



Enriching Lives

Instructions on Installation, Operation & Maintenance for Kirloskar Pump Type – DB $\times e$



KIRLOSKAR BROTHERS LIMITED

Established 1888

A Kirloskar Group Company



KIRLOSKAR BROTHERS LIMITED

REGD. AND HEAD OFFICE UDYOG BHAVAN, TILAK ROAD PUNE-411002

WARRANTY

We warrant that the pump supplied from 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 dispatch 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 or arise solely from faulty workmanship or defective material.

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

KIRLOSKAR BROTHERS LIMITED



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Note: A copy of **General instructions for installation, operation & maintenance of 'Kirloskar pumps'** is attached at the end of this manual.



1. GENERAL:

1.1 This booklet covers instructions for following models of **DBXe** pumps.

x
factor



*x*ceptional Efficiency
*x*clusive Design Engineering
*x*traordinary life
*x*emplary Standard
*x*pansive features
*x*treme testing
*x*tra MOC

SHAFT UNIT-25	SHAFT UNIT-25A	SHAFT UNIT-35	SHAFT UNIT-55
32/13	32/16	65/26	100/40
40/13	40/16	65/32	125/32
50/13	50/16	80/20	125/40
65/13	65/16	80/26	150/32
32/20	80/16	80/32	150/40
40/20	32/26	100/20	
50/20	40/26	100/26	
65/20	50/26	100/32	
		125/26	
		150/26	

1.2 Kirloskar **DBXe** pumps are back-pull-out design, which enables to remove the rotating unit of pump for inspection and repairs without disturbing the pipe connections and motor by using spacer type coupling.

1.3 Four driving units thereby reducing inventory and achieving interchangeability of parts cover the complete range of DBXe pump.

1.4 Pumps when properly installed and given due care in operation and



maintenance should be inspected and located in dry place. The coupling should be rotated once in a month to prevent pitting of bearing surface.

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

1.6 Applications:

'DB_{xe}' pumps can be used for clean low viscosity liquid (up to 20 cSt) having temperature range - 10°C to + 120 °C. with adequate NPSHa to take care of liquid vapor pressure.

The fields of application of these pumps include.

- Water supply
- Sprinkler
- Air conditioning
- Industrial water
- Lift irrigation
- Textile mills
- Swimming pool water
- With small Firefighting equipment
- Drinking water/Potable water
- Cooling water
- Condensate
- Clean juice in sugar industry
- Light chemicals
- Solvent in pharma industry and monomers in paint industry
- Alcohol in distillery

For any other application, please refer to KBL

1.7 Constructional Features:

- Dimensions are fully conforming to EN733 (*except 32/26 and 150/26*)
- Centerline delivery with self-venting feature.
- Back pullout type design



- Pump is having dry shaft design.
- Max. allowable working pressure is $\leq 16 \text{ kg/cm}^2$
- **Flange drilling** : BSEN 1092-PN-16 FF (*standard*)
ANSI B16.1 CL-125 FF (*optional*)
BSEN 1092-PN-16 RF (*only for st casing*) (*standard*)
ANSI B16.5 CL-150 RF (*only for st st casing*) (*optional*)
- **Auxiliary tapping** : BSP (*standard*)
- **Coupling** : Flexible jaw type spacer coupling
- **Stuffing box sealing** : Gland Packing / Mechanical seal (DIN and Cartridge).
- Interchangeability of components
- Pre-lubricated grease sealed bearings (*standard*) / Oil-lubricated bearings (*Optional*)
- Improved allowable suction pressure limit
 - Up to 1800 rpm : 5 bar & Above 1800 rpm and up to 3500 rpm : 3 bar
- Dry Shaft design avoiding liquids contact with pump shaft.
- For Steel casing nozzle Forces and Moments complying as per API610
- High Energy Efficiency to comply to requirement of **Minimum Efficiency Index**
MEI ≥ 0.7 only for clear cold water application pumps as per EN 16480.
- Pumps can be offered with CE marking

1.8 Material of construction:

Pump Casing / Casing Cover	: Cast Iron / CF8M / CF8
Impeller	: Cast Iron / Bronze / CF8M/ CF8
Wear Rings	: Cast Iron / Bronze /SS316/SS304
Pump Shaft	: CS 45C8 / ASTM A-276: SS410/SS316/SS304
Shaft Sleeve	: ASTM A-276 : SS410 H /SS316/SS304



2. SAFETY INSTRUCTIONS:

2.1 General Information

Before performing any actions detailed within this instruction, the Site Health and Safety instructions shall be read and fully understood. The instructions in this document shall also be read and fully understood.

Whenever the equipment is operated, maintained or used in any way, the procedures detailed within these instructions shall be followed. The pump supplied by Kirloskar Brothers Limited (KBL) has been designed with safety in mind, where hazards cannot be eliminated; the risk has been minimized 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. It is the responsibility of the user of the equipment for maintaining safe working practices at all times. The pumps are supplied with stickers for hazard, caution and safety wherever these are applicable.

2.1.1 Within the manual, safety instructions are marked with safety symbols.

Hazard.



This symbol refers to general mechanical aspects of safety.

Hazard.



This symbol refers to electrical safety.



This symbol is used to introduce safety instructions whose non-observance may lead to damage to the machine and its functions.



2.1.2 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.

Pump 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. Should accidental loss or damage occur, contact KBL immediately.

2.1.3 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 the appropriate tools for their respective tasks.

2.1.4 KBL firmly insists that all personnel responsible for installation, operation and maintenance of the equipment must read the manual before any work is done.

2.1.5 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 pressurized systems and hazardous substances. Other personal protection equipment must be worn where local rules apply.

2.2 **Caution** *DO NOT* wear loose or frayed clothing or jewellery, which could catch on the controls or become trapped in the equipment.

2.3 Operation of the equipment for the application other than for which it is supplied can increase the risk from hazards. Please consult KBL before making such change in the application of the equipment.

2.4 Improper installation, operation and maintenance of the product supplied by KBL could result in injury or death.

2.5 Use safety equipments like hand gloves and safety shoes while operating **DBxe** pumps.



2.6 Transport Handling and Storage Instructions:

2.6.1 Transport.

Pumps are dispatched in duly assembled condition. Lubricating oil in the bearing housing is drained prior to dispatch of pump. Pumps are protected against corrosion and packed for transport by normal road, rail and sea carriers.

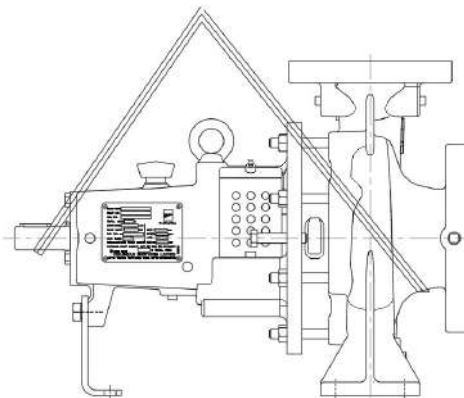
2.6.2 Handling



Crushing Hazard.

When lifting the pump or pump set, use-lifting equipment having a safe working load rating suitable for the weight specified. Use suitable slings for lifting any pump not provided with lifting points.

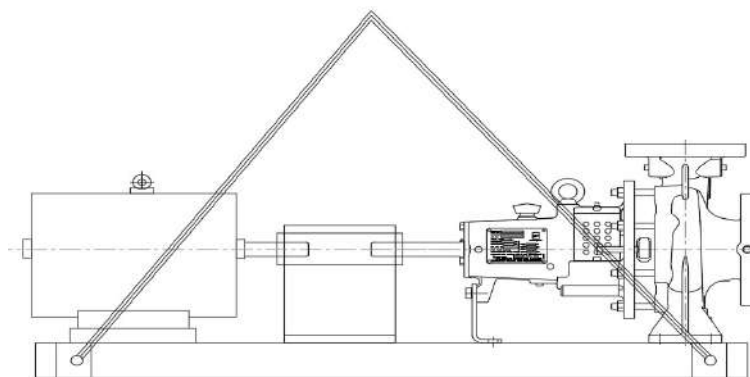
The use of suitable forklift truck and four-chain crane sling equipment is recommended but locally approved equipment rating may be used.



Pump should be slung as shown.

Caution

Pump set must be lifted from the lifting holes provided using suitable four chain lifting equipment.



2.6.3 Storage-

2.6.3.1 Temporary Storage for up to six weeks.

If the pump unit is not to be used immediately, it should be stored carefully in a horizontal position, in a sheltered, dry location.

Caution

Additional rust preventive should be applied to all unpainted carbon steel or cast iron parts and should not be removed until final installation.

2.6.3.2 Long Term Storage.



Shearing Hazard.

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 the safety.

Fill the bearing housing with recommended oil to ensure that the shaft and bearings remain rust free.



2.6.3.3 Exposed or Extreme Conditions Storage.

For exposed storage or extreme variants in atmospheric or environmental conditions, please refer to KBL for special storage instructions to suit the conditions acceptable.

2.7 Environmental safety

Always keep the station clean to avoid and/or discover emissions.

Waste and emissions regulations:

Observe these safety regulations regarding waste and emissions:

- Appropriately dispose of all waste.
- Handle and dispose of the processed liquid in compliance with applicable environmental regulations.
- Clean up all spills in accordance with safety and environmental procedures.
- Report all environmental emissions to the appropriate authorities.

Electrical installation

For electrical installation recycling requirements, consult your local electric utility.

Recycling guidelines

Always follow local laws and regulations regarding recycling.

3. EQUIPMENT SCHEDULE:

3.1 Installation:

For location, preparing foundation, installation, alignment, general maintenance, trouble shooting, etc., the instructions given in our publication - '**GENERAL INSTRUCTIONS FOR INSTALLATION, OPERATION AND MAINTENANCE OF KIRLOSKAR CENTRIFUGAL PUMPS**' which is also printed along this booklet must be followed very carefully. 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.

3.2 MOUNTING AND ALIGNMENT

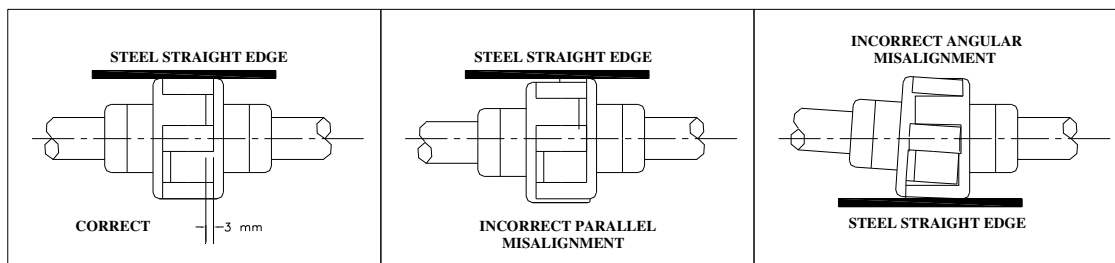
A flexible coupling is used to connect pump shaft to the driver.

3.2.1 ALIGNMENT

ALWAYS REMEMBER "A FLEXIBLE COUPLING IS NOT A UNIVERSAL JOINT".

Correct alignment is essential for the smooth operation of the pump. There are two types of misalignment between the pump shaft and the drive shaft, which are:

Angular misalignment – Shaft with axis concentric, but not parallel.



Parallel misalignment – Shaft with axis parallel, but not concentric.



This misalignment is checked by using a straight edge as shown in figure given above. Alternatively, it can be checked by any other suitable device like laser.

3.2.1.1 Before commissioning the pump set, please ensure:

- A) The pipe connections are flushed and tightened properly.
- B) Alignment is proper.



4. OPERATION:

4.1 EQUIPMENT DESCRIPTION -

All 'DBxe' type of pumps are constructed as standard water pumps in accordance **EN733** (*except 32/26 and 150/26*) as far as their main dimensions and performance ratings are concerned. These are single stage, single suction, horizontal shaft and volute type foot mounted pumps with the bearing bracket also having a support foot. These are centrifugal pumps with enclosed type impeller and are fitted with standard accessories.

Gland packing or Mechanical seal is used to seal the leakage of pumped liquid across the shaft.

4.2 EQUIPMENT OPERATION -

4.2.1 Before starting the pump check the following:

- 1) The pump rotates freely by hand.
- 2) The sealing connections if any, is properly tightened and adjusted.
- 3) Fill in the oil for bearings in case of Oil lubricated bearings, if not done earlier.
- 4) The direction of rotation of driver. It should correspond to the direction of rotation of pump.
- 5) The pump casing and the suction pipeline is fully primed with the liquid.
- 6) Valve on delivery side is closed.
- 7) Stuffing box packing is properly tightened.
- 8) The cock for pressure gauge connection is closed.

4.2.2 Starting the pump

- 1) Start the pump. Let the prime mover pickup its full speed.
- 2) Open the valve on delivery line gradually.
- 3) Regulate the required flow by adjusting the delivery valve.
- 4) Open the cock for pressure gauge connection.



4.2.3 During running the pump check the following things and regulate if needed

- 1) The pump is running smooth.
- 2) The flow of sealing liquid (if external liquid is provided for sealing purpose) is uninterrupted.
- 3) Leakage through stuffing box is normal. There should be leakage of 60-80 drops per minute.
- 4) The bearings are not getting abnormally hot.
- 5) Head and capacity developed by the pump is as specified.
- 6) Power consumption is within limit.
- 7) Ensure that there is no mechanical friction in the pipe.
- 8) 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.

4.2.4 During stopping the pump

- 1) Close the valve on the delivery line.
- 2) Stop the motor.
- 3) Close the cooling water and sealing liquid connections.
- 4) If the pump is not required to be operated for a long time, drain the casing completely. If the pump is required to be stored for a long time, the bearing housing should be dried internally with hot air and should be flushed with moisture free protective such as light oil or kerosene.

Failing to follow right shop practices during equipment operation will result into failure of product & in turn product warranty gets void.



5. MAINTENANCE:

5.1 MAINTENANCE ENVIROMENT, HEALTH AND SAFETY (EHS) INSTRUCTIONS

Following hazards may arise during maintenance work.



Fluid Pressure Jet Hazards

Check and ensure that the pump operates at below the Maximum Working Pressure specified.



Hazardous Materials:

Wear a suitable mask or respirator when working with chemical material handling.



Hazardous Gases, Mists, Sprays and Leaks.

Be aware of the hazards relating to the pumped fluid, especially the danger from inhalation from 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.

Before attempting any maintenance on a pump, particularly if it has been handling any form of hazardous liquid; ensure that the unit is safe to work on. The pump must be flushed thoroughly with suitable cleanser to purge away any of the product left in the pump components. The plant operator should carry this out 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 that may be contaminated.



Electric Shock and Accidental Starting Hazard:

Isolate the equipment before any maintenance work is done. Switch off the mains supply, remove fuses, apply lockouts where applicable and affix suitable isolation warning signs to prevent inadvertent re-connection.

In order to avoid the possibility of maintenance personnel inhaling dangerous fumes or vapors, it is recommended that maintenance work be carried out away from the pump location by removal of the rotating unit assembly to a suitable maintenance area.

5.2 General maintenance Documents :

1) Maintenance documents:

- i) Pump Sectional assembly drawing with part list
- ii) Pump Outline dimension drawing
- iii) Mechanical seal assembly drawing
- iv) Foundation plan drawing

2) Specific maintenance data:

5.2.1 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.

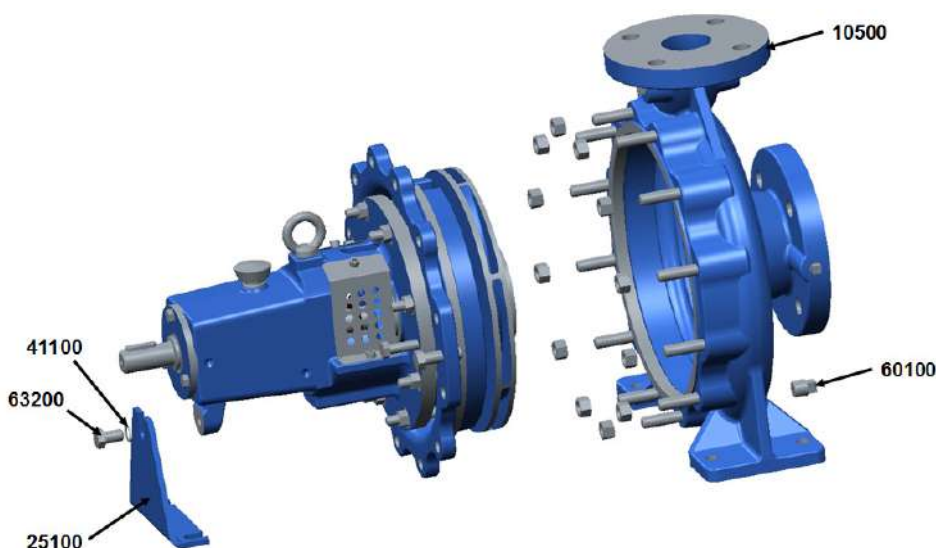
Procedure for dismantling and re-assembly

While dismantling and re-assembling, the cross-sectional assembly drawing and specification part list should be referred.

5.2.1.1 Dismantling:

Follow the following simple steps to dismantle the pump.

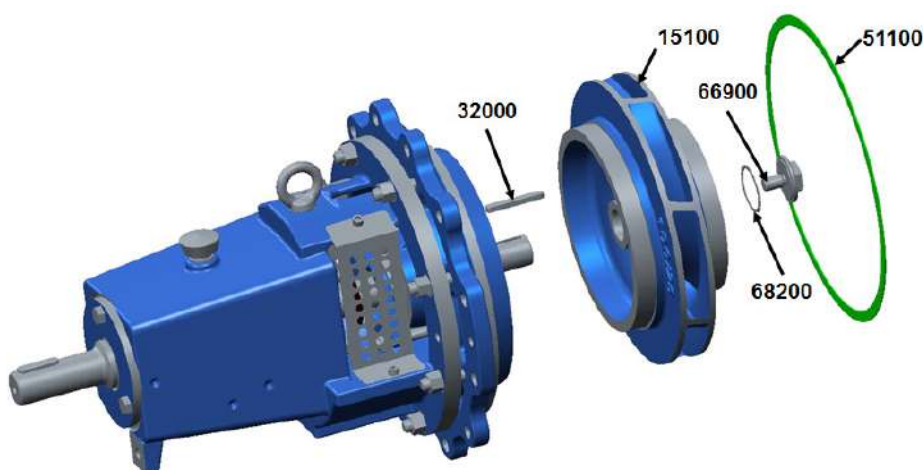
- 5.2.1.1.1 Isolate power supply to motor.
- 5.2.1.1.2 Shut off valves controlling flow to and from the pump.
- 5.2.1.1.3 Remove the gland seal sealing connection and auxiliary piping, if any.
- 5.2.1.1.4 Remove the spacer of jaw type coupling in case of pumps fitted with spacer type coupling. Remove the prime-mover in case of pumps fitted with standard type of jaw type coupling. Remove the pump half of coupling from the pump shaft.
- 5.2.1.1.5 Drain the delivery casing by removing the drain plug (60100). Remove support foot (25100). Drain the oil from bearing housing in case of oil lubricated pump.
- 5.2.1.1.6 Adjust string or chain tension to support the weight of the back pull out assembly by holding down the eyebolt provided on top of bearing housing.



- 5.2.1.1.1 Pumps covered under assembly 'A'. (Refer cross sectional view on page 25).

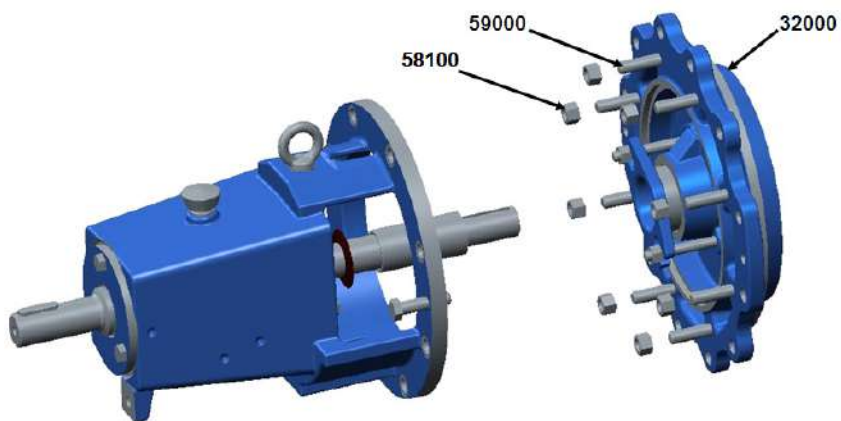
Unscrew the nuts (58100) holding delivery casing (10500), stuffing box housing (22000) and bearing housing (24000). Take out the sub-assembly of bearing housing with stuffing box and impeller, etc.

- 5.2.1.1.2 Pumps covered under assembly 'B'. (Refer cross sectional on page 26).
- 5.2.1.1.3 Unscrew the nuts (58100) holding delivery casing (10500) and stuffing box housing. Take out the sub-assembly of stuffing box housing, bearing housing, impeller, etc.
- 5.2.1.1.4 Slightly pull out the driving unit till impeller (15100) clears the pump casing (10500).
- 5.2.1.1.5 Place this rotating unit on a table or clean and dry place for further dismantling.
- 5.2.1.1.6 Remove casing gasket (51101).
- 5.2.1.1.1 Unscrew the impeller Hex Screw (66900) and remove gasket (68200).
- 5.2.1.1.2 Remove the impeller (15100) from the pump shaft (18000).
- 5.2.1.1.3 Take out the impeller key (32000).



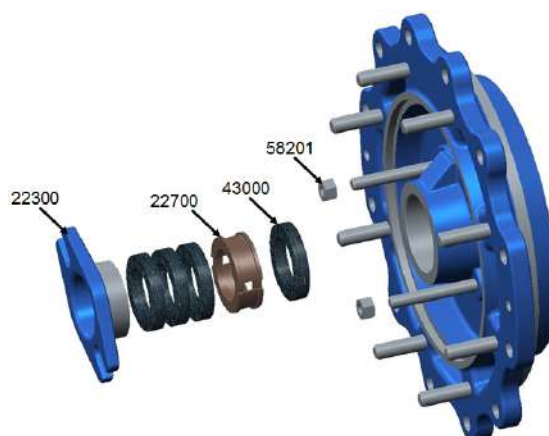
Removal of stuffing box gland packing:

- 5.2.1.1.4 In case of assembly 'A' just separate the stuffing box housing casing cover (22000) from the bearing housing.
- 5.2.1.1.5 In case of assembly 'B' separate the stuffing box housing casing cover (22000) from the bearing housing by unscrewing the nuts (58100) holding them together.



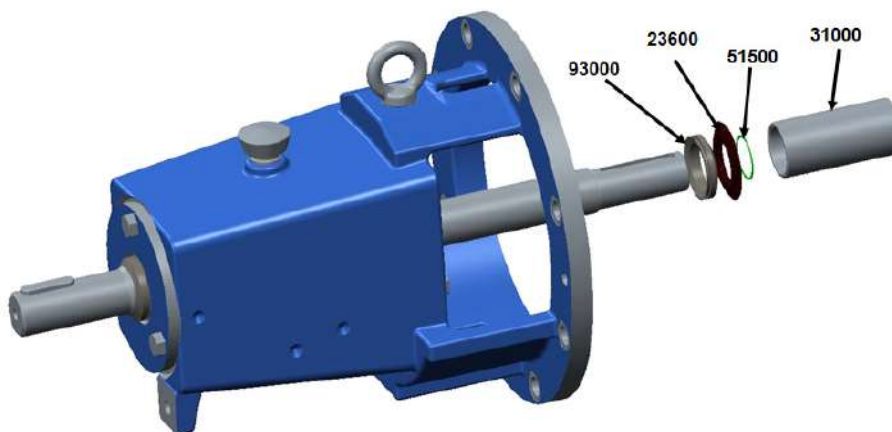
5.2.1.1.6 Unscrew the gland nuts (58201) and take out gland (22300).

5.2.1.1.7 Remove gland packing rings (43000) along with lantern ring (22700) from the stuffing box housing.

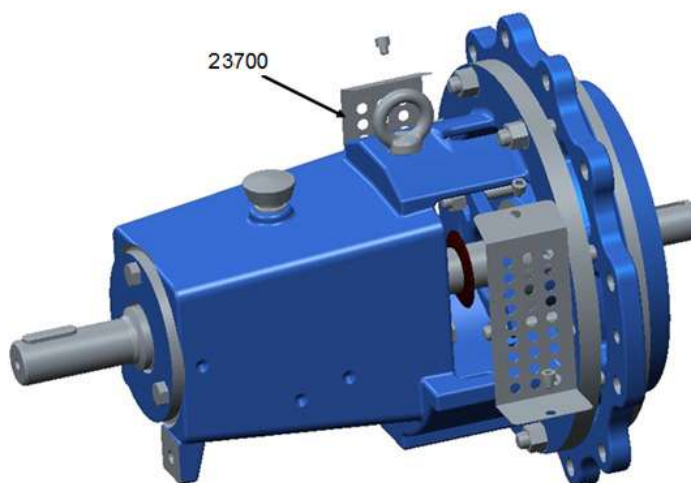


5.2.1.1.8 Remove the shaft sleeve (31000) and remove gasket for shaft sleeve (51500).

5.2.1.1.9 Remove liquid deflector (23600). Remove the 'V' ring (93000) from shaft.



5.2.1.1.10 Remove Stuffing Box guard (23700) by removing cap screw.

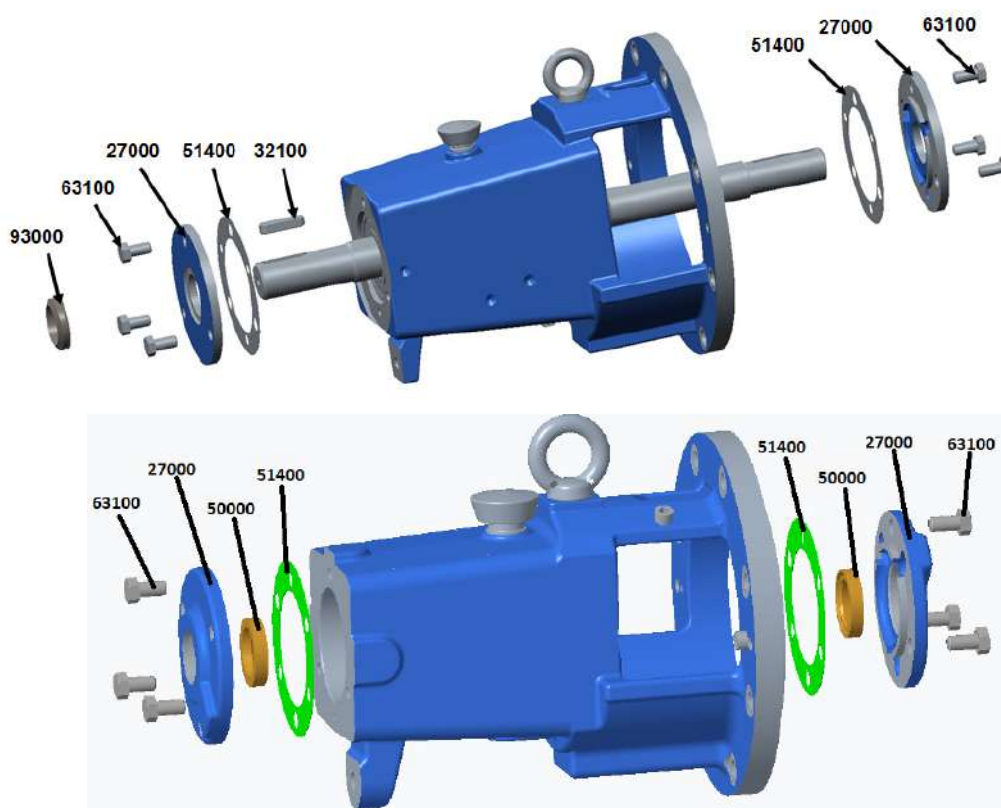


5.2.1.1.11 Remove the Coupling key (32100) from pumps Shaft. Remove the 'V' ring (93000) from shaft. In case of oil lubricated pump oil seals (50000) are provided both at DE and NDE bearing cover instead of 'V' rings

5.2.1.1.12 In case of grease lubricated pump remove the bolts (63100) holding bearing cover NDE and DE and remove bearing cover (27000) and in

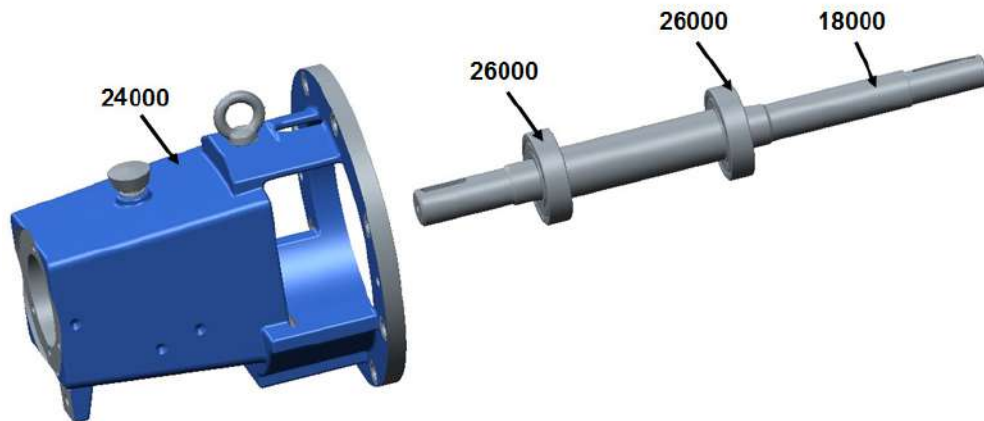
case of oil lubricated pump remove bearing cover along with oil seal (50001)

5.2.1.1.13 Remove the DE side and NDE side Bearing cover gasket (51400).



5.2.1.1.14 Take out the shaft (18000) from the bearing housing along with bearing (26000) by light hammering from driving end.

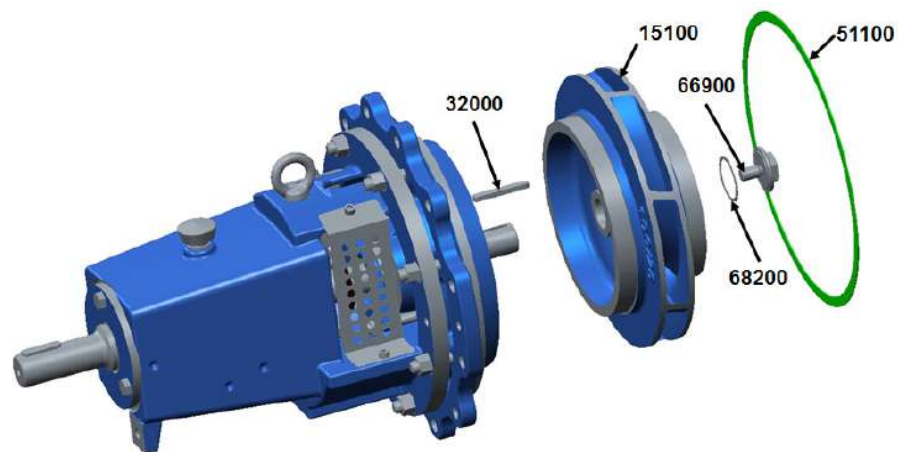
5.2.1.1.15 Remove the bearings (26000) from shaft with the help of puller. Do not hammer the bearings as hammering may spoil them.



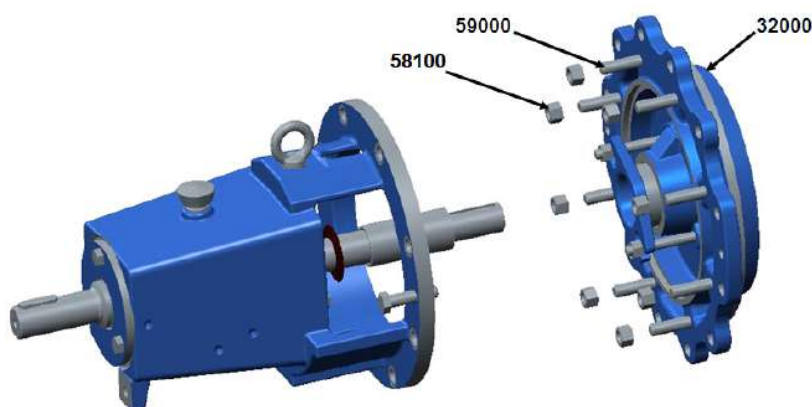
A) Removal of Single Cartridge Mechanical seal from stuffing box:

Refer following steps– (Refer mechanical seal drawing)

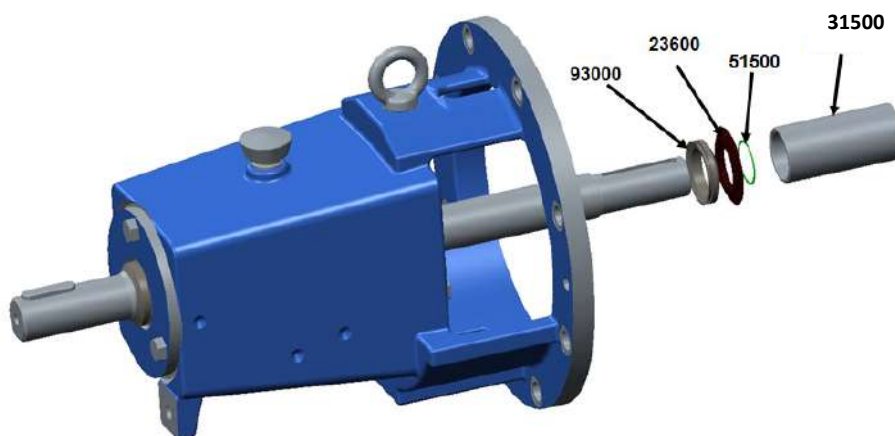
- a) Remove auxiliary piping connections viz. sealing, flushing, of mechanical seal cover.
- b) Before any action to be taken for cartridge seal removal, FIRST SLIDE THE SLIDING WASHERS AND ENGAGE THEM IN THE GROOVE ON DRIVE COLLAR FIRMLY.
- c) Unscrew the impeller Hex Screw (66900) and remove gasket (68200).
- d) Remove the impeller (15100) from the pump shaft (18000).
- e) Take out the impeller key (32000).



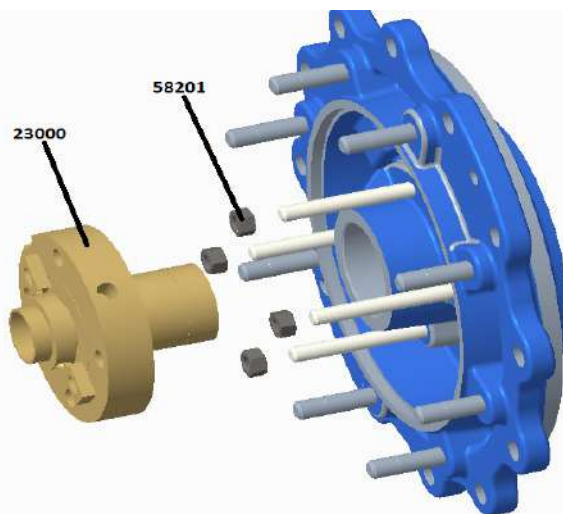
- f) Remove hex. nuts from casing cover (22000) studs holding the cover of mechanical seal.
- g) In case of assembly 'A' just separate the stuffing box housing casing cover (22000) from the bearing housing.
- h) In case of assembly 'B' separate the stuffing box housing casing cover (22000) from the bearing housing by unscrewing the nuts (58100) holding them together.



- i) Remove the shaft sleeve for mechanical seal (31500) from the shaft. Remove gasket for shaft sleeve (51500), liquid deflector (23600). 'V' ring (93000) from the shaft.



- j) Remove Cartridge mechanical seal (23000) assembly.



- h) Loosen grub screw holding the liquid deflector (23600). Take out deflector.

6.9.2 Disassembly of pumps fitted with a DIN Mechanical Seal:

Remove the impeller key and carefully withdraw the shaft sleeve complete with the rotating element of the mechanical seal.

Note: If after examination of the rotating element, it is found necessary to remove the rubber bellows from the shaft sleeve, the complete mechanical seal assembly will have to be replaced.

Removal of the mechanical seal depends on the pump construction:

For pumps with shaft sizes 25,25A 35 and 55 with a bolted casing cover construction only.

- a) Remove stud nuts from the bearing housing first, before proceeding with instruction

For pumps with shaft size 25,25A or 35 and with clamped casing cover construction, commence with instruction b).

- b) Using screw drivers or similar tools as levers in the recesses provided carefully rise apart and remove the casing cover complete with the stationary element of the mechanical seal, from the bearing housing. Care must be taken to ensure that the stationary element of the seal and the shaft are not damaged when extracting the shaft.



- c) The stationary element of the seal may be removed from the casing cover by pressing out by hand from the drive end. If the stationary element is damaged or shows signs of wear, it must be replaced. Pull off thrower from shaft. Unscrew the hexagon screws and remove both bearing covers from the bearing housing. Using a soft faced hammer or suitable drift, carefully drive the pump shaft out with its bearings in the direction of the drive end, i.e. away from the pump end, ensuring that the impeller nut thread is not damaged. Care must be taken to ensure that the pump end bearing passes centrally through the bore of the drive end bearing housing.

5.2.1.2 Reassembly:

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 thoroughly checked for wear and replaced, if necessary. Replace all paper packing's.

➤ Re-assembly of Gland packed pump :

- 5.2.1.2.1 Mount the driving and non-driving end side bearings on the shaft. Use arbor press or induction heater. Do not use hammer.

Caution

*It is recommended that bearings should be heated in oil bath at temperature up to max 1200C and then fitted. If hot oil bath is not available, then ARBOUR PRESS must be used.
Use gloves while fitting bearings from hot oil bath
Grease lubricated pump bearing are supplied with sealed bearing in case of oil lubricated pump bearings are not sealed type.*

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

In case of oil lubricated pump fit oil seal (500001) inside the groove of bearing cover and then fit the bearing cover.



- 5.2.1.2.3 Insert the shaft along with bearings in bearing housing from DE side.
- 5.2.1.2.4 Fit the DE bearing cover and tighten the bolts to hold it on bearing housing. In case of oil lubricated pump fit oil seal (500001) inside the groove of bearing cover and then fit the bearing cover.
- 5.2.1.2.5 Only for grease lubricated pump fit the 'V' ring on shaft adjacent with DE & NDE side bearing cover
- 5.2.1.2.6 Mount the liquid deflector on shaft on NDE side.
- 5.2.1.2.7 Fit the gasket for shaft sleeve on the shaft and fit the shaft sleeve for gland packing (310000).
- 5.2.1.2.8 Insert the gland (22300) over the shaft
- 5.2.1.2.9 In case of pumps covered under assembly 'A' locate the stuffing box housing on bearing housing.
- 5.2.1.2.10 In case of pumps covered under assembly 'B' locate the stuffing box housing on bearing housing and tighten the nuts to hold them in position.
- 5.2.1.2.11 Insert the stuffing box packing rings along with lantern ring.
- 5.2.1.2.12 Tighten the gland nuts.
- 5.2.1.2.13 Fit the impeller key on shaft.
- 5.2.1.2.14 Fit the impeller on shaft.
- 5.2.1.2.15 Place the gasket between impeller and impeller Screw and tighten the impeller Screw.
- 5.2.1.2.16 Place the packing between delivery casing and stuffing box housing.
In case of pumps covered under assembly 'A' fit the sub-assembly of bearing housing, stuffing box housing and impeller, etc., on the delivery casing and tighten the nuts holding delivery casing, stuffing box housing and bearing housing.
- 5.2.1.2.17 Place the packing between delivery casing and stuffing box housing.
In case of pumps covered under assembly 'B' fit the sub-assembly of bearing housing, stuffing box housing and impeller, etc., on the



delivery casing and tighten the nuts holding delivery casing and stuffing box housing.

5.2.1.2.18 Fit the drain plug for delivery casing and other plugs, if any. Mount the foot support.

5.2.1.2.19 Fit the pump half of jaw type coupling on the pump shaft. For standard jaw type coupling, fit the prime mover in position. For spacer type jaw type coupling fit the spacer in position.

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

5.2.1.2.21 Fit the St. Box guard.

Caution

New packing has to be run-in and it is good practice to start the pump with the stuffing box gland quite loose. Packing that is too tight in the box will cause undue friction, creating heat, which will glaze the packing and possibly score the shaft sleeves. To be effective, the packing must remain soft and pliable. If stuffing box friction is so great that the pump shaft cannot be turned by hand, the box is not properly packed.

➤ Re-assembly of cartridge Mechanical Seal fitted pump :

Follow the above mentioned procedure 5.2.1.2.1 to 5.2.1.2.6 for rest refer following

- a) Take the complete cartridge from its package. Do not disassemble or alter the unit. Gently insert assembly of the cartridge mechanical seal on the shaft and let it rest on shaft.
- b) Fit the gasket for shaft sleeve on the shaft and fit the shaft sleeve for gland packing (310000) and for mechanical seal pump fit shaft sleeve for mechanical seal (315000) provided along with mechanical seal.



Caution

While sliding the cartridge assembly, ensure the sleeve slides forward easily to avoid the seals getting over compressed and damaged. Do not give jerks to the assembly, which may damage the mating ring. While sliding the complete assembly do not hammer on the gland. Apply grease or oil on the shaft while sliding the assembly. This will ease the sliding of O-ring.

Then put casing cover (22000) & guide it into

- c) In case of pumps covered under assembly 'A' locate the stuffing box housing on bearing housing.
- d) In case of pumps covered under assembly 'B' locate the stuffing box housing on bearing housing and tighten the nuts to hold them in position.
- e) Tighten the cartridge seal cover nuts only finger tight.

After that follow the above mentioned procedure 5.2.1.2.13 to 5.2.1.2.19

- f) Fit the gland sealing and other auxiliary piping connections, if any.
- g) Fit the St. Box guard.

Note :

The instructions given in this book are of general nature. This manual is to be read in contest with C/S (cross-sectional) drawing supplied against order. In case of mechanical seal arrangement, KBL invariably supply C/S (cross-sectional) drawing indicating mechanical seal arrangement. This drawing should be referred while commissioning of pumps and carrying out any maintenance work.

➤ **Installation of DIN Mechanical Seals**

Lubricate the outer surface of the stationary element of the mechanical seal (23000) with soapy water or silicone grease (not oil), ensure that it is square to its housing in the casing cover (22000) and push home by hand, taking care not to apply excessive force or to damage the sealing surface. Check that it has been seated fully and that the sealing surface is clean and undamaged.



Refit the casing cover to the bearing housing; fit the bolts for the bolted casing cover, tightening them uniformly and in diagonally opposed pairs sequence.

Position the rotating seal face over the shaft to butt against the static seal element, taking care not to damage the sealing surfaces. Insert the gasket into the sleeve and ensure that it is properly seated.

Lubricate the inner and outer surfaces of the sleeve lightly with silicone grease, fit the spring assembly in position and mount the sleeve over the shaft, compress the spring and insert the impeller key to retain the sleeve in position. Ensure that the rotating seal face is floating against the spring before re-fitting the impeller.

5.3 PREVENTIVE MAINTENANCE:

Preventive maintenance schedule is the periodical checks and precautions by which possibilities of failures and breakdowns are minimized.

5.3.1 Daily checks:

- 5.3.1.1 Pressure gauge reading.
- 5.3.1.2 Bearing temperature.
- 5.3.1.3 Leakage through stuffing box.
- 5.3.1.4 Noise and vibration.
- 5.3.1.5 Voltage and current.
- 5.3.1.6 Constant flow of external sealing liquid if provided.
- 5.3.1.7 Oil leakages (in case of oil lubricated pump)
- 5.3.1.8 Leakages through mechanical seal (if applicable)

5.3.2 Periodical checks:

- 5.3.2.1 Replenish the sealed bearings for deficiency of grease.
- 5.3.2.2 Replenish the OIL (*for oil lubricated pump only*)
- 5.3.2.3 Change the stuffing box packing.
- 5.3.2.4 Check the alignment of the pump set.
- 5.3.2.5 Calibrate the measuring instruments.



5.3.2.6 Check the sealing connections for leakage, etc.

5.3.2.7 Leakages through mechanical seal (if applicable) and replenishment of seal faces.

5.3.3 Annual Check :

5.3.2.1 The pump should be overhauled completely to check the running clearances and to replace worn out parts.

5.3.2.2 The effects of liquid handled on pump components should be checked. If abnormal corrosion, erosion is observed, the component should be replaced with that of suitable material.

5.3.2.3 The auxiliary pipelines and functioning of the auxiliary system should be checked. The main pipe also should be checked for scaling, leakage etc.

5.3.3.4 The measuring instruments, gauges etc should be recalibrated.

5.3.3.5 Full running test may be carried out to check whether there is any fault in the performance, in comparison with original performance.

Caution

Mechanical seal in pump:

The mechanical seal is a precision product having been subjected to quality control throughout all stages of manufacture. The seals are designed to accommodate reasonable tolerances in the equipment, however in order to obtain the maximum life with trouble free performance, the equipment should be adequately maintained. When mechanical seal is functioning satisfactorily without any leakage, the preventive maintenance is not advocated. If leakage occurs, a through check up is needed. While fitting the mechanical seals in the pump initially by KBL, due care is taken for its proper fitment. Like other parts in the equipment the mechanical seals are subject to wear at the mating faces of the rotating and stationary ring. The rate of wear will differ with the operating conditions and various other factors such as lubricating property of the liquid pumped, the presence of impurities in liquid and other operating conditions. In view of this no firm recommendations can be given for renewal of seal rings / complete seals. DBxe pumps are supplied with cartridge type factory assembled mechanical seals and no further operating length adjustments are required.



Flushing: *Flushing at the mechanical seal faces is necessary to provide lubrication, cooling of the seal faces and hence pump should not be run without flushing at the seal faces. Please refer mechanical seal assembly drawing for flushing liquid pressure and temperature.*

In case failure to check above points & maintain proper records/precautions of checks by customer / user, KBL warranty gets void.

5.3 CORRECTIVE MAINTENANCE

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 break down we recommend the location of the fault by referring the table for 'Break Down Check Points' given at the end of this manual.



6. TECHNICAL DATA:

6.1 Models

'DBxe' type of pumps are available in models as referred to in 1.1. Only three shaft units (driving units) are used for complete range of 'DBxe' pumps. The models covered under individual shaft units are given in interchangeability chart (Refer 6.2).

DBxe pumps are suitable for clean liquids having temperature -10 to $+100^{\circ}\text{C}$.

6.2 Interchangeability Chart

INTERCHANGEABILITY CHART OF DBxe PUMP COMPONENTS																			
PART CODE NO.	PART DESCRIPTION	QTY. PER UNIT	PUMP MODELS																
			DRIVING UNIT 25					DRIVING UNIT 25A					DRIVING UNIT 35					DRIVING UNIT 55	
			32/13	40/13	50/13	65/13	32/20	40/20	50/20	65/20	32/16	40/16	50/16	65/16	80/16	32/26	40/26	50/26	65/26
22300	GLAND	1								1							2		3
22700	LANTERN RING	1								1							2		3
23600	DEFLECTOR	1								1							2		3
24000	BEARING HOUSING	1					1							2					4
25100	SUPPORT FOOT	1	1	1	1	2	2	2	2	3	1	1	2	4	3	3	3	3	3
26000	BEARING	2								1							2		3
27000	BEARING COVER (DE & NDE)	2								1							2		3
31000	SHAFT SLEEVE	1								1							2		3
32000	KEY FOR IMPELLER	1								1							2		3
32100	KEY FOR COUPLING	1								1							2		3
06900	IMPELLER SCREW	1								1							2		3
43000	GLAND PACKING	4								1							2		3

6.3 Direction of rotation :

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

6.4 Rotation speed :

All the models are suitable for speed of 1450 rpm.

Besides, following models are also suitable for speed of 2900 rpm.

32/13, 40/13, 50/13, 65/13, 32/16, 40/16, 50/16, 65/16, 80/16, 32/20, 40/20, 50/20, 65/20, 80/20, 100/20, 32/26, 40/26, 50/26, 65/26, 80/26, 100/26.



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

6.5 Bearings ;

The shaft is supplied with antifriction sealed ball bearings at driving end and non- driving end. The bearing specifications are given below. The designations of bearings are as per SKF catalogue. However, equivalent bearings in type, capacity and dimensions are also used. 'DBxe' pumps are provided with antifriction heavy-duty ball bearing, which can carry axial thrust loads in either direction. In these bearings, wear is negligible resulting in accurate alignment for uninterrupted service. L10 Bearing life will be 17,500 working hrs. Within 0.75 to 1.1 BEP zone and 10,000 working hrs Other than 0.75 to 1.1 BEP zone.

Bearing details Grease Lubricated Pump (Sealed Bearings)

Driving Unit Size	Bearing Details		Grease Quantity
	Driving End	Non Driving End	gms
25 & 25A	6305-2RS1	6305-2RS1	5.0
35	6307-2RS1	6307-2RS1	8.0
55	6311-2RS1	6311-2RS1	1.20

Bearing details Oil Lubricated Pump

Driving Unit Size	Bearing Details		Oil Quantity
	Driving End	Non Driving End	litre
25 & 25A	6305-C3	6305-C3	0.2
35	6307-C3	6307-C3	0.55
55	6311-C3	6311-C3	0.9



6.6 Lubrication :

Factory Pre-Grease sealed bearings are the standard scope of supply for grease-lubricated pumps. Pumps with oil-lubricated bearings will be supplied against specific order. Below are its specifications. After about 10,000 operating hours, not later than two years, however, dismantle the bearings and replace same if required based on the condition of bearings.

When service conditions are particularly unfavorable (dusty and wet service, high ambient temperature), then intervals for replacing must be correspondingly shorter.

a) Details of Oil Lubrication:

Manufacturers	Speed -1450 rpm	Speed -2900 rpm
Indian oil	SERVOSYSTEM 100	SERVOSYSTEM 68
Hindustan Petroleum	ENKLO-100	ENKLO-68
Shell	TELLUS 100	TELLUS 68
TEXACO	RANDO HD100	RANDO HD68

Variation in lubrication:

As an optional scope of supply, pumps can be supplied with oil-lubricated ball bearings. If the bearing temperature is always below 50°C and if there is only small risk of contamination, oil should be changed after about once a year. If the bearing temperature is up to 82°C and has a danger of contamination, oil should be changed after about every six months. All the bearings are with C3 clearances. Cooling of the oil in bearing housing is not possible.

For continuous bearing temperature up to 80 °C and up to 1500 rpm speed, oil grade ISO VG100 is recommended for above 1500 rpm VG 68 oil grade is recommended.



6.7 Flexible coupling details :

Sr. No	Pump Model	Model of Std Love-Joy coupling	Model of Spacer Type Love-Joy coupling
1	32/13, 40/13, 50/13, 65/13, 32/16, 40/16, 32/20	L - 100	RRL - 100
2	50/16, 65/16, 40/20, 50/20, 32/26, 40/26	L - 110	RRL - 110
3	80/16, 65/32, 80/32, 100/32, 125/26	L - 150	RRL - 150
4	80/20, 65/20, 50/26, 65/26, 125/32	L - 190	RRL - 190
5	100/20, 80/20, 100/40, 100/26, 150/32	C - 226	CQ - 226
6	125/40, 150/40	C - 276	CQ - 276

* Note: However, couplings are selected considering motor kW and motor make.

6.8 Stuffing box with gland packing arrangement.

6.8.1 Stuffing box sealing arrangement;

Self liquid sealing is standard supply for gland packed pump. For pump with mechanical seal sealing arrangement may vary depending on API plan selected.

6.8.2 Stuffing box packing specification:

Non asbestos type, CHAMPION-36 OR REX-RI99 OR EQ (PTFE BRAIDED WITH GRAPHITE). However, stuffing box packing suitable for liquid handled is supplied against specific requirements.

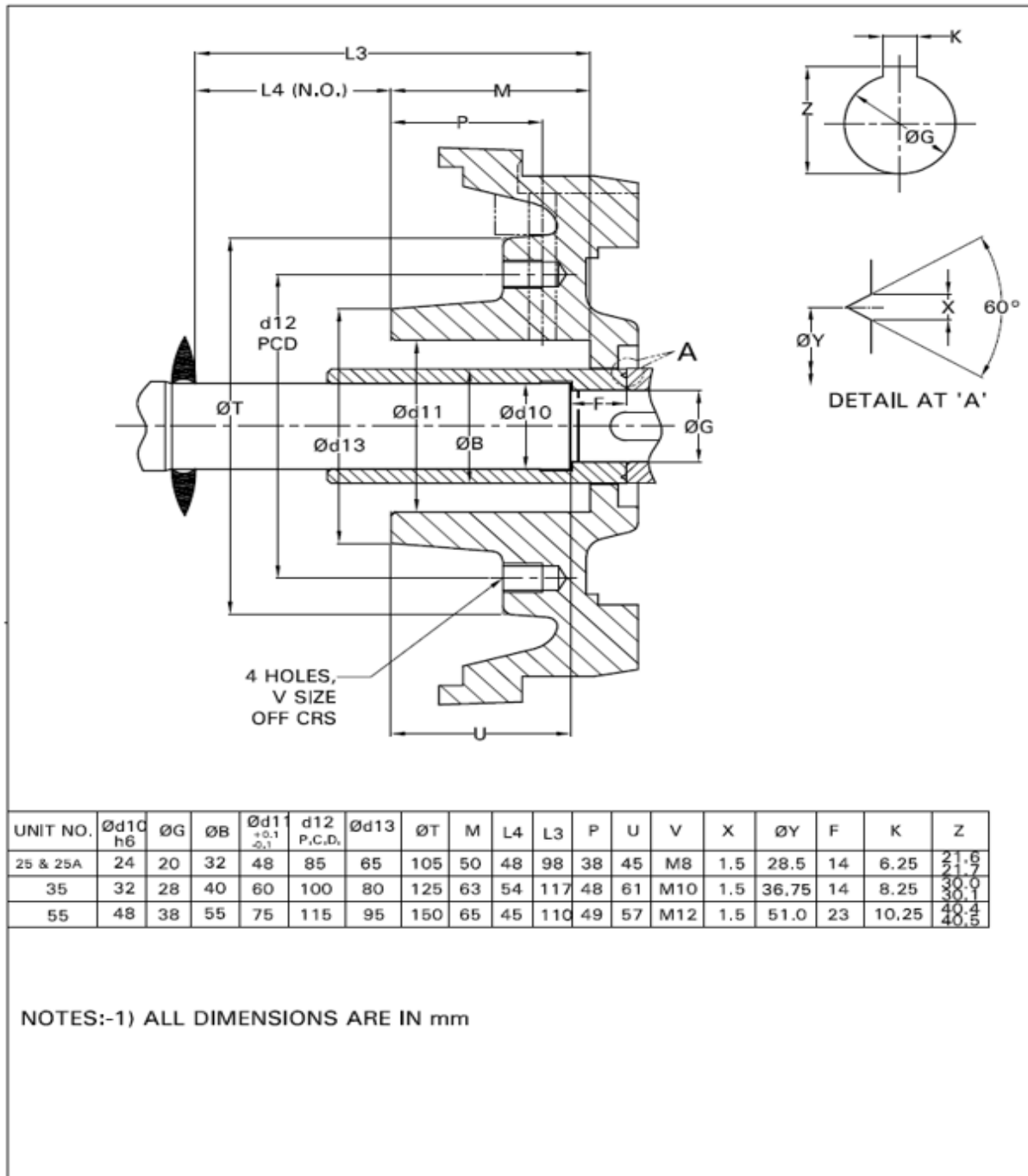


6.8.3 Stuffing box packing and Lantern ring :

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

Shaft Unit no	Size of packing mm	Length of packing mm	No. of packings with one lantern ring	Position from impeller side	Mechanical seal
25 / 25A	8 sq	510	4	1 + L + 3	Cartridge Type
35	10 sq	650	4	1 + L + 3	Cartridge Type
55	10 sq	840	4	1 + L + 3	Cartridge Type

6.8.4 Stuffing box details for Gland Packing and Cartridge Mechanical Seal -



- For Cartridge Mechanical Seal size please refer dimension Ød10. Please do not refer dimension ØB.
- Dimension P is for self-internal sealing arrangement only.



Whenever cartridge mechanical seal is required the seal selected and face combination of the seal shall be compatible to the service and application of the pump.

**(Always refer seal recommendation received from respective seal manufacturer) Below mentioned seal are standard cartridge seals generally used for “DBxe” pumps.*

Seal faces will vary depending upon the type of application. However, as a general guide line elastomer can be selected as per below.

- ***Liquid Water & Temp up to 80°C : Viton***
- ***Liquid Hot Water & Temp above 80°C: EPDM***
- ***Liquid Chemical need to get recommendation from seal supplier.***

For special applications confirmation need to be taken from seal manufacturer. Mechanical seals are offered with different API plans depending upon the compatibility of handling liquid.

If other make seals are requested by client, refer to Engineering with seal recommendations and drawing based on pump stuffing box dimensions.

6.9 Stuffing Box with DIN Mechanical Seal arrangement.

The mechanical seal is optional feature and supply will be of **DIN 24960**, unbalanced type bare mechanical seal only. The mechanical seal sizes are as below.

Unit Size	Mech. Seal Size
Unit 25 & 25A	32 mm
Unit 35	38 mm
Unit 55	55mm

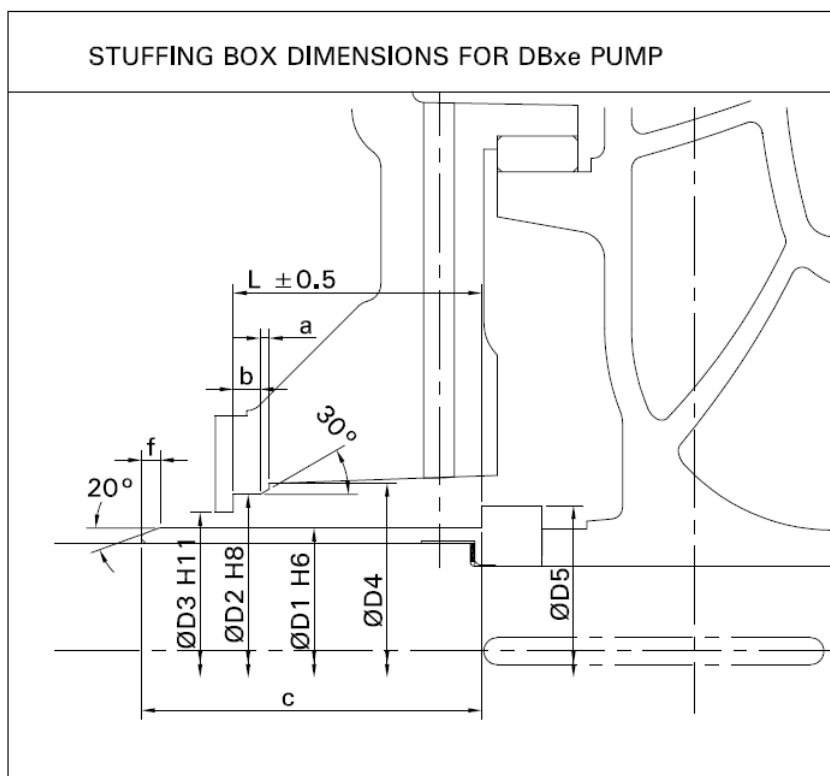


6.9.1 Mechanical Seal chamber dimensions

These dimensions conform to requirements of DIN 24960 standard.

A) For Seal sizes 32, 38 & 55 mm

Sr. No.	Pump Size	DIN Mechanical Seal Chamber Dimensions									
		Size D1	D2	D3	D4	D5	a	b	c	f	L
01	32/13	32	48	42	55	38.5	2	5	43	4	42.5
02	40/13										
03	50/13										
04	65/13										
05	32/20										
06	40/20										
07	50/20										
08	65/20										
09	32/16										
10	40/16										
11	50/16										
12	65/16										
13	80/16										
14	32/26										
15	40/26										
16	50/26										
17	65/26	38	56	49	63	48	2	6	51	4	45
18	65/32										
19	80/20										
20	80/26										
21	80/32										
22	100/20										
23	100/26										
24	100/32										
25	125/26										
26	150/26										
27	100/40	55	75	62	81	65	2.5	6	60	4	47.5
28	125/32										
29	125/40										
30	150/32										
31	150/40										



6.9.2 Conversion Kit :

	PARTS NEED TO BE REPLACED for CONVERSION from GLAND PACKING to MECHANICAL SEAL		
PART DISCRIPTION	GLAND PACKED	DIN MECHANICAL SEAL CONVERSION KIT	CARTRIDGE MECHANICAL SEAL CONVERSION KIT
CASING COVER	Available	New	New
SHAFT SLEEVE	Available	New	New
GLAND & GLAND PACKING	Available	Not Applicable	Not Applicable
LANTERN RING	Available	Not Applicable	Not Applicable
MECHANICAL SEAL	Not Applicable	DIN 24960	Cartridge Type
INTERNAL FLUSHING	Available	Available	Not Applicable
EXTERNAL FLUSHING	Not Applicable	Not Applicable	New



7. PARTS LIST & CROSS-SECTIONAL ASSEMBLY:

Part List for DBxe pumps

Part no.	Description	Qty. per Pump
10500	Pump Casing	1
15100*	Impeller	1
18000	Pump Shaft	1
19000*	Casing Wear ring, Suc. Side	1
19100	Casing Wear ring, Del. Side	1
22000	Casing Cover	1
22300	Gland	1
22700*	Lantern Ring	1
23600*	Liquid Deflector	1
24000	Bearing Housing	1
25100	Support Foot	1
26000*	Radial Ball Bearing SKF or eq.	2
27000	Bearing Cover	2
30300	Lifting Eye Bolt	1
31000*	Shaft Sleeve	1
32000*	Key For Impeller	1
32100	Key for Coupling	1
23700	St. Box Guard	2
41100	Lock Washer for Support Foot	1
43000*	Gland Packing	4
44500*	Oil level Sight Glass (for oil lub. Pump)	1
44400	Oil Filter Plug (For Oil lub. Pump)	1
50000*	Oil Seal (For Oil lub. Pump)	2
51100*	Gasket for Casing Cover	1
51400*	Gasket for Bearing Cover	2
51500*	Gasket for Shaft Sleeve	1
63100	Hex Screw for Bearing Cover	6
63200	Hex Screw for Support Foot	1
58100	Hex Nut for Pump Casing Stud	8/12 (Based on pump size)
58201	Hex Nut for Gland Stud	2
58202	Hex Nut for Casing Cover Stud to Brg. Housing	6/8 (Based on pump size)
59000	Stud for Pump Casing and Casing Cover	8/12 (Based on pump size)
59101	Stud for Casing Cover and Gland	2



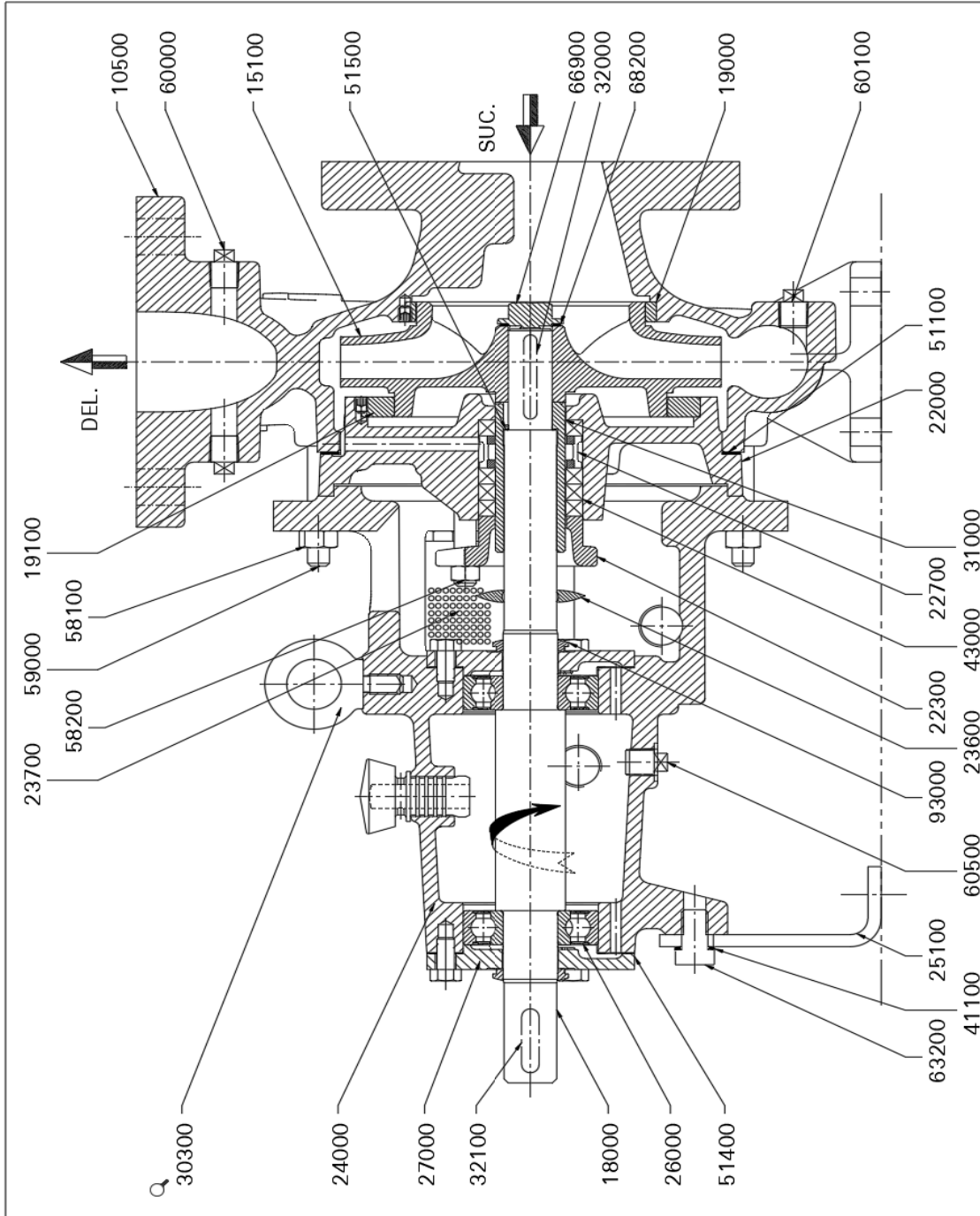
59102	Studs for Casing Cover to Brg. Housing	6/8 (Based on pump size)
45700	Vent plug	1
60000	Gauge plug	2
60100	Drain plug for casing	1
60200	Sealing plug	1/2
60500	Drain plug for bearing housing	1
51701	Gasket for collared plug	1
51702	Gasket for collared plug	1
51704	Gasket for st. Box sealing plug	½ (Based on pump size)
51703	Gasket for brg. Housing drain plug	1
66900*	Impeller Hex Screw	1
93000	"V" ring	2

* Indicates Recommended Spares.

8 CROSS SECTIONAL ASSEMBLY:

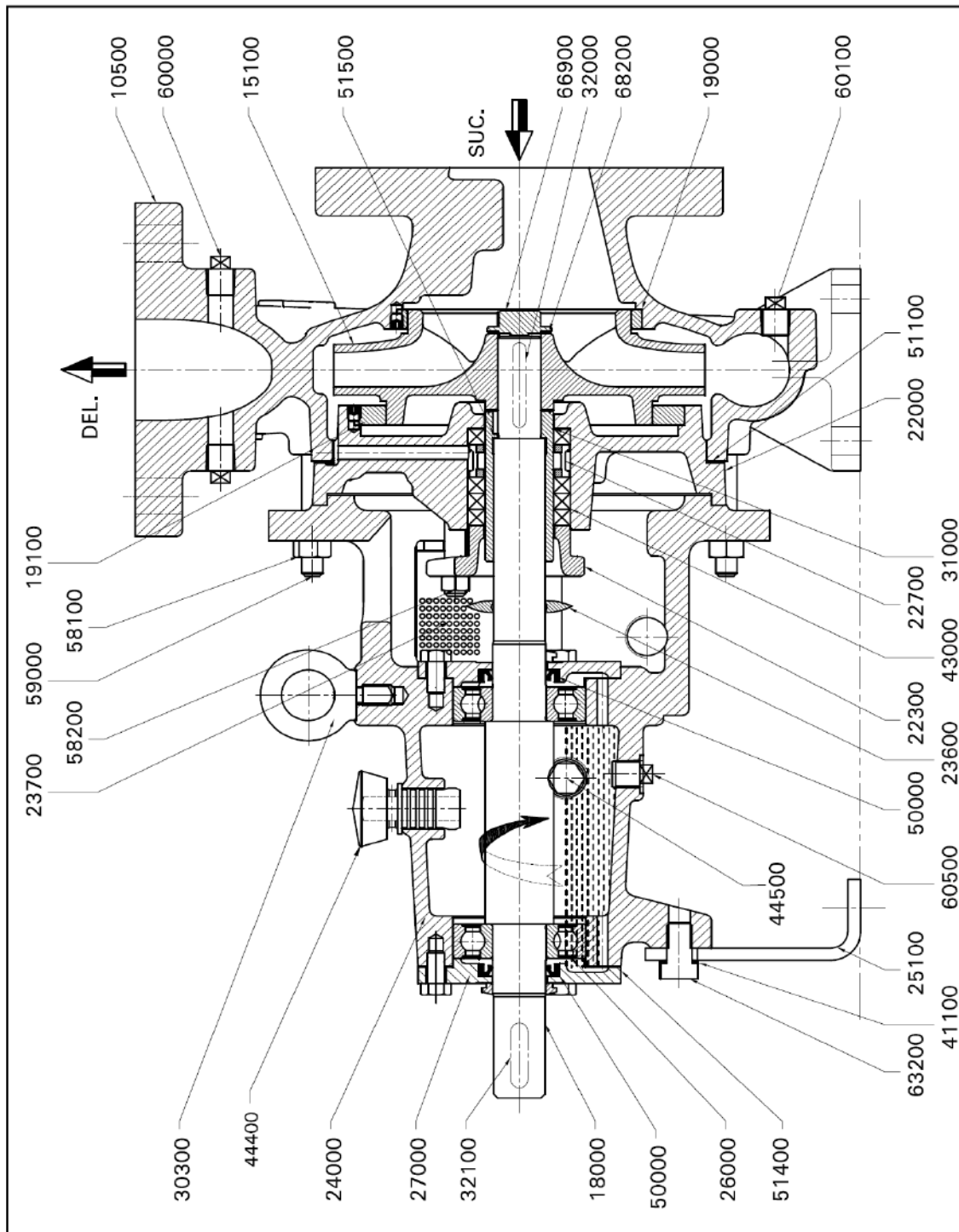
a. CROSS SECTIONAL ASSEMBLY OF (Gland Packed and Grease Lubricated)

1) DBxe 32/13 to 65/13 2) DBxe 32/16 to 80/16 3) DBxe 32/20 to 100/20 4) DBxe 32/26 to 125/26



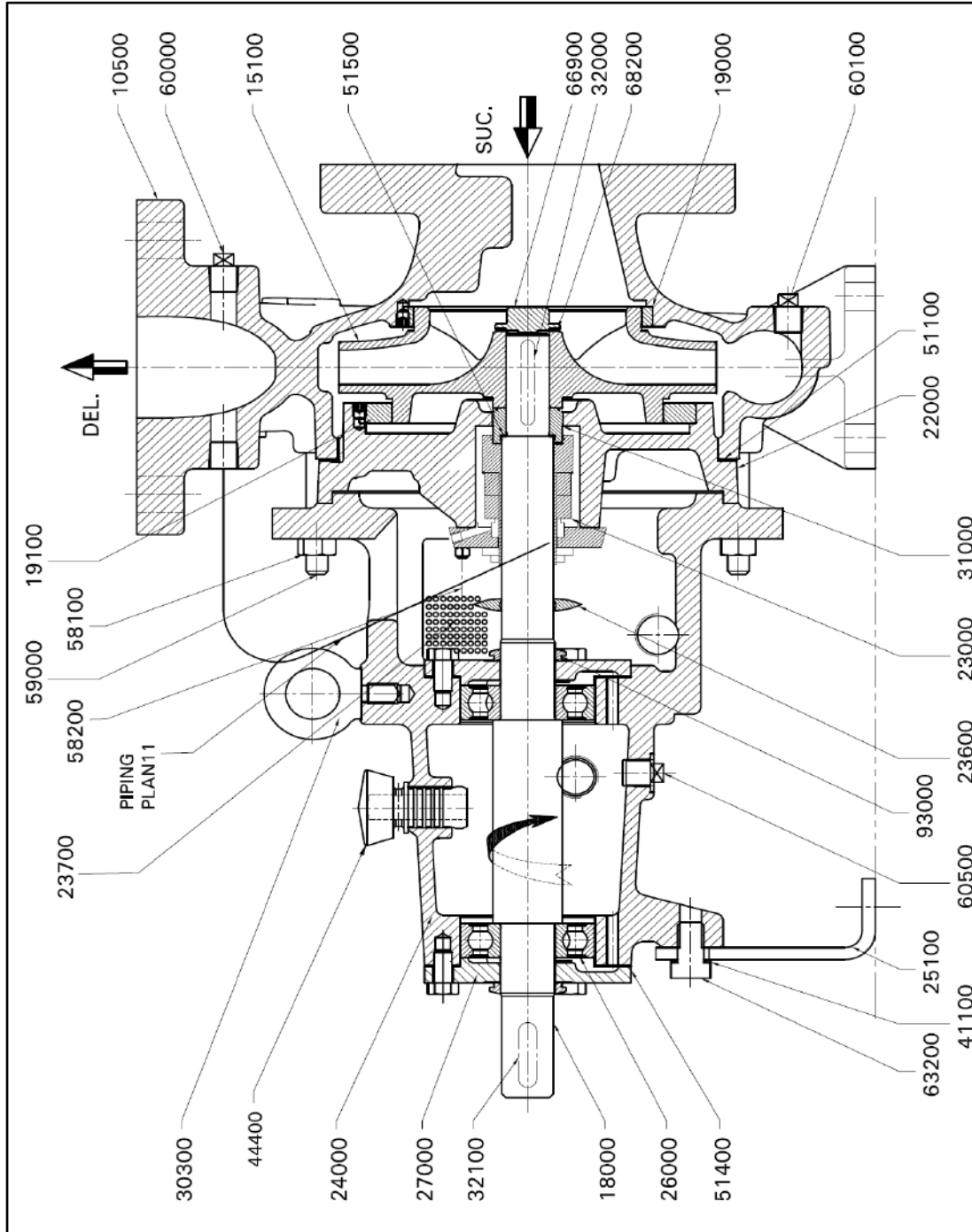
b. CROSS SECTIONAL ASSEMBLY OF (Gland Packed and Oil Lubricated)

2) DBxe 32/13 to 65/13 2) DBxe 32/16 to 80/16 3) DBxe 32/20 to 100/20 4) DBxe 32/26 to 125/26



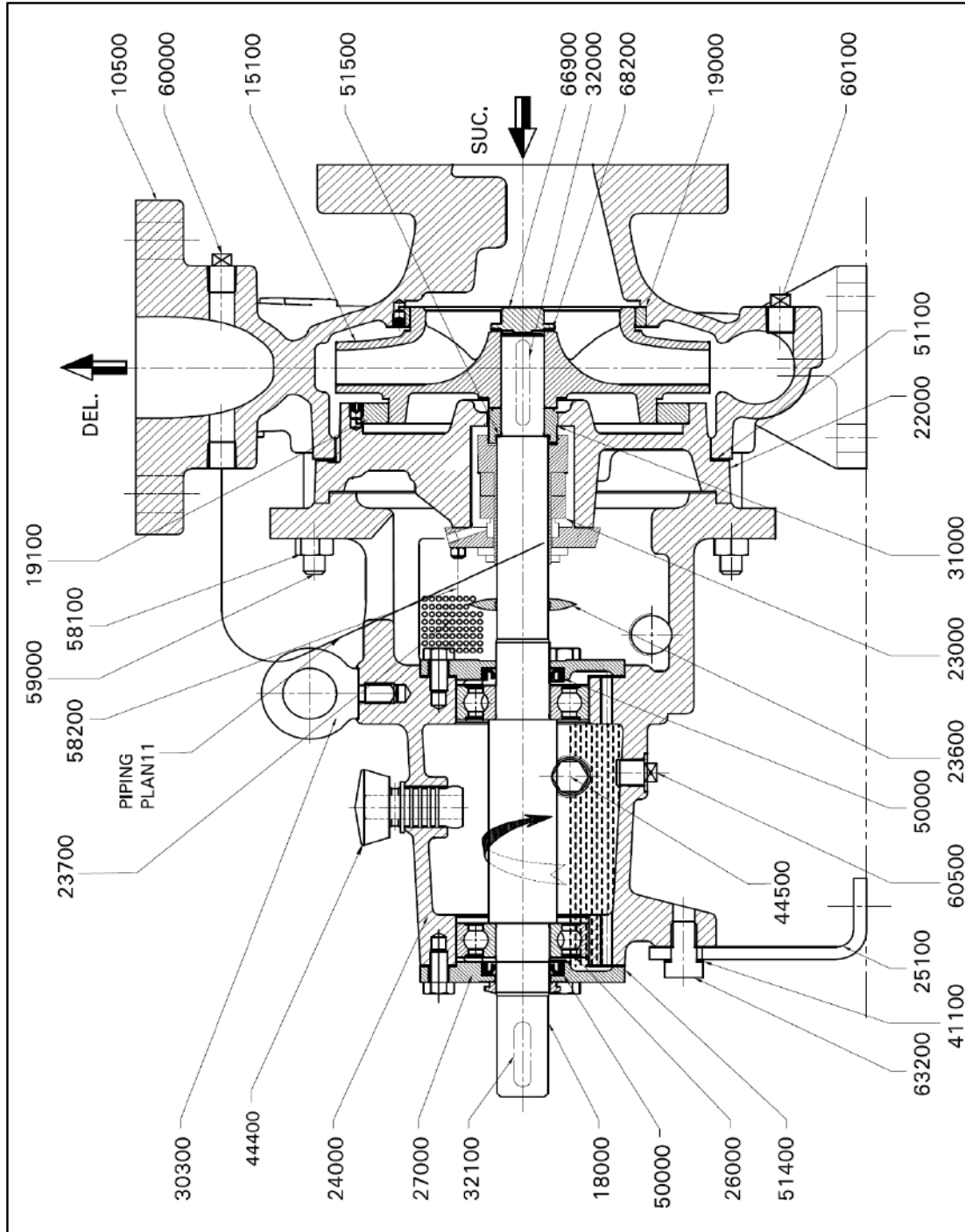
c. CROSS SECTIONAL ASSEMBLY OF (Mech Seal and Grease Lubricated)

- 1) DBxe 32/13 to 65/13 2) DBxe 32/16 to 80/16 3) DBxe 32/20 to 100/20 4) DBxe 32/26 to 125/26



d. CROSS SECTIONAL ASSEMBLY OF (Mech Seal and Oil Lubricated)

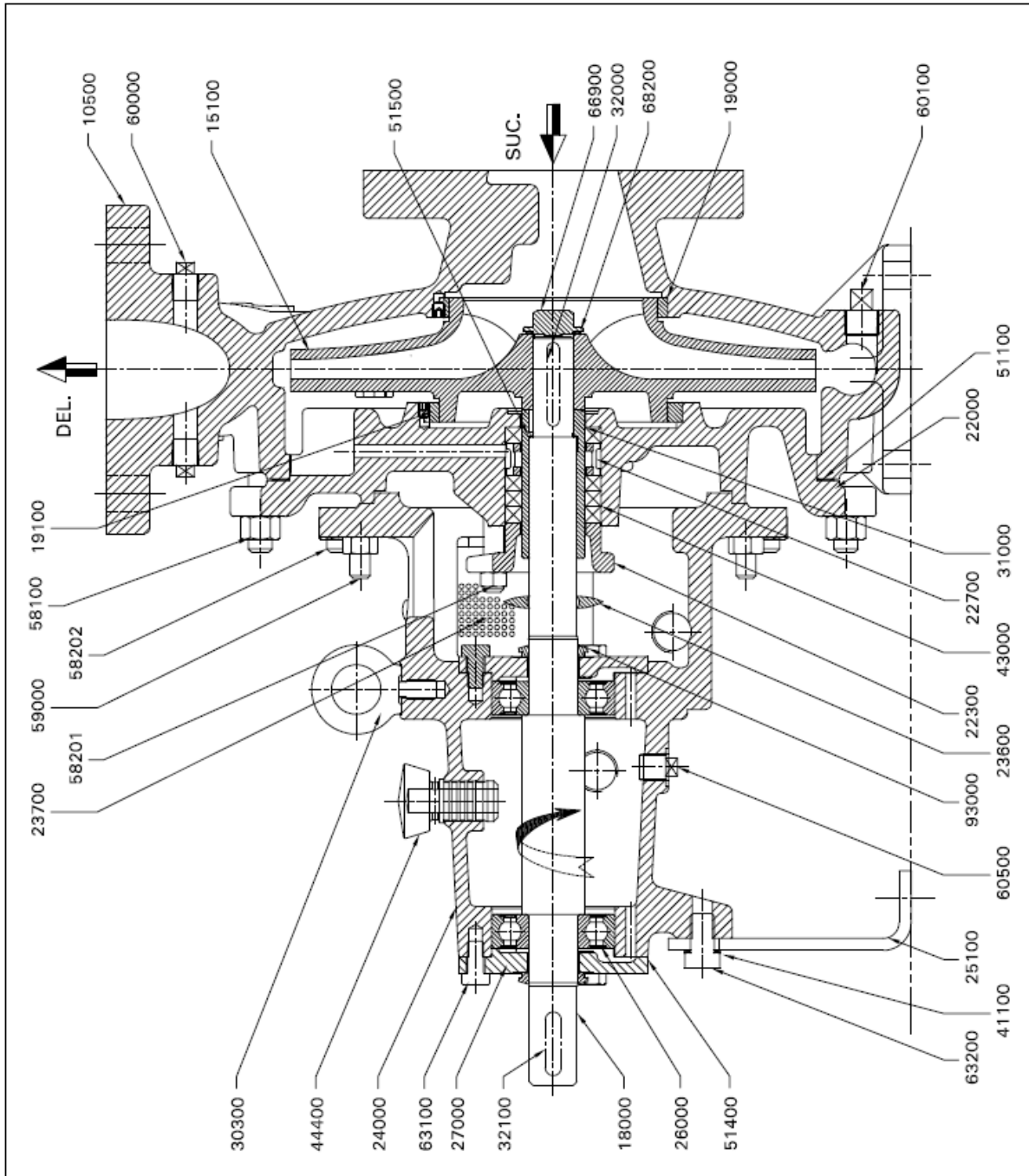
- 1) DBxe 32/13 to 65/13 2) DBxe 32/16 to 80/16 3) DBxe 32/20 to 100/20 4) DBxe 32/26 to 125/26



e. CROSS SECTIONAL ASSEMBLY OF (Gland Packed and Grease Lubricated)

DBxe 65/32 to 150/32

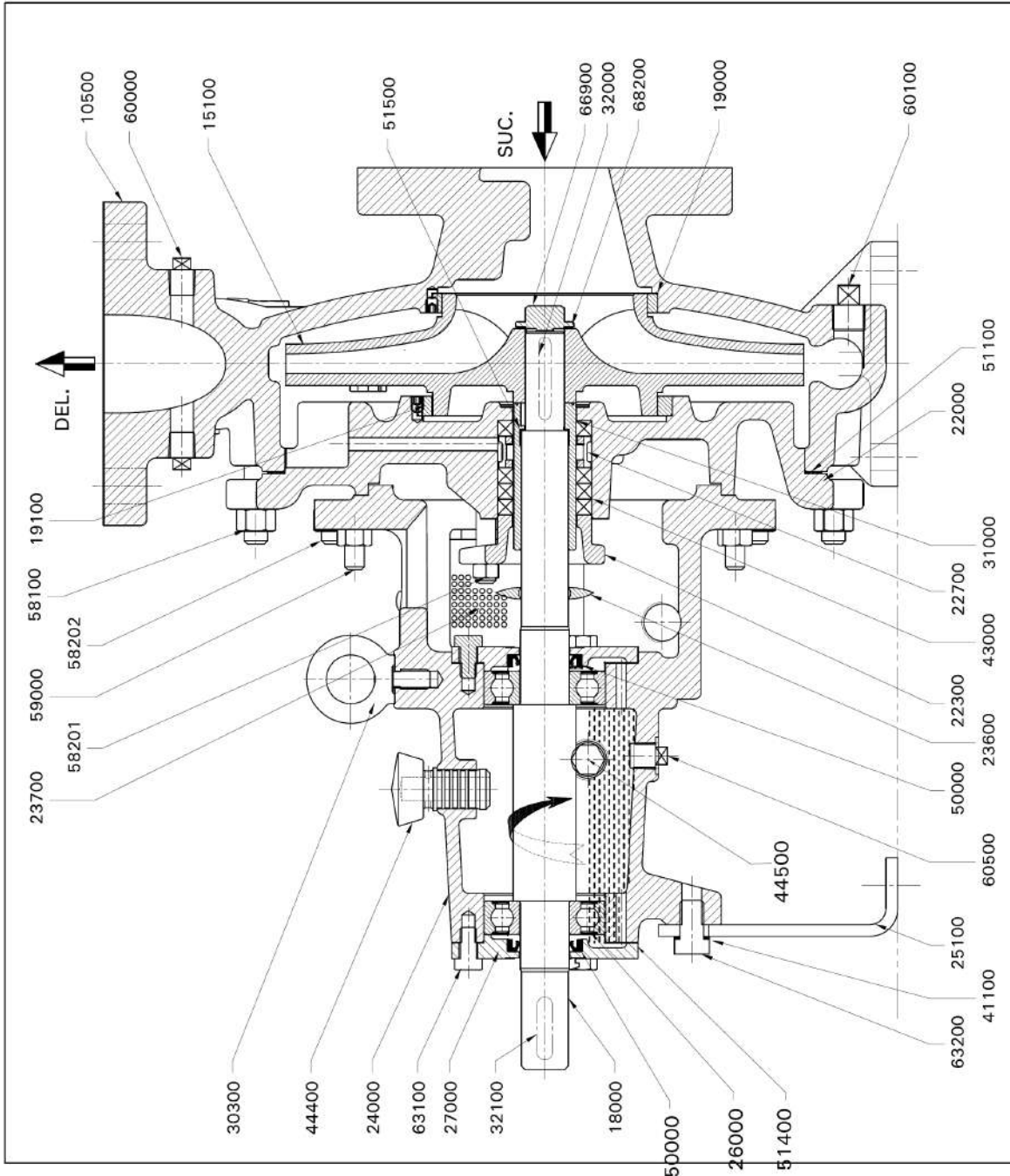
DBxe 100/40 to 150/40



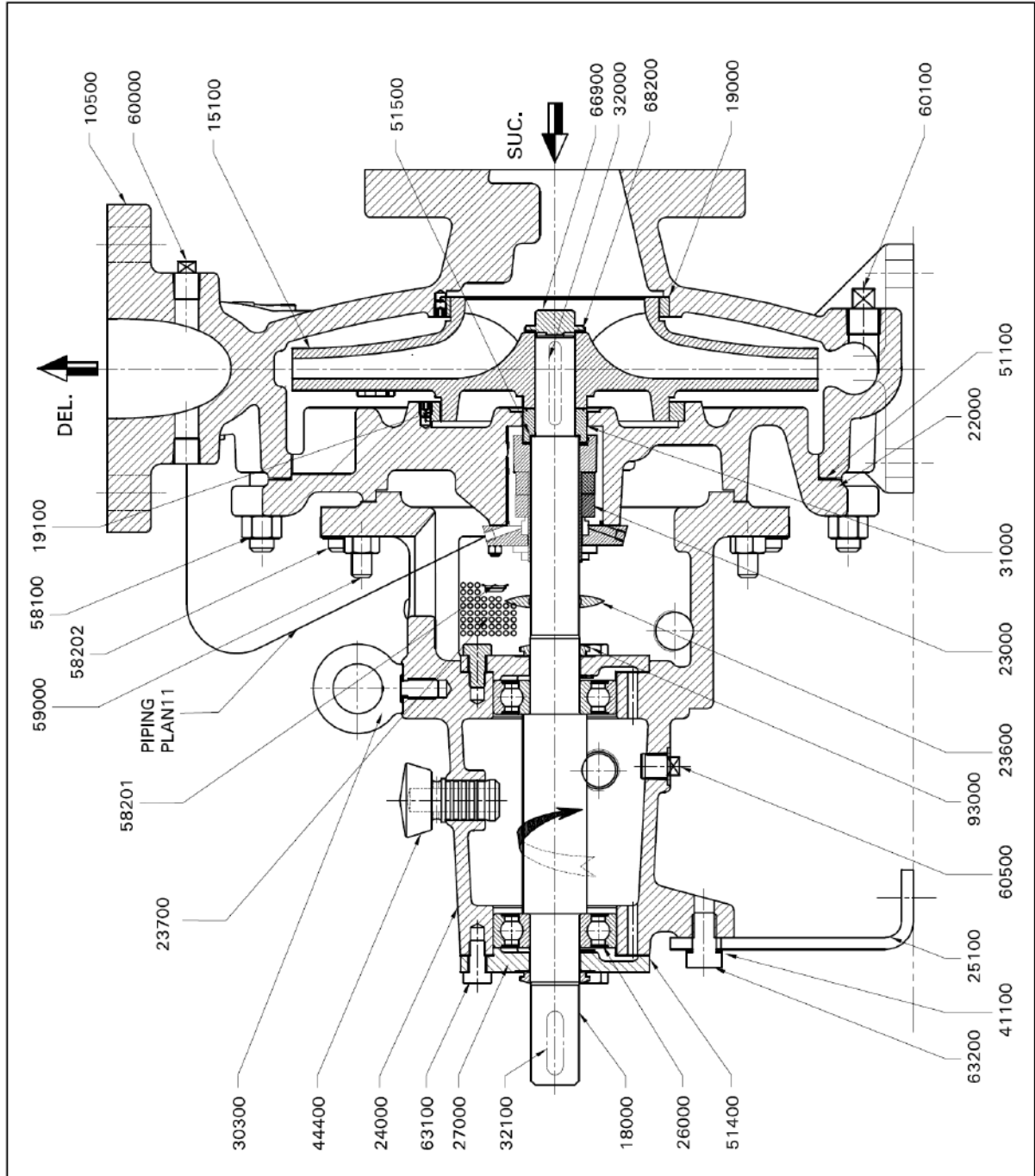
f. CROSS SECTIONAL ASSEMBLY OF (Gland Packed and Oil Lubricated)

DBxe 65/32 to 150/32

DBxe 100/40 to 150/40

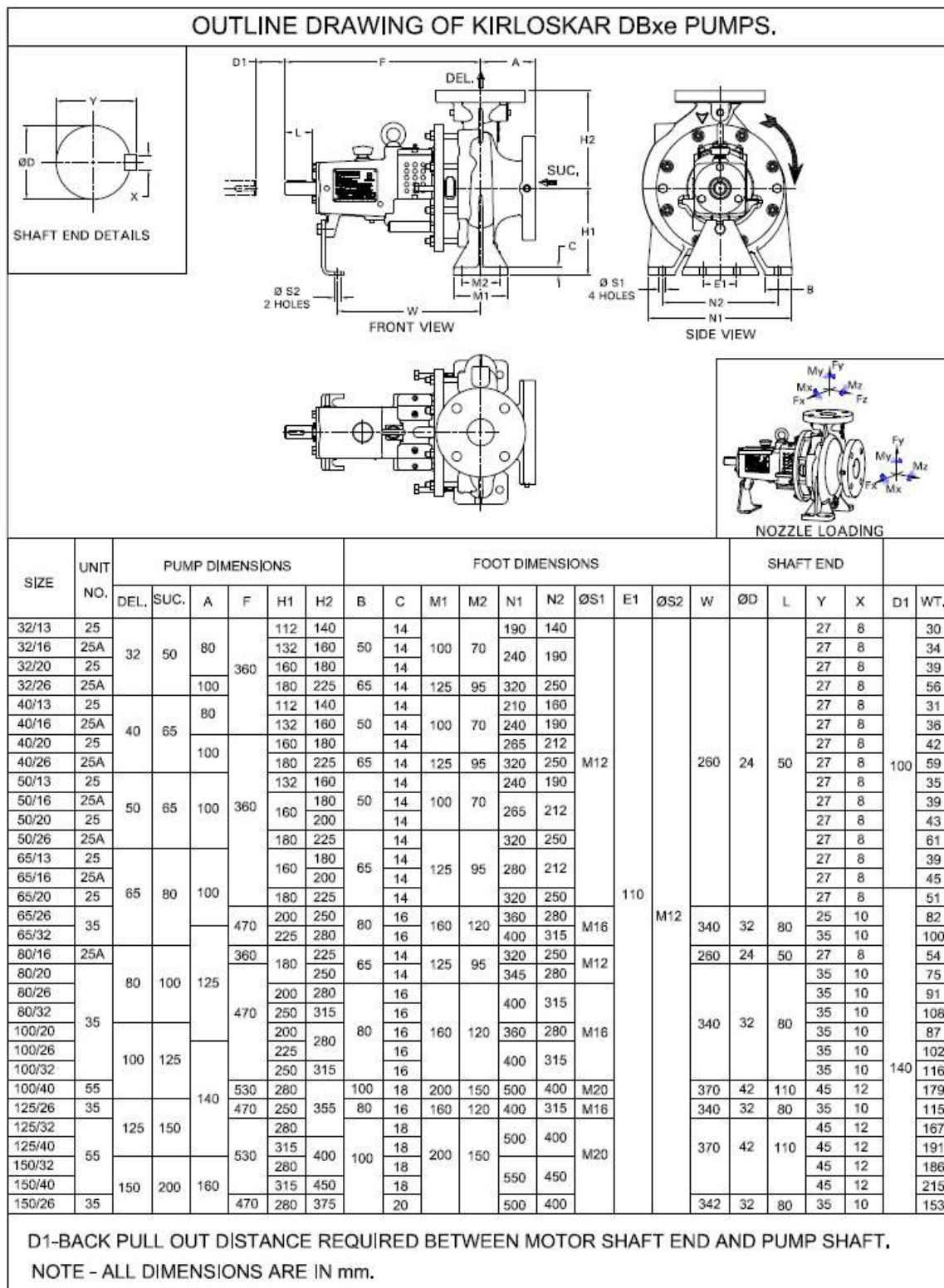


g. **CROSS SECTIONAL ASSEMBLY OF (Mech Seal and Grease Lubricated)**
 DBxe 65/32 to 150/32
 DBxe 100/40 to 150/40

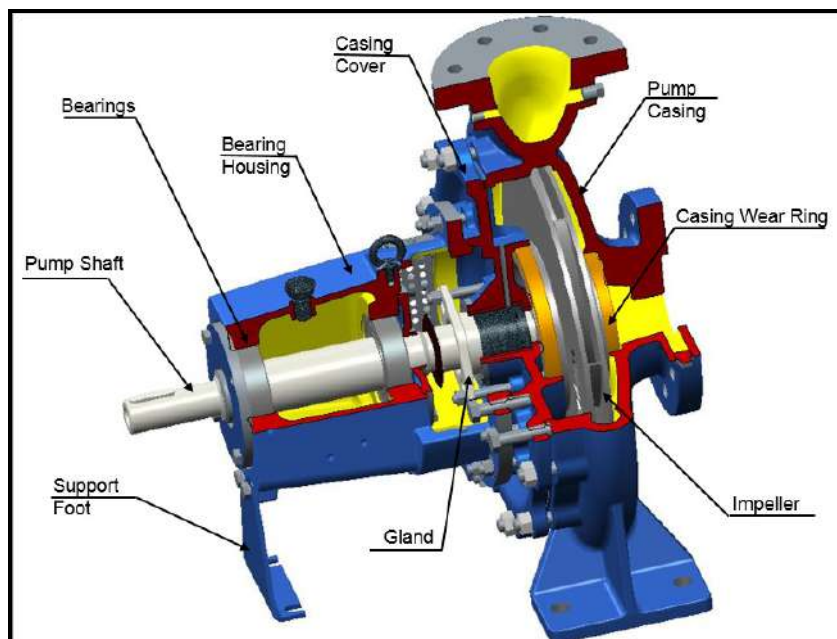




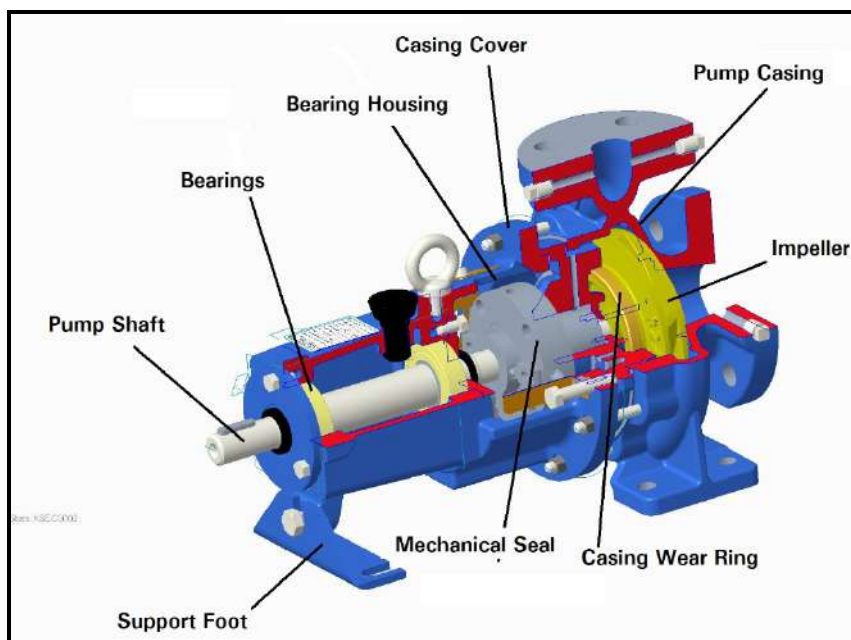
9.0 OUTLINE DIMENSIONS -



8. CUT SECTION VIEW:



PUMP-GLAND PACKING



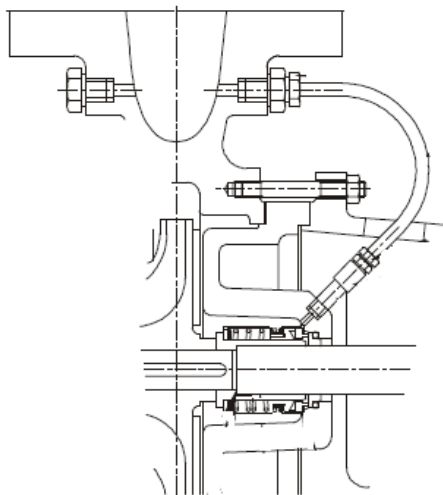
PUMP-CARTRIDGE MECH SEAL

9. MECHANICAL SEAL DETAILS:

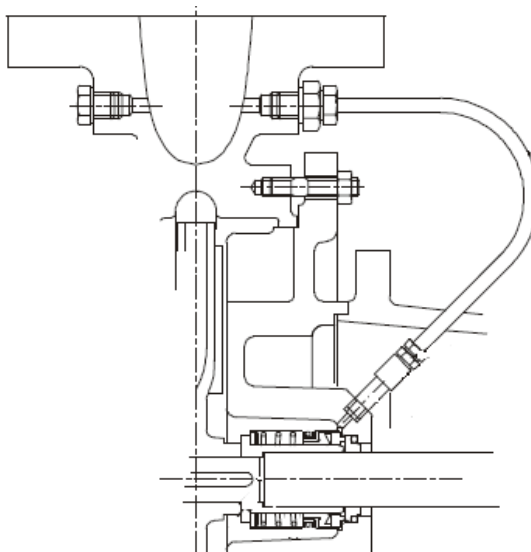
For Pump section for shaft units 25,35 & 55 with Mechanical Seal Details.

With clamped casing cover.

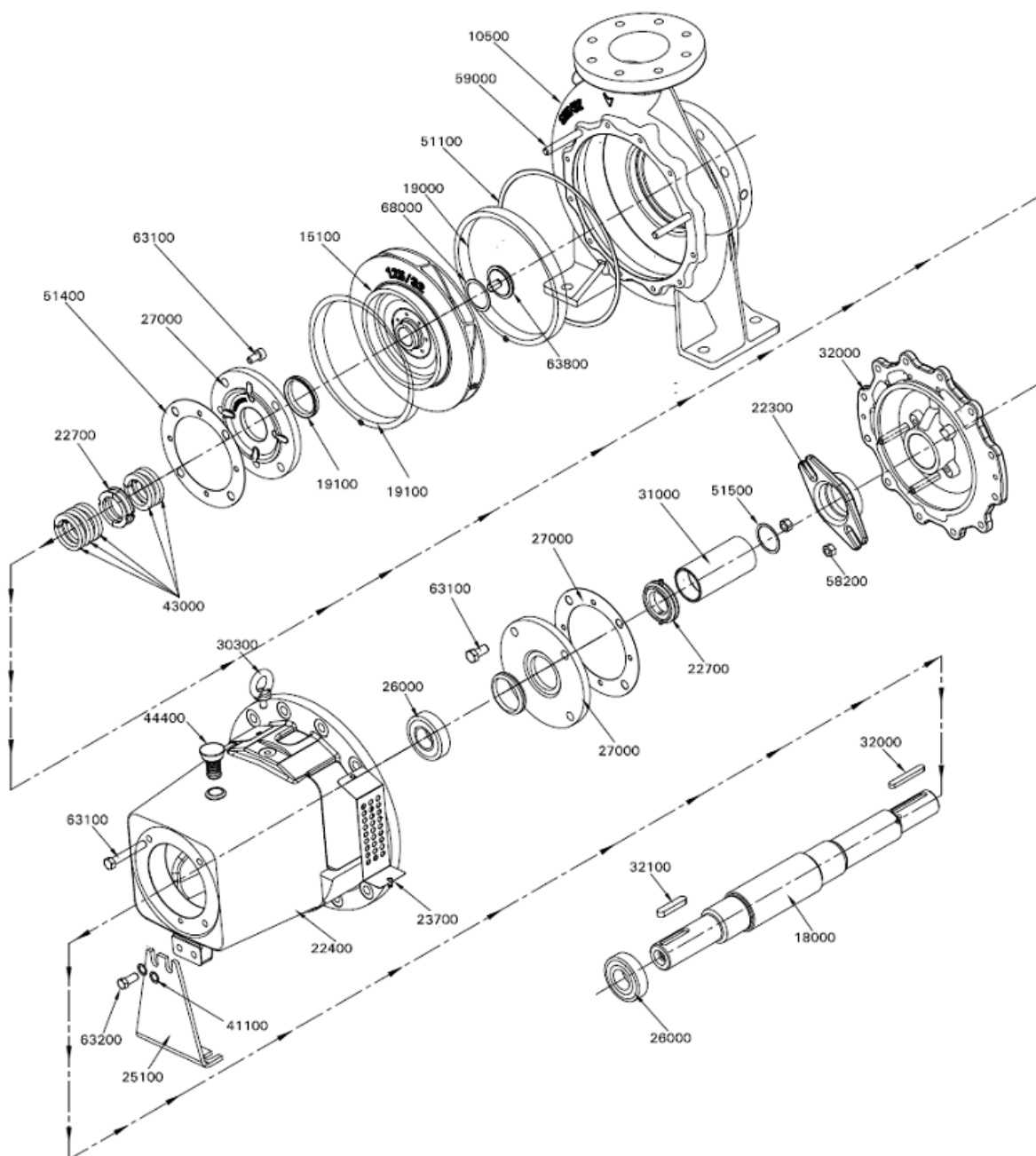
MECHANICAL SEAL
STUFFING BOX



With bolted casing cover.

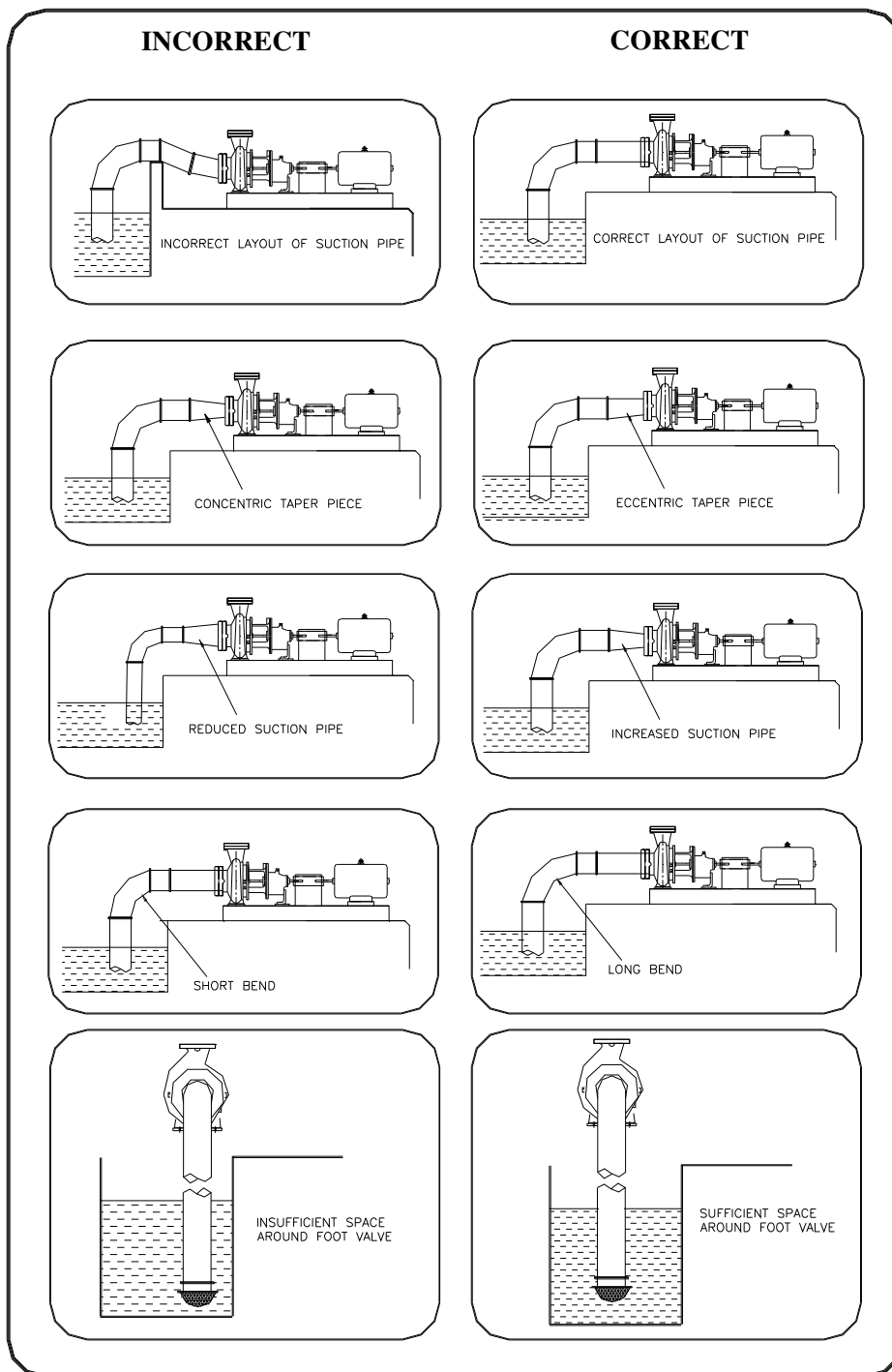


10. EXPLODED VIEW:





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 satisfactory performance and if it is operated in excess of the conditions for which it is manufactured, the equipment is subjected to excessive stresses and strains.

LOCATION

The pump should be located as near the liquid source as possible. This will minimize 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 whenever required.

FOUNDATION

The foundation should be sufficiently substantial to sustain any vibrations and to form a permanent rigid support for the base plate. This is important in maintaining the alignment of a directly 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 of two and one half diameter larger than the bolt should be used to allow movement for the final position of the foundation bolts. Earthing is required to be provided to the base plate.

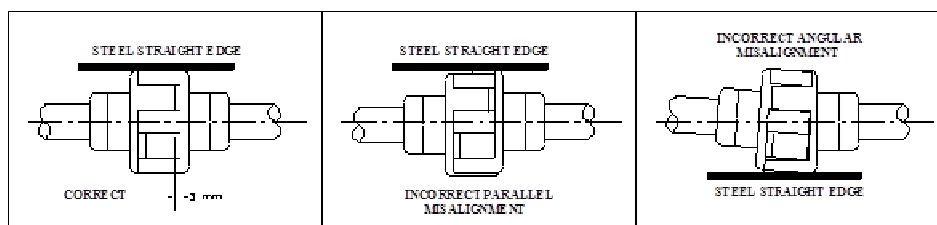
ALIGNMENT

Pumps and the drivers supplied by the manufacturers, mounted on a common base plate are accurately aligned before dispatch. However, as the alignments are likely to be disturbed during transit to some extent and hence must not be relied upon to maintain the factory alignment. Re-alignment is necessary after the complete unit has been leveled 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 the 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. There are two types of misalignments.

- 1) Angular misalignment – Shaft with axis concentric, but not parallel.
- 2) Parallel misalignment – Shaft with axis parallel, but not concentric.



LEVELING 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 misalignment 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 the driver are in level. Check the coupling faces, suction and discharge flanges for the horizontal and vertical position by means of spirit level.

FLEXIBLE COUPLING ALIGNMENT

The two halves of the coupling should be at least 3 mm apart so that they cannot touch each other when the driver shaft is rotated. Necessary tools for approximately checking are straight edge or an outside caliper. A check for parallel misalignment 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 the positions. Care must be taken that the straight edge must be parallel to the axis of the shaft. May be other alternative method like laser can be used.



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:

1. Setting, seasoning of the foundation.
2. Pipe strains distorting or shifting the machines.
3. Wear of the bearing.

PIPING

Both suction and delivery pipes and accessories should be independently supported near the pump, so that when the flanges, bolts are tightened no strains will be transmitted to the pump casing. It is usually advisable to increase the size of both the suction and delivery pipe at the pump nozzles in order to decrease the loss of head due to friction and for the same reason piping should be arranged with minimum possible bends as possible, or it should be made with 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. It can be achieved by supporting the pipelines at appropriate locations.

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 leakages. 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 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 away from any side



of the wall by 450 mm. the end of the strainer must 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 EQUALIZING LINE (AND LIQUID LINE)

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 the 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 in to the pump or choking the foot-valve and for this purpose an efficient strainer should be provided.

STUFFING BOXES AND PACKING (only for gland packed pump)

Stuffing boxes should be carefully cleaned and 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 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 re-lubrication periods under normal condition.

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 hrs. or the nearest pump overhaul time.

PRIMING

No pumping action occurs unless the pump casing is filled with the liquid. Pump casing and suction pipe must therefore be completely filled with 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 the air vent.
- b. When there is liquid under some pressure in the discharge pipe, priming can be effected by bypassing the pressured 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 at the top of casing can be used to remove air from pump 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 at 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 the check valve.

STUFFING BOXES (only for gland packed pump)

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 the rings are worn out, the clearance becomes greater and more water passes back into the suction side. The rings 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 / mechanical seal 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 nameplate.

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 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 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 and stuffing box, etc.
11. Suction lift too high.
12. Suction head too low (difference between pressure at suction connection and vapor 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 out 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 out 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 out.
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.



CUSTOMERS ARE ADVISED TO DISPOSE OF ALL UNUSABLE WASTE LIKE GASKETS, GLAND PACKING, OIL, BATTERIES, PACKING MATERIAL ETC THROUGH APPROPRIATE DISPOSAL AGENCIES AND IN ACCORDANCE WITH LOCAL REGULATION TO AVOID HARMFUL IMPACT (IF ANY) ON ENVIRONMENT.



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