



Enriching Lives

**INSTRUCTIONS ON
INSTALLATION
OPERATION AND
MAINTENANCE FOR**

**KIRLOSKAR PUMP
TYPE SHL AND
SHL-V (DIRECT MOUNTED)**

KIRLOSKAR BROTHERS LIMITED

UDYOG BHAVAN, TILAK ROAD, PUNE - 411 002

KIRLOSKAR BROTHERS LIMITED
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 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

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Please furnish complete nameplate details, name of parts, part nos. And material of construction while ordering spare parts for the pumps.

CAUTION:

THIS INSTRUCTION MANUAL COVERS THE GENERAL REQUIREMENT OF INSTALLATION, OPERATION AND MAINTENANCE. HOWEVER THE END USER SHOULD ALSO REFER TO THE DRAWINGS AND DOCUMENTS IF SUPPLIED AGAINST SPECIFIC ORDERS.

1. **General**

- 1.1 This booklet covers instructions for SHL Pump.
- 1.2 This pump is having enclosed type impeller capable of handling liquids containing solids. The delivery casings are volute type. Supporting feet are cast on bearing housing as well as on delivery casings. Shaft is supported in suitable antifriction bearings. Pump is having casing ring and stuffing box bush.
- 1.3 Pumps when properly installed and given due care in operation and maintenance should operate satisfactorily for a long period.
- 1.4 When the pump is received, sometime before the actual use of pump, it should be inspected and located in a dry place. The couplings should be rotated once in a month to prevent pitting of bearing surfaces.

2. **INSTALLATION**

- 2.1 For location, preparing foundation, installation, alignment, piping general maintenance, trouble shooting etc. the instructions given in our publication –“**INSTRUCTIONS MANUAL ON CENTRIFUGAL PUMPS**” which is printed alongwith this manual must be followed carefully.
- 2.2 If the pump is drawing liquid from the vessel under vacuum, then vacuum equalizing connection piping must be made as per instruction given in above publication. The external sealing connection to the pump, if applicable, must be made after installing and before commissioning the pump. Pump on hot service must have final coupling alignment made with the unit at its operating temperature.

3. **OPERATION**

- 3.1 Before starting the pump, check the following:
 - 3.1.1 The pump rotates freely by hand.
 - 3.1.2 Sealing connection provided is properly tightened and adjusted.
 - 3.1.3 Fill in the grease, if not done earlier.
 - 3.1.4 The direction of rotation of motor correspond to the direction of the rotation of the pump.
 - 3.1.5 The pump and suction pipe is fully primed with the liquid to be pumped.
 - 3.1.6 Valve on the delivery side is closed.
 - 3.1.7 Stuffing box packing is properly tightened.
 - 3.1.8 The cock for the pressure gauge connection is closed.
- 3.2 **STARTING THE PUMP:**
 - 3.2.1 Start the pump. Let the prime mover pick up its full speed.
 - 3.2.2 Open the valve on delivery side.
 - 3.2.3 Open the cock for pressure gauge connection.
- 3.3 **DURING RUNNING THE PUMP:**
Check the following things and regulate if necessary.

- 3.3.1 The pump is running smoothly.
- 3.3.2 Leakage through stuffing box is normal. There should be leakage of 60 to 80 drops/min.
- 3.3.3 The bearings not getting heated up excessively.
- 3.3.4 Head and capacity developed by the pump is as specified.
- 3.3.5 Power consumption is within the limit.
- 3.3.6 Ensure that there is no mechanical friction in the pump.
- 3.3.7 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.

- 3.3.8 If motor driven pumpset operates at considerably reduced head, the discharge increases and motor consumes higher current than the normal resulting in heating up of the motor. In such condition, arrangements should be made to throttle the valve on delivery side either manually or automatically to build head to safe value.
- 3.3.9 Stop the pump immediately, if any defects are detected.

DO NOT START THE PUMP UNLESS THE 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 cooling water and sealing liquid connections.
- 3.4.4 If the pump is not required to be operated for a long time, then drain the casing completely. Also drain the lub. Oil from bearing housing.

4. TECHNICAL DATA

4.1 DIRECTION OF ROTATION:

Clockwise when viewed from driving end.

4.2 BEARINGS:

The shafts are supported on antifriction bearings at driving and non-driving end. The details of the bearings are as per Annexure-I. The designations of the bearings are as per SKF catalogue. However, equivalent bearings in type, capacity and dimensions can be used.

4.3 LUBRICATION:

- 4.3.1 The bearings are grease lubricated.

4.3.2 Grease lubrication-

Following grades of grease available in the market are suitable.

INDIAN OIL
HINDUSTAN PETROLEUM
CALTEX

SERVOGEM-3
NATRA-3 OR LITHON-3
STARFAX-3

ANNEXURE-I

Pump Type	(SKF or equivalent) at D.E. Part Code-263	(SKF or equivalent) at N.D.E. Part Code-261
SHL 250/40 SHL 250/50 SHL 300/50	22319E	NU2319EC
SHL 250/40V (Direct mounted) SHL 250/50V (Direct mounted) SHL 300/55V (Direct mounted)	22320E	NU2320EC
SHL 350/65B SHL 350/65BM SHL 350/65A	22326CC/W33	NU326ECE

4.3.3 Quantity – Approximately 20 Gms.per bearing.

4.3.4 Refilling period –

After every 1000 hours of running.

4.3.5 Bearing temperature-

Maximum allowable bearing temperature is 40° C above ambient.

4.4 STUFFING BOX:

4.4.1 Stuffing Box Sealing:

Grease sealing arrangement is provided.

4.4.2 Specification of Stuffing box packing, Grease Nipple, gasket 'O' Ring etc.

ANNEXURE-II

Part Code	Description	Pump Type				
		SHL-250/40 SHL-250/40V (Direct mounted)	SHL-250/50 SHL-250/50V (Direct mounted)	SHL-300/55 SHL-300/55V (Direct mounted)	SHL-350-65B SHL-35065BM	SHL-350/65A
441	Grease Nipple Size- BSP	1/4"	1/4"	1/4"	1/4"	1/4"
430	Stuffing Box Packing Sq.mm x Long mm	16 x 2220	16 x 2220	16 x 2220	20 x 2500	20 x 2500
516.1	Gasket for Insp. Hole Cover (For Suction Cover) mm	160 x 0.8 T sq.	160 x 0.8 T sq.	2000 x 0.8 T sq.	260 x 190 I.D. x 0.8 T	260 x 190 I.D. x 0.8 T
516.2	Gasket for Insp. Hole Cover (For Pump Casing) (ID x OD x Thick mm)	130 x 185 x 0.8	130 x 185 x 0.8	165 x 215 x 0.8	190 x 270 x 0.8	190 x 270 x 0.8
515	Gasket for Shaft Sleeve (ID x OD x Thick mm)	110 x 120 x 1	110 x 120 x 1	110 x 120 x 1	126 x 135 x1	126 x 135 x1
522.1	'O' Ring for Shaft Sleeve (ID x Dia mm)	80 x 4	80 x 4	80 x 4	95 x 4	95 x 4
522.2	'O' Ring for Suction Cover (ID x Dia mm)	412 x 4	513 x 4	545 x 4	618 x 6	618 x 6

5. MAINTENANCE

Preventive maintenance schedule is the periodical check and precautions by which possibilities of failures and breakdowns are made very remote.

5.1 DAILY CHECKS

5.1.1 Pressure gauge reading.

5.1.2 Bearing temperature.

5.1.3 Leakage through stuffing box.

5.1.4 Noise and vibration.

5.1.5 Voltage and current.

5.2 PERIODICAL MAINTENANCE

5.2.1 Replenish the grease.

5.2.2 Change the stuffing box packing.

5.2.3 Check the alignment of the pumpset.

5.2.4 Calibrate the measuring instrument.

5.2.5 Check the sealing and cooling connections for leakage etc.

6. OVERHAULING-

With normal daily operating spell, the pump will be due for overhaul after about 5000 working hours. This work should be carried out by skilled personnel.

6.1 DISMANTLING:

6.1.1 Remove the bolts of suction and delivery flanges. Take out distance pieces of suction and pump delivery pipes. Take out motor stool (290) in case of SHL-V (direct Mounted) from pump casing.

6.1.2 Dismantle the pump casing completely by loosening the drain plug (601).

6.1.3 Take out sealing connections and other accessories.

6.1.4 Uncouple the pump from its prime mover by removing the coupling and take the pump on a table for further dismantling.

6.1.5 Loosen the nuts holding suction cover (210) to the pump casing (101). Take out the suction cover (210) with the help of release bolts.

6.1.6 Remove the rubber "O" ring for suction cover and pump casing (522.2).

6.1.7 Disconnect the casing ring (190) from the suction cover, if worn out only.

6.1.8 Loosen the hex. socketed cap screw (669) for impeller nut (330) and remove it.

6.1.9 Loosen the nuts holding the pump casing and bearing housing (242). Remove the pump casing. Loosen the impeller nut (330) and remove it out. (Take out lock washer for impeller nut (621)).

6.1.10 Take out impeller (151).

6.1.11 Remove the impeller key (320.1).

6.1.12 Remove the gland (223) and remove gland packing (430) along with lantern ring (227).

6.1.13 Remove "O" ring for casing cover and pump casing (522.3). Take out casing cover (220).

6.1.14 Remove the stuffing box bush (350) if worn out.

- 6.1.15 Remove the shaft sleeve (311) and shaft sleeve key (320.2).
- 6.1.16 Remove water deflector (236).
- 6.1.17 Pull out the pump coupling. Remove the coupling key (321).
- 6.1.18 Take out bearing cover DE (270).
- 6.1.19 Remove the bearing lock nut (336) and bearing nut (335).
- 6.1.20 Tap the pump shaft (180) from the impeller side with wooden mallet such that it will come out from coupling side along with the bearings.
- 6.1.21 Remove the bearing cover NDE (271). Take out the outer race of the roller bearing NDE side.
- 6.1.22 Remove DE and NDE bearing.
- 6.1.23 Felt rings are to be removed if worn out.

THIS COMPLETES DISMANTLING OF THE PUMP

Before proceeding for reassembly of pump, following points have to be checked.

- A) Rotate bearings by hand and check if they rotate smoothly. Renew them if they are not rotating freely or if the races are deteriorated.
- B) Check shaft for possible run out. The shaft run out should not exceed 0.08 mm at bearing portion and 0.125 mm at other parts.
- C) Remove any dust or rust from parts and if necessary apply new paint/coating on the same.
- D) Clean all parts thoroughly with kerosene or petrol.
- E) If reassembly is not to be made immediately, then apply rust preventive coating on the same.
- F) Examine all the parts for refitting, wear out etc. Damaged or corroded parts should be either reconditioned or replaced by new.
- G) Ensure that newly fitted parts are free from damage and from burrs.
- H) Examine water deflector, 'O' rings, felt rings etc for damage or deterioration. If replaced with new make sure that they are of the requisite dimensions.

6.2 REASSEMBLY

- 6.2.1 Wipe out shaft (180) with clean light oil.
- 6.2.2 Mount the spherical roller bearing (263) on the pump shaft (180). Bearing should touch the shoulder on the shaft.
- 6.2.3 Mount the inner race of the roller bearing on NDE bearing.

CAUTION

- (a) Use arbour press while fitting the bearing. However, it is recommended that bearing should be heated in oil bath at temperature at 70° C to 80° C.

- (b) Slide inboard bearings on shaft by hand and make sure that it is square with shaft. Press evenly the inner race of the bearing until bearing is seated firmly against the shaft shoulder.
 - (c) Do not use hammer to fit the bearings. Do not mark the shaft, especially where it contacts the oil seal.
- 6.2.4 Fit the bearing nut (335) on DE side and tighten it. Now insert the bearing lock nut (336) and tighten it.
- 6.2.5 Insert the shaft (180) in the bearing housing (242) from coupling side. Give light blows to shaft till the outer race of the bearing DE touches to the step provided in the bearing pedestal.
- 6.2.6 Replace felt rings (502) in bearing covers (270) and (271) if they are removed.
- 6.2.7 Fit the bearing cover DE (270) and tighten it.
- 6.2.8 Push outer race of roller bearing (261) at NDE in to the bearing housing (242).
- 6.2.9 Fit the bearing cover NDE (271) and tighten it.
- 6.2.10 Put the coupling (321) on shaft and mount the pump half coupling. Put the water deflector coupling.
- 6.2.11 Put the water deflector (236) and gland (223).
- 6.2.12 Fix the shaft sleeve key (320.2) on the shaft and put the "O" ring (522.1) for shaft sleeve. Push the shaft sleeve (311) till it touches the shoulder provided on the shaft.
- 6.2.13 Fit the stuffing box bush (350) in the casing cover. Put "O" ring (5223.) on casing cover. Fit the casing cover (220).
- 6.2.14 Put the impeller key (320.1) on pump shaft (180).
- 6.2.15 Fit the impeller (151) on the shaft till it touches the shaft sleeve.
- 6.2.16 Put the lock washer (621) and tighten the impeller nut (330). Fix helicoil screw lock and hex socketed cap screw (669). Fit the pump casing (101). Diametrically opposite bolts are to be tightened.
- 6.2.17 Fit the casing ring (190) inside the suction cover, if it is removed.
- 6.2.18 Put the "O" ring (522.2) on the pump casing and connect the suction cover (210) as per arrangement 2+L+3 from impeller side. Fit the motor stool (290) on pump casing in case of SHL-V (Direct Mounted).

Make the sealing pipe connections and fix the other accessories.

This completes the reassembly of the pump. Couple the pump with motor, do the alignment.

7. SPARE PART LIST AND CROSS SECTIONAL DRAWING
7.1 SPARE PART LIST

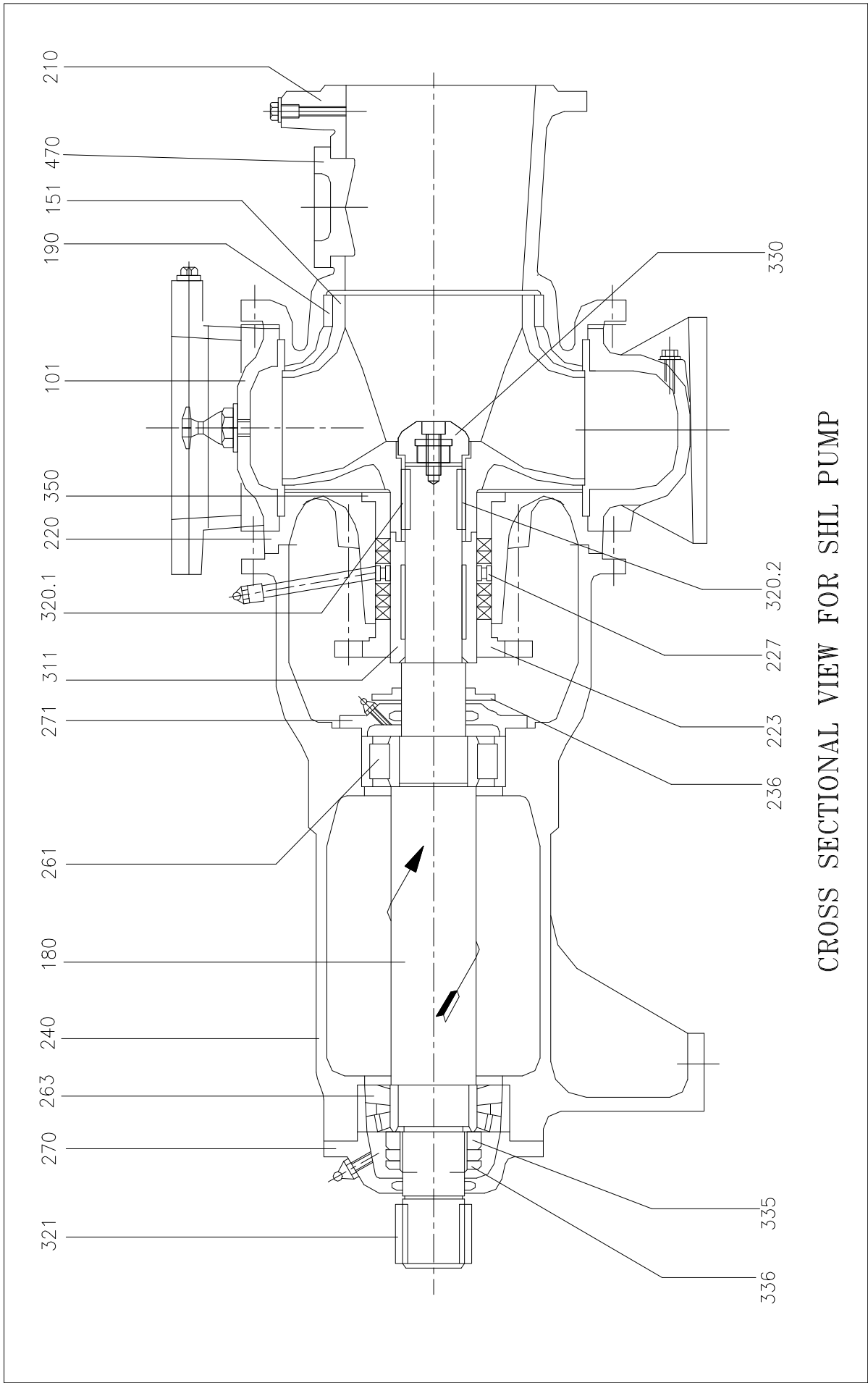
PART CODE	PART DESCRIPTION	QTY REQUIRED PER PUMP
101	PUMP CASING	1
151*	IMPELLER- ENCLOSED	1
220	CASING COVER	1
180*	PUMP SHAFT	1
190*	CASING WEAR RING	1
210	SUCTION COVER	1
320.1*	KEY FOR IMPELLER	1
320.2*	KEY FOR SHAFT SLEEVE	1
330	IMPELLER NUT	1
470.1	INSP. HOLE COVER FOR SUCTION SIDE	1
470	INSP. HOLE FOR PUMP CASING	1
471	PROTECTION COVER	1
479	HEL. SCREW LOCK INSERT	1
514.2*	GASKET FOR BEARING COVER NDS	1
515*	GASKET FOR IMPELLER & SHAFT SLEEVE	1
516.2*	GASKET FOR INSPECTION HOLE COVER	1
522.1*	'O' RING FOR SHAFT SLEEVE	1
522.2*	'O' RING FOR SUCTION COVER	1
581.1	HEX. NUT FOR CASING AND SUCTION COVER STUD	12
590.1	STUD FOR CASING AND SUCTION COVER	12
590.2	STUD FOR CASING AND BRG. HOUSING	12
596	STUD FOR INSPECTION HOLE COVER	4/8
600.1	PIPE PLUG FOR SUCTION GAUGE CONNECTION	1
600.2	PIPE PLUG FOR DELIVERY GAUGE CONNECTION	1
601	PIPE PLUG FOR CASING DRAIN	1
602	PIPE PLUG FOR SEALING	1
604	PIPE PLUG FOR PRIMING	1
650	HEX. SOCKET GRUB SCREW FOR CASING WEAR RING	2
669	SCREW FOR IMPELLER	1
682*	GASKET FOR IMPELLER SCREW	1
516*	GASKET FOR INSPECTION HOLE COVER SUCTION SIDE	1
220	CASING COVER	1
621.1*	PUNCHED WASHER FOR IMPELLER NUT	1
224	CLAMPING PLATE	1
227	LANTERN RING	1
223	SPLIT GLAND	1
236	LIQUID DEFLECTOR	1
311*	SHAFT SLEEVE	1
350*	STUFFING BOX BUSH	1
430*	GLAND PACKING	1 SET
441	GREASE NIPPLE FOR LUBRICATION	1
263*	SP. ROLLER BRG.	1
261*	CY. ROLLER BRG.	1

PART CODE	PART DESCRIPTION	QTY REQUIRED PER PUMP
514.2*	GASKET FOR BRG. PEDESTAL AND BRG. COVER NDS	1
530	PIPE NIPPLE FOR SEALING	1
596	STUD FOR INSPECTION HOLE COVER	4/8
605	PIPE PLUG FOR BRG. HOUSING DRAIN	1
540.1	SOCKET FOR SEALING	1
550	WHEEL COCK	1
581.1	HEX. NUT FOR STUD OF CASING	12
582	HEX. NUT FOR STUD OF GLAND AND CASING	2
588	HEX NUT FOR CASING AND INSP. HOLE COVER	4/8
590.3	STUD FOR GLAND AND CASING	2
630.2	HEX RELEASE SCREW FOR BRG. COVER NDS	2
630.3	HEX RELEASE SCREW FOR BRG. COVER DS	2
630.1	HEX SCREW FOR BRG. PEDESTAL RELEASE	2
640	HAMMER DRIVE SCREW FOR NAME PLATE	8
650	HEX SOCKET GRUB FOR LIQUID DEFLECTOR	1
673	LUBRICATION NAME PLATE	1
621.1	PUNCHED WASHER FOR IMPELLER NUT	1
631.1	HEX SCREW FOR BRG. PEDESTAL	4/8
603	PIPE PLUG FOR CASING	1
502.1*	FELT RING	1
592.2*	FELT RING NDS	1
242	BEARING PEDESTAL	1
261	BEARING DE	1
263	BEARING COVER	1
270	BEARING COVER DE	1
271	BEARING COVER NDE	1
321*	KEY FOR COUPLING	1
336	BEARING LOCK NUT	1
335	BEARING NUT	1
450	VENT VALVE	1
544	REDUCER	1
666	HEX SOCKET GRUB SCREW FOR ST. BOX BUSH	4
514.1	GASKET FOR BEARING COVER DE	1
630.4	HEX RELEASE SCREW FOR SUCTION COVER	2
631.2	HEX SCREW FOR BEARING COVER NDE	4
640.1	HAMMER DRIVE SCREW FOR NAME PLATE	1
657	CTSK SCREW	1
670	DUTY NAMEPLATE	1
672	ARROW NAMEPLATE	1
621.1	PUNCHED WASHER FOR ST. BOX BUSH	1
673	LUB NAME PLATE	1

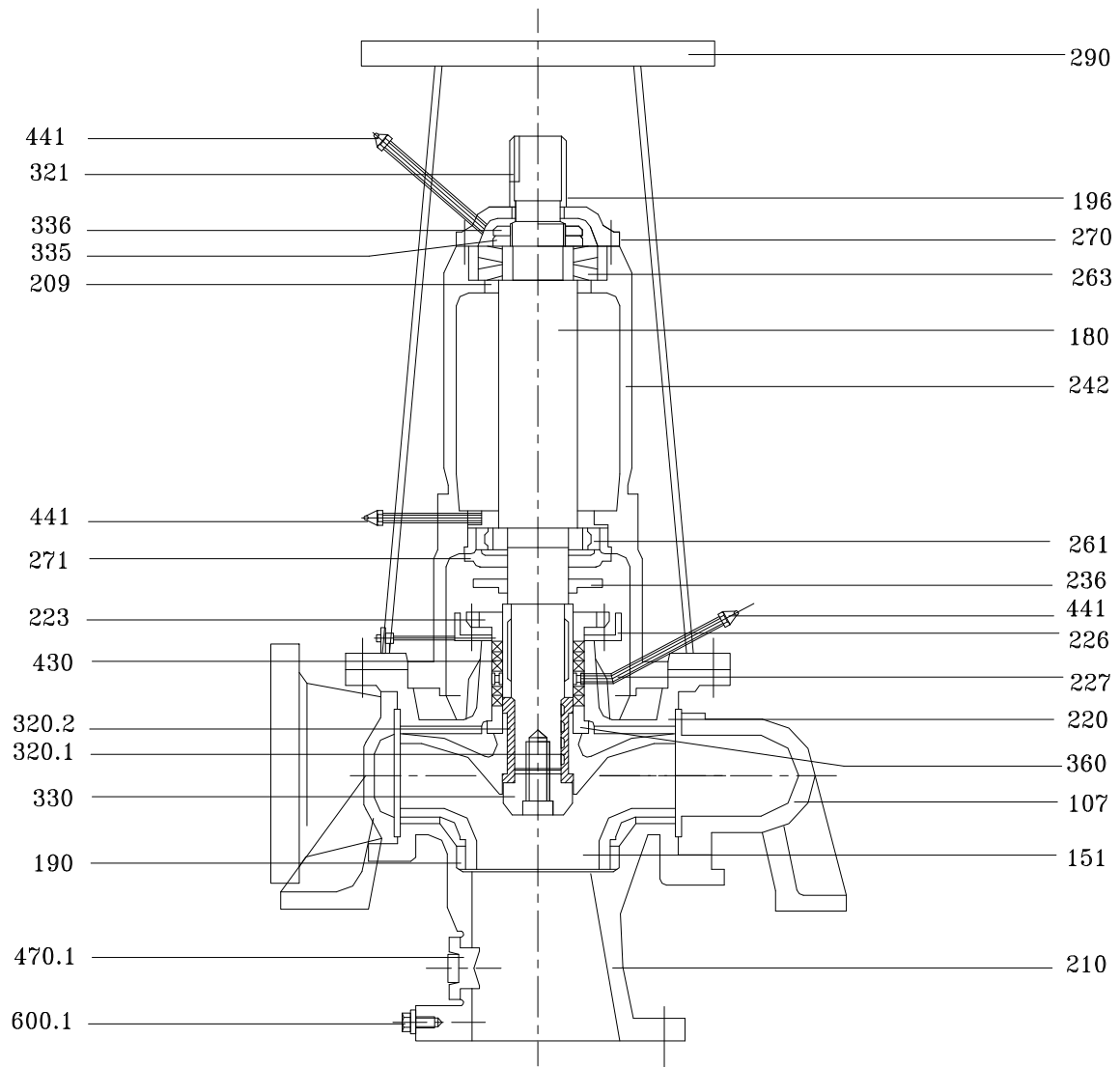
* Recommended spares required for two years normal working.

INTERCHANGEABILITY OF COMPONENTS

PART NO.	NAME OF THE PART	TOTAL NO. OF PARTS	PUMPS MODELS (SHL)				
			250/40	250/50	300/55	350/65B	350/65MB
101	Pump casing	4	1	2	3	4	4
151	Impeller	5	1	2	3	4	5
180	Shaft	2	1	1	1	2	2
190	Casing ring	4	1	2	3	4	4
220	Casing cover	4	1	2	3	4	4
223	Gland	2	1	1	1	2	2
227	Lantern ring	2	1	1	1	2	2
240	Bearing housing	2	1	1	1	2	2
261	Cylindrical roller bearing	2	1	1	1	2	2
263	Spherical roller bearing	2	1	1	1	2	2
270	Bearing cover (DE)	2	1	1	1	2	2
271	Bearing cover (NDE)	2	1	1	1	2	2
311	Shaft sleeve	3	1	1	2	3	3
350	St. Box bush	4	1	2	3	4	4
320.1	Key for impeller	2	1	1	1	2	2
320.2	Key for impeller and shaft sleeve	2	1	1	1	2	2
330	Impeller nut	2	1	1	1	2	2
335	Bearing nut	2	1	1	1	2	2
336	Bearing lock nut	2	1	1	1	2	2
321	Key for coupling	2	1	1	1	2	2
470	Insp. Hole cover	4	1	2	3	4	4
236	Deflector	2	1	1	1	2	2



CROSS SECTIONAL VIEW FOR SHL PUMP



CROSS SECTIONAL ASSEMBLY OF SHL-V PUMP

GENERAL INFORMATION & SAFETY REQUIREMENTS

- 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 designated 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 jewellery which could catch on the controls or become trapped in the equipment.
- 1.6 Read the instruction manual before installation, operation and 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, gauges and dials etc. must be maintained at all times. Hazardous or flammable materials must not be stored in pump rooms unless safe areas or racking and suitable containers have been provided.
- 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, replace 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°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 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 or 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 warning 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 hazardous materials.

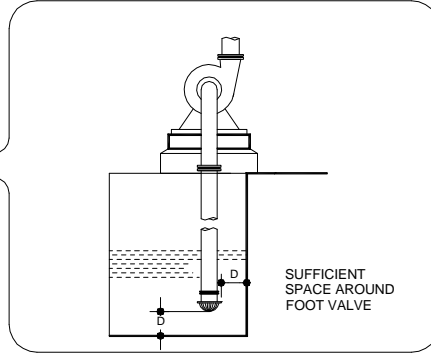
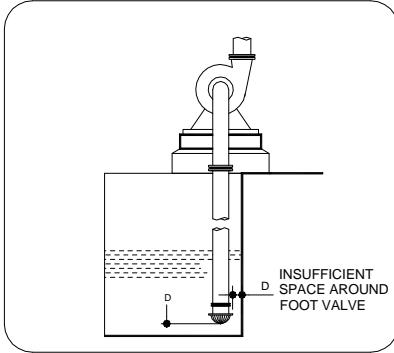
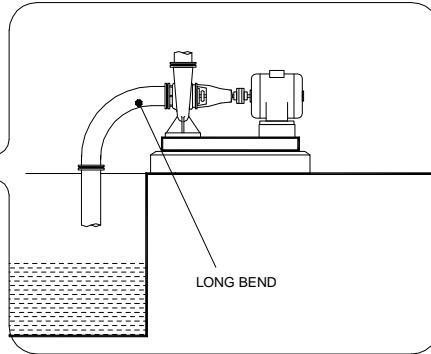
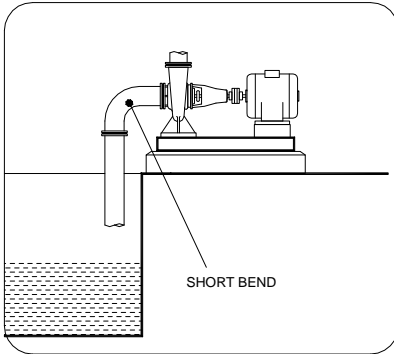
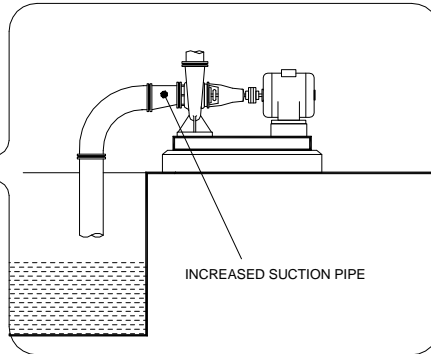
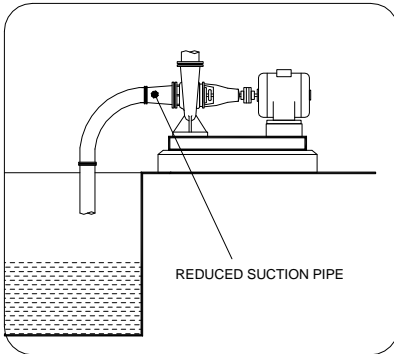
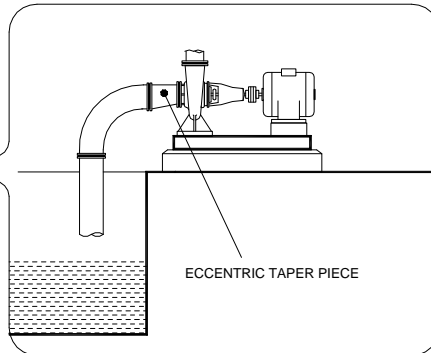
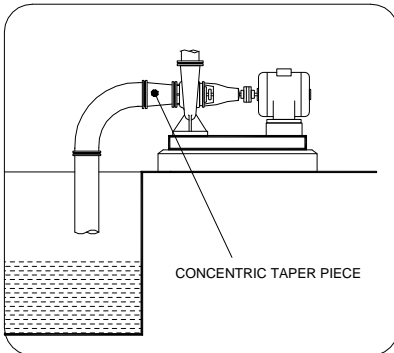
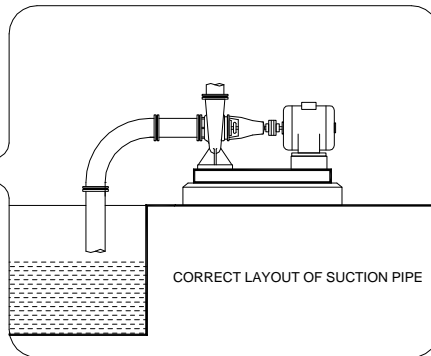
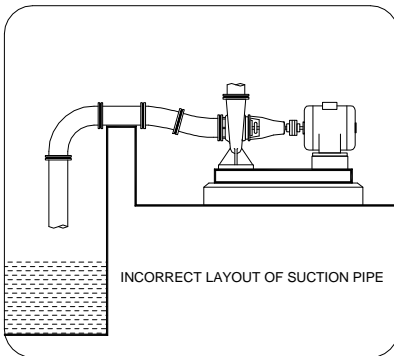
Be aware of the hazards relating to the pumped fluid, especially the danger from inhalation of noxious and toxic gases, skin and eye contact or penetration. Obtain and understand the hazardous substance data sheets relating to the pumped fluid and note the recommended emergency and first aid procedures.

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 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 in 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 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.

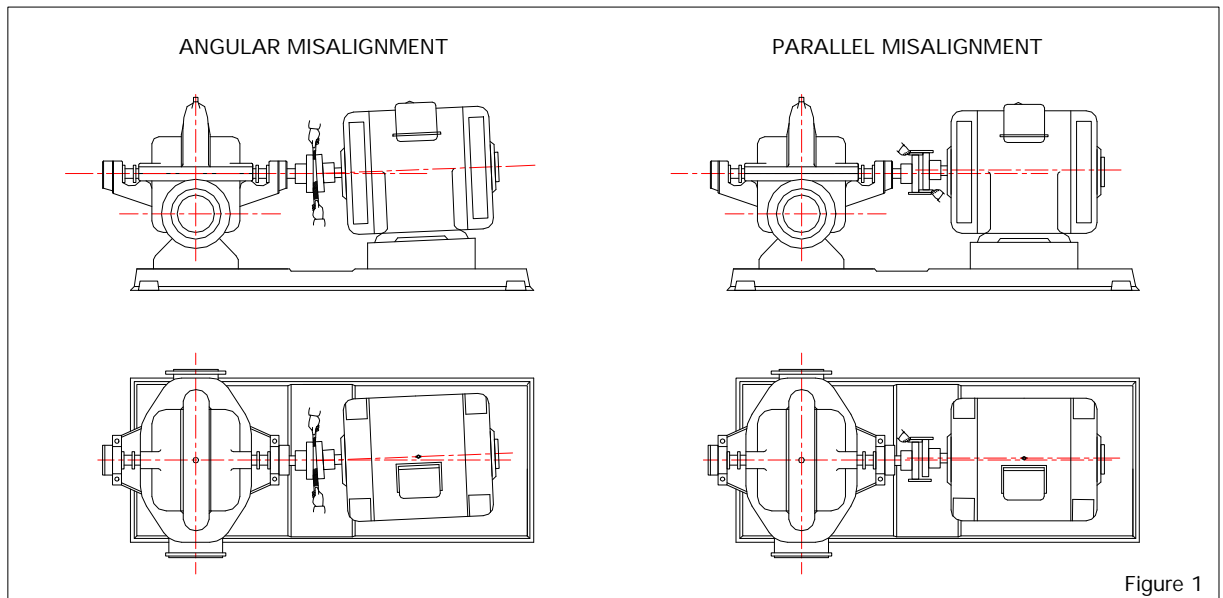
FLEXIBLE COUPLING

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.



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 an outside caliper.

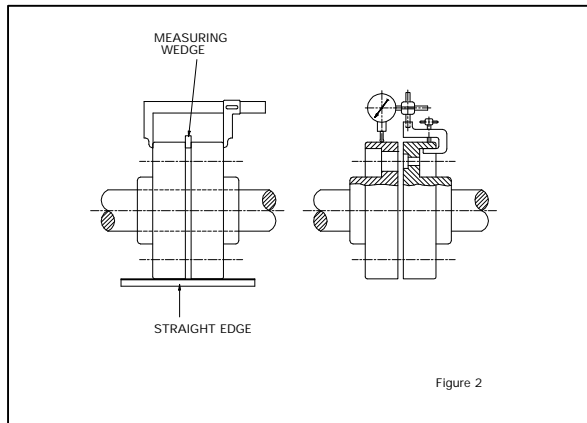
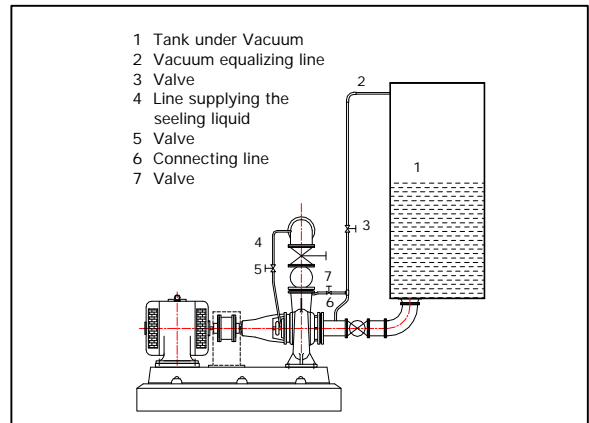


Figure 2



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 dial 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 along 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 so that 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 or 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 EQUALISING LINE (AND LIQUID LINE) (SEE FIGURE 3)

If the pump draws from a system under vacuum an equalising 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 gritty, 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 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 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 bypassing 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 pumps 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.

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