Enriching Lives

INSTRUCTIONS
ON
INSTALLATION OPERATION
AND
MAINTENANCE
FOR

KIRLOSKAR PUMPS
TYPE - SHS

Grease Lubricated and Water Lubricated

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UDYOG BHAVAN, TILAK ROAD, PUNE 411 002 (INDIA)

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 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 our arise solely from faulty workmanship or defective material.

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

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TABLE OF CONTENTS

1. INTRODUCTION

SHS/SHS-E type sump pumps are manufactured to the close tolerances and rigid specifications. Hence proper erection and maintenance is equally important to ensure trouble free service.

This booklet covers important guidelines and instructions on erection, operation and maintenance for the following sizes of SHS pumps.

STANDARD SHS PUMP MODELS

*UNIT-7	*UNIT-9	UNIT-11	UNIT-13
SHS 50/26 N, NB, Q	SHS100/26 N, Q	SHS 150/26N, NB, Q	SHS 200/32 N, Q
SHS 80/26 N, Q	SHS 100/32 N, Q	SHS 150/32 N, Q	SHS 150/40 N, Q
SHS 65/32 N, NB, Q	SHS 80/40 N, Q	SHS 100/40 N, Q	SHS 200/40N

*Above 3500 mm column length only.
** SHS-E pump models

UNIT-7	UNIT-9
SHS 50/26 NE, NBE, QE	SHS 100/26 NE, QE
SHS 80/26 NE, QE	SHS 195/32 NE, QE
SHS 65/32 NE, NBE, QE	SHS 80/40 NE, QE

**Upto 3500 mm column length only.

The above models can be offered with following impellers :

P — Single vane enclosed impeller.
N — Two vanes enclosed impeller.
Q — Three vanes semi open impeller.
R — Eight vanes free flow impeller.

These instructions should fbe followed carefully failing which it may result in the unsatisfactory performance/damage to the pump.

Only mechanical aspects are dealt in this manual. Civil and electrical engineering details are to be fifnalised at customers end only.

The special problems arising at the site should be referred to the supplier. The name plate details should be mentioned while making correspondence with supplier/ manufacturer.

2. PRE-REQUISITIES FOR SATISFACTORY OPERATION

For satisfactory operation, the pump must work under specific conditions given below :

2.1 The pump handles the liquid as specified in the O/A.

2.2 The pump operates as the duty point as specified in the O/A.

2.3 Minimum submergence is kept as shown in the outline dimension drawing supplied.

2.4 Operating and maintenance instructions are followed as given in this manual.

2.5 Load of delivery pipe and other accessories such as sluice valve, reflux valve is not coming directly on pump column.

2.6 The erection must be done by the experienced/skilled personnel. Prior confirmation must be taken from the manufacturer/supplier, if the pump is to be used for the conditions other than specified in the O/A.

3. PUMP HOUSE LAYOUT

The sump should be so designed as to provide.

3.1 **Enough Storage capacity to avoid :**

3.1.1 Sudden fluctuations in liquid levels.

3.1.2 Kinematic disturbances at the bell mouth such as turbluence, eddies, vortices etc.

3.1.3 Air entrainment.

3.2 **Low velocity :**

The maximum liquid velocity in sump should not exceed one meter per second in any case. Velocity can be reduced by providing suitable baffles in the flow passage.

3.3 **Individual flow pattern :**

Where one sump houses more than one pumping set, every pump shcuId have its individual flow pattern undisturbed by the other. While locating the sump in the sump, minimum distance from walls floor and adjacent pipes as recommended by manufacturers should be maintained.

3.4 Screen at inlet of the sump to avoid entry of large size solid (size more than specified for the particular type of pump).

3.5 **Pump submergence :**

The lowest liquid level in the sump should be 300 mm above the centre line of the pump as indicated in the outline drawing supplied. Highest liquid level should be below the breather hold provided on top suspension pipe.

The level in the sump should be controlled by liquid level controller/float switch.

Pump house requirement

These cover mainly the following aspects.

3.6 **Strength of the building :**

The building should be strong and sturdy to withstand the water thrust and weight of the pump etc. The floor should be designed so to take weight of the machine including that of the water column in the rising pipes, axial thrust of the impeller, water hammer etc.

3.7 **Sufficient floor area for working/overhauling :**

The following factors should be considered —

3.7.1 Propar spacing of the pumps to avoid transmission of vibration from one machine to another.

3.7.2 Easy and safe access to electrical switch gear.

3.7.3 Space for dismantling the pump parts during overhauling.

3.7.4 Space for tools and equipment of the operator.

3.7.5 Sufficient head room for erection. Provision for overhead travelling crane or chain pulley.

3.8 **Block :**

3.8.1 Pump house should provide adequate height between the foundation and upper most position of the crane hook to facilitate smooth and easy erection.

3.8.2 The pump house should provide sufficient cross travel of the trolley so that the pump subasemblies can be moved without any hindrances of receiving any undue stress during movement.

3.9 Ventilation for cooling of the motor.

3.10 Provision for store room.

4. STORAGE & HANDLING

4.1 **On receiving the material —**

The SHS SHS-E pump having column lengths upto 2 meters are despatched in completely assembled condition. The pumps with more than 2 meters column length are despatched in partially assembled form.

4.1.1 Check that all the packages are intact and that open parts are not damaged in transit.

4.1.2 Open the packings and check contents of each packings against delivery notes.

4.1.3 Check specifically line shafts by using V blocks or on lathe by dial gauge and verify that these are not bent and are in good conditions (when the shafts are supplied in separate package). The runout of shafts should be maximum 0.075 mm at bearing portions and 0.150 mm maximum at other positions.

4.1.4 **Report immediately discrepancies, if any, to the supplier.**

4.1.5 Unless the pump is to be installed immediately, repack the material in respective cases after the contents have been verified against delivery note.

4.2 **Storage :**

4.2.1 Storing place should be free from dust, heat, moisture etc. Store room should have sufficient space for easy movement and stacking of material. The floor of the store room should be hard and plain.

4.2.2 Do not place the packages one over the other inconveniently. Keep the parts on wooden logs and properly levelled.

4.2.3 Keep the parts in proper sequence so that during erection they can be taken out in an orderly fashion.

4.3 **Handling :**

4.3.1 All machined parts are coated with special anti-rust coat. If any part is found exposed, clean it and apply a thick coating of grease or anti-rust compound and then wrap it with was paper to prevent further rusting.

4.3.2 Never try to drag any component part or packages of parts for any reason. Dragging sets in intrinsic vibration which distorts the accuracies, parallelism etc. of machined surfaces. Distortion of accuracies might cause serious functional and operational troubles.

4.3.3 Over hanging should be avoided as far as possible. While lifting the parts by the ropes, they should be properly balanced.

4.3.4 Transportation should be free from jerks. Long parts should not be handled without due supports.

4.3.5 Open parts must be transported on soft and well supported bedding.

4.4 **Caution :**

CARE MUST BE EXERCISED IN HANDLING OF ALL PARTS PARTICULARLY THE SHAFTS. THEY ARE MACHINED TO CLOSE TOLERANCES AND CAREFULLY INSPECTED AT FACTORY AND IF BENT, CAN CAUSE TROUBLE. A BENT SHAFT SHOULD NEVER BE INSTALLED.

5. FOUNDATION

The foundation layout should be considered from the following aspects :

5.1 **Dimensional requirements**

5.1.1 The location of foundation bolts should be marked as per the outline drawing supplied in advance. The bolt holes should come on beam centre or on supporting frame centre.

5.1.2 If necessary, the machined pads should be welded to the beams to provide sufficient depth to foundation bolts and to provide uniform and machined surface for levelling.

5.1.3 The position of girders/supporting structure should be arranged in such a fashion that there is no hindrance while lowering the pump in the sump.

5.2 **Strength**

5.2.1 The total load is borne by the motor stool and support plate in turn by the beam on which they are resting. In order to take all this load including safety factor for vibration, the girders/beams should be firmly embedded in the walls.

5.2.2 The girders or supporting frames should be of adequate strength to take the load of complete set, weight of the liquid column, axial thrust etc.

5.3 **Levelling**

5.3.1 It is essential to check the level of the girders/beams individual and in combination before mounting the motor stool. It is to be borne in mind that motor stool has to be levelled perfectly to the accuracy of 0.05 mm per metre. For smooth working of the pump. it is necessary that the motor stool keeps up its horizontal level perfectly after mounting and that rotating unit keeps its vertical position. The rotating unit should be aligned with its vertical axis.

5.3.2 If the girders are not in one level, then they should be brought in one level by suitably grinding, filling etc. or by welding machined pads. It is to be ensured that there should be no point contact after mounting of the motor stool on the girders.

5.5 **Disturbances to the leveling**

After mountisng the motor stool and support plate on the girders, delivery branch flange above support plate should perfectly match with the flange of the delivery pipe. In case, the matching is imperfect with respect to the parallelism centre axis, bolt holes etc. of the delivery branch it is bound to disturb the alignment. Clearance between the flanges should be such that it does not give rise to any displacement of the pumping unit, during tightening them togehter alongwith the intermediate packing. Due care should be taken to see that load of the delivery piping and accessories such as sluice valve, reflux valve etc. should not come on the motor stool and support plate. Separate firm supports should be given to the delivery pipe and its accessories.

6. TOOLS AND EQUIPMENT

6.1 The equipment and tools which are essential for erection of the pump.

6.1.1 The crane/chain pulley block :

The crane/chain pulley block should be of ample capacity to take the load of the complete unit. The pulley block should have the lift of about 3 metres and the hand chains provided should fbe long enough to operate it conveniently from the floor. The chain pulley block of 3 tons capacity is most suitable.

6.1.2 Chains, shackless etc.

6.1.3 Jute ropes, crow bars and small pipes for leverage, wire rope.

6.1.4 Light but accurate straight edge.

6.1.5 Spirit level having the accuracy of 0.02 mm/m.

6.1.6 Kerosene or thinner for cleaning for parts.

6.1.7 Small wire brush for cleaning threads of shafts and couplings.

6.1.8 Threading compound for shaft and pipe threads.

6.1.9 Feeler gauge and shims of brass and steel for adjustment of level.

6.1.10 'V' blocks, dial guage with magnetic stand to check the runout of the shafts.

6.1.11 Two sturdy wooden logs or MS girders to rest the clamps during erection process.

6.2 **Special spanners and clamps supplied alongwith the pumps are as under :**

6.2.1 2 pairs of clamps for suspension pipe (for column length 2 m and above)

6.2.2 2 pairs of clamps for rising pipe (for column length 2 m and above)

6.2.3 1 set of clamp for line shaft.

6.2.4 Hex. socket head cap screw key.

6.2.5 2 spanners for screwed coupling and bearing nuts.

6.2.6 1 spanner for transmission shaft.

6.2.7 1 spanner for coupling pins.

6.2.8 4 eye bolts for lifting the motor stool.

6.2.9 1 spanner for pipe nut.

6.3 **Besides above, the erector must have following standard tools and equipment for smooth erection :**

6.3.1 Files—Triangular, half, round and flat of different cuts and sizes.

6.3.2 Triangular scraper.

6.3.3 2 sets of standard or ring spanners, set of box spanners, set of allen keys.

6.3.4 Set pipe wrenches and chain tang.

6.3.5 Adjustable spanner, screw drivers of 150 mm (6") and 300 mm (12").

6.3.6 Steel rule and steel tape.

6.3.7 Set of taps and dies up to 25 mm (1").

6.3.8 Chisel, machinist's hammer (1 kg.) hack saw, vice etc.

6.3.9 Emery paper, grease gun, thin rolled sheets of 0.03 mm to 0.05 mm thickness for cutting shims.

6.3.10 Cotton waste and clean pieces of cloth for cleaning bearings.

7. PREPARATORY FOR ERECTION

During transit and storage of equipment after it has reashed at site considerable dust and foreign material may have lodged on the various parts fof the pumps. All parts/ assembled unit must be cleaned and checked with great care before commencing the erection. It is necessary to remove the antirust cost given on the machined surface before starting the erection.

7.1 **Complete assembled pump —**

7.1.1 Remove the antirust coat applied to the machined open surfaces of motor stool, coupling etc. with the help of thinner and kerosene. In case of pump supplied with water lubricated, rubber bearings should be flushed with clear cold water only.

7.1.2 Rotate the flexible coupling by hand. It should rotate freely.

7.1.3 Check all the bolts and nuts for their tightness as there is a possibility of nuts gettings loose during transit and handling.

7.2 **Pumps with column length of more than 2 metres :**

In this case, only pump unit is despatched in assembled form and transmission unit, driving units, rising pipes are sent in dismantled condition.

7.2.1 **Pump unit :**

Rotate the pump shaft by hand or by using pipe wrench to see that the impeller is free (rotating properly). Remove the antirust coat from the machined portions of the transmission bearing and threaded portions of the shaft with the help of thinner and kerosene. Clean the threaded portion with the help of wire brush or old tooth brush.

7.2.2 **Transmission unit :**

Intermediate shafts —

The intermediate shafts are despatched in wooden packings. Unpack the shafts and clean them thoroughly with thinner and kerosene. The screwed couplings are also to be cleaned with above solvent. The threads of the coupling and shaft to be cleaned by using wire brush or tooth brush. Ensure that threaded portions are completely tree from dust, rust etc.

Transmission bearings —

Clean the machined surfaces of bearing spider with thinner/kerosene. It should be free from sharp edges and burr. Clean the bearing bush. The grooves of bearing bush must be free from dust and burr.

Check the spring of oil seals fixed in the bearing covers are not damaged. In the case pump supplied with water lubrication the rubber bearing are used as transmission bearings. These should not come in contact with oil, grease, paint etc. These bearings should be cleaned with clear cold water only.

Column pipes —

Clean the flanges and guide faces thoroughly with thinner and kerosene. Ensure that corresponding portions of bearings spiders are fitting properly. if they do not, scrape them suitably. Clean the column pipes from inside.

7.2.3 **Drivisng unit :**

Clean the motor stool, thrust bearing carrier, bush bearing perfectly. Antirust coat from the machined surfaces should be removed by using thinner/kerosene. Check the grooves on the bronze bearing bush are clear from dust and burr. Ensure that grease passes smoothly when forced from the grease nipple. Clean the thrust bearing in the kerosene. Check the springs of the oil seals fixed in the bearing covers are not damaged. Thrust bearing and bush bearing should be absolutely free from dust particles hence these are to be covered suitably till they are used in the assembly.

7.2.4 **Head shaft and flexible coupling :**

Clean the head shaft and coupling with the help of thinner and kerosene. Remove the sharp edges or burr if any, from the key way and make sure that coupling key fits properly. Coupling bushes should not come in contact with grease, oil, paint etc.

7.2.5 **Rising pipes :**

Clean the sockets and threaded surfaces of rising pipes.

7.2,6 Pipes for lubrication :

When the pumps are supplied with grease lubrication the lubrication pipes to be filled with fresh grease. For pumps with water lubrication, pipe nipples should be flushed with water. Also check the joints for its leakage.

7.3 Checking :

Though all parts are inspected and duly packed while despatching from Works, there is every possibility of bending of shaft, damage to the machined portions during transit. Hence following checks should be made before commencing the installation.

- Threaded portions of the shaft, screwed couplings etc. are not damaged.
- Screwed coupling fits properly on the shaft. It should not be too tight or too loose on the shaft.
- All the mating surfaces fit properly.
- The shafts are not bent during transit. Check them with the help of 'V' blocks and dial gauge or on centre lathe. The shaft run outs should not exceed 0.075 mm at bearing portion and 0.150 mm at other portions.

7.4.1 While assembling do not apply undue force.

7.4.2 Avoid use of hammer.

7.4.3 Ensure perfect matching of contact surfaces.

7.4.4 Each and every part should be free from high points.

7.4.5 Take care that no part is left out through oversight. Every single item, however small has an importence in the proper functioning of the pump.

7.4.6 Take care that no foreign substance is dropped or left inside. They will get stuck up and cause jamming.

7.4.7 All tools and equipment are kept ready on hand before starting the erection. Cross sectional drawing and erection instructions should be referred to during erection.

7.4.8 Erection should be done by specialized and experienced personnel.

8. ERECTION PROCEDURE OF THE PUMPS WITH GREASE LUBRICATION

8.1 Erection procedure for grease lurbicated pumps with column length more than 2 m.

8.1.1 Pump unit is sent from Works in duly assembled conditions. It includes pump casing (107), impeller ((151/153). Impeller shaft (186), bell mouth (211), casing cover (220), bottom column pipe (133.2), first bearing spider (245) etc.

8.1.2 Fix adapter piece (559), to the casing cover (220) and connect copper tube (562.2) to this adapter. Temporarily tie the copper tube to the column pipe till it is connected to the motor stool.

8.1.3 Connect bend (280) and first rising pipe (142.1) to the delivery nozzle. Insert packing between flanges before connecting them. Take care while fitting the bend that rising pipe fitted on it will be parallel to the column pipe. In any case, the rising pipe should not be under tension while passing it through the support plate (383).

8.1.4 Fix the clamp to the suspension pipe. Also fix clamp to the rising pipe. Arrange the clamps in such a way that both the clamps are at the same height. This facilitate smooth erection (erection can be carried out with singleclamp for column pipe when the rising pipes are light and small).

8.1.5 Lift the unit vertically with the help of ropes/chains and chain pulley block. While lifting take care that bell mouth is not dragged against the floor. Suspend the unit vertically.

8.1.6 Put two girders or strong wooden logs across the foundation to rest the clamps while erection. Lower the unit in the sump till the clamps rest on girders.

8.1.7 Apply the thread compound liberally inside the screwed coupling and impeller, shaft. Fit the screwed coupling (395) to the impeller shaft (186) after inserting brg. spider (245).

8.1.8 Column pipe (133.1) and intermediate shaft (184) should be suspended by the separate clamps. These are to be suspended in such a way that intermediate shaft protrude out of the column pipe. Fix again brg. spider (245).

8.1.9 Connect the intermediate shaft to the screwed coupling. Make sure that ends of the shafts are butted properly.

8.1.10 Lower the column pipe and fix it to the bottom column pipe (133.2). Tighten the diametrically opposite bolts evenly.

8.1.11 Similarly lower the rising pipe by fixing the clamp to it and couple it to the bottom rising pipe with the help of coupler. Chain spanners to be used for tightening. Apply thread compound liberally to the threaded portion before connecting the pipes (flanged rising pipes are supplied in case of heavier pipes.)

8.1.12 Fix the adapter (569) to the bearing spider (245). Connect the copper tube (562.6) to this adapter. Temporarily tie copper tube to the column pipe till it is connected to the motor stool.

8.1.13 Lift the complete unit slightly. Remove the clamp fixed to the bottom column pipe and bottom risifng pipe. Lower the complete unit till the clamps fixed to the column pipe and rising pipe rest on the girders.

8.1.14 Smear grease to the transmission bearing bush. Fit the bearing spider (245) with its covers and oil seals (278 & 600.3) on the column pipe.

8.1.15 Repeat the same procedure till head shaft (185) top column pipe (132) complete rising pipes and other copper lubrication pipes are assembled. Let the whole unit rest on the clamp fixed to the top column pipe (132) and top rising pipe (142.2).

8.1.16 Fit pipe nut for rising pipe (338) with the help of spanner to it and fix, the motor stool to the top column pipe (132). Tighten the dismetrically opposite bolts evenly. While fixing the motor stool, make sure that holes on the motor stool and foundation will match properly.

8.1.17 Fit the adapter (559) to the motor stool. Connect the Nylon tubes (562.2, 562.4, 562.6) to the corresponding adapters.

8.1.18 Lift the unit slightly and remove the clamps fixed to the column pipe and rising pipe. Remove the girders used for erection and lower whole unit till motor stool rests on the supporting structure foundation. With hanging supports to motor stool, adjust the holes of the motor stool with that of foundation holes.

8.1.19 Fix support plate (383) on the foundation. Just fix the foundation bolts and do not tighten them. Adjust the pipe nut (338) from the bottom till it touches the plate. Fit another pipe nut from top.

8.1.20 Tighten the foundation bolts of the motor stool. Check the level on the machined surface of the motor stool. It should be levelled accurately to the limit of 0.05 m to 0.075 m/meter.

8.1.21 Fix the cover for bearing bush along with oil seal and cover sheet (270.2) (500.2) and to the thrust bearing carrier (247). Smear the grease to the bearing bush (352). Fit the thrust bearing carrier (247) to the motor stool.

8.1.22 Fit the thrust bearing (262) in the thrust bearing carrier. Fill the grease (only about 50% of the volume to be filled).

8.1.23 Put the thrust bearing adaptor (272) on the head shaft till it touches the thrust bearing.

8.1.24 Now the rotating unit to the lifted up to ensure correct clearance between impeller and wear plate (only for SHS-Q pumps).

The adjustment is done as under :

Put the bearing nuts (335) & (336) on the head shaft till it easily touches the bearing adapter (272). Do not tighten it further. Put the pump coupling (390) along with the key on head shaft. Mount the magnetic stand of the dial indicator on the motor stool & prop of the dial gauge on the face of the coupling. Hold the coupling to prevent its rotation. Adjust the zero of the dial guage. Tighten the bearing nut (335). Such that rotating unit is fitted by 0.5 mm. Rotate the coupling so that it should rotate freely. Tighten the lock nut (336) for locking the bearing nut (335).

8.1.25 Remove the flexible coupling and coupling key.

8.1.26 Fit the bearing cover (270.1) alongwith the oil seal (500.1) and cover sheet.

8.1.27 Fix the coupling key (321) and fit the flexible coupling pump half (390) on the head shaft (185).

8.1.28 Tighten the foundation bolts of the support plate. Make the further connection of valves and delivery pipe. Ensure the complete weight of the delivery pipe and accessories is not coming on the support plate. Connect tubes (562.1, 562.3, 562.5 & 562.7) to adapter piece (559) and nipple of the grease lubricator.

8.1.29 Mount grease lubricator on support plate (383). Refer instructions on grease lubricator supplied with SHS pumps.

8.1.30 Once again check the level on the surface of the motor stool. It should be levelled accurately while tightening the bolts with the use of shims, if necessary.

8.1.31 Fix the flexible coupling motor side (391) on the motor. Make the motor connections and check the direction of rotation before fitting on the motor stool. The direction of rotation should be clockwise when viewed from top.

8.1.32 Mount the motor on the motor stool. There should be a gap of 6 mm between two coupling faces. Check the parallel and angular alignment of the coupling. Fix the coupling pins, coupling bushes (404, 409, 400).

8.2 **Pumps with column length of less than two metres :**

Complete pump is sent from Works in assembled condition. Only rising pipe connections is to be made. Other instructions follow as per above points 8.1.28 to 8.1.32. Motor stool is to be levelled perfectly with the use of shims, if necessary to limit of 0.05 to 0.075 m/metre.

8.3 **Erection Procedure for Pump with Water Lubrication :**

Pump with column length more than 2 metres :

8.3.1 Pump unit is sent from Works in duly assembled condition. It includes pump casing (107), impeller (151/153), impeller shaft (186), bell mouth (211), casing cover (220), column pipe (133.2), bearing spider (245) etc.

8.3.2 Connect the pipe nipple (535.4) with half part of the union joint (545.2) to the casing cover (only for external water lubricated pump).

8.3.3 Connect bend (280) and first rising pipe (142.1) to the delivery nozzle. Insert packing between flanges before connecting them. Take care while fitting the bend that rising pipe fitted on it will be parallel to the column pipe. In any case the rising pipe should not be under tension while passing it through support plate (383).

8.3.4 Fix the clamp to the bottom column pipe (133.2). Also fix clamp to the rising pipe. Arrange the clamps in such a way that both the clamps are at the same height to facilitate smooth erection (Erection can be carried out with the single clamp for column pipe when the rising pipes are light and small).

8.3.5 Lift the unit vertically with the help of slings and chain pulley block While lifting take care that bell mouth of pump casing will not drag against the floor.

8.3.6 Put two girders on strong wooden logs across the foundation to rest the clamps while erecting. Lower the unit in the sump till the clamps rest on girders.

8.3.7 Apply the thread compound liberally inside the screwed coupling and on the threads of impeller shaft. Fit the screwed coupling (395) on impeller shaft (186) after inserting brg. spider (245).

8.3.7.1 Use thread compound to prevent rust or seizing.

8.3.7.2 Half of the coupling length should come on each shaft.

8.3.7.3 Coupling should fbe completely free from dust.

8.3.8 Column pipe (133.1) and intermediate shaft (184) should be suspended by the seperate clamps. These are to be suspended in such a way that shaft protrudes out of the column pipe. Fix again brg. spider (245).

8.3.9 Connect intermediate shafts to the screwed coupling. Make sure that ends of the shafts are butted properly.

8.3.10 Lower the column pipe (133.1) and fix it to the bottom column pipe (133.2). Tighten the diametrically opposite bolts evenly.

8.3.11 Similarly lower the rising pipe and couple it to the bottom rising pipe with the help of coupler. Chain spanners are to be used for tightening. Apply thread compound liberally to the threaded portion before connecting the pipes (Flanged rising pipes are supplied in case of heavier pipes)

8.3.12 Make connection of water lubrication pipe of 13 mm (1/2") upto union joint (545.1).

8.3.13 Lift the complete unit slightly and remove the clamp fixed to the bottom column pipe (133.2) bottom rising pipe. Lower the complete unit till the clamps fixed to the column pipe and rising pipe rest on the girders.

8.3.14 Fit the bearing spider (245) on the intermediate shaft and column pipe. Make the lubrication pipe connection upto bearing spider.

8.3.15 Repeat the same procedure till head shaft (185) top column pipe (132), top rising pipe, (142.2) and water lubrication pipes are assembled. (let the whole unit rest on the clamp fixed to the top column pipe (132) and top rising pipe (142.2).

8.3.16 Fit the pipe nut (338.2) for rising pipe and lock nut (338.1) on the water lubrication pipe.

8.3.17 Lift the motor stool (290) with the help of eye bolts screwed to it and fix the motor stool to the top column pipe (192). At the same time pass the water lubrication pipe through the hole provided on the motor stool. Tighten the diamatrically opposite bolts evenly. While fixing the motor stool, make sure that holes on the motor stool and foundation match properly.

8.3.18 Lift the unit slightly and remove the clamps fixed to the top column pipe and rising pipe. Remove the girders used for erection and lower the whole unit till motor stool rest on the foundation. With hanging support to motor stool adjust the holes of the motor stool with foundation holes.

8.3.19 Fix the support plate (383) on the foundation. Just fix the foundation bolts but do not tighten them. Adjust the pipe (338) from the bottom till it touches the plate. Fit another pipe nut (338) from top. Put rising pipe flange. Adapter should be put if the pumped liquid is to be for lubrication.

8.3.20 Adjust the nut (336.1) for water lubrication pipe till it touches motor stool from the bottom. Fit another hex nut from top.

8.3.21 Tighten the foundation bolts of the motor stool. Check the level on the machined surface of the motor stool. It should be levelled accurately to the limit of 0.05 mm to 0.076 mm.

8.3.22 Fix the cover for bearing bush alongwith oil seal (270.2), (500.2) to the thrust bearing carrier (247). Smear the grease to the bearing bush (352). Fit the thrust bearing carrier (247) to the motor stool.

8.3.23 Fit the thrust bearing (262) in the thrust bearing carrier. Fill the grease only about 1/2 of the volume to be filled.

8.3.24 Push the thrust bearing adapter (272) on the head shaft till it touches the thrust bearing.

8.3.25 Now the rotating unit to be lifted up to ensure correct clearance between impeller and wear plates. (Only for SHS-Q pumps). The adjustment is done as following :

Entire procedure is as per outlined in 8.1.24 given in this manual.

8.3.26 Remove the flexible coupling and coupling key.

8.3.27 Fit the bearing cover (270.1) alongwith the oil seal (500.1).

8.3.28 Fix the coupling key (321) and fit the flexible coupling pump half (390) on the head shaft.

8.3.29 Connect the water lubrication pipe nipple (535.2) with whell cock (550) to the clear cold water connection for bearing lubrication and ensure proper flow of water through the pipes. If the pumps are handling clear cold water then same water can be used for transmission bearing lubrication. In such cases, the water lubrication pipe should be connected to the adapter flange (506) through tee (546.1) and copper tube (560).

8.3.30 Tighten the foundation bolts of the support plate. Make the further connection of valves and delivery pipe. Ensure the complete weight of the delivery pipe and accessories is not coming on the support plate.

8.3.31 Loosen the foundation bolts of motor stool slightly and check the level of the surface of the motor stool. It should be levelled accurately with the use of shims. If necessary. Check the motor stool spigot and face run out with the use of dial gauge and magnetic stand.

8.3.32 Make the motor connections and check the direction of rotation before fitting on to the motor stool. The direction of rotation should be clock-wise when viewed from the top.

8.3.33 Mount the motor on the motor stool. There should fbe a gap of 6 mm between the two coupling faces. Check the parallel and angular alignment of the coupling. Fix the coupling pins.

8.4 **Pumps with Column Length Less Than 2 M.**

Complete pump is sent in assembled condition from Works.

8.4.1 Remove companion flanges delivery side (490) or socket (540) upper pipe nut for rising pipe (338).

8.4.2 Lift the complete unit by using wire rope. The wire rope should be wound around the motor stool (290) and the unit lifted by chain pulley block.

8.4.3 Lower the pump into the sump taking care the girders or sump walls do not damage the lubricating pipes that present in external water lubricated pump.

8.4.4 Rest the motor stool on the girders and insert the foundation bolts into corresponding holes in the base. Tighten nuts, but not fully.

8.4.5 Place the support plate for rising pipe (382) on top rising pipe (142.2). Adjust the lower nut for this pipe (338) so that it touches the plate (383). Insert bolts in corresponding holes. Tighten the nuts.

8.4.6 Fit the upper pipe nut (338) companion flanges (490) or socket (540) on the rising pipe.

8.4.7 Fit the upper nut for lub (336.1) socket (540.1) pipe nipples and wheel cock.

8.4.8 Connect pipe nipple (535.1) to external supply of clear cold water for lubrication.

8.4.9 Level the pump accurately by using shims as in the case of the pumps with suspension length more than 2 M. (Refer 8.3.31).

8.4.11 Supply external clear cold water for 5 minutes before starting the pump at the same time rotate the pump coupling by hand. It should rotate freely. If it does not adjust the bearing lock nuts (335/336) suitably to make it free. The method for pumps with column length more than 2 M. as fper 8.3.25.

8.4.12 Place the motor on motor stool and tighten the nuts (The direction of rotation of motor should fbe checked before fitting on the motor stool or by removing coupling pins (404) if motor has already been fitted on stool. It should be CLOCKWISE when viewed from top.

9. OPERATION

9.1 **Prior to starting :**

9.1.1 Rotate the coupling by hand. It should rotate freely.

9.1.2 Minimum submergence is kept as specified (300 mm above the pump centre line).

9.1.3 Force the grease by grease gum into the copper pipes, if they are not filled up earlier. When the pumps are supplied with water lubrication system the rubber bearings should be pre-lubricated for 5 minutes with clear cold water from external source.

9.1.4 Close the delivery side sluice valve.

9.1.5 Check the supply voltage and it should be within the +5% range of the voltage indicated on the name plate of the motor.

9.2 **Putting the pump in operation :**

9.2.1 Start the pump. Let the motor pick up full speed.

9.2.2 Open the discharge valve.

9.2.3 Close the cock of external lubrication water if pumps are supplied with self water lubrication.

9.3 **Check during running :**

Check the following things and regulate if necessary :

9.3.1 Pump is running smooth.

Check vibration and noise. Stop the pump immediately, if there is an abnormal noise from the pump.

9.3.2 Power consumption is within the limit.

Check the current. It should not exceed the rated value specified on the name plate of the motor.

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

9.3.4 Head and capacity developed by the pump is as specified on the name plate of the pump.

9.3.5 Pump and motor bearings are not getting hot excessively.

9.3.6 Check the grease flow through tubes, removing acorn nut on three-way piece.

9.3.7 For the pumps with external water lubrication, check the pressure of external water. It should be 1 atmosphere above the maximum working head of the pump.

9.3.8 If any defects are detected, stop the pump immediately and it should not be started unless defects are rectified. Report immediately to the supplier if it is not possible to rectify the defect.

9.4 **Stopping the pump :**

9.4.1 Pump should be switched off only after closing the delivery side sluice valve.

9.4.2 In case of external water lubrication, it is to be stopped, only after pump comes to stand.

10. MAINTENANCE

10.1 **Daily checks :**

10.1.1 Pressure gauge reading.

10.1.2 Voltage and current.

10.1.3 Pump and motor bearing temperature.

10.1.4 Proper supply of grease to bearings.

10.1.5 Liquid level in the sump.

10.1.6 Working of grease lubricator.

10.1.7 Uninterrupted flow of lubrication water for water lubricated pumps.

10.2 **Periodical checks :**

10.2.1 Replenish the grease for bush bearisng, thrust bearings and motor bearings.

10.2.2 Check the vibration.

10.2.3 Check the liquid level controllers for their satisfactory operation.

10.2.4 Calibrate the measuring instruments.

10.2.5 Check the level of the motor stool. There are possibilities of disturbances to the level due to resetting of foundation or due to delivery pipeline strains.

10.2.6 Clean the sump as there are chances of deposition of the contents of the liquid handled.

IMPORTANT

If the pump is to be kept idle for long period, it should be run for short time once in a week at its maximum speed to prevent the shafts and impeller from sticking. Pump should never run dry. Dry running will result into seizing of bearing and other mating surfaces.

OVERHAULING

10.3.1 With normal daily operating spell the pump will be due for overhaul after about 10,000 working hours. This work should be carried out by specialized personnel.

10.3.2 After dismantling, parts are to be cleaned and checked throughly for wear and tear. Following parts are to be checked for clearance and replaced if it exceeds those given below :

i) Impeller & wear plate (only for SHS-Q pumps) : 1 mm
ii) Shat & bush bearing. : 0.55 mm

10.4 **Dismantling :**

10.4.1 Dismantling procedure of grease lubricated pumps. The procedure for dismantling is as follows :

10.4.1.1 Remove the delivery pipe connection.

10.4.1.2 Disconnect the motor.

10.4.1.3 Unscrew the bolts and take out the motor.

10.4.1.4 Remove the copper tubes connected to grease lubricator and motor stool. Disconnect grease lubricator alongwith pads from support plate (383).

10.4.1.5 Remove the coupling nuts and pins (404) alongwith the coupling bushes (400) and coupling washers (409). Remove the pump coupling (390) by using suitable puller alongwith coupling key (321).

10.4.1.6 Remove the bearing cover (270.1) by unscrewing the bolts.

10.4.1.7 Unscrew the two bearing nuts (335/336) so that the thrust bearing adapter (.272) thrust bearing (262) and the thrust bearing carrier (247) can be removed. Release bolts are provided.

Loosen the foundation bolts of motor stool and support plate (383).

10.4.1.8 Unscrew the pipe nut (338). Take out the support plate (383).

10.4.1.9 Now lift the entire pump unit with the help of bolts and fit clamps to the top column pipe (132) and top rising pipe (142.2).

10.4.1.10 Disconnect the copper tubes from motor stool. Remove the bolts holding the motor stool to the top column pipe. Take out the motor stool (290).

10.4.1.11 Lift the complete unit vertically with the clamps fixed to the top column pipe (132). Fix other set of clamps to the column pipe (133.1) and rising pipe (142.1). Let the complete unit rest on these clamps.

10.4.1.12 Loosen the bolts and take out the top column pipe. Similarly remove the top rising pipe (142.2).

10.4.1.13 Disconnect the head shaft (185) alongwith the screwed coupling (395). Remove the grease lubrication pipe, copper pipes (562.4).

10.4.1.14 Take out the bearing spider (246) with its covers (278).

10.4.1.15 Lift the unit on clamps and fix another clamps to the next column pipe and rising pipe. Repeat the procedure to remove intermediate column pipes, rising pipes and copper pipes.

10.4.1.16 After removal of the last bearing spider (245) take out the remaining unit out of the sump.

10.4.1.17 Disconnect the bend (280) alongwith the rising pipe (142.1). Disconnect copper tube (562.2).

10.4.1.18 Rest the unit vertically on bell mouth (211) carefully.

11.4.1.19 Remove the bottom column pipe (133.2).

10.4.1.20 Loosen the nuts holding casing cover (220) to the pump casing (107). Take out casing cover from the impeller & shaft assembly.

10.4.1.21 Hold other end of the shaft by spanner & unscrew the impeller screw (669) by using allen key.

10.4.1.22 Pull out the impeller (151). Remove impeller key (320).

10.4.1.23 Disconnect bell mouth (211) from the pump casing (107).

10.4.1.24 Remove impeller shaft sleeve (311) alongwith its key (323) from impeller shaft. After ddismantling all parts as above, it will be necessary to clean them & inspect them for any wear & tear. If any part is found to be wornout, the same should be replaced with new-one & then only work of reassembly should be undertaken.

10.4.2 Dismantling procedure for water lubricated pumps :

10.4.2.1 Remove the delivery pipe connection, water lubrication pipe connections etc.

10.4.2.2 Disconnect the motor connections.

10.4.2.3 Unscrew the nuts and take out the motor.

10.4.2.4 Remove the coupling nuts and pipe (404) alongwith the coupling bushes (400) and washers (409). Remove the pump coupling (390) by using suitable puller alongwith coupling key.

10.4.2.5 Remove the bearing cover (270.1) alongwith the oil seal (500.1) by unscrewing the bolts.

10.4.2.6 Unscrew the two bearing nuts (335/336) so that the thrust bearing adapter (272) thrust bearing (262) and the thrust bearing carrier (247) can be removed.

10.4.2.7 Unscrew the pipe nut (338) and the water lubrication pipe nuts (336.1)

10.4.2.8 Fix eye bolts to the motor stool. Take out the support plates (383).

10.4.2.9 Now lift the entire unit with the help of lifting eye bolts and fit the clamps to the column pipe and rising pipe. Rest the unit on these clamps.

10.4.2.10 Remove the bolts holding the motor stool (290) and the top column pipe (132). Take out the motor stool (290).

10.4.2.11 Lift the unit vertically. Fix other pair of the clamps to column pipe (133.1) and rising pipe (142.1). Let the unit rest on the clamps fixed to the column pipe and rising pipe.

10.4.2.12 Unscrew the bolts and take out the top column pipe (132).

10.4.2.13 Disconnect the head shaft (185) alongwith the screwed coupling (395). Remove the water lubrication pipe (535). Disconnect the top rising pipe (142.2).

10.4.2.14 Take out the bearing spider (245).

10.4.2.15 Lift the unit on the clamps and fix another clamps to the next column pipe (133.1) and rising pipe (142). Repeat the procedure to remove the intermediate column pipes, rising pipes and water lubrication pipes.

10.4.2.16 After removal of the last bearings spider (245) take out the remaining unit out of the sump.

10.4.2.17 Disconnect the bend (280) alongwith the rising pipe (142.1) and the water lubrication pipe (535.4).

10.4.2.18 Rest the unit vertically on bell mouth (211) carefully.

10.4.2.19 Remove the bottom column pipe.

10.4.2.20 Loosen the nuts holding casing cover (220) to the pump casing (107). Take out casing cover from the impeller and shaft assembly.

10.4.2.21 Hold other end of the shaft by spanner and unscrew the impeller screw (669) by using Allen key.

10.4.2.22 Pull out the impeller (151). Remove impeller key (320).

10.4.2.23 Disconnect the bell mouth (211) from the pump casing (107).

10.4.2.24 Remove impeller shaft sleeve (311) alongwith its key (323) from impeller shaft.

After dismantling all the parts, as above it will be necessary to clean them & inspect them for any wear & tear. If any part is found to be wornout the saine should be replaced with newone & then only work of reassembling should be undertaken.

10.5 **Reassembly**

Follow the procedure given below in case of pumps to be assembled after dismantling for overhauling. Clean all the parts thorughly in kerosene, petrol or benzene to remove dust, dirt etc. Replace the parts with a newone if found damaged.

In case of replacement of bush drill & tap (M6 x 12L) the bush and mating part together, at the junction of the two & fit a grub screw in the tapped hole to avoid rotation of bush.

10.5.1 Reassembly of grease lubricated pumps :

10.5.1.1 Put the impeller shaft sleeve (311) on pump shaft (180)/impeller shaft (186).

10.5.1.2 Slide impeller on shaft & tighten the impeller screw (669) with its gasket (682) by using Allen key.

10.5.1.3 Fix bearing covers (271) with oil seals (500.4) to casing cover (220) already fitted with bearing bush (353).

10.5.1.4 Fix bell mouth (211) on pump casing (107) & tighten diametrically opposite nuts one by one.

10.5.1.5 Insert casing cover (220) on pump shaft (186)/impeller shaft (180). Insert the whole assembly so far made into pump casing (107) with gasket in proper position. Tighten dimetrically opposite nuts evenly.

10.5.1.6 Mount the column pipe (133.2/132) on casing cover. Tighten opposite nuts one by one.

10.5.1.7 Pump with column length more than 2 M.

Fix bearing covers (278) with oil seals (500.3) to bearing spider (245) already fitted with bearing bush (351). Mount bearing spider (245) on column pipe (133.2). Follow the procedure given in 8.1.1.

10.5.1.8 Pump with column length upto 2 M.

10.5.1.8.1 Fix adapter pieces (559) to casing cover (220) and motor stool (290). Connect copper tube (562.2) to these adapters.

10.5.1.8.2 Connect bend (280), rising pipe (142.2) to the pump nozzle. Insert packing between flanges before connecting them.

10.5.1.8.3 Fix clamps to the column pipe (132) and rising pipe (142.2). Arrange the clamps in such a way that both the clamps will be at the same height to facilitate smooth erection.

10.5.1.8.4 Lift the unit vertically with the help of slings and chain pulley block. While lifting take care that bell mouth will not drag against the floor.

10.5.1.8.5 Fit the pipe nut (338) for rising pipe and follow the procedure from 8.1.16.

10.5.2 Reassembly of water lubricated pumps :

Follow the procedure given below in case of pumps to be assembled after dismantling for overhauling. Clean all the parts thoroughly in Kerosene, Petrol or Benzene to remove dust, dirt etc. Replace the parts with a new one if found damaged.

10.5.2.1 Put the impeller shaft sleeve (311) on pump shaft (180)/impeller shaft (186).

10.5.2.2 Slide impeller on shaft & tighten the impeller screw (669) with its gasket (682) by using Allen key.

10.5.2.3 Fix bearing cover (271.1) & bearing cover (271.2) with sealing ring (194) to the casifng cover (220). Provided casing cover is already fitted with rubber bearing (354). (The same is applicabfle for external water lubricated pumps.)

10.5.2.4 Fix bell mouth (211) on the pump casing (107) & tighten diametrically opposite nuts one by one.

10.5.2.5 Insert casing cover (220) on pump shaft (186)/Impeller shaft (180). Insert the whole assembly so far made into pump casing (107) with gasket in proper position. Tighten diametrically opposite nuts evenly.

10.5.2.6 Mount the column pipe (132.2/132) on casing cover. Tighten opposite nuts one by one.

10.5.2.7 Pump with column length more than 2 M.

Press the rubber bearing (357) into the bearing spider (245). Fit grub screw. Mount bearing spider on the column pipe (133.2) Fix bearing cover (278) to bearisng spider (245).

Follow the procedure given in 8.3.2.

10.5.2.8 Pump with column length less than 2 M.

10.5.2.8.1 Connect pipe nipple (535.4) with half part of union joint (545.2) to the bearisng cover (271.1). Make further pipe connection upto pipe nipple (535). (The same is applicable only for water lubricated pump)

10.5.2.8.2 Connect bend (280) and rising pipe (142.2) to the pump nozzle. Insert packing between the flanges before connecting them.

10.5.2.8.3 Fix the clamps to the column pipe (132) and rising pipe (242.2). Arrange the clamps in such a way that both the clamps will be at the same height to facilitate smooth erection.

10.5.2.8.4 Lift the unit vertically with the help of slings and chain pulley block. While lifting take care that bell mouth will not drag against the floor.

10.5.2.8.5 Put two girders on strong wooden logs across the foundation to rest the clamps while erecting. Lower the unit in the sump till the clamps rest on girders.

10.5.2.8.6 Fit the pipe nut (338.2) for fixing pipe and lock nut (338.1) on the water lubrication pipe if exists.

Follow the procedure from 8.3.17.

11. TECHNICAL SPECIFICATION :

11.1 Lubricants for thrust ball bearing and bush bearings. Thrust ball bearing and all bronze bush bearings are grease lubricated. The grease should be free from dirt and dust. The grease should conform to the following specifications or their equivalents available in the market :

a) Indian Oil : Servogem-3
b) Caltex : Regal starfak No. 3
c) Hindustan Petroleum : Lithon-3 or Natra-3

Refilling period–after 1000 hrs. of working.

11.2 The grease for bush bearings when pumps are grease lubricated. (Line shaft bearings)

It should conform to the following grades or their equivalents available in the market :

a) Indian Oil : Servorex-L-01
b) Caltex : H-Grease No. 1-EP
c) Hindustan Petroluem : Limpplex-0

Refilling period–Continuous through grease lubricator.

11.3 Water lubrication when pumps are liquid lubricated. The rubber bearings are lubricated by clear cold water. The bearings are lubricated from external source water if the water handled by the pump is not clear and cold. The pressure of the water from external source should be 1 kg/cm^2 above the maximum pressure developed by the pump.
Qty of water – 30 L/M.

It is suggested to use/flow indicatior in the water lubricating pipe to ensure flow of the lubricating water. The rubber bearings are to be prelubricated for about 5 minutes from external sources before starting the pump.

11.4 Bearing temperature :

The permissible bearing temperature rise is 40°C above ambient temperature.

11.5 Thrust ball bearing SKF-51310 or its equivalent. SKF-51311 or its equivalent for SHS 150/40, 200/32, 200/40 pumps only.

11.6 **Direction of rotation :**

The direction of rotation is clockwise when viewed from the top of the pump.

12 SPARE PARTS LIST
SPECIFICATION LIST OF SHS PUMP

Part No.	Description	No. per Set
107	Pump Casing	1
130	Pump Casing Spacer (for SH-S/R Pump)	1
132	Column Pipe (Top)	1
133.01	Standard Column Pipe	*
132.2	Bottom Column Pipe	1
142.1	Rising Pipe (Std.)	*
142.2	Rising Pipe	1
151**	Impeller (SHS/N & SHS/P Pumps)	1
153**	Impeller Semi Open (SHS/Q Pumps)	1
166*	Impeller Free Flow (for SHS/R Pumps)	1
180**	Pump Shaft	1
184**	Intermediate Shaft	*
185**	Head Shaft	1
186**	Impeller Shaft	1
190**	Casing Ring (for SHS/N & SHS/P Pumps)	1
194**	Sealing Ring	1
211	Bell Mouth	1
220	Casing Cover	1
245	Bearing Spider	*
247	Thrust Bearing Carrier	1
262**	Thrust Ball Bearing SKF or Equivalent	1
270.1	Bearing Cover for Head Shaft	1
270.2	Bearing Cover for Head Shaft	1
271	Bearing Cover for Impeller Shaft Bearing	2
271.2	Bearing Cover for Impeller Shaft D. S.	1
271.1	Bearing Cover for Impeller Shaft Pump Side	1
272	Thrust Bearing Adapter	1
278	Bearing Cover for Bearing Spider	*

Part No.	Description	No. per Set
280	Bend	1
290	Motor Stool	1
311**	Shaft Sleeve Pump Side	1
312**	Intermediate Shaft Sleeve	*
320**	Key for Impeller	1
321	Key for Coupling	1
323**	Key for Shaft Sleeve	1
335	Bearing Nut	1
336	Lock Nut	1
338.1	Pipe Nut for Lub. Pipe	*
338.2	Pipe Nut for Rising Pipe	2
351**	Intermediate Bearing Bush	*
352**	Bearing Bush for Head Shaft	1
353**	Bearing Bush for Impeller Shaft	1
354**	Rubber Bearing for Impeller Shaft	1
357**	Rubber Bearing for Bearing Spider	*
383	Support Plate for Rising Pipe	1
390	Coupling Half Pump Side	1
391	Coupling Half Driver Side	1
395	Screwed Coupling	*
400**	Coupling Bushes	*
404**	Coupling Pins	*
408**	Nut for Coupling Pins	*
409	Washers for Coupling Pins	*
441	Grease Nipple	2
460**	Wear Plate (for ShS/Q & SHS/R Pumps)	1
470	Inspection Cover	1
479	Helicoil Lock Insert	1
490**	Companion Flange	*
500.1**	Oil Seals D. S.	1
500.2**	Oil Seal Pump Side	1
500.3**	Oil Seal for Bearing Spider	*
500.4**	Oil Seal for Casing Cover	2
511**	Gasket for Casing Cover	1
513.1**	Gasket for Companion Flange	*
513.2**	Gasket for Bend	1
535.1	Pipe Nipple	1
535.2	Pipe Nipple	3

Part No.	Description	No. per Set
535.3	Pipe Nipple	1
535.4	Pipe Nipple	*
535.5	Pipe for Lubrication	*
540.1	Socker Delivery End	1
540.2	Socket for Rising Pipe	*
542	Elbow	1
544	Reducer	1
545.1	Union Joint	*
545.2	Union Joint	*
546	Tee 1/2" BSP	*
550	Wheel Cock	1
558	Sealing Nut	*
559	Adapter Piece	*
560	Copper Pipe	*
562.1	Nylon tube (above Motor Stool)	1
562.2	Copper Pipe (for Casing Cover)	1
562.3	Nylon tube (above Motor Stool)	1
562.4	Copper Pipe (for third Bearing Spider)	1
562.5	Nylon Tube (above Motor Stool)	1
562.6	Copper Pipe (for Second Bearing Spider)	1
562.7	Nylon Tube (above Motor Stool)	1
562.8	Copper Pipe (for fourth Bearing Spider)	1
669**	Screw for Impeller	1
682**	Gasket for Impeller Screw	1
506	Adapter Flange	1

NOTE :

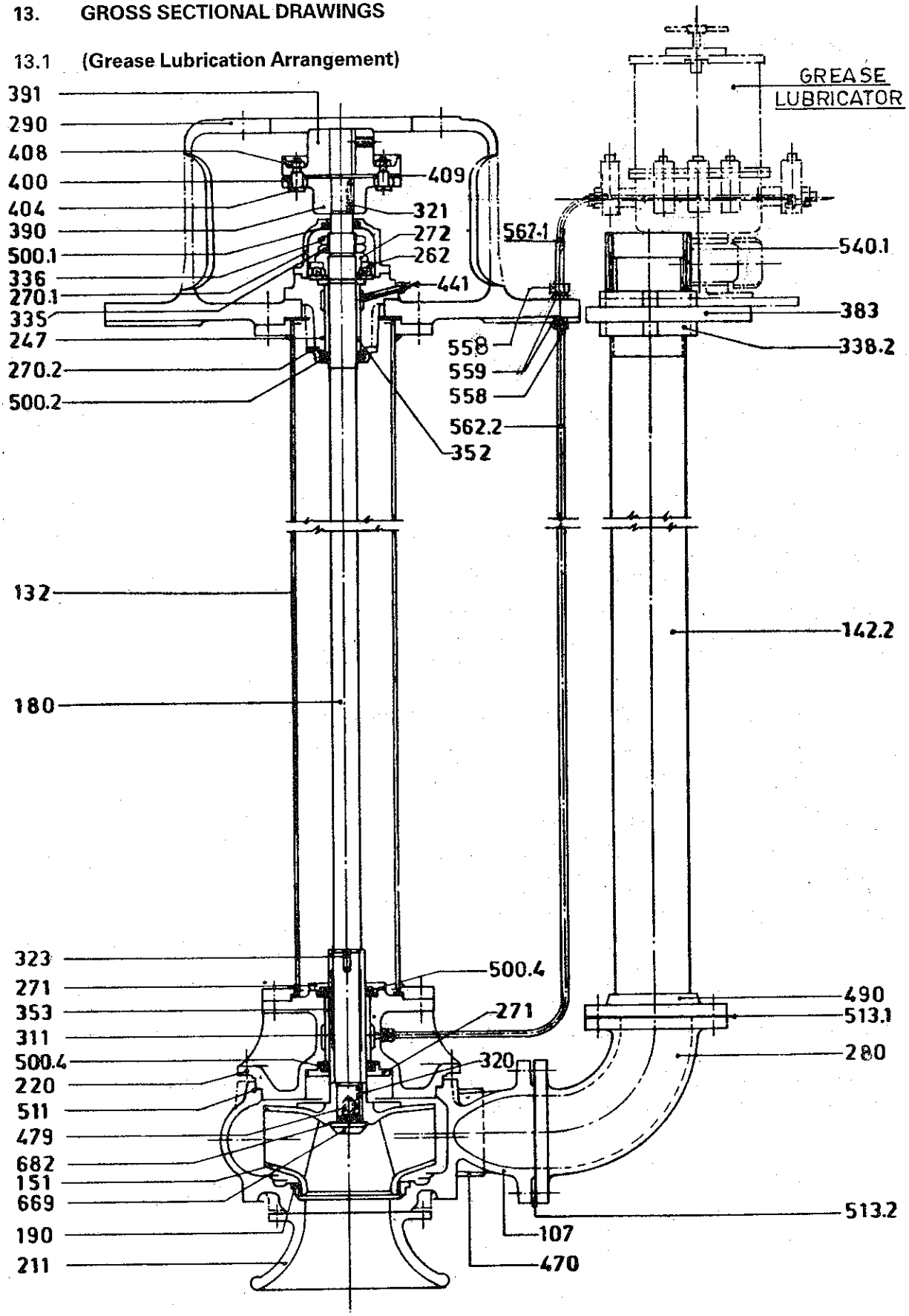
1. * Quantity will depend upon column length.

2. ** Recommended spares for two years normal working.

3. Pipe flange is provided instead of socket for rising pipe 6" & above, and pipe flange supplied against O/A for rising pipe 4" & below sizes.

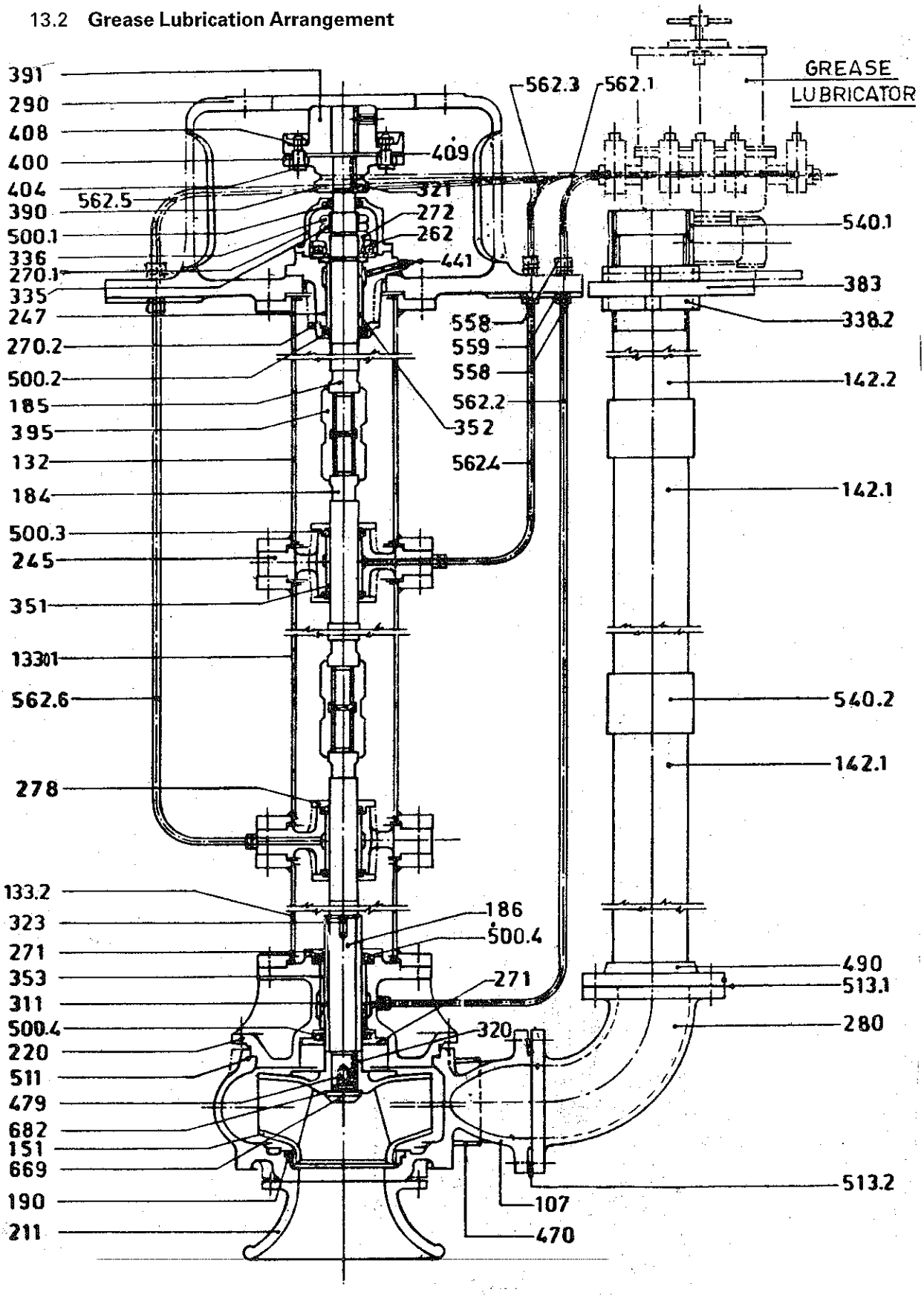
13. GROSS SECTIONAL DRAWINGS

13.1 (Grease Lubrication Arrangement)



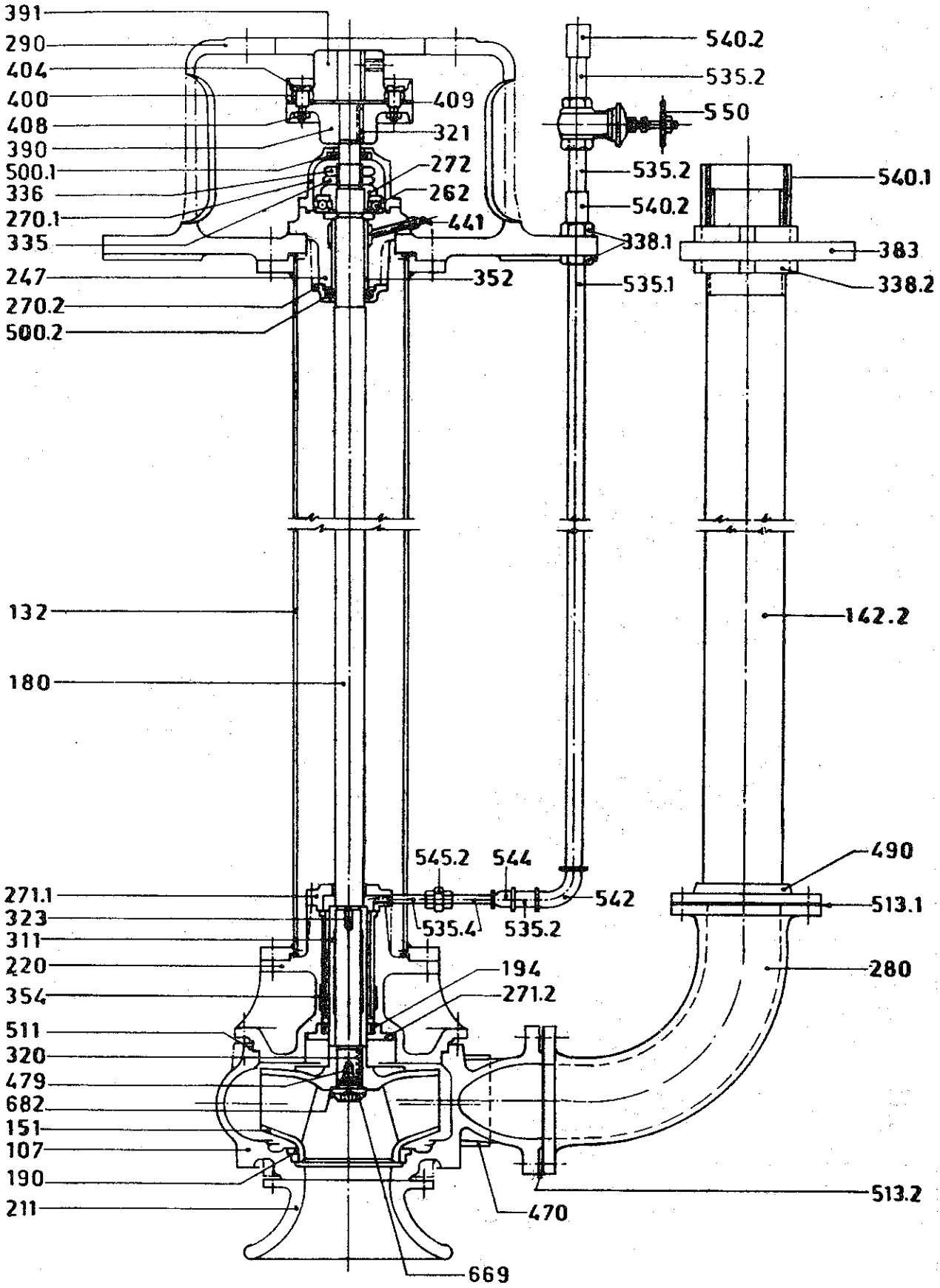
CROSS SECTIONAL ASSEMBLY WITH COLUMN LENGTH UP TO 2 metres

13.2 Grease Lubrication Arrangement



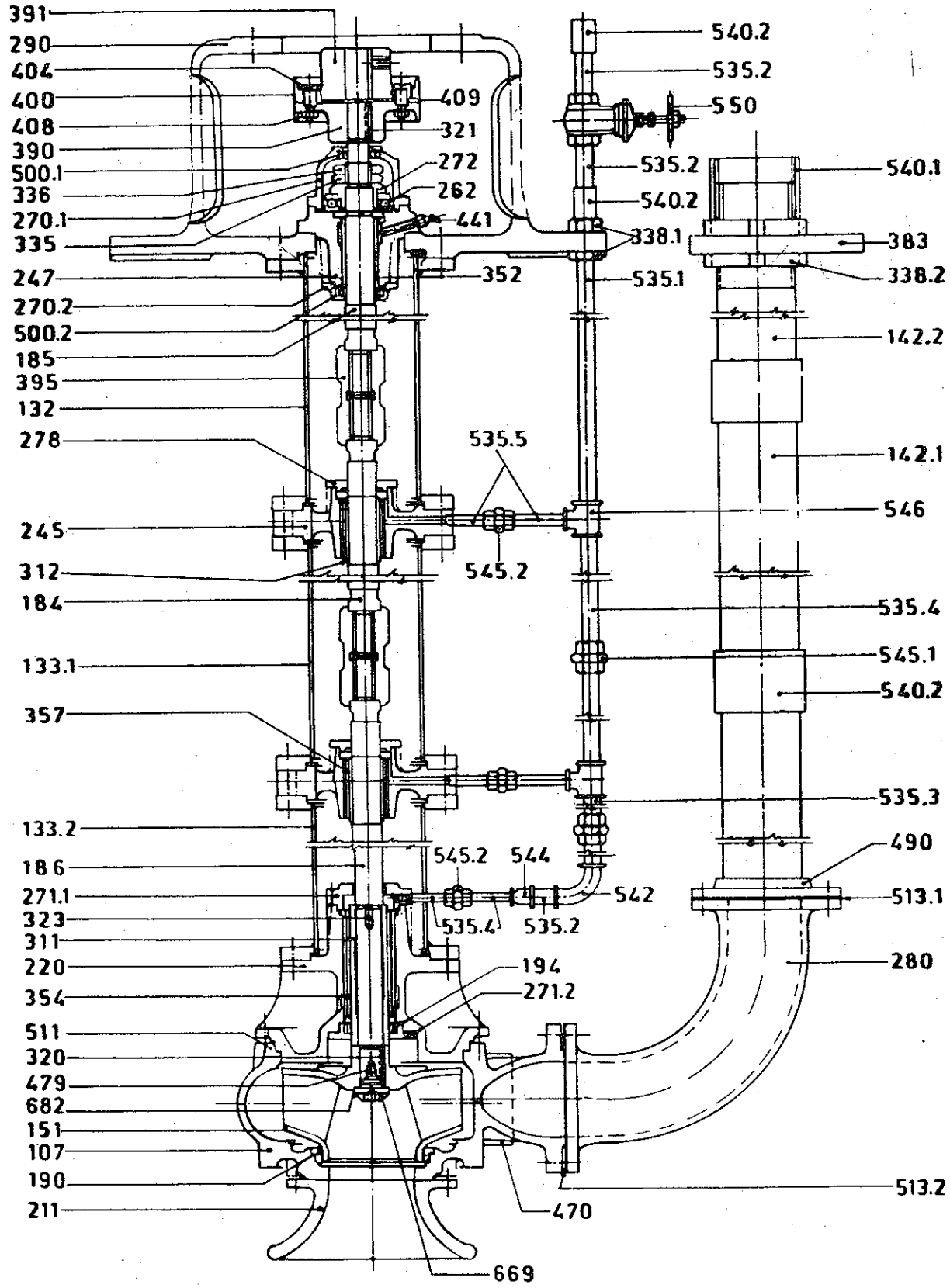
CROSS SECTIONAL ASSEMBLY WITH COLUMN LENGTH MORE THAN 2 metres

13.3 **External/Self Water Lubrication Arrangement**



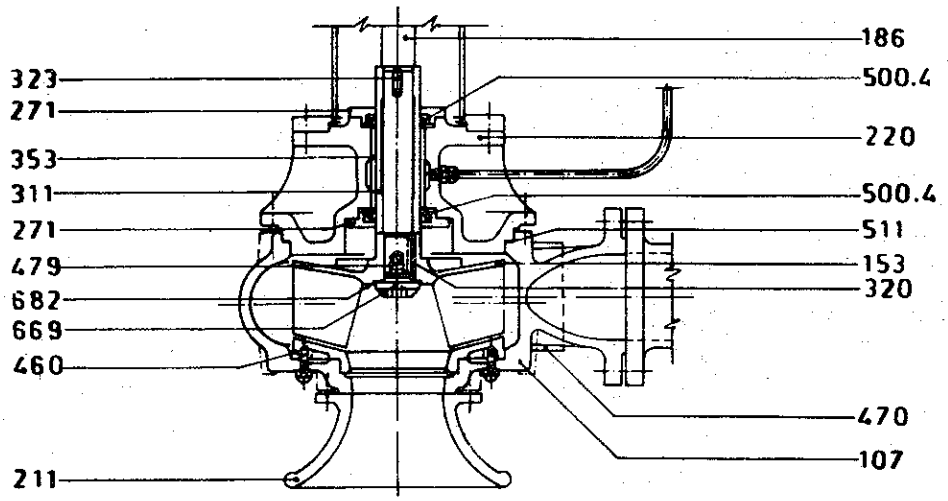
CROSS SECTIONAL ASSEMBLY WITH COLUMN LENGTH UP TO 2 metres

13.4 External/Self Water Lubrication Arrangement

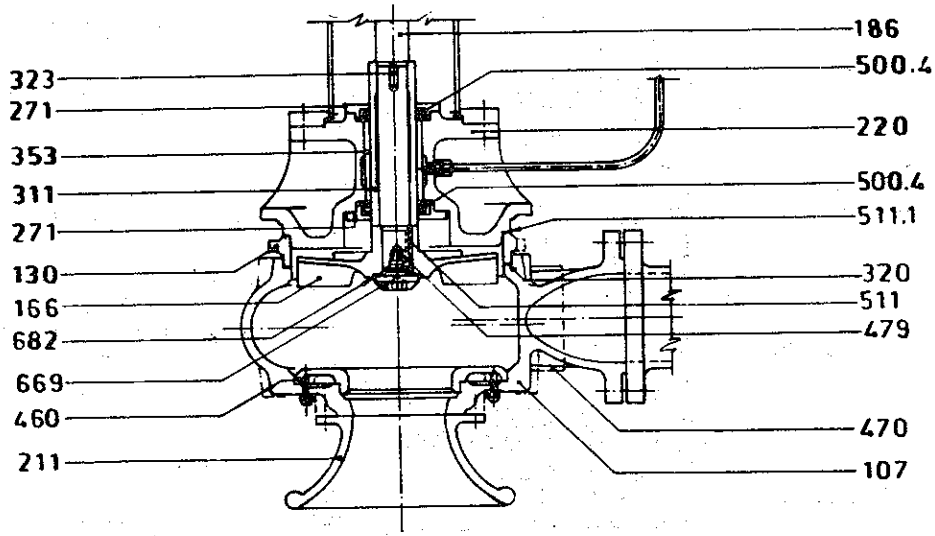


CROSS SECTIONAL ASSEMBLY WITH COLUMN LENGTH MORE THAN 2 metres

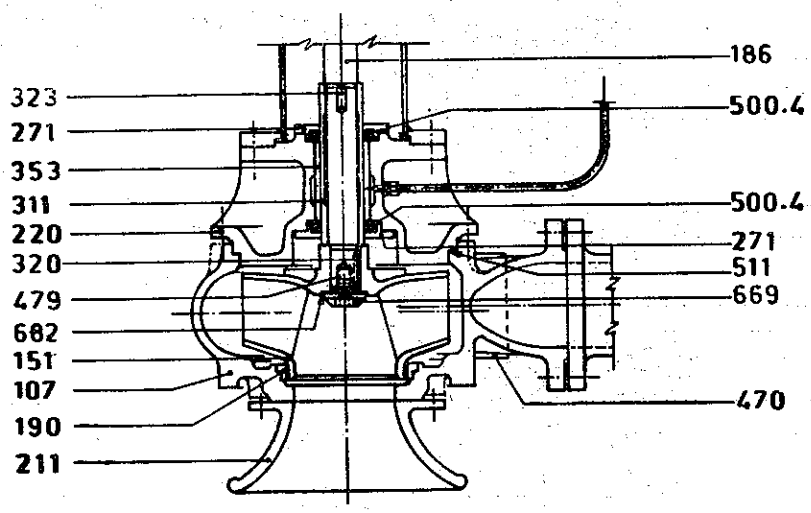
13.5 Pump Unit of SHS Pump (Grease Lubricated Arrangement)



PUMP UNIT OF 'SHS' PUMP WITH 'Q' TYPE IMPELLER

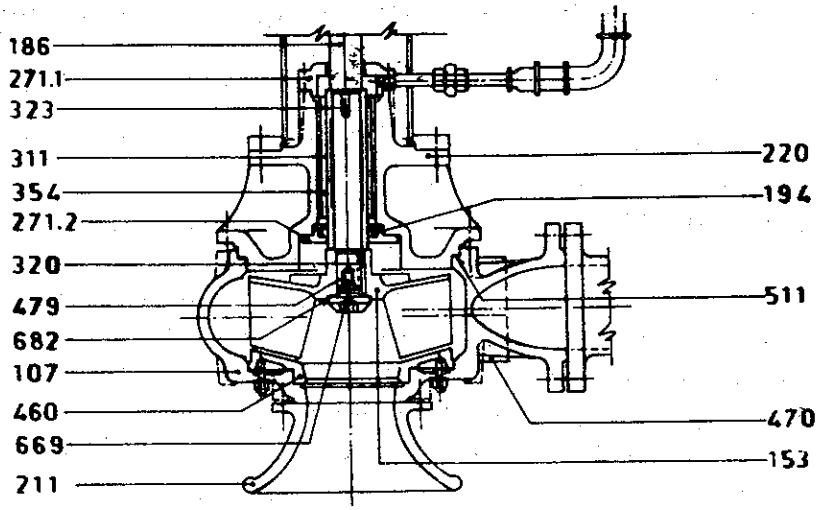


PUMP UNIT OF 'SHS' PUMP 'R' TYPE IMPELLER

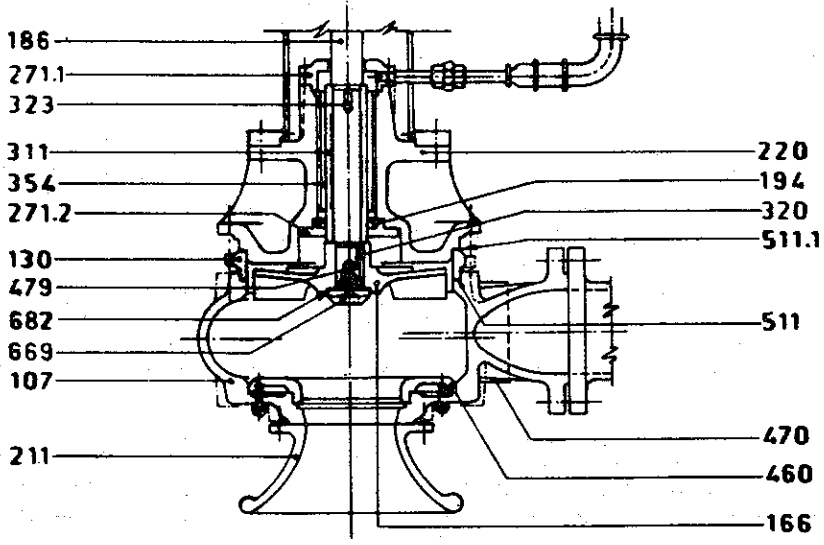


PUMP UNIT OF 'SHS' WITH 'N' & 'P' TYPE IMPELLER

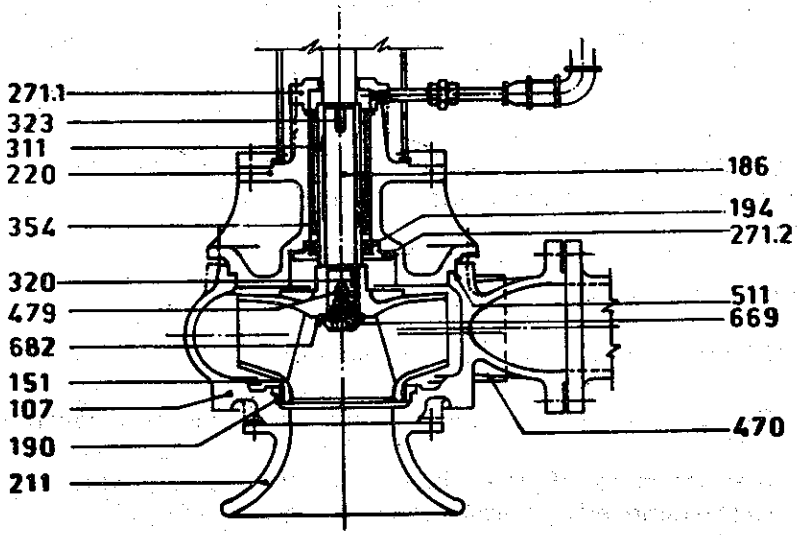
13.6 Pump Units of SHS Pump with External Water Lubrication Arrangement



PUMP UNIT OF SHS ' PUMP WITH 'Q' TYPE IMPELLER



PUMP UNIT OF 'SHS' PUMP WITH 'R' TYPE IMPELLER



PUMP UNIT OF SHS WITH 'N' & 'P' TYPE IMPELLER

14. INSTRUCTIONS ON GREASE LUBRICATOR

14.1 General Description

The grease lubricator is motor driven & provides a compact unit for delivering soft grease under pressure to a given number of different transmission bearing points.

14.2 Specifications :

a)	Reservoir Capacity	:	1.5 litres
b)	Max. No. of outlets (pump element)	:	5
c)	Del. pr. Kg/Cm^2	:	200 (Max.)
d)	Dose of pump/cycle (adjustable) in cc	:	0.05 to 0.025 (Max 5 gms/min) per pump element
e)	Reduction ratio of drive	:	70:1
f)	Motor rating HP 3 phase, 415 volt, 1500 rpm	:	0.16
g)	Overall size	:	Length - 400 mm Width - 250 mm Height - 495 mm

14.3 Operation :

Grease Lubricator is a device to discharge metered amount of grease from different plunger pumps housed in a common body. Each plunger pump delivers grease at a high pressure to the lubrication point independently.

Grease lubricator comprises of a single pumping station having a number of pump element assemblies placed radially and fitted onto the outer periphery of the housing. These pump elements are actuated by a cam which is rotated by a speed reduction drive coupled to an electric motor.

The dose per cyole of the pump element is adjustable & can be set for the desired output 'in situ' by an adjusting screw provided in each pumps-element. A locking nut has been provided to lock the adjusting screw in derived position.

Reservoir stores the grease. It is provided with a reflector plate inside which continuously stirs the grease during rotation of cam. For filling grease into the reservoir, a port in the front side of the housing is provided.

This system is meant for continuous running. However these type of lubricators are run intermitlently manually or through controller. Where on time is a parameter for running the lubricator while off time is idle. (This is a not a standard Scope of Supply).

14.4 Priming procedure for Grease Lubricator :

a) Fill the reservoir with oil ($^1/_3$ of reservoir)

b) Connect nylon tubes to the copper tubes of pumps (below motor stool).

c) Start the motor of grease lubricator & fully open first plunger, slowly the air will be removed by pressurised oil & it is ensured by observing decrease in oil level in reservoir. Then open one by one all plungers & ensure that air is removed.

14.5 **Maintenance :**

Normally the lubricator shall not give any problem while functioning. However, it all depends upon the purity of the grease filled in the reservoir. Adjustment of the dosage shall be done by adjusting screws provided with each plunger pump.

Precaution :

a) Make sure that direction of rotation of motor is as per the marking.

b) Gear box is filled with oil.

c) Adjustment of the discharge from the plunger pump is done & then locked permanently. The clockwise rotation shall decrease discharge of pump and vice versa.

d) Tubing taken from the pump is connected with the ferrule connection. Tubing should fbe preferably of 6 mm OD.

e) Grease filled in the lubricator must be absolutely clean and the lid is to be closed and locked.

f) If any plunger is not required to be used, please donot block it otherwise the pressure will build in the pump & body may burst. In such case remove the plunger pump assembly & close the part by a plug having M22 x 1.5 thread.

g) It is recommended that after every six months, total system must be cleaned thoroughly & plunger pump must be inserted with proper alignment so that cam touching the plunger pumps is not overloaded.

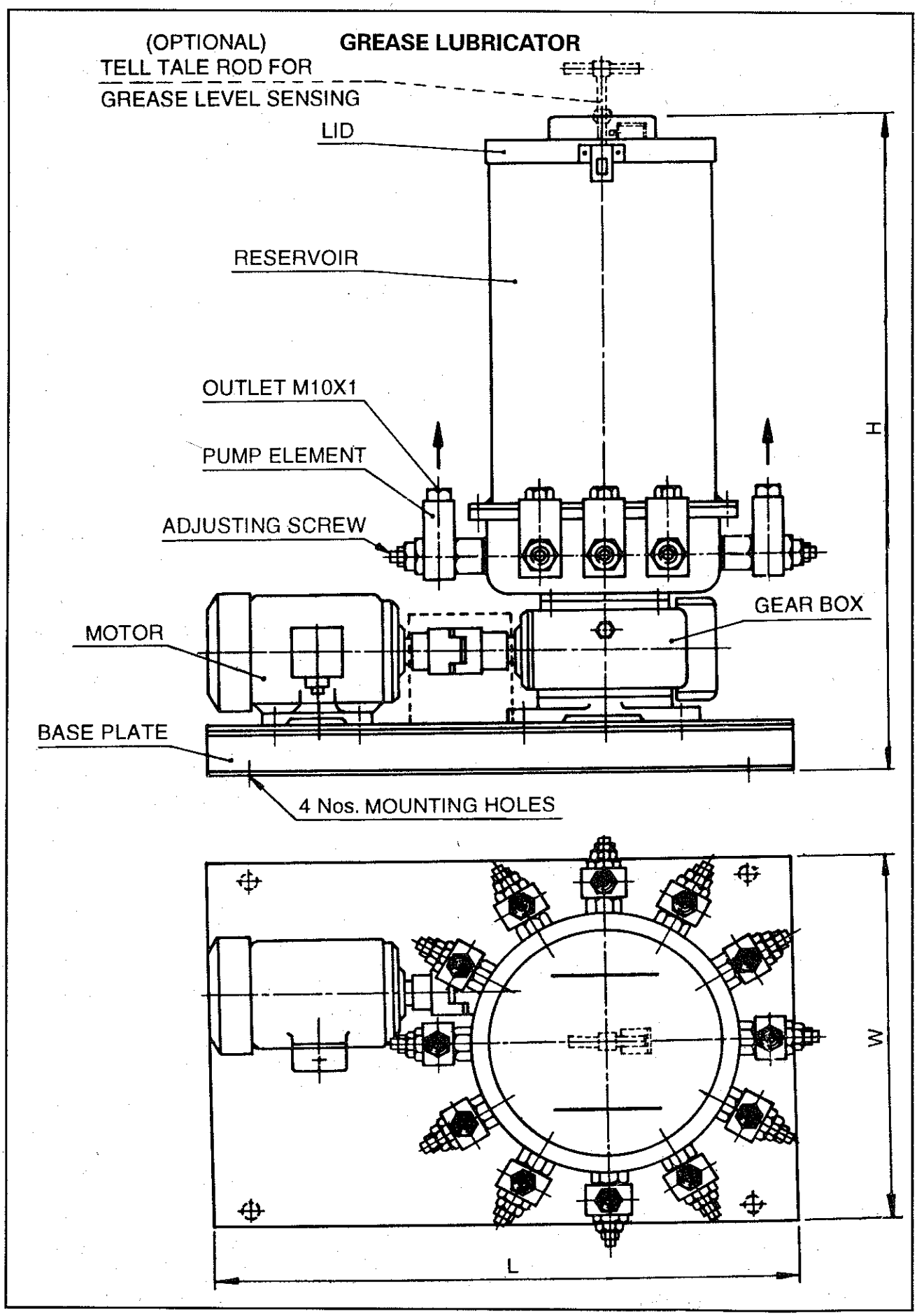
h) With consumption of grease, dead weight slips down and ultimately at minimum grease level it operates a micro switch provided at top cover. Care to be taken that at this juncture & grease to be filled from the bottom port provided at the housing by the help of transfer pump directly.

i) If relief valve is used in each line taken from the pump, the out put of relief valve shall be put back into the reservoir.

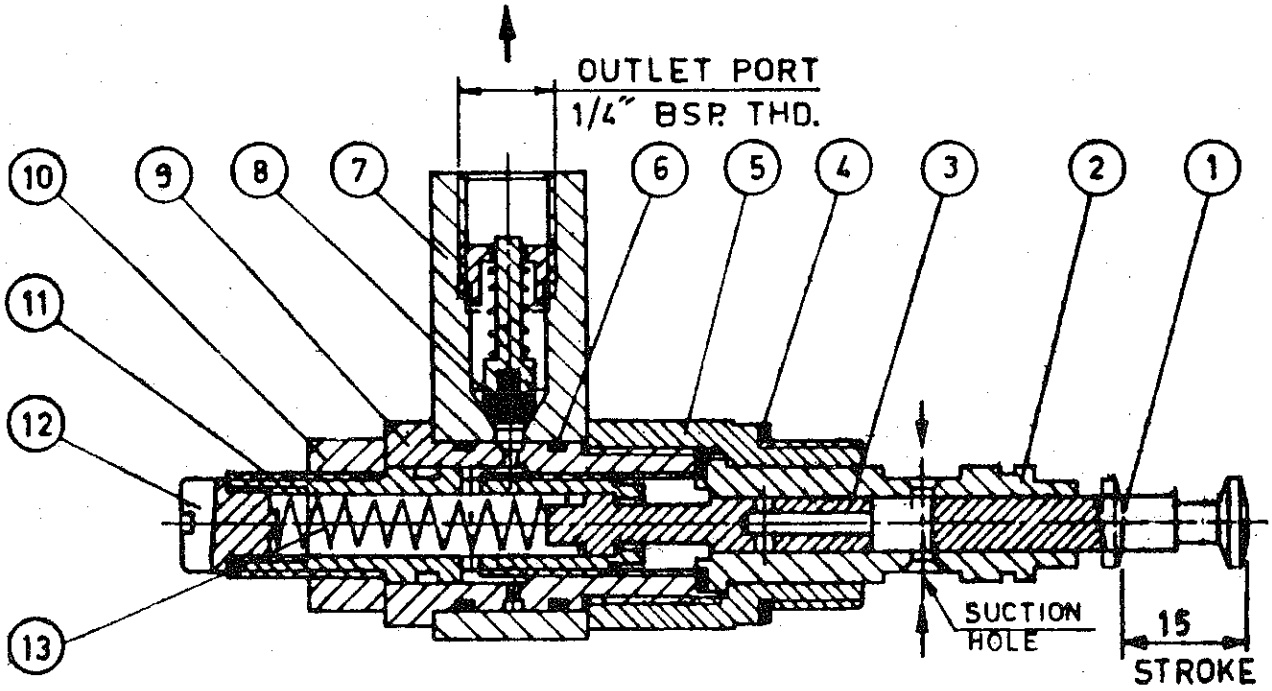
j) These lubricators are good for any grease upto NLGI-II

k) Grease Specifications :

Indian Oil	SERVOREX L.O.
Caltex	H GREASE No. 1 (EP)
Hindustan Petroleum	LIMPEX - O


(OPTIONAL) GREASE LUBRICATOR
TELL TALE ROD FOR
GREASE LEVEL SENSING
LID
RESERVOIR
OUTLET M10X1
PUMP ELEMENT
ADJUSTING SCREW
GEAR BOX
MOTOR
BASE PLATE
4 Nos. MOUNTING HOLES
H
W
L

PUMP ELEMENT ASSEMBLY



ITEM NO.	DESCRIPTION	QTY
1.	PLUNGER (OUTER)	1
2.	PLUNGER BODY	1
3.	PLUNGER (INNER)	1
4.	WASHER	1
5.	THREADED SLEEVE	1
6.	O-RING	1
7.	BANJO	1
8.	CHECK VALVE ASSY.	1
9.	THREADED BUSH	1
10.	JAMNUT	1
11.	SHELL	1
12.	ADJUSTING SCREW	1
13.	SPRING	1

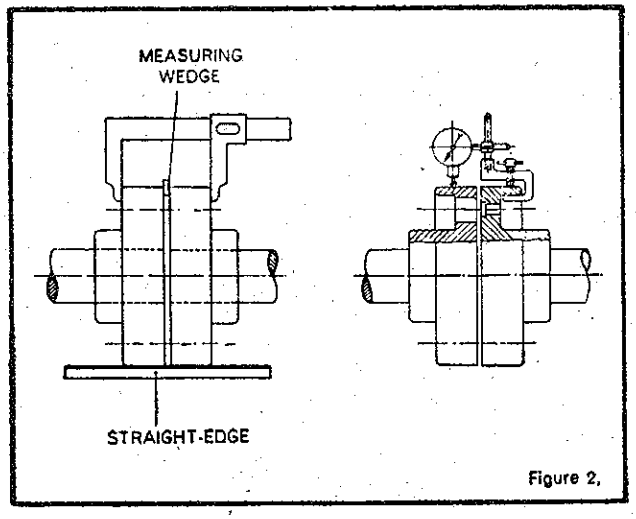
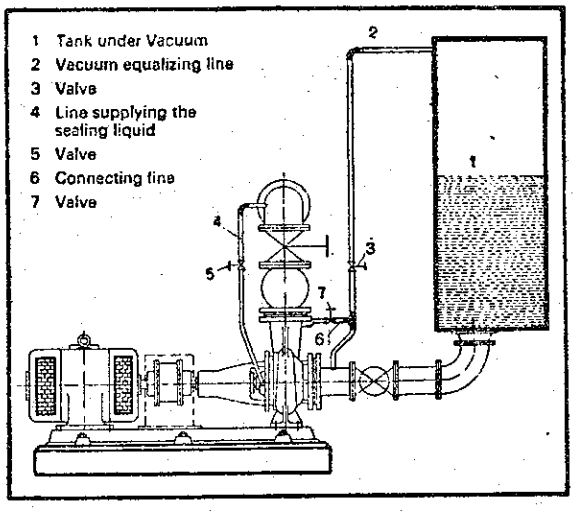


Figure 2.



A check for parallel alignment is made by placing a straight-edge across both coupling periphery at the top, bottom 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 delivery 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 at least 450 mm. The end of the suction pipe should be provided with a strainer of 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 protect 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 vacuum 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 the non-return valve.

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 bearings 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.

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 rigid 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.

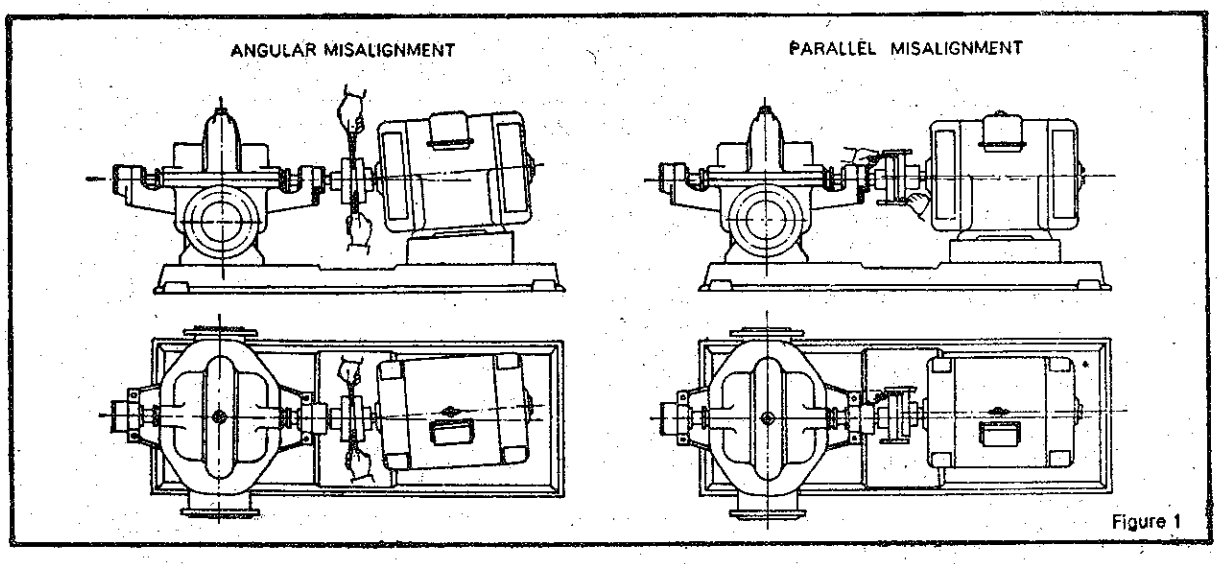


Figure 1

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.

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 remember 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

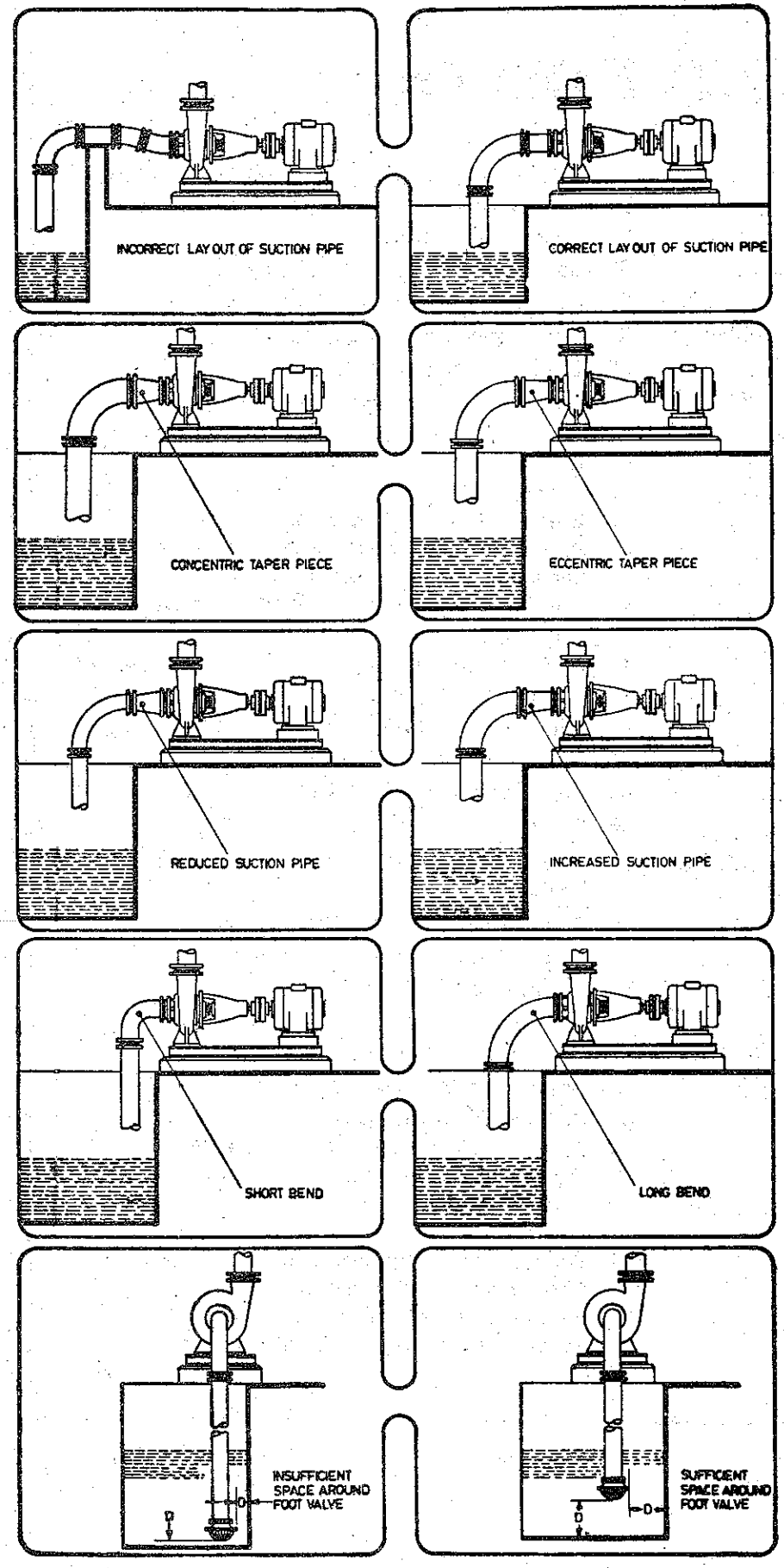
CHECK POINTS

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 Bearings 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 of 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 balanced
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.

Enriching Lives

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

6.0) SAFETY INSTRUCTIONS WHILE MAINTENANCE & SERVICING

Do not attempt repairs, you do not understand. Use proper tools.

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

Isolate the equipment before any maintenance work is done. Switch off the main supply, remove fuses, apply lockouts 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 locations by removal of bearing housing and shaft assembly to a suitable maintenance area.

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 contain fibrous material, as these can be hazardous when the fibrous dust is inhaled. Be cautious, if other supplier's components have been substituted for genuine KBL parts, these may then contain hazardous materials.

Store all oily rags or other flammable material in a protective container in a safe place. Do not weld or flame cut on pipes/tubes that contents flammable fluids. Clean them thoroughly with nonflammable solvent before welding or flame cutting on them. Use solvent/chemical resistant gloves for hand protection.

Dispose of all wastes like gaskets, gland packing, oil, batteries, packing material etc. in accordance with local regulations. Normally this would involve incineration of liquid waste and controlled landfill of polymerised material.

Adequacy of suitable crane should be checked before lifting the purnp/pump components. Also condition of pulleys, chain and lifting shackles should be checked before use.

3.0) SAFETY INSTRUCTIONS WHILE HANDLING AND STORAGE

When lifting the pump, use the lifting points specified on general arrangement drawing, if provided. 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 forklift truck and chain crane sling equipment is recommended but locally approved equipment of suitable rating may be used. While lifting, the equipment adjusts the center of gravity, so that it is balanced properly.

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, replace afterwards to protect the pump and maintain safety.

4.0) SAFETY INSTRUCTIONS WHILE ASSEMBLY & INSTALLATION

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°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.

5.0) SAFETY INSTRUCTIONS WHILE COMMISSIONING & OPERATION

Never attempt adjustments while the pump is running, unless otherwise specified in the operation, maintenance manual.

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.

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 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 warning signal can be heard with car 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.

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. Installation, operation & maintenance personnel must use safe working practices at all the times.

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

A Pump 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 person net responsible for installation, operation and maintenance and they must be trained, adequately qualified and supplied with appropriate tools for their respective tasks.

1.3) Most accidents involving product operation, maintenance and repair are caused by failure to observe safety rules or precautions. An accident can often be avoided by recognizing potentially situations before an accident occurs. A person must be aware of potential hazard associated in activities of installation, operation & maintenance of equipments.

1.4) 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.

1.5) Ear defenders should be worn where the specified Equipment noise level exceeds locally defined safe Levels. Safety glasses or goggles or face shield should be worn where working with pressurised systems and hazardous substances. Other personal protection equipment must be worn where local rules apply. Wear safety shoes, helmets and cotton overalls (Apron) when you enter pump house. Noise level should not exceed 90 dbA and 110 dbA for motor driven and engine driven pumps respectively.

1.6) Do not wear loose clothing or jewelry, which could catch on the controls or become trapped in the equipment.

1.7) 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.

1.8) 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.

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

1.10) Use suitable earthing and tripping devices for electrical equipments.

2.1) **IMPROPER INSTALLATION, OPERATION, MAINTENANCE, LUBRICATION, REPAIR OF THIS KBL PRODUCT COULD RESULT IN INJURY OR DEATH.**

If tool, procedure work method are operating technique not specifically recommended by KIRLOSKAR BROTHERS LIMITED is used, it should be ensured that it is a safe for personnel around and others. It should also be ensured that the product will not be damaged or made unsafe by the operation, lubrication, and maintenance or repair procedures you choose.

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