INSTRUCTIONS
ON
INSTALLATION OPERATION
AND
MAINTENANCE
FOR

KIRLOSKAR PUMPS
TYPE - (Large Size)
DB

KIRLOSKAR BROTHERS LIMITED
Regd. & Corporate Office : Udyog Bhavan, Tilak Road, Pune 411 002. (India)
Works : Kirloskarvadi 416 308. Dist. Sangli (Maharashtra)

KIRLOSKAR BROTHERS LIMITED
REGD. & HEAD OFFICE: 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 or arise solely from faulty workmanship or defective material.

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

—KIRLOSKAR BROTHERS LIMITED

CONTENTS

PLEASE ENSURE THESE INSTRUCTIONS ARE READ FULLY BEFORE. INSTALLATION AND OPERATION OF THE PUMP.

PLEASE FURNISH COMPLETE NAME PLATE DETAILS, NAME OF PART NOS. MATERIAL CONSTRUCTION AND QUANTITY WHILE ORDERING SPARE PARTS.

1. GENERAL

1.1 The booklet covers instructions for following models of DB large size pumps.

Unit	DB large size pumps.
35	150/20, 150/26
45	200/20, 200/26*
55	200/33, 200/40, 250/33A*, 250/33B* 250/36, 300/34* and 300/36*.

(*Only these pumps are developed).

1.2 Kirloskar DB large size pumps are of back-pull-out design which enable to remove the relating unit of pump for inspection and repairs without disturbing the pipe connections.

1.3 The complete range of DB large size pumps is covered by three driving units thereby reducing inventory and achieving interchangability of parts.

1.4 Pumps when properly installed and given due care in operation and maintainance should operate satisfactorily for a long period.

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

2. INSTALLATION

2.1 For location, preparing foundation, installations, alignment, general maintainance, trouble shooting etc. the instruction given in our publication General instructions for installation, operation and maintainance of centrifugal pumps." Which is printed with this booklet must be followed carefully.

2.2 The external sealing connection to the pump, if applicable, must be made after installing and before commissioning the pump.

2.3 The vacuum equalizing connection should be made if the pump suction is under vaccum conditions.

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 if any, is properly tightened and adjusted.

3.1.3 Oil level in brg. housing.

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

3.1.5 The pump and suction pipe is fully primed with the liquid.

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 pr. 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 slowly.

3.2.3 Open the cock for pr. gauge connection.

3.3 During running the pump.
Check the following and regualte, if necessary.

3.3.1 The pump is running smooth.

3.3.2 The flow of sealing liquid (if external liquid is provided for sealing purpose) is uninterrupted.

3.3.3 Leakage through st. box is normal. There should be leakage of 60-80 drops per minute.

3.3.4 The bearings not getting heared up excessively.

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

3.3.6 Power consumption is within the limit.

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

3.3.8 Stop the pump immediately, if any defects are noticed. Do not start the pump unless defects are rectified. Reports 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 external sealing liquid connection if any.

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

4 TECHNICAL DATA

4.1 models

"DB large size" type pumps are available in models as referred to in 1.1. Only three shaft units (driving units) are used for complete range of "DB large size" pumps. The models covered under individual shaft units are given in interchangability chart (4.2).

4.2 Interchangeability Chart

COMPONENT	Qty./ Unit	PUMP SIZE										
		150/20	150/26	200/20	200/26	200/33	200/40	250/33A	250/33B	250/36	300/34	300/36
		Shaft unit-35*		Shaft unit-45*				Shaft unit-55				
Pump casing	1	1	2	3	4	5	6	7	8	9	10	11
Impeller	1	1	2	3	4	5	6	7	7	8	9	10
Impeller nut and washer	1	1	1	2	2	3	3	3	3	3	3	3
Shaft sleeve	1	1	1	2	2	3	3	3	3	3	3	3
Gland	1	1	1	2	2	2	3	3	3	3	3	3
Lantern ring	1	1	1	2	2	3	3	3	3	3	3	3
Shaft	1	1	1	2	2	3	3	3	3	3	3	3
Bearing housing	1	1	1	2	2	3	3	3	3	3	3	3
Bearing cover	2	1	1	2	2	3	3	3	3	3	3	3
Bearing	2	1	1	2	2	3	3	3	3	3	3	3
Casing cover	1	1	2	3	4	5	6	5	5	7	8	7

* Existing DB driving units.

4.3 Direction of rotation

The direction of rotation is clockwise when viewed from driving end. Reverse rotation is not possible.

4.4 Rotation Speed

All the models are suitable for speed of 1450 rpm.

Please contact the supplier or manufacturer if the pump is to be used for other speeds than specified above.

4.5 Bearings

The shaft is supplied with antifriction ball brgs. at driving end and non-driving end. The bearing specifications are given below. The designation of bearings are as per SKF catalogue. However, equivalent bearings in type, capacity and dimensions are also used.

Sr. No.	Pump Unit	Bearing No. SKF or equiv. DE	NDE
1.	Unit 35	6307	6307
2.	Unit 45	6309	6309
3.	Unit 55	6411	6411

4.5.1 **Oil seal details**

Sr. No.	Pump Unit	Size
1.	Unit 35	35 I.D. × 47 O.D. × 77
2.	Unit 45	45 I.D. × 60 O.D. × 87
3.	Unit 55	55 I.D. × 80 O.D. × 137

4.6 **Lubrication**

4.6.1 Bearings are oil lubricated.

4.6.2 Pumps are also supplied with grease lubricated brgs. against specific orders.

4.6.3 Following grades of oil available in the market are suitable.

Name	Oil specification at 1450 rpm.
Indian Oil	Servesystem No. 317
Hindustan Petroleum	Enclo-53

4.6.4 **Refilling Period**

For a new pump oil is to be changed after 200 hrs. of working. For subsequent filling, oil is to be changed after about 1000 hrs of working.

4.7 **Flex. coupling details**

Sr. No.	Pump Model	Size of std. Love-Joy coupling	Size of spacer type Love-Joy coupling
1.	150/20, 200/20	L-150	RRL-150
2.	150/26	L-225	RRL-225
3.	200/26	C-226	CQ-226
4.	200/33	C-276	CQ-276
5.	200/40, 250/36, 300/36	C-295	CQ-295
6.	250/33A, 250/33B, 300/34	C-280	CQ-280

4.8 **Stuffing box**

4.8.1 St. box sealing arrangement :

Self liquid sealing is standard supply. External liquid sealing arrangement can be provided on request.

4.8.2 Stuffing box packing specification—Champion style 3116-Graphited cotton packing is used in the pump as a standard supply. However, st. box packing suitable for liquid handled is supplied against specific requirements.

4.8.3 Stuffing box packing and Lantern ring—

Please refer to the following chart for st. box packing size and position of lantern ring.

Unit	St. box packing size mm (sq)	Length of packing mm	Packing arrangement and position of lantern ring (L) from impeller side
35	10	650	1 + L + 3
45	10	840	1 + L + 3
55	10	960	1 + L + 3

5. MAINTAINANCE

Preventive maintainance schedule is the periodical checks and precautions by which possibilities of failure and breakdown the 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 current.

5.1.6 Constant flow of external sealing liquid if provided.

5.2 Periodical maintainance

5.2.1 To check the oil level.

5.2.2 Change the stuffing box packing.

5.2.3 Check the alignment of the pumpset.

5.2.4 Calibrate the measuring instruments.

5.2.5 Check the sealing 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 done by skilled personnel.

6.1 Dismantling

6.1.1 Remove the gland sealing connection and auxiliary piping if any.

6.1.2 Remove the spacer of Love-joy coupling in case of pumps fitted with spacer type coupling. Remove the prime mover in case of pumps fitted with standard type of Love-joy coupling. Remove the pump half of coupling from the pump shaft.

6.1.3 Drain the delivery casing by removing the drain plug (601). Remove support foot (251).

6.1.4 Pumps with clamped casing cover :

Unscrew the nuts holding delivery casing (105) and stuffing box housing (220) and bearing housing (240). Take out the sub-assembly of bearing housing with stuffing box and impeller etc.

6.1.5 Pumps with sindded casing cover :

Unscrew the nuts holding delivery casing (105) and stuffing box housing and take out the sub-assembly of stuffing box housing, bearing housing, impeller etc.

6.1.6 Unscrew the impeller nut (330) and remove washer under it (410).

6.1.7 Remove the impeller (151) from the shaft.

6.1.8 Take out impeller key (320).

6.1.9 In case of assembly 6.1.4 just separate the stuffing box (220) from the bearing housing.

6.1.10 In case of assembly 6.1.5 separate the stuffing box housing (220) from bearing housing by unscrewing the nuts holding them together.

6.1.11 Unscrew the gland nuts and take out gland (223).

6.1.12 Remove stuffing box packings (430) alongwith lantern ring (227) from st. box housing.

6.1.13 Remove the shaft sleeve (310) and remove gasket for shaft sleeve (515).

6.1.14 Remove the bolts holding bearing cover, DE to bearing housing and remove bearing cover.

6.1.15 Remove liquid deflector (236). Remove the bolts holding bearing cover and bearing housing and remove bearing cover.

6.1.16 Take out shaft (180) from bearing housing alongwith bearings (260) by high hammering from driving end.

6.1.17 Remove the circlip and bearings (260) from shaft with the help of puller. Do not hammer the bearings as hammering may spoil them.

6.1.18 Remove circlip in brg. housing.

6.2 **Re-assembly**

Before assembling, all the parts should be thoroughly cleaned in Kerosene, Petrol or Benzene to remove the dirt, rust etc. After cleaning all the parts should be throughly checked for wear and replaced, if necessary. Replace all paper packings.

6.2.1 Fit circlip in brg. housing of DE side. Mount the driving and non-driving end side bearings on the shaft and fit circlip at DE bearing. Use arbor press. Do not use hammer.

6.2.2 Fit the NDE bearing cover and tighten the bolts to hold it on bearing housing.

6.2.3 Insert the shaft alongwith bearings in bearing housing.

6.2.4 Fit the DE bearing cover and tighten the bolts to hold it on bearing housing.

6.2.5 Mount the liquid deflector on shaft on NDE side.

6.2.6 Fit the gasket for shaft sleeve on the shaft and fit the shaft sleeve.

6.2.7 Insert the gland over the shaft.

6.2.8 In case of pumps covered under 6.1.4 clause, locate the st. box housing on bearing housing.

6.2.9 In case of pumps covered under 6.1.5 clause, locate the st. box housing on bearing housing and tighten the nuts to hold them in position.

6.2.10 Insert the st. box packing rings along with lantern ring.

6.2.11 Tighten the gland nuts.

6.2.12 Fit the impeller key on shaft.

6.2.13 Fit the impeller on shaft.

6.2.14 Place the washer between the impeller and impeller nut and tighten the impeller nut.

6.2.15 Place the packing between del. casing and st. box housing. In case of pumps covered under clause 6.1.4 fit the sub-assembly of bearing housing, st. box housing and impeller etc. on the del. casing and tighten the nuts holding del. casing, st. box housing and bearing housing.

6.2.16 Place the packing between del. casing and st. box housing. In case of pumps covered under clause 6.1.5 fit the sub-assembly of bearing housing, st. box housing, impeller etc. on the delivery casing and tighten the nuts holding delivery casing and st. box housing.

6.2.17 Fit the drain plug of delivery casing and other plugs if any. Mount the foot support.

6.2.18 Fit the pump half of Love-joy coupling on the pump shaft. For standard Love-Joy coupling, fit the prime mover in position. For spacer type love-joy coupling fit the spacer in position.

6.2.19 Fit the gland sealing and other auxiliary piping connections, if any.

6.2.20 Fill the oil in brg. housing.

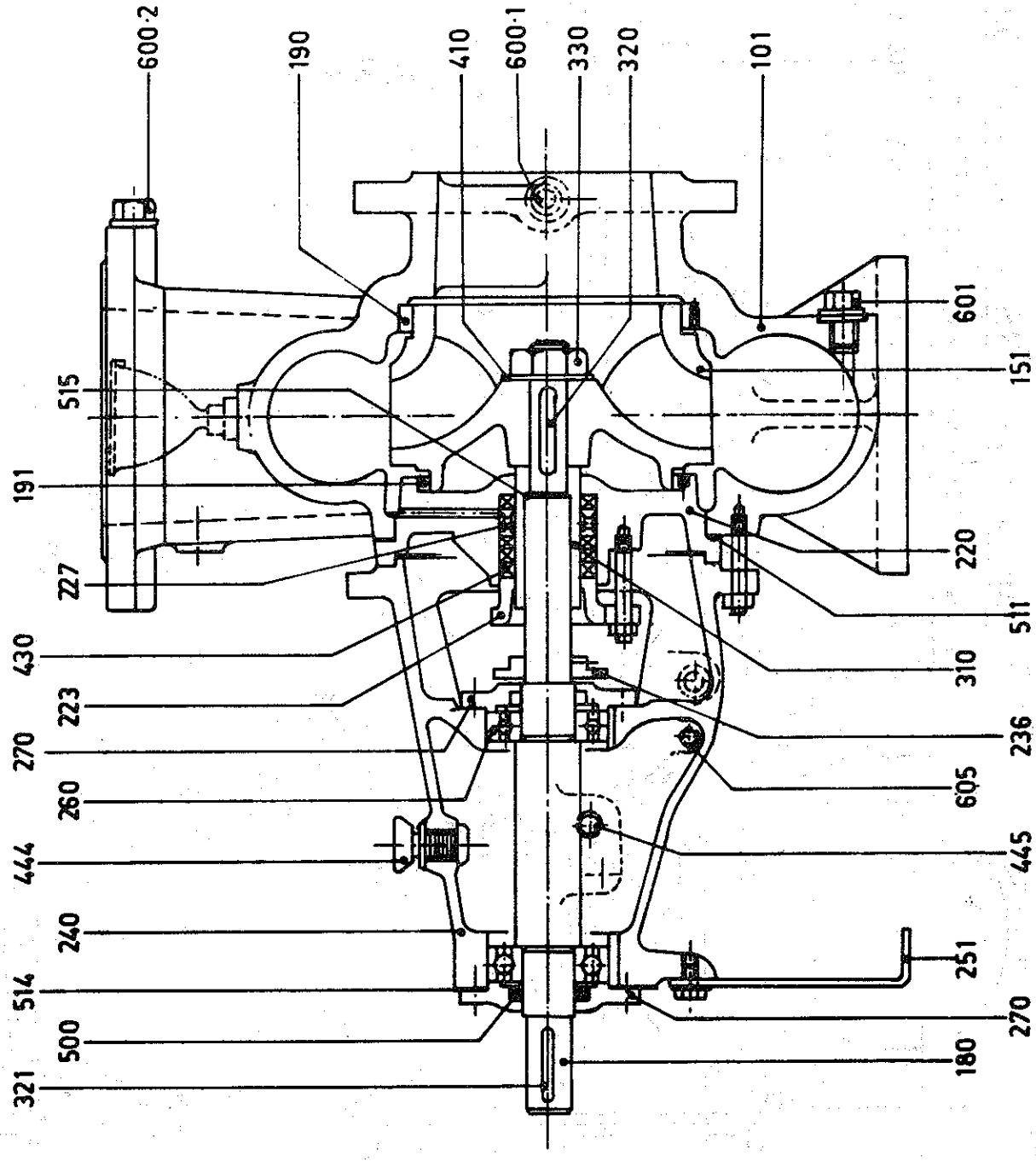
7. SPARE PART LIST & CROSS-SECTIONAL DRAWINGS

Part Nos.	Description	Qty.
105/101*	Pump casing	1
151*	Impeller	1
180—	Pump shaft	1
190*	Casing wear ring, suc. side	1
191*	Casing wear ring, back side	1
220	Casing cover (st. box housing)	1
223	Gland	1
227	Lantern Ring	1
236*	Liquid deflector	1
240	Bearing housing	1
251	Support foot	1
260*	Radial ball bearings	2
270	Bearing cover DE & NDE	2
310*	Shaft sleeve drive side	1
320	Key for impeller	1
321	Key for coupling	1
330	Impeller nut	1
411	Lock washer for support foot	1
410*	Lock washer for impeller nut	1
430*	St. box packing	4
445*	Oil level sight glass	1
444	Oil filler plug	1
500*	Oil seal	2
511*	Gasket for pump casing	1
514*	Gasket for brg. cover DE & NDE	2
515*	Gasket for shaft sleeve	1
600.1	Gauge plug suc. side	1
601	Drain plug for casing	1
600.2	Gauge plug Del. Side	1
605	Drain plug for brg. hsg.	1
517.1	Gasket for collared plug (suc. side)	1
517.2	Gasket for collared plug (del. side)	1
517.3	Gasket for collared plug (Del. casing)	1
517.5	Gasket for brg. hsg. drain plug	1

*Recommended spares for two-year normal working.
—Recommended spares for five year normal working.

NOTE : Pump casings are available in two types.

i) Central del. nozzle (only for pumps DB 150/20, 150/26).
ii) Side del. nozzle (All pumps except DB 150/20, 150/26).

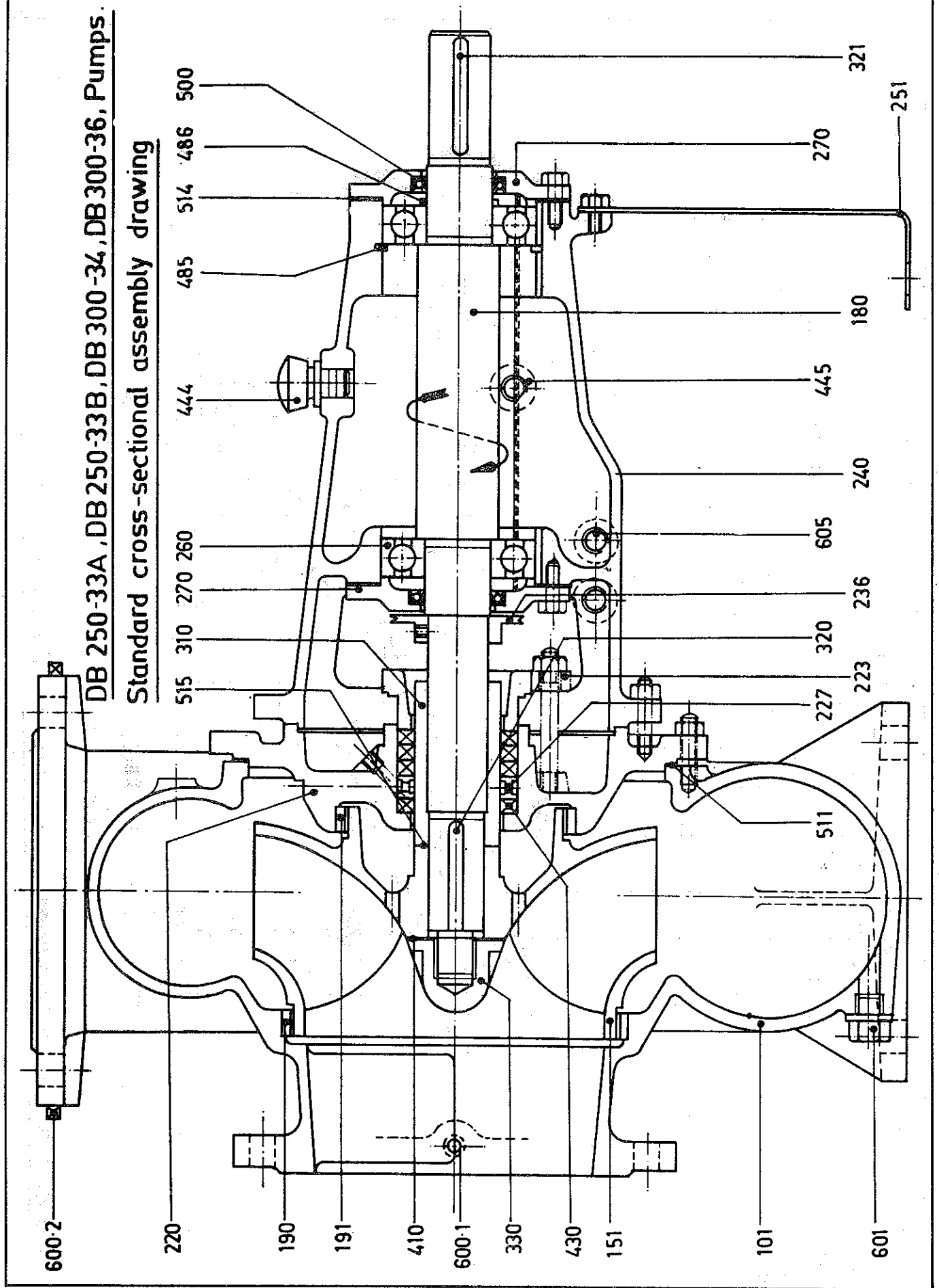


DB 200-26 Pump Standard Cross Sectional Assembly Drawing.

Issue Date :25/09/2000
Last Revision Date :

DB 250-33A, DB 250-33B, DB 300-34, DB 300-36, Pumps.

Standard cross-sectional assembly drawing



GENERAL INFORMATION & SAFETY INSTRUCTIONS

1.0 The products supplied by KBL have been designed with safety in mind. Where hazards cannot be eliminated, the risk has been minimised by the use of guards and other design features. Some hazards cannot be guarded against and the instructions below MUST BE COMPLIED WITH for safe operation. These instructions cannot cover all circumstances, YOU are responsible for using safe working practices at all times.

1.1 KBL products are designed for installation in 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 or maintenance of the equipment. Check and confirm that the manual is relevant copy by comparing pump type on the nameplate and with that on the manual.

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

1.8 Clear and easy access to all controls, 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 of flush water may result in damage and premature failure of the pump.

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

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

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

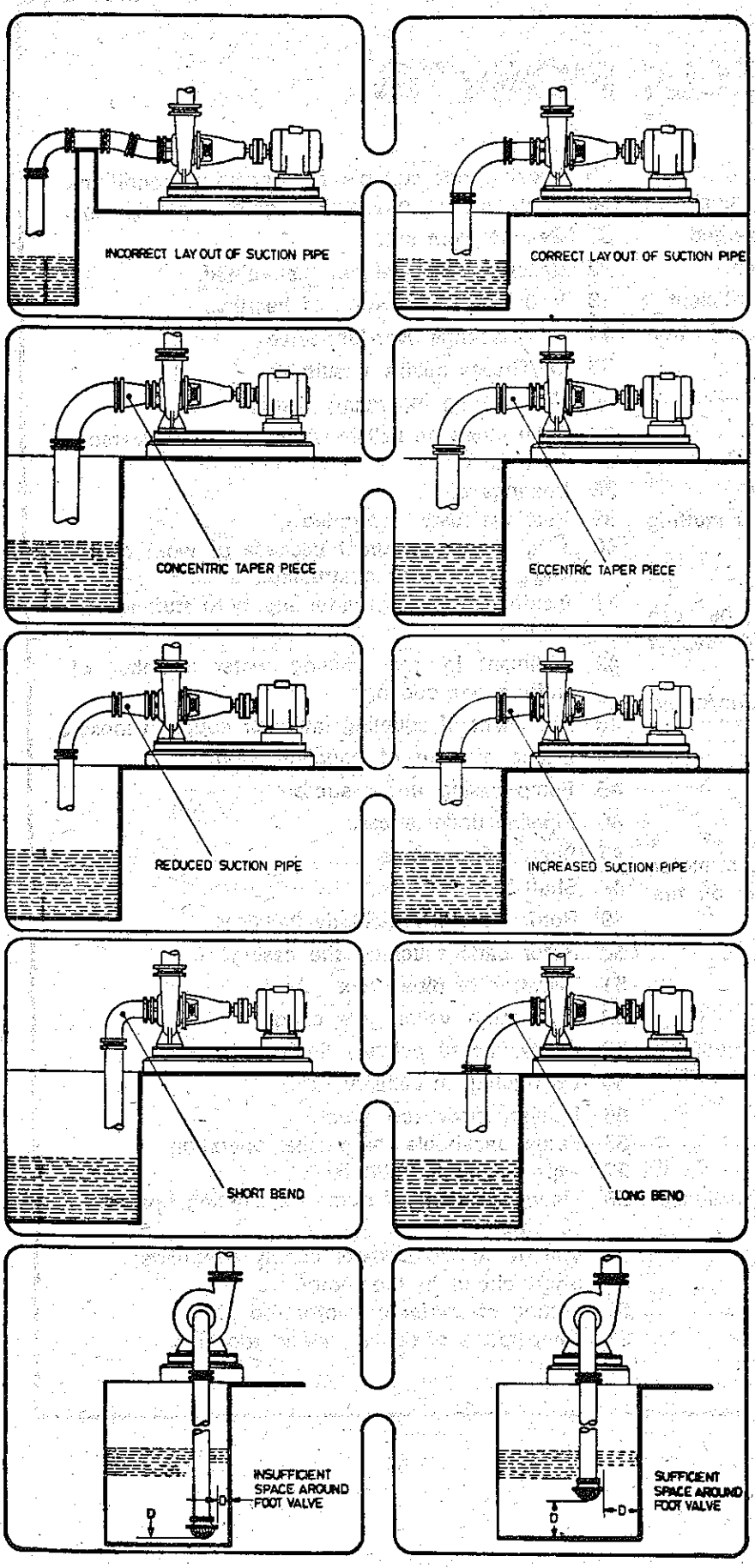
Isolate the equipment before any maintenance work is done. Switch off the mains supply, remove fuses, apply lock-outs where applicable and affix suitable isolation warning signs to prevent inadvertent reconnection. In order to avoid the possibility of maintenance personnel inhaling dangerous fumes or 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 maintenance area.

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

Kirloskar

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

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.

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

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.

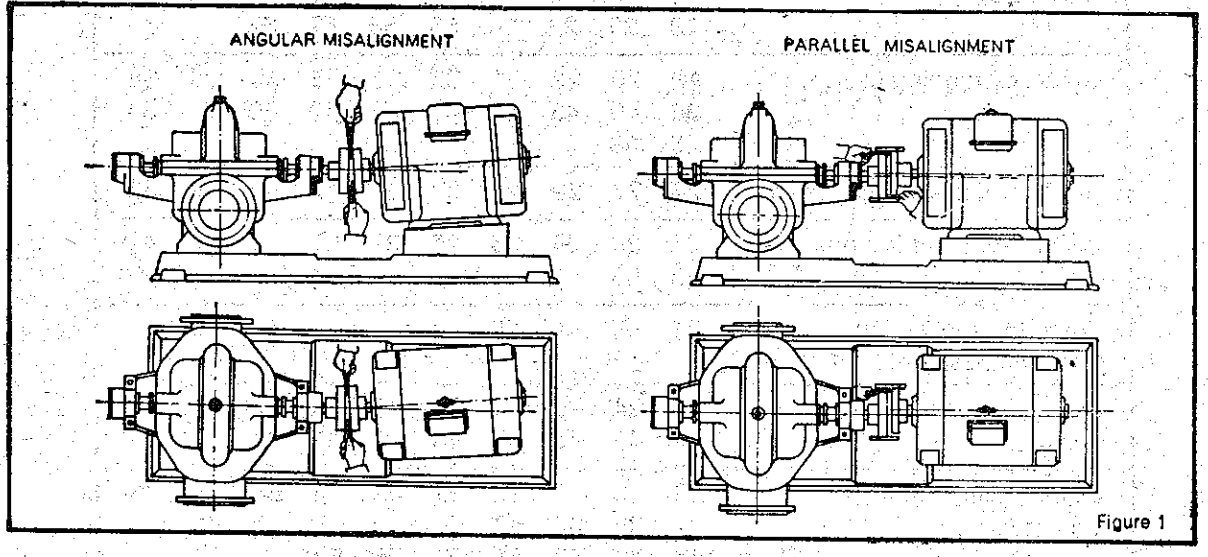


Figure 1

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.

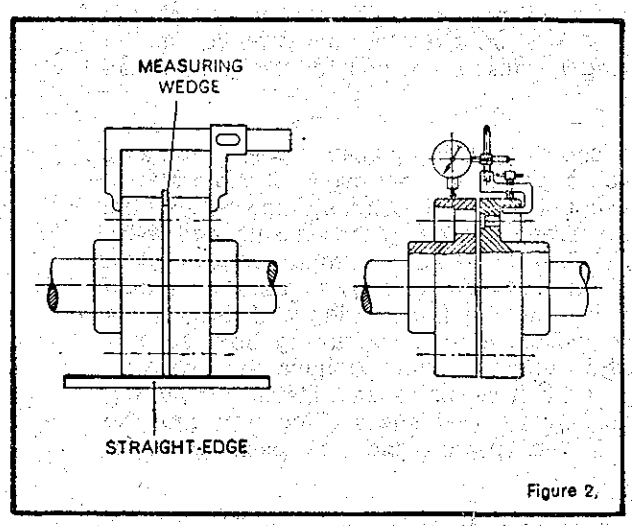
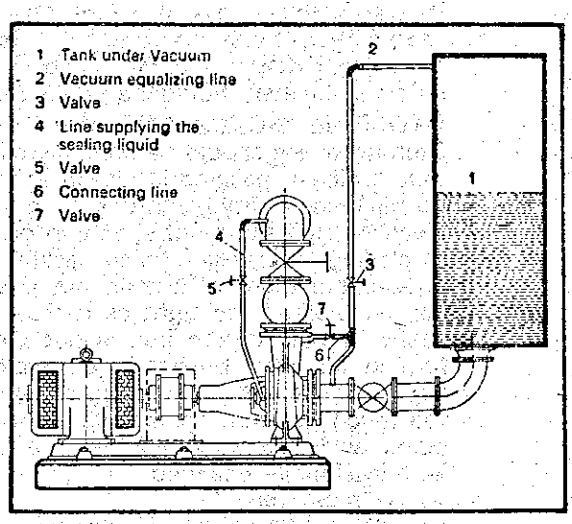


Figure 2,



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

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				

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