe. It will be drawn into eddies, smothering the vortex.

Impeller too small	Check with supplier to see if a larger impeller can be used, otherwise cut pipe losses of increase speed or both, but be careful not to overload drive.
Obstruction of liquid passages	Dismantle pump and inspect passages of impeller and casing. Remove obstruction.
Air or gas in liquid	May be possible to over rate pump to point where it will provide adequate pressure despite condition.
Head lower than rating	Machine impeller O/D to size advised by supplier.
Liquid heavier than rating	Use larger driver. Consult supplier for recommended size.
Viscosity of liquid greater than rating	Use larger driver, Consult supplier for recommended size.
Shaft bent	Check deflection of rotor. Total indicator run-out should not exceed 0.002 inch on shaft and 0.004 inch on impeller wear ring surface.
Bearing worn	Check bearings for damage or excessive wear. Any irregularities will cause a drag on the shaft.
Misalignment of pump and driver	Realign pump and driver.
Defects in motor	Check any motor defects. The motor may not be ventilated properly due to a poor location.
Voltage and/or frequency lower	The voltage and frequency of the electrical current may be lower than that for which the motor was rated. Consult supplier for correct supply.
Rotor binding	Check deflection of rotor. Check bearings for damage or excessive wear.
Speed too high	Check voltage on motor.
Foundation not rigid	Check if foundation bolt nuts are drawn tight against base. Check the foundation against recommendations in instructions.
Lubricating oil/grease dirty, contaminated	Clean bearings and bearing housing as per instructions and relubricate.



Pump Type	Mechanical Seal 'A' mm	Soft Packed 'A' mm
65/24	198	283
80/24	198	283
100/24	256	355
125/24	252	337
150/24	252	337
250/29	316	415
125/29	198	283
80/30	198	283
100/30	198	283
125/30	252	337
150/30	256	355
200/30	316	415
250/30	316	415
50/24	198	283
80/30	198	283
100/38	256	355
125/38	256	355
150/38	256	355
200/38	330	419
250/38	330	419
150/48	330	419
200/48	330	419

JOINT PLANGE

1. Tightening Torque and Sequence

Hexagon head nuts used in this main joint flange of SCT pumps should be tightened to the torque stated in the table below and in the sequence stated in Fig. 13.

	TIGHTENING TORQUES	
SCREW SIZE	lbf ft	nm
M 16	120	160
M 20	260	360
M 24	440	600

2. Tightening sequence.

2.1 Tighten the four 'corner' nuts marked 1, 2, 3 and 4.

2.2 Work outward along shaft axis towards the stuffing boxes in opposite quarters tightening nuts in regions 5, 6, 7 and 8.

2.3 Work outwards along the branch and in opposite quarters tightening nuts in regions 9, 10, 11 and 12.

2.4 Repeat the whole sequence

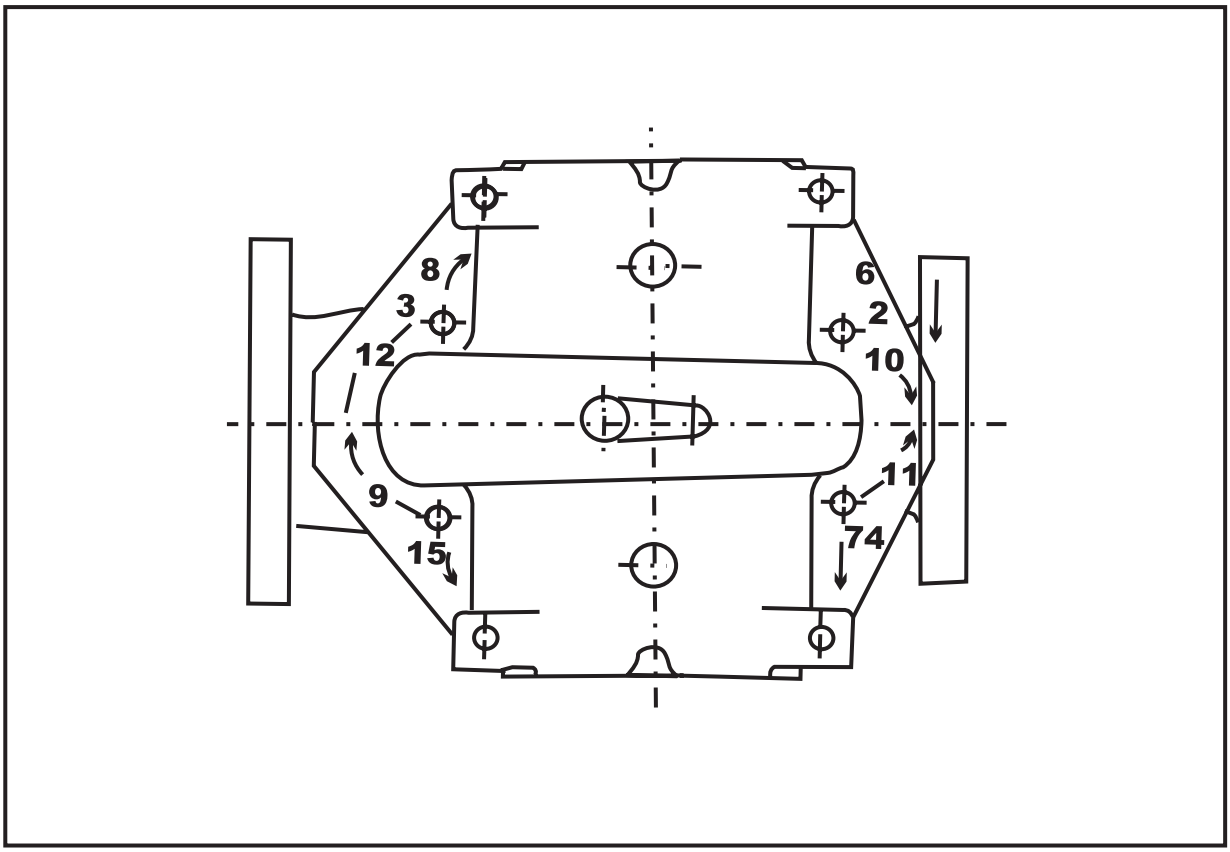


FIG. NO. 1 : ANCHORING ARRANGEMENT OF PUMP SOLE PLATES

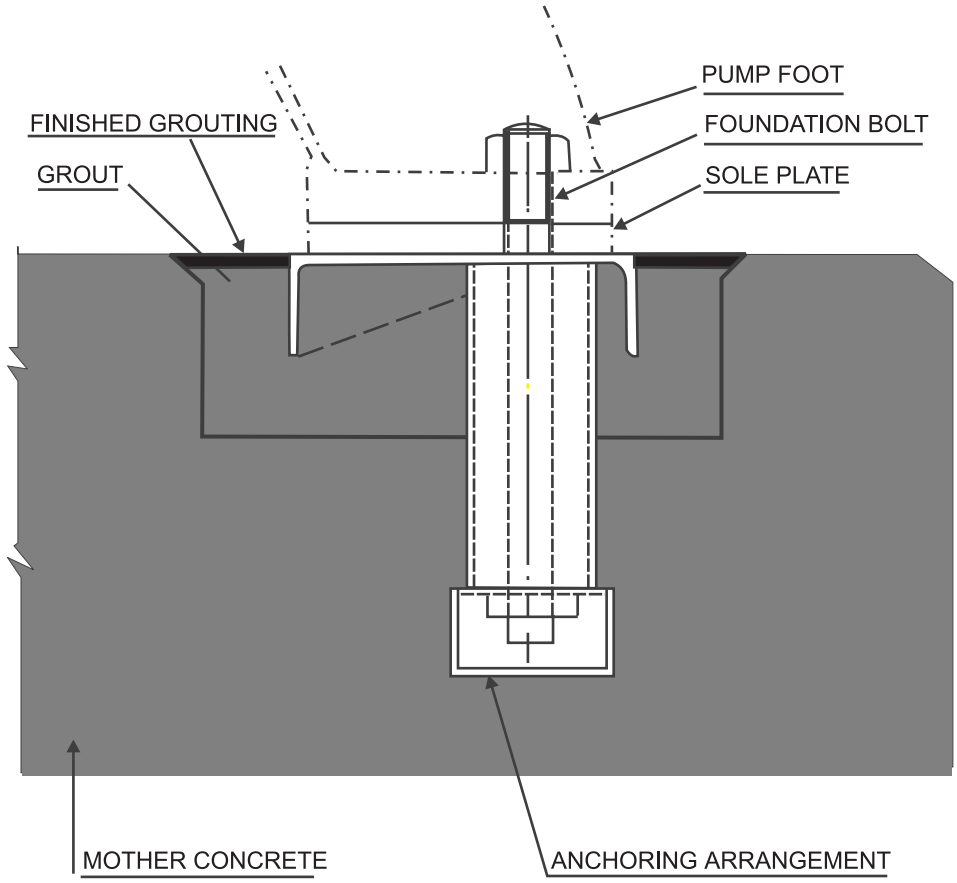
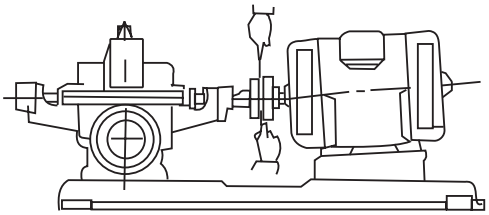


FIG. NO. 2 CHECKING ANGULAR ALIGNMENT



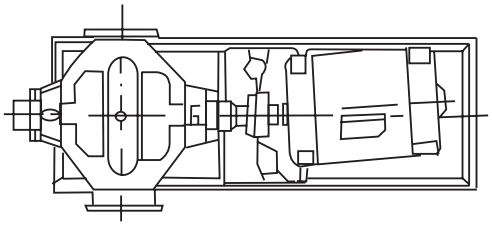
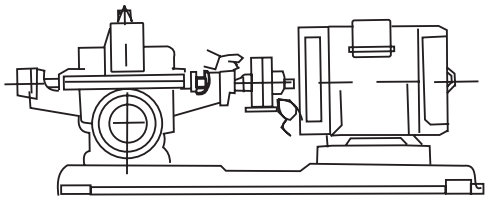


FIG. NO. 3 CHECKING PARALLEL ALIGNMENT



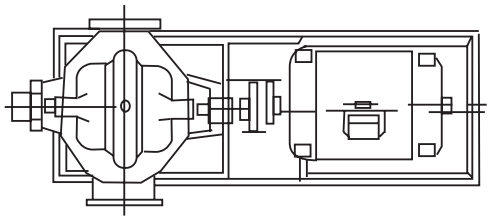


FIG. NO. 4 CHECKING COUPLING ALIGNMENT

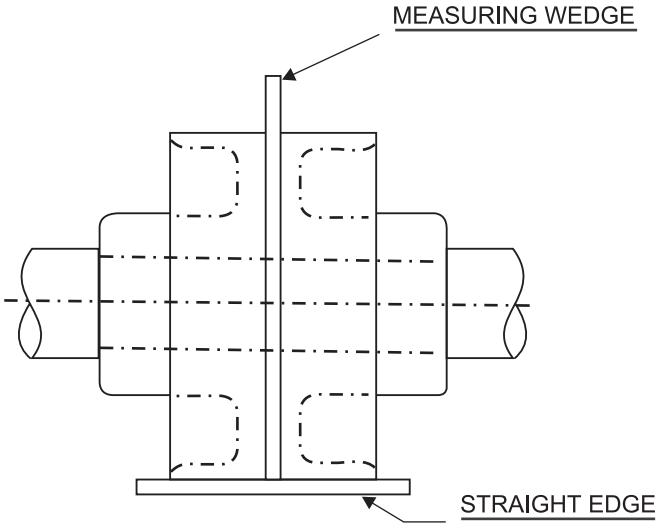
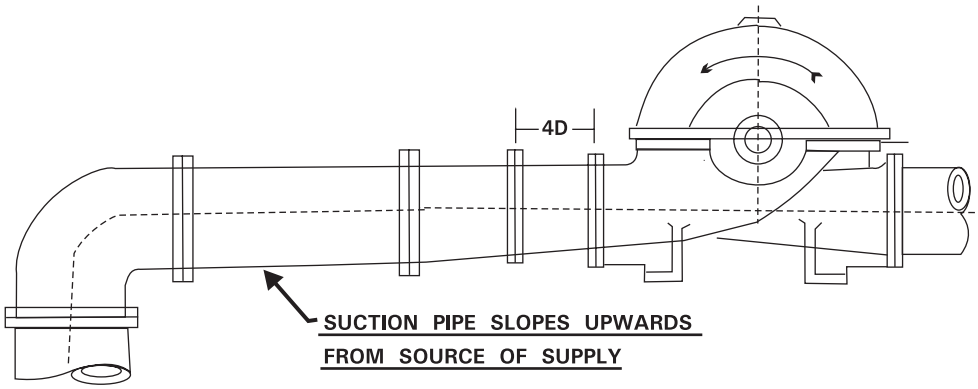


FIG. NO. 5(a) SUCTION PIPING.

RECOMMENDED



NOT RECOMMENDED

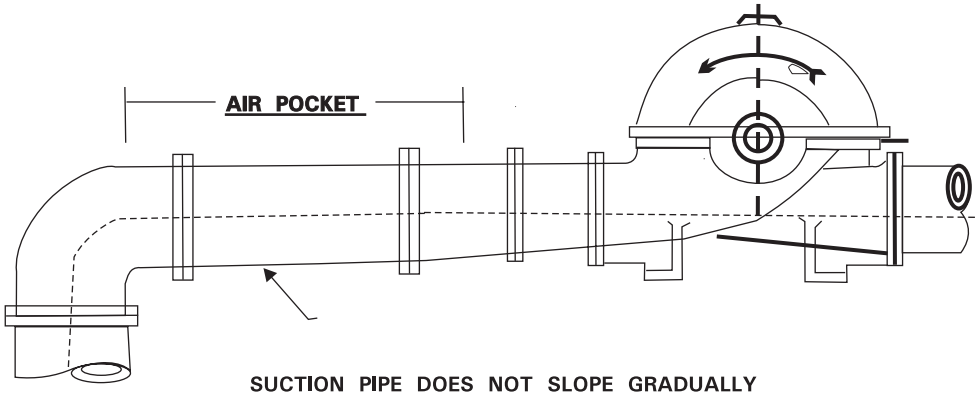
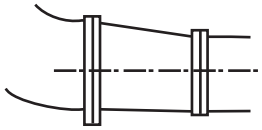


FIG. NO. 5(b) SUCTION PIPING

RECOMMENDED

NOT RECOMMENDED



FOR SUCTION HEAD

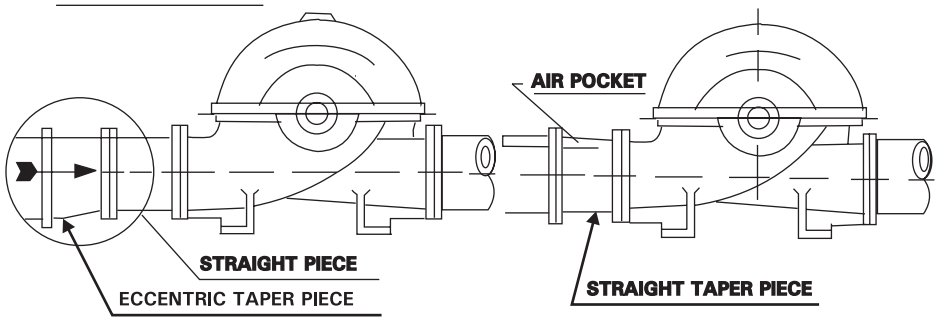


FIG. NO. 5 (c)

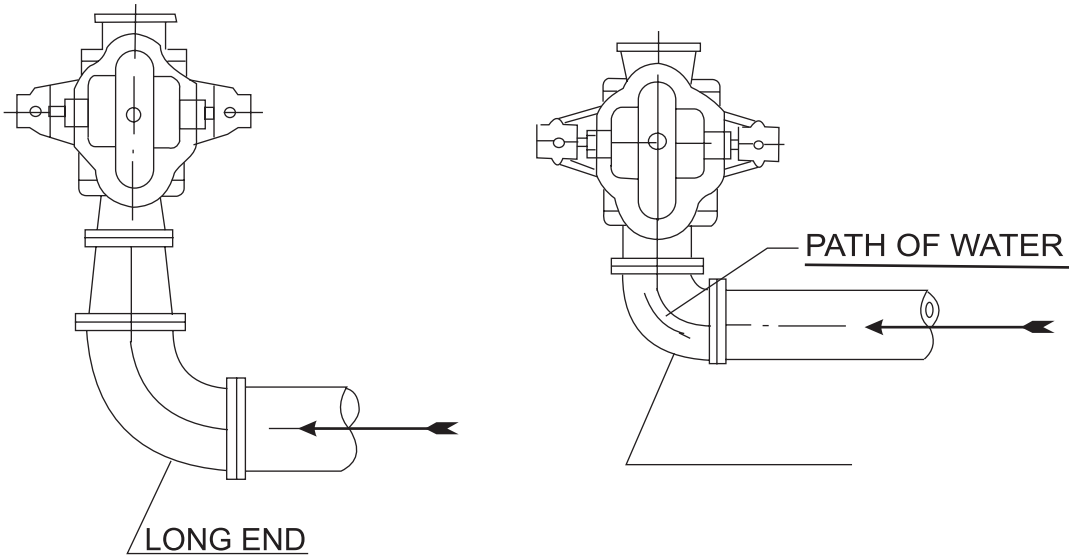
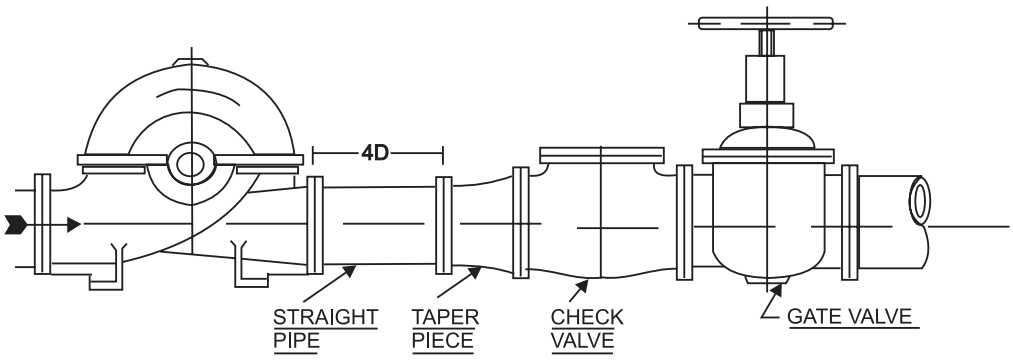


FIG. NO. 6 DISCHARGE PIPING



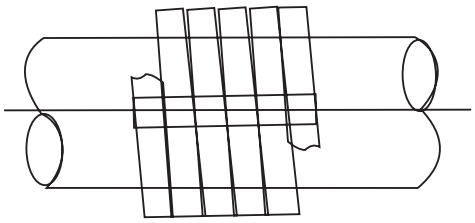


Fig. A

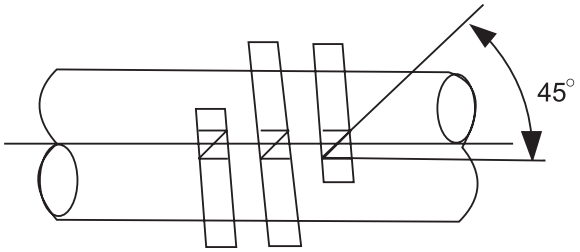


Fig. B

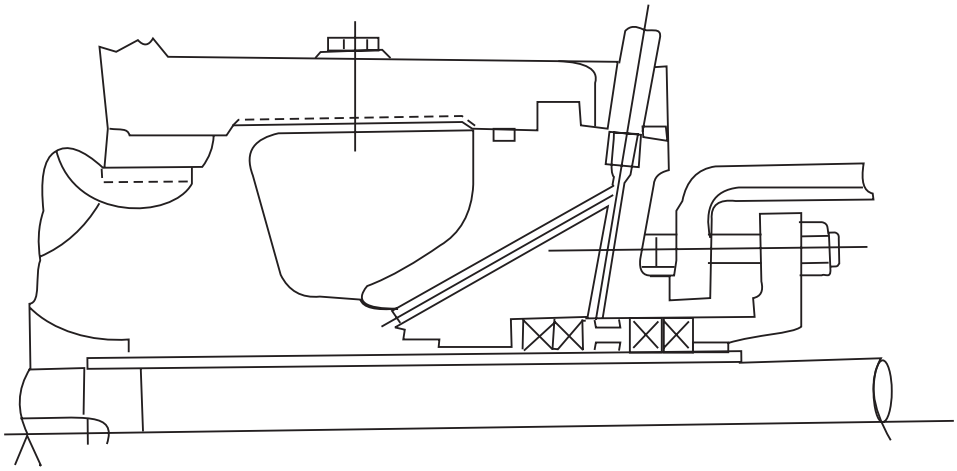


Fig. C

Fig. 7

MECHANICAL SEAL

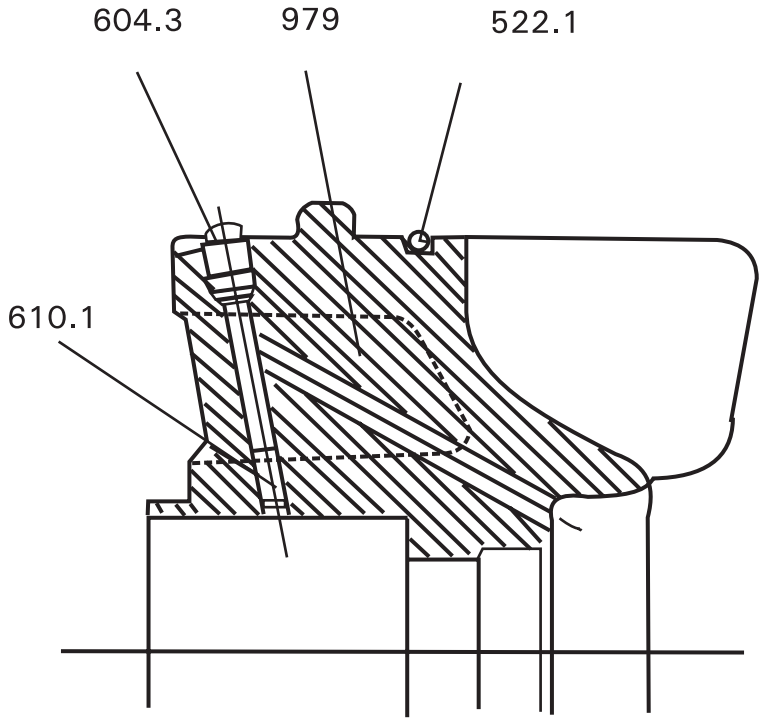


FIG. 7-a

SOFT PACKED

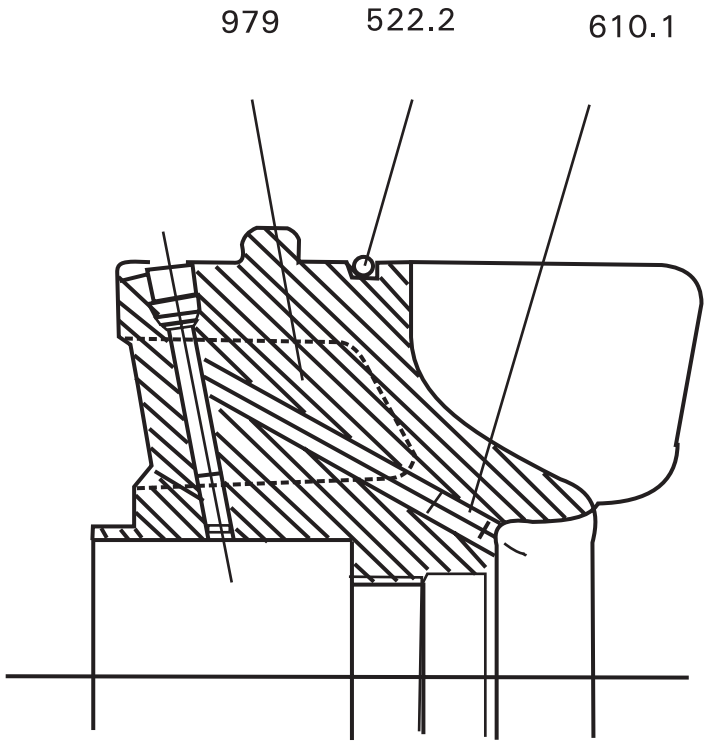
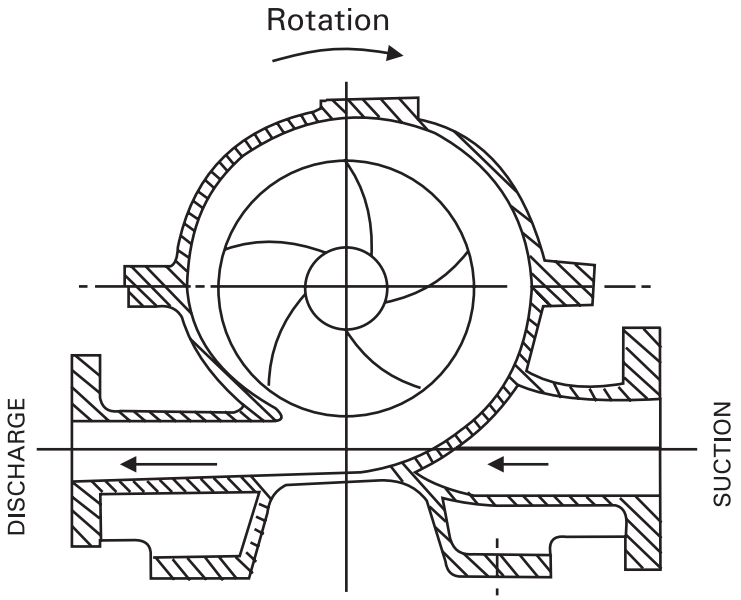
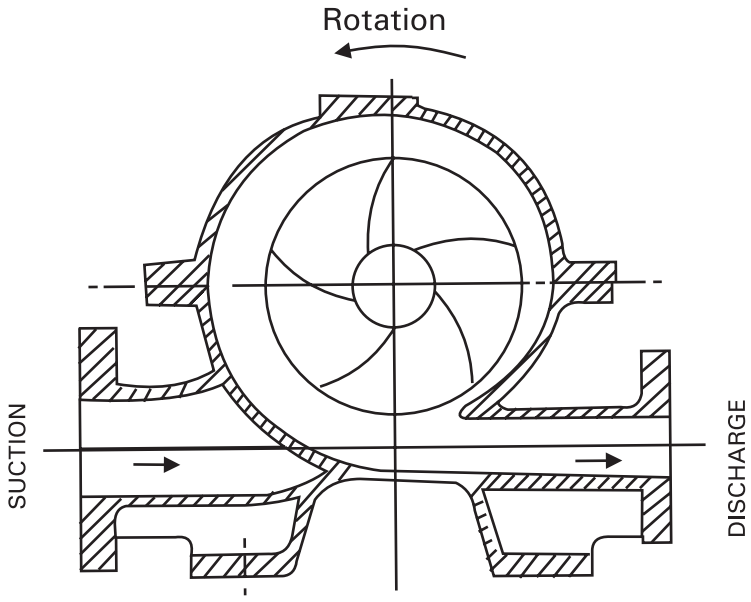


FIG. 7-b



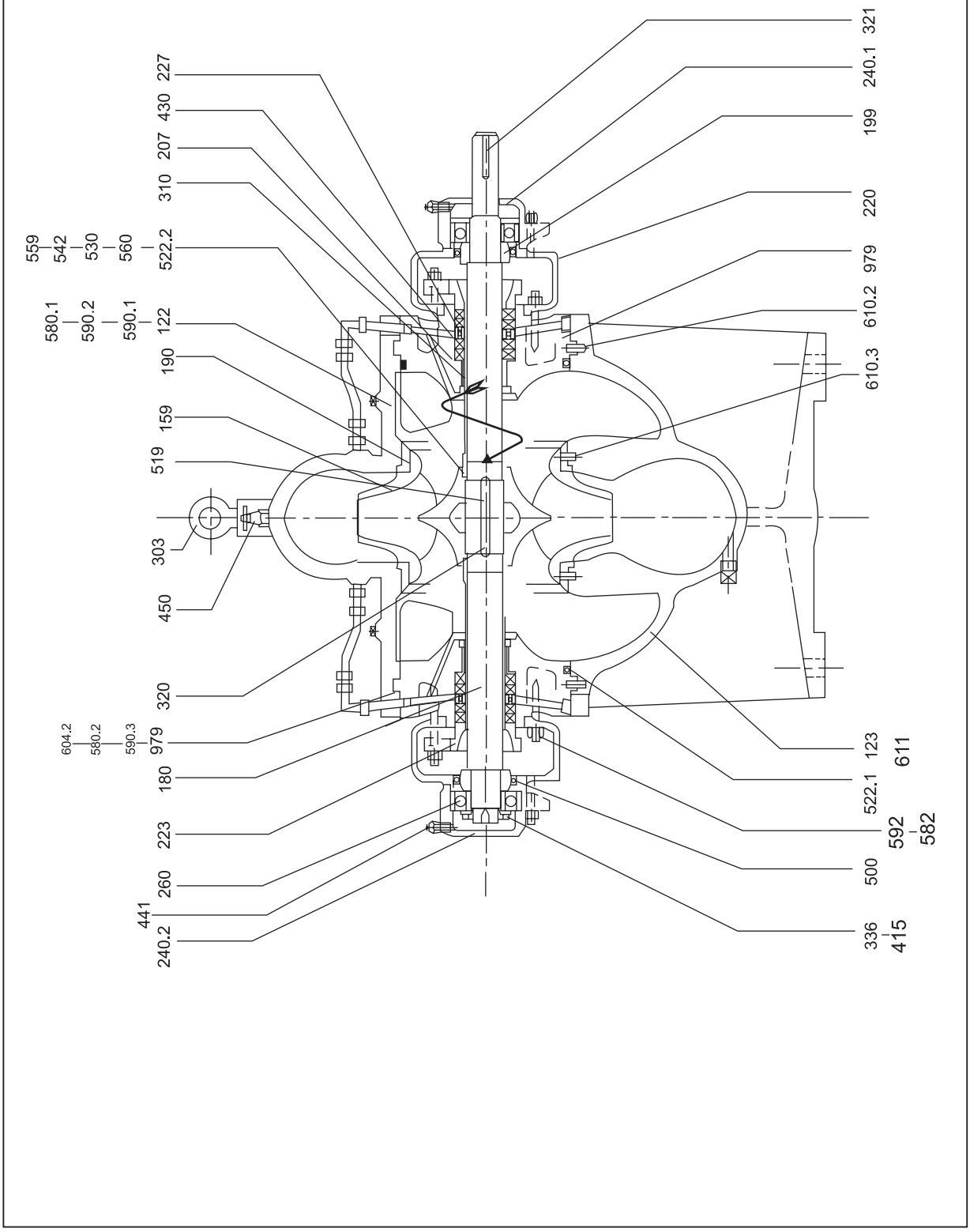
Clockwise Rotation Viewed
from the Coupling End



Counter Clockwise Rotation
Viewed from the Coupling End

PARTLIST OF STANDARD SCT PUMPS FOR MODULE 1, 2 & 3

PART CODE	PART DESCRIPTION
122	UPPER HALF CASING
123	LOWER HALF CASING
159	IMPELLER
180	SHAFT SOFT PACK
190	WEAR RING
199	SHOULDER RING
207	ST. BOX PACKING
220	ST. BOX COVER BS
223	GLAND
227	LANTERN RING
240.1	BEARING HOUSING
240.2	BEARING HOUSING
260	BEARING
303	EYE BOLT
310	SHAFT SLEEVE
320	IMPELLER KEY
321	KEY FOR COUPLIN
336	LOCK NUT FOR B
415	LOCK WASHER FOR
430	GLAND PACKING
441	GREASE NIPPLE
450	VENT VALVE
500	OIL SEAL
519	GASKET BET-UPPER HALF AND LOWER HALF CASING
522.1	O RING FOR INSERT
522.2	O RING FOR SLEEVE
530	PIPE NIPPLE
542	ELBOW
559	STUD COUPLING
560	TUBE FOR SEAL
580.1	HEX. NUT
580.2	HEX. NUT INSERT
582	HEX. NUT FOR GLAND
590.1	STUD FOR CASING
590.2	STUD FOR CASING
590.3	STUD FOR INSERT
592	STUD FOR GLAND
600	PIPE PLUG
605.1	SEALING PLUG
610.2	LOCKING PIN
610.3	PIN FOR FLUSHING
611	LOCATING PIN
979	INSERT SOFT PACKED


559
542
530
560
580.1
590.2
590.1
604.2
580.2
590.3
227
430
207
310
522.2
122
190
159
519
303
450
320
979
180
223
260
441
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199
220
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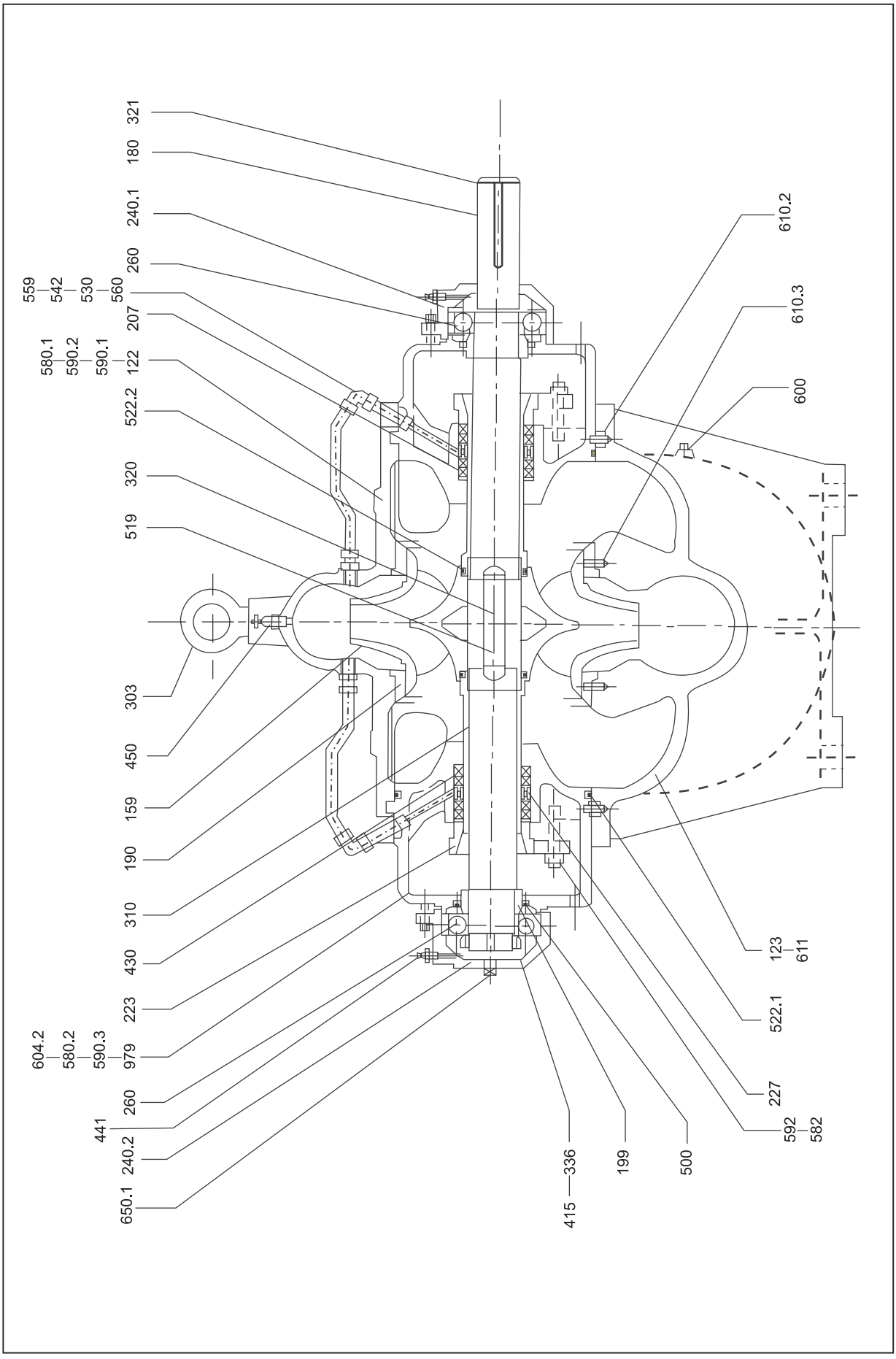
610.3
123
611
522.1
592
582
500
336
415


321
180
240.1
260
560
207
122
522.2
320
519
303
450
159
190
310
430
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979
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650.1
604.2
580.2
590.3
441
559
542
530
580.1
590.2
590.1
610.2
610.3
600
123
611
522.1
227
592
582
336
199
500
415

GENERAL INFORMATION & SAFETY INSTRUCTIONS

1.0 The products supplied by KBL 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.

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

A Pump Duty 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. If accidental loss or damage occur, contact KBL immediately.

1.2 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 appropriate tools for their respective tasks.

1.3 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.

1.4 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 personnel protection equipment must be worn where local rules apply.

1.5 Do not wear loose clothing or jewellary which could catch on the controls or become trapped in the equipment.

1.6 Read the instruction manual before installation, operation or maintenance of the equipment. Check and confirm that the manual is relevant copy by comparing pump type on the nameplate and with that on the manual.

1.7 Note the 'Limits of product application- permissible use' specified in the manual. Operation of the equipment beyond these limits will increase the risk from hazards noted below and may lead to premature and hazardous pump failure.

1.8 Clear and easy access to all controls, guages 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.

1.9 IMPROPER INSTALLATION, OPERATION OR MAINTENANCE OF THIS KBL PRODUCT COULD RESULT IN INJURY OR DEATH.

2.0 SAFETY INSTRUCTIONS WHILE HANDLING AND STORAGE

When lifting the pump, use the lifting points specified on general arrangement drawing. Use lifting equipment having a safe working load rating suitable for the weight specified. Use suitable slings for lifting pump which is not provided with lifting points. The use of fork-lift truck and chain crane sling equipment is recommended but locally approved equipment of suitable rating may be used.

Do not place fingers or hands etc. into the suction or discharge pipe outlets and do not touch the impeller, if rotated this may cause severe injury. To prevent ingress of any objects, retain the protection covers or packaging in place until removal is necessary for installation. If the packaging or suction and discharge covers are removed for inspection purposes, relpace afterwards to protect the pump and maintain safety.

3.0 SAFETY INSTRUCTIONS WHILE ASSEMBLY & INSTALLATION

Do not place fingers or hands etc. into the suction or discharge pipe outlets and do not touch the impeller, if rotated this may cause severe injury. To prevent ingress of any objects, retain the protection covers or packaging in place until removal is necessary for installation.

Do not touch any moving or rotating parts. Guards are provided to prevent access to these parts, where they have been removed for maintenance they must be replaced before operating the equipment.

Shaft alignment must be checked again after the final positioning of the pump unit and connection to pipework as this may have disturbed the pump or motor mounting positions. If hot liquids (above $80^{o}C$) are being pumped, alignment should be checked and reset with the pump and motor at their normal operating temperature. If this is not possible, KBL can supply estimated initial offset figures to suit extreme operating temperatures.

Failure to support suction and delivery pipework may result in distortion of the pump casing, with the possibility of early pump failure.

4.0 SAFETY INSTRUCTIONS WHILE COMMISSIONING & OPERATION

Do not touch any moving or rotating parts. Guards are provided to prevent access to these parts, where they have been removed or maintenance they must be replaced before operating the equipment.

Check that the pump is primed. Pump should never be run dry as the pumped liquid acts as lubricant for the close running fits surrounding impeller and damage will be incurred.

Failure to supply the stuffing box or mechanical seal with cooling of flush water may result in damage and premature failure of the pump.

Do not touch surfaces which during normal running will be sufficiently hot to cause injury. Note that these surfaces will remain hot after the pump has stopped, allow sufficient time for cooling before maintenance. Be cautious and note that other parts of the pump may become hot if a fault is developing.

Do not operate water pumps in temperatures below freezing point, without first checking that the pumped fluid is not frozen and the pump is free to turn. Pumps in these environments should be drained down during inactivity and re-primed before starting.

In addition to local or site regulations for noise protection, KBL recommend the use of personal ear protection equipment in all enclosed pump rooms and particularly those containing diesel engines. Care must be taken to ensure that any audible alarm or warming signal can be heard with ear defenders worn.

Be aware of the hazards relating to the pumped fluid, especially the danger from inhalation of noxious and toxic gases, skin and eye contact or penetration. Obtain and understand the hazardous substance data sheets relating to the pumped fluid and note the recommended emergency and first aid procedures.

5.0 SAFETY INSTRUCTIONS WHILE MAINTENANCE & SERVICING

Before attempting any maintenance on a pump particularly if it has been handling any form of hazardous liquid, it should be ensured that the unit is safe to work on. The pump must be flushed thoroughly with suitable cleaner to purge away any of the product left in the pump components. This should be carried out by the plant operator and a certificate of cleanliness obtained before starting work. To avoid any risk to health it is also advisable to wear protective clothing as recommended by the site safety officer especially when removing old packing which may be contaminated.

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.

Wear a suitable mask or respirator when working with packing and gasket components which 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 hazadous materials.

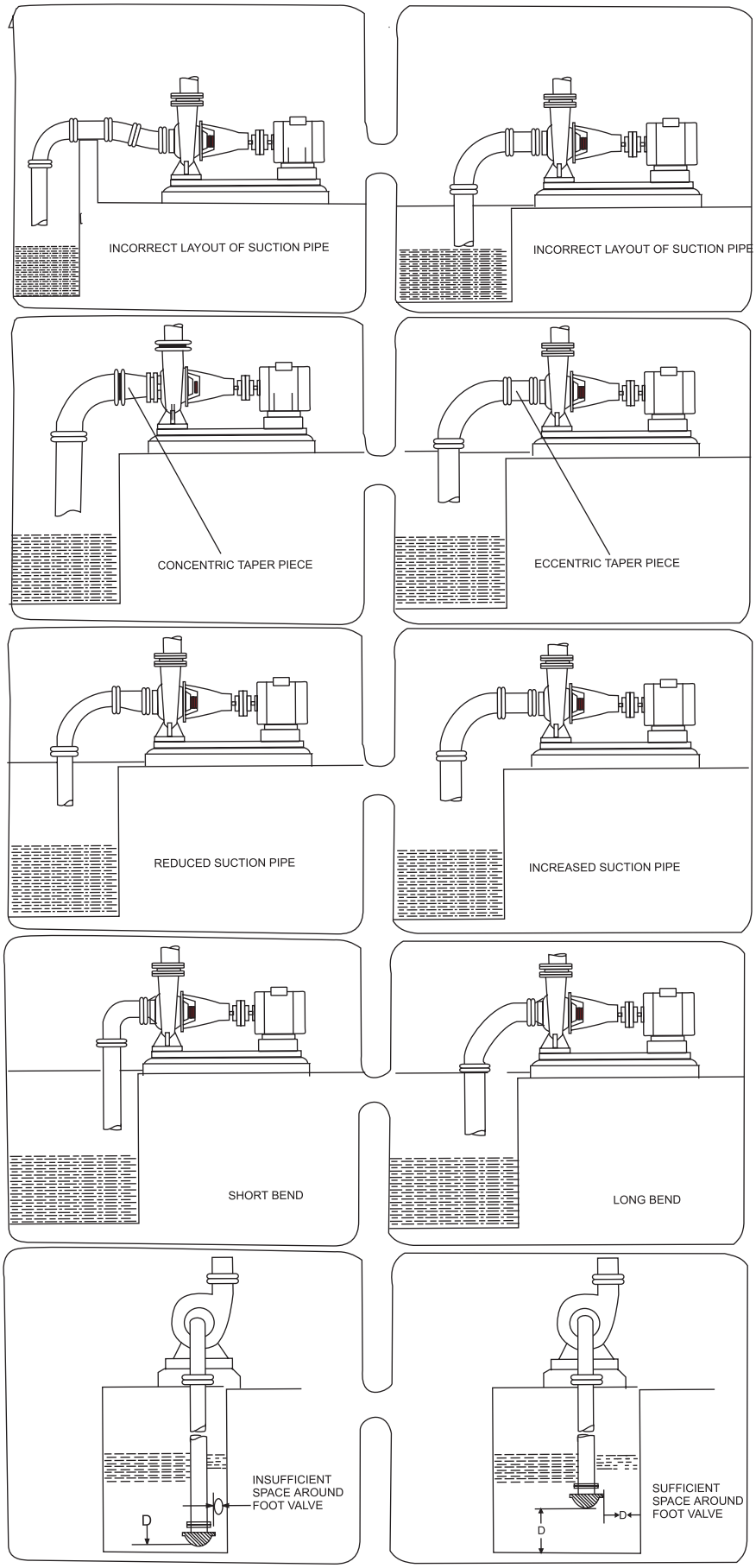
Be aware of the hazards relating to the pumped fluid, especially the danger from inhalation of noxious and toxic gases. Skin and eye contact or penetration. Obtain and understand the hazardous substance data sheets relating to the pumped fluid and note the recommended emergency and first aid procedures.

Isolate the equipment before any maintenance work is done. Switch off the mains supply, remove fuses, apply lock-outs where applicable and affix suitable isolation warning signs to prevent inadvertent reconnection. In order to avoid the possibility of maintenance personnel inhaling dangerous fumes or vapours, it is recommended that the maintenance work be carried out away from the pump locations by removal of bearing housing and shaft assembly to a suitable maintenance area.

Ref. : Proposed draft standard prEN 800 :
Pumps and pump units for liquids;
General safety requirements.

INCORRECT

CORRECT



FOR RECOMMENDATIONS OF SUITABLE SUCTION AND DELIVERY PIPE SIZE PLEASE CONTACT OUR AUTHORISED DEALER OR NEAREST REGIONAL OFFICE

GENERAL INSTRUCTIONS FOR INSTALLATION OPERATION & MAINTENANCE OF KIRLOSKAR CENTRIFUGAL PUMPS

GENERAL INSTRUCTIONS FOR INSTALLATION, OPERATION & MAINTENANCE OF KIRLOSKAR CENTRIFUGAL PUMPS

WARNING

The equipment supplied is designed for specific capacity, speed, pressure and temperature. Do not use the equipment beyond the capacities for which it is manufactured. The equipment manufactured is also shop tested for the satisfactory performance and if it is operated is excess of the conditions for which it is manufactured, the equipment will be subject to excessive stresses and strains.

LOCATION

The pump should be located as near the liquid source as possible. This will minimise the suction lift and pump will give better performance.

Ample space should be provided on all the sides so that the pump can be inspected while in operation and can be serviced conveniently whenever required.

FOUNDATION

The foundation should be sufficiently substantial to absorb any vibration and to form a permanent rlgid support for the base plate. This is important in maintaining the alignment of a direct connected unit. A concrete foundation on a solid base is advisable. Foundation bolts of the proper size should be embedded in the concrete located by a drawing or template. A pipe sleeve about two and one-half diameter larger than the bolt should be used to allow movement for the final position of the foundation bolts.

ALIGNMENT

Pumps and drivers that are supplied by the manufacturers, mounted on a common base plate are accurately aligned before despatch. However as the alignments are likely to be disturbed during transit to some extent and therefore must not be relied upon to maintain the factory alignment. Re-alignment is necessary after the complete unit has been levelled on the foundation and again after the grout has been set and foundation bolts have been tightened. The alignment must be checked after the unit is piped up and re-checked periodically.

FLEXIBLE COUPLING

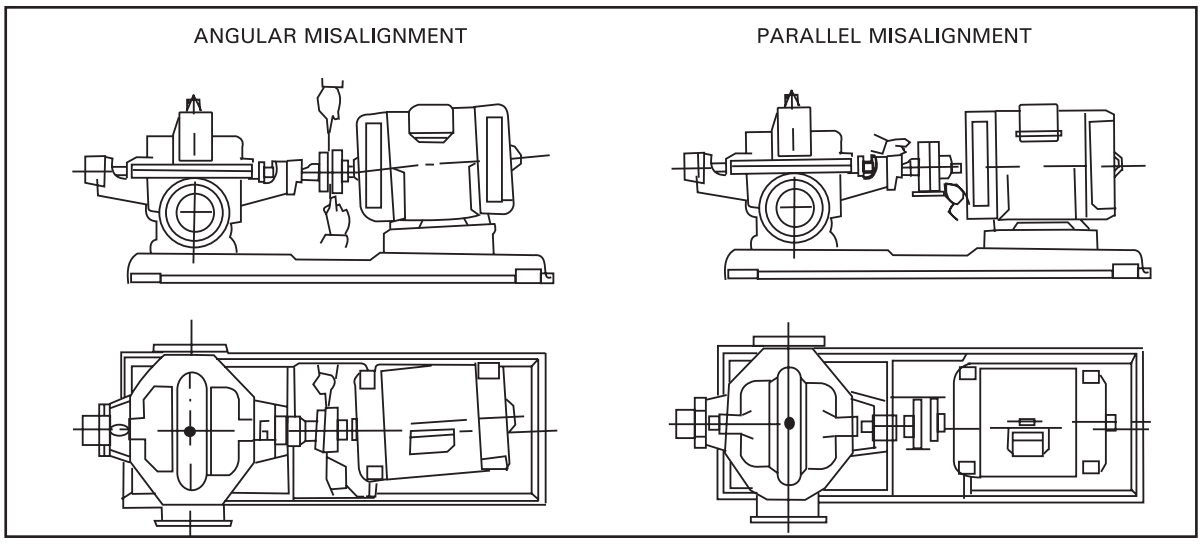
A flexible coupling will not compensate for misalignment of the pump and driver shafts. The purpose of the flexible coupling is to compensate for temperature changes and to permit the movement of the shafts without interference with each other while transmitting power from the driver to the pump.

TYPE OF MISALIGNMENT (SEE FIGURE 1)

There are two types of misalignment between the pump shaft and the driver shaft.

a) Angular misalignment : Shafts with axis concentric but not Parallel.

b) Parallel misalignment : Shafts with axis Parallel but not concentric.



LEVELLING THE UNIT

When the unit is received with the pump and driver mounted on the base plate, it should be placed on the foundation and the coupling halves disconnected. The coupling should not be reconnected until all alignment operations have been completed. The base plate must be supported evenly on wedges inserted under the four corners so that it will not be distorted or sprung by the uneven distribution of the weight. Adjust the wedges until the shafts of the pump and driver are in level. Check the coupling faces, suction and discharge flanges for the horizontal or vertical position by means of spirit level.

FLEXIBLE COUPLING ALIGNMENT (SEE FIGURE 2)

The two halves of the coupling should be at least 4 mm apart so that they cannot touch each other when the driver shaft is rotated. Necessary tools for approximately checking are straight-edge and on an outside caliper.

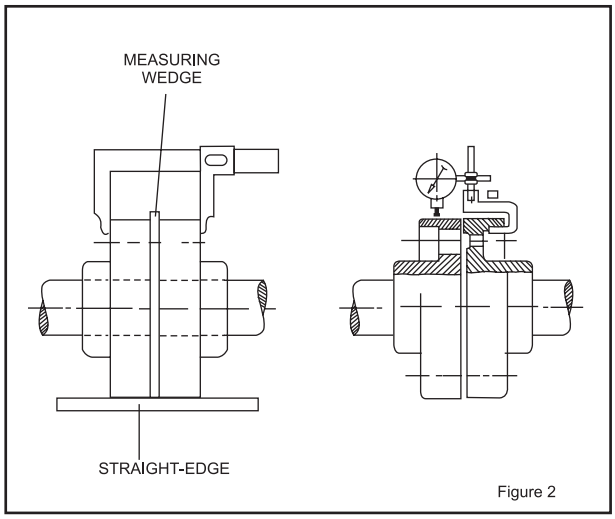
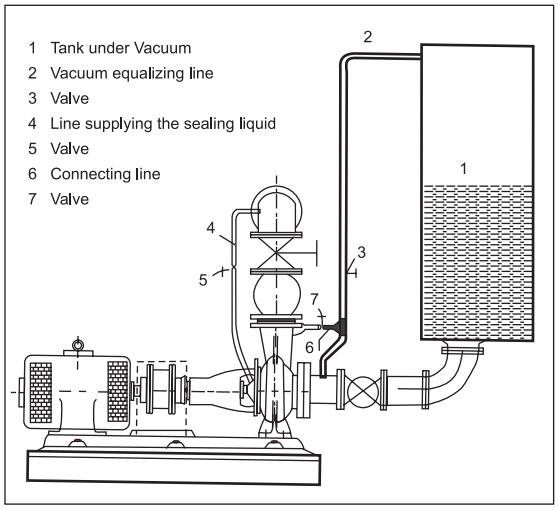


Figure 2



A check for parallel alignment is made by placing a straight-edge across both coupling periphery at the top, botton and both the sides. The unit will be in parallel alignment when the straight-edge rests evenly on the coupling periphery at all positions. Care must be taken to have the straight-edge parallel to the axis of the shafts.

A check for angular alignment is made by using an outside caliper across the width of the coupling faces at various points.

Coupling alignment can be checked with dia gauge indicator as shown in Fig. 2.

GROUTING

When the alignment is correct, the foundation bolts should be tightened evenly but not too firmly. The unit can then be grouted by working soft concrete under the edges. Foundation bolts should not be fully tightened until the grout is hardened, usually 48 hours after pouring.

FACTORS THAT MAY DISTURB ALIGNMENT

The unit should be periodically checked for alignment. If the unit does not stay in line after being properly installed, the following are possible causes :

a) Setting, seasoning of the foundation.

b) Pipe strains distorting or shifting the machines.

c) Wear of the bearings.

PIPING

Both suction and deivery pipes and accessories should be independently supported near the pump so that when the flanges bolts are tightened no strain will be transmitted to the pump casing. It is usually advisable to increase the size of both suction and delivery pipes at the pump nozzles in order to decrease the loss of head from friction and for the same reason piping should be arranged with as minimum bends as possible as these should be made with a long radius wherever possible. The pipe lines should be free from scales, welding residuals etc., and have to be mounted in such a way that they can be connected to suction and delivery flanges without any stress on the pump. Adequate supports should be given to pipe lines to that the weight of the pipe lines does not fall on the pump. The use of minimum number of the bends and other fittings will minimise the frictional losses.

SUCTION PIPE

The suction pipe should be as short as possible. This can be achieved by placing the pump near the liquid to be pumped. The suction pipe must be kept free from air leaks. This is particularly important when the suction lift is high. A horizontal suction line must have a gradual rise to the pump. Any high point in the pipe will be filled with air and thus prevent proper operation of the pump. A concentric taper piece should not be used in a horizontal suction line as it forms an air pocket in the top of the reducer and the pipe. Use an eccentric piece instead.

The end of the suction pipe must be well submerged to avoid whirlpools and ingress of air but must be kept clear of any deposits of mud, silt grit etc. The pipe must be clear from any side of wall by atleast 450 mm. The end of the suction pipe should be provided with a strainer or sufficient open area.

DELIVERY PIPE

A check (non-return) valve and a gate of sluice valve (regulating valve) should be installed in the discharge line. The check valve placed between the pump and the gate valve is to product the pump from excessive pressure and to prevent water running back through the pump in case of failure of the driving machine.

Discharge piping should be provided with a sluice valve adjacent to the delivery flange to control the discharge, if required.

VACUUM EQUALIZING LINE(AND LIQUID LINE) (SEE FIGURE 3)

If the pump draws from a system under vaccum an equalizing pipe must be carried from the highest point of the suction line, however, as close to the suction flange of the pump as possible, to the top of the feed tank to keep gas bubbles that might have been entrapped in the flow from entering the pump. The line should be fitted with an isolating valve which should be closed only for maintenance work on the pumpset.

Apply sealing liquid (external sealing) to the shaft seal cage to prevent entry of air in the case of pumps with packed stuffing box. It is convenient to tap the sealing liquid from the delivery line above

FOOT VALVE

It is advisable to install a foot valve to facilitate priming. The foot valve should have sufficient clear passage for water. Care must be taken to prevent foreign matter from being drawn into the pump or choking the foot valve and for this purpose an efficient strainer should be provided.

STUFFING BOXES AND PACKING

Stuffing boxes should be carefully cleaned and the packing placed in them.Be sure that sufficient packing is placed at the back of the water seal cage. If the water to be pumped is dirty or grity, sealing water should be piped to the stuffing boxes from clean outside source of supply in order to prevent damage to the packing and shaft. In placing the packing, each packing ring should be cut to the proper length so that ends come together but do not overlap. The succeeding rings of packing should not be pressed too tight as it may result in burning the packing and cutting the shaft. If the stuffing box is not properly packed, friction in stuffing box prevents turning the rotor by hand. On starting the pump it is well to have the packing slightly loose without causing an air leak, and if it seems to leak, instead of putting too much pressure on the gland, put some heavy oil in the stuffing box until the pump works properly and then gradually tighten up the gland. The packing should be occasionally changed.

BALL BEARINGS

Correct maintenance of ball bearings is essential. The bearing manufacturers give the following as a guide to relubrication periods under normal conditions.

Three monthly when on continuous duty.

Six monthly when on eight-hour per day duty.

The bearing and housings should be completely cleaned and recharged with fresh grease after 2500 hours or the nearest pump overhaul time.

PRIMING

No pumping action occurs unless the pump casing is filled with liquid. Pump casing and suction pipe must therefore be completely filled with the liquid and thus all air removed before the pump is started. Several different priming methods can be used depending on the kind of installation and service involved.

1) Liquid level above pump level.

   Pump is set below liquid level of source of supply so that liquid always flows to pump under positive head.

2) Priming with Foot Valve

   a) When pump is installed on suction lift with foot valve at the end of suction line, fill pump with water from some outside source till all air is expelled and water flows through air vent.

   b) when there is liquid under some pressure in the discharge pipe, priming can be effected by byepassing the pressure liquid around the check and gate valve. Of course, the initial priming must be effected from some outside source.

   NOTE : In this case, the foot valve must be capable of withstanding pump pressure and possible surge.

3) Priming by ejector : An ejector operated by steam, compressed air or water under pressure and connected to air vent on top of casing can be used to remove air from and prime the pump on suction lift installations.

4) Priming by dry vacuum pump : A hand or power pump sucks in all the air from the casing and the suction pipe, and thus primes the system.

STARTING

The pump must not be started without being primed. Be sure that the driver rotates in the proper direction as indicated by a direction arrow on the pump casing.

RUNNING

On account of its simple construction, the centrifugal pump requires practically no attention while running. Lubrication of the bearings and manipulation of the glands are the only things that need attention from the operator.

STOPPING

Before stopping the pump, close the gate valve. This will prevent water hammer on check valve.

STUFFING BOXES

Do not tighten the glands excessively. A slight dripping of water from the stuffing boxes when pump is running keeps packing in good condition.

CASING RINGS

Casing rings are fitted in the casing to reduce the quantity of water leaking back from the high pressure side to the suction side. These casing rings are fitted to maintain a small clearance and depend on the water in the pump for lubrication. When they are worn out, the clearance becomes greater and more water passes back into the suction. They must be replaced from time to time to restore the pump efficiency to its normal value.

SPARE PARTS

A set of ball bearings, a set of casing rings and a set of gland packing rings must always be kept at hand to ensure uninterrupted service from the pump. While ordering for spare parts, always give type, size and serial number of the pump as stamped on the name plate.

PUMP TROUBLE

When investigating trouble with Kirloskar pumps, always rememeber that pumps have been tested at the factory and are mechanically correct when sent out. Discounting the possibility of damage during transit, most of the trouble in the field is due to faulty installation. Investigation shows that the majority of troubles with centrifugal pumps result from faulty conditions on the suction side.

BREAKDOWN-CAUSE-CHECK POINTS

In case of breakdown we recommend the location of the fault by using the following table.

BREAKDOWN	CHECK POINTS
Pump does not deliver	1 7 8 9 10 11 12 14 15 17 18 19 23 25 26 56 57 58
Pump delivers at reduced capacity	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 17 18 19 20 21 22 56 57 58
Delivery performance deteriorates	1 3 7 9 10 11 12 13 14 19 20 21 22 23 24 53 57 62
Pump delivers too much	16 56 57 58
Delivery is interrupted	1 3 6 7 8 9 10 11 12 13 14 15 16 19 22 23 25 26 56 57 58 62
After stopping pump runs in reverse direction	52
Very noisy	1 2 5 6 7 8 11 12 13 15 19 20 22 54 55 56 57 62
Unsteady running of pump	19 20 22 31 32 33 35 36 37 38 39 40 43 44 47 48 49 50 51 54 55 58
Stuffing box leaks excessively	24 27 28 29 30 31 47 48 49 53
Fumes from stuffing box	22 23 24 25 26 27 28 29 30 41 42 43
Pump rotor locked in standstill position	22 45 46 50
Pump is heating up and seizing	23 24 25 26 27 28 29 30 40 41 42 45 46 47 48 49 50 54
Bearing temperature increases	19 20 21 22 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 51 54 55 58
Motor will not start	14 22 60
Motor gets hot or burns out	14 22 27 28 40 43 50 55 56 57 58 59 60 61
Motor is difficult to start	14 22 27 28 45 46 50 58 59 60

CHECK POINTS

1 Suction pipe, foot valve choked.
2 Nominal diameter of suction line too small.
3 Suction pipe not sufficiently submerged.
4 Too many bends in the suction line.
5 Clearance around suction inlet not sufficient.
6 Shut off valve in the suction line in unfavourable position.
7 Incorrect layout of suction line (formation of air pockets)
8 Valve in the suction line not fully open.
9 Joints in the suction line not leak-proof.
10 Air leaking through the suction line & stuffing box etc.
11 Suction lift too high.
12 Suction head too low (difference between pressure at suction connection and vapour pressure too low).
13 Delivery liquid contains too much gas and/or air.
14 Delivery liquid too viscous.
15 Insufficient venting.
16 Number of revolutions too high.
17 Number of revolutions too low.
18 Incorrect direction of rotation (electric motor incorrectly connected, leads of phases on the terminal block interchanged)
19 Impeller clogged.
20 Impeller damaged.
21 Casing rings worn out.
22 Separation of crystals from the flow of pumping liquid (falling below the temperature limit/equilibrium temp).
23 Sealing liquid line obstructed.
24 Sealing liquid contaminated
25 Lantern ring in the stuffing box is not positioned below the sealing liquid inlet.
26 Sealing liquid omitted.
27 Packing incorrectly fitted.
28 Gland tightened too much/slanted.
29 Packing not suitable for operating conditions.
30 Shaft sleeve worn in the region of the packing.
31 Bearing worn out.
32 Specified oil level not maintained.
33 Insufficient lubrication of bearings.
34 Ball bearings over-lubricated.
35 Oil/Grease quality unsuitable.
36 Ball bearing incorrectly fitted.
37 Axial stress on ball bearings (no axial clearance for rotor).
38 Bearings dirty.
39 Bearing rusty (corroded).
40 Axial thrust too great because of worn casing rings, relief holes obstructed.
41 Insufficient cooling water supply to stuffing box cooling.
42 Sediment in the cooling water chamber of stuffing box cooling.
43 Alignment for coupling faulty or coupling loose.
44 Elastic element of coupling worn.
45 Pump casing under stress.
46 Pipeline under stress.
47 Shaft runs untrue.
48 Shaft bent.
49 Rotor parts insufficiently balance
50 Rotor parts touching the casing.
51 Vibration of pipe work.
52 Non-return valve gets caught.
53 Contaminated delivery liquid.
54 Obstruction in delivery line.
55 Delivery flow too great.
56 Pump unsuitable for parallel operation.
57 Type of pump unsuitable.
58 Incorrect choice of pump for existing operating conditions.
59 Voltage too low/ power supply overloaded.
60 Short circuit in the motor.
61 Setting of starter of motor too high.
62 Temperature of delivery liquid too high.

KIRLOSKAR BROTHERS LIMITED
UDYOG BHAVAN ,TILAK ROAD ,PUNE 411002 (INDIA)

HISTORY CARD

Pump Type _____

Serial No. _____

Material Construction _____

O/A No. _____

Total Head _____

Discharge _____

speed _____

bhp/kw _____

Motor hp _____

Location _____

Application _____

liquid Handled _____
(Name)

Chemical composition _____

Sp. Gravity _____ pH value _____

Temperature _____

Suspended Solid % _____

Nature of Liquid —— Abrasive/Corrosive/
Inflammable.

Stuffing Box Packing/Mechanical Seal

Specification _____

Type _____ Size _____

Material Code _____

Sealing/Recirculation Liquid Self/External

Pressure _____ Quantity _____

Cooling Connection Yes/No

Size _____ Quantity _____

Date of Commissioning _____

Special Remarks

ROUTINE MAINTENANCE
(Dates of Replenishing/Refilling/Checking)

Stuffing Box Packing			Lubricating Oil/Grease			Checking	Overhauls

REPLACEMENT DETAILS

Name of Part	Date of Replacement	Reason for Replacement	Serviced by	Remarks
Impeller				
Pump Shaft				
Shaft Sleeve				
Casing Rings				
Bearings				
Stuffing Box Bush/Mech. Seal				
Other parts				