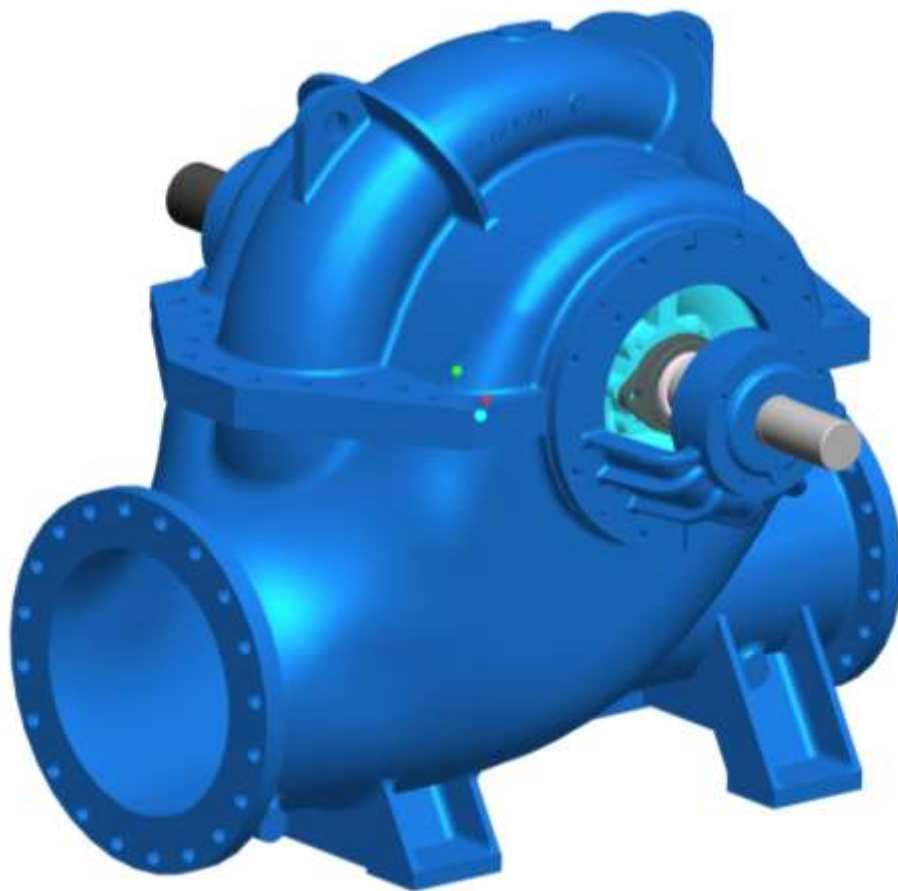


INSTRUCTION ON INSTALLTION, OPERATION & MAINTENANCE FOR KIRLOSKAR PUMP TYPE UP EXTENDED



KIRLOSKAR BROTHERS LIMITED

"Yamuna" S.No.98/3 to 7, Baner, Pune 411045

KIRLOSKAR BROTHERS LIMITED
Udyog Bhavan, Tilak Road, Pune 411 002 (India)

WARRANTY

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

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

KIRLOSKAR BROTHERS LIMITED

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Please ensure these instructions are read fully before installation and operation of the pump.

Please furnish complete name plate details, part description, part nos, material construction and quantity while ordering spare part.

1. GENERAL

1.1 The booklet covers instructions for following types of Extended UP pumps.

1	UP 150/56	12	UP 300/39
2	UP 200/56	13	UP 300/46
3	UP 200/64 (8UPH6M)	14	UP 300/57
4	UP 250/33	15	UP 350/54
5	UP250/35	16	UP 350/66
6	UP 250/46	17	UP 400/46
7	UP250/46M	18	UP 400/48
8	UP 250/57	19	UP 400/51
9	UP 250/66 (10UPH6)	20	UP 400/67
10	UP 300/34	21	UP 500/51
11	UP300/34D1	22	UP 500/68

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

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

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

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

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

1.7 Nomenclature of the pump

Nomenclature for pump is as given below.

UP 250/46

UP- Basic pump type

250- Nominal Delivery size in mm

/ - Always slash

46- Nominal Impeller diameter in cm.

PUMP DESCRIPTION

Casing - The casing is of axially-split volute design with suction and discharge flanges and mounting feet cast integral with the lower half casing. Tapped and plugged holes are provided for priming, vent, drain and gauge connections. Upper half casing is removable without disturbing suction or discharge piping.

Suction and Discharge is on a common centerline in both the horizontal and vertical planes.

Impeller - The impeller is of the enclosed double-suction (except UP 150/56 pump), statically and hydraulically balanced. The impeller is keyed to the shaft and positioned axially by the shaft sleeves. Hub shall have sufficient metal thickness to allow machining for installation of casing wear rings.

Shaft - The shaft shall be of ample size to operate under load with of minimum deflection.

Shaft Sleeves - The shaft sleeves should protect the shaft from wear and from contact with the pumped liquid. An O-ring shall be furnished under sleeve to prevent leakage.

Insert (Stuffing Box) - The insert is consisting of at least six packing rings and a split type gland to permit removal and access to packing. Ample space is provided for repacking the insert.

Bearings - The bearings are grease lubricated or oil lubricated. The inboard or coupling end bearing is a single row ball bearing. The outboard bearing is a double row cylindrical roller bearing which is retained by bearing locknut and lock washer.

Bearing Housings - The bearing housings are bolted to the end of the lower half casing and assure positive alignment of the rotating element. The housings provides a fit for the inboard bearing that allows freedom for thermal expansion while the outboard bearing is

clamped in place to take all thrust loads and keep the rotating element in its proper axial location.

Base plate - The base plate is sufficiently rigid to support the pump and driver and shall be provided with a drip pan beneath the pump. The drip pan contains a tapped drain connection.

Coupling - Coupling can be supplied – Snap-wrap / Pin-Bush / Spacer type

Coupling Guard - The coupling guard can be in MS / AL / Bronze.

Rotation - Pump can have clockwise or counterclockwise rotation when viewed from its driving end.

2. SAFETY INSTRUCTIONS:

2.1: General Information

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

Whenever the equipment is operated, maintained or used in any way, the procedures detailed within the Health and Safety Dossier (DHS) and any 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.

- 2.1.1 KBL products are designed for installation in designated areas, which are to be kept clean and free of obstructions that may restrict safe access to the controls and maintenance access points.
- 2.1.2 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 [safety instructions](#) mentioned in 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 DO NOT wear loose or frayed clothing or jewelries, which could catch on the controls or becomes 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 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.

2.6: Transport handling and storage instructions:

2.6.1: Transport.

Pumps are dispatched in duly assembled condition. Pumps are protected against corrosion and packed for transport by normal road, rail and sea carriers.

2.6.2: Handling

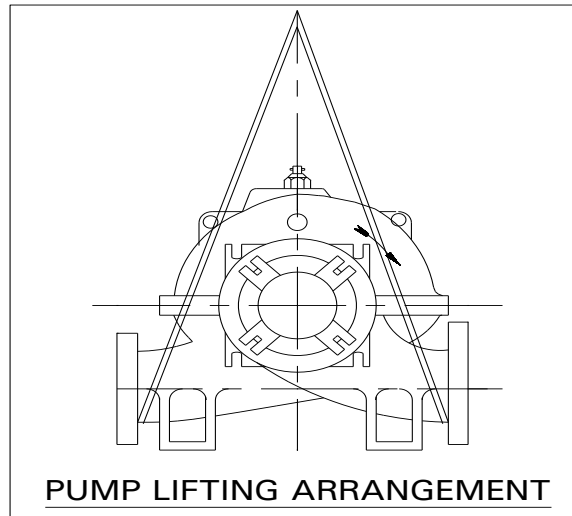


Crushing hazard

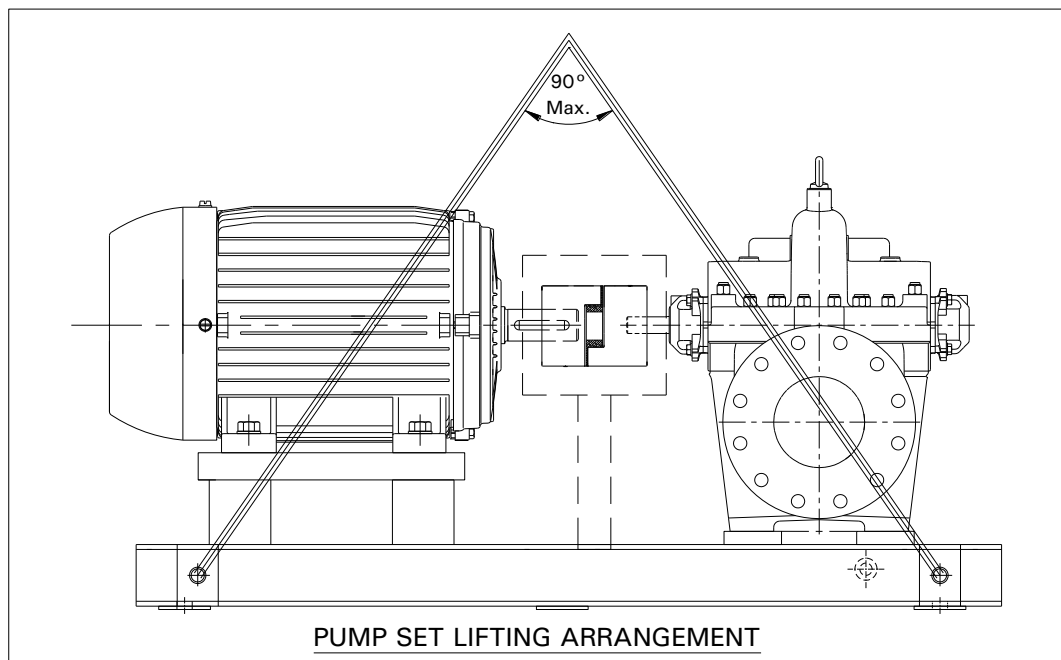
When lifting the pump or pump set, use lifting equipment having a safe working load rating suitable for the weight specified. Use suitable slings for lifting any pump not provided with lifting points.

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.



Pump set must be lifted from the lifting holes provided [on the pump by](#) using suitable four chain lifting equipment.



2.6.3: Storage.

2.6.3.1: Temporary storage up to six weeks.

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

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

- a) Ensure that the bearings are packed with the recommended grease, to prevent moisture from entering around the shaft.
- b) Remove the glands, packing's and lantern rings from the stuffing box if the pump is equipped in this manner. If the pump is equipped with mechanical seal, dismantle and coat the seal with light oil.
- c) Ensure that suction and discharge branches of the pump and all other openings are covered with cardboard, wood or masking tape to prevent foreign objects entering the pump.
- d) If the pump is to be stored where there is no protective covering, it is advisable to cover the unit with a tarpaulin or other suitable covering.
- e) The shaft should be manually rotated periodically to prevent pitting of the bearing surfaces by moisture.



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 grease 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.

3 INSTALLATIONS

3.1 Receiving the pump

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

- a) Broken or cracked equipment, including base, motor or pump feet and flanges.
- b) Bent shaft
- c) Broken motor end bells, bent eyebolts or damaged boxes of motor
- d) Missing parts.
- e) Pump shaft rotates freely.

Pumps and drivers are normally shipped from the factory mounted on a base plate. Couplings may either be completely assembled or have the coupling hubs mounted on the shafts and the connecting members removed. When the connecting members are removed, they will be packaged in a separate container and shipped with the pump or attached to the base plate.

Parts or accessories are some times wrapped individually or fastened to the equipment. If any damage or losses have been incurred; promptly notify your KBL representative, KBL Dealer and the transport company who delivered the pump. When unloading pump units, lift equally at four or more points from the base.

DO NOT LIFT ONLY THE DRIVER OR PUMP.

3.2 Preparation

Before installing the pump, clean the suction and discharge flanges thoroughly.

Remove the protective coating from the pump shaft. If the pump has been in storage and prepared for storage in the manner outlined previously, remove all the grease from the

bearings. Then bearings should be flushed with carbon tetrachloride or kerosene and relubricated.

3.3 Location

The pump should be installed as near the suction supply as possible, with the shortest and most direct suction pipe practical. The total dynamic suction lift (static lift plus friction losses in suction line) should not exceed the limits for which the pump was sold.

The pump must be primed before starting. Whenever possible, the pump should be located below the fluid level to facilitate priming and assure a steady flow of liquid. This condition provides a positive suction head on the pump. It is also possible to prime the pump by pressurizing the suction vessel.

❖ Pumps must be fully primed at all times during operation.

When installing the pump, consider its location in relation to the system to assure that sufficient Net Positive Suction Head (NPSHA) is available at the pump inlet connection. Available NPSH must always equal or exceed the required NPSH (NPSHR) of the pump. The pump should be installed with sufficient accessibility for inspection and maintenance. A clear space with ample head room should be allowed for the use of an overhead crane or hoist sufficiently strong to lift the unit.

❖ **NOTE: Allow sufficient space to be able to dismantle pump without disturbing the pump inlet and discharge piping.**

Select a dry place above the floor level wherever possible. Take care to prevent pump from freezing during cold weather when not in operation. If the possibility of freezing exists during a shut-down period, the pump should be completely drained, and all passages and pockets where liquid might collect should be blown out with compressed air.

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

3.4 Foundation

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

The foundation should be poured without interruptions to within 20 to 40 mm of the finished height. The top surface of the foundation should be well scored and glued before the concrete sets. This provides a bonding surface for the grout. Foundation bolts should be set in concrete as shown in Fig. 1. Allow enough bolt length for grout, shims, lower base plate flange, nuts and washers. The foundation should be allowed to cure for several days before the base plate is shimmed and grouted.

3.5 Baseplate setting

Use blocks and shims under base for support at foundation bolts and midway between bolts, to position base approximately 25 mm above the concrete foundation with studs extending through hole in the base plate.

By adding or removing shims under the base, level the pump shaft and flanges. The Base plate does not have to be leveled. Draw foundation bolt nuts tight against base plate and observe pump and motor shafts or coupling hubs for alignment.

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

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

3.6 Grouting procedure

Grout compensates for uneven foundation, distributes weight of unit and prevents shifting. Use an approved, non-shrinking grout as follows, after setting and leveling unit See Fig. 2.

- a) Build strong form around foundation to contain grout.
- b) Soak top of concrete foundation thoroughly, then remove surface water.
- c) Baseplate should be completely filled with grout and, if necessary, drill vent holes to remove trapped air.
- d) After grout has thoroughly hardened, check the foundation bolts and tighten if necessary.

- e) Check the alignment after the foundation bolts are tightened.
- f) Approximately 14 days after the grout has been poured or when the Grout has thoroughly dried, apply an oil base paint to the exposed edges of the grout to prevent air and moisture from coming in contact with the grout.

3.7 Alignment procedure

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

A flexible coupling will only compensate for small amount of misalignment and should not be used to compensate for excessive misalignment of the pump and driver shafts.

Inaccurate alignment results in vibration and excessive wear on the bearings, sleeve or shaft and wear rings.

Coupling alignment can be checked with dial gauge Indicator also. In Angular and parallel alignment all measurements show that all points of coupling faces are within ± 0.2 mm of each other. Alignment should be performed after the base plate has been properly set and grout has dried thoroughly according to instructions. Final alignment should be made by shimming driver only.

Alignment should be made at operating temperatures. After final alignment, it is necessary to dowel pump and driver feet to the base plate.

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 reasons:

- a) Setting, Seasoning of the foundation.
- b) Pipe strains, distorting or shifting of the machines.
- c) Wear of the bearings.

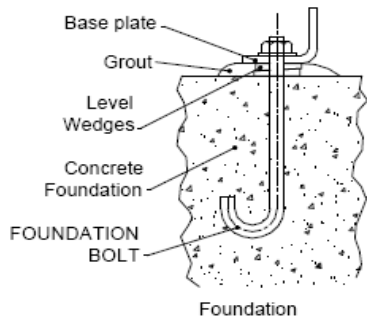
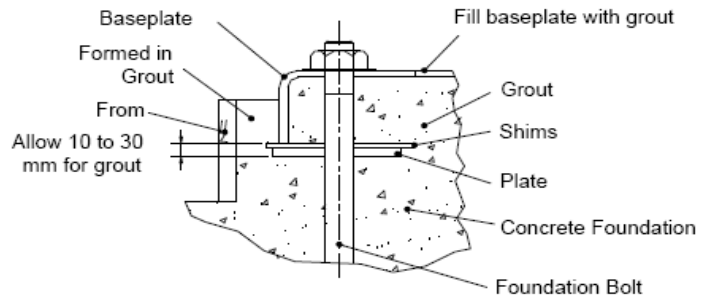
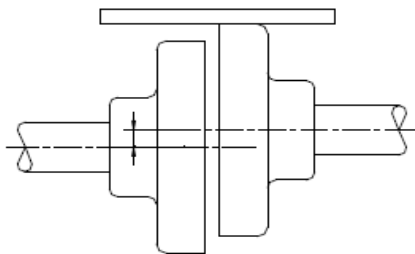


FIG. 1



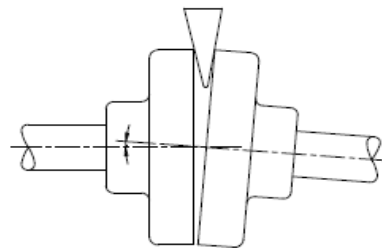
Setting Baseplate & Grouting

FIG. 2



Parallel Alignment

FIG. 4



Angular Alignment

FIG. 3

COUPLING ALIGNMENT

3.8 Suction and Discharge Piping

When installing the pump piping, make sure to observe the following precautions:- Piping should always move towards the pump. Do not move pump to pipe. This could make final alignment impossible.

Both suction and discharge piping should be supported independently and close to pump so that no strain is transmitted to the pump when the flange bolts are tightened. Use pipe hangers or other supports at necessary intervals to provide support. When expansion joints are used in the piping system, they must be installed beyond the piping supports close to the pump.

It is advisable to increase the size of both suction and discharge pipes at the pump connection to decrease the loss of head from friction.

For negative suction, to avoid priming activity every time, valve should be placed in suction piping.

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

Make sure that all piping joints are air tight. Provide pipe expansions bellows when hot fluids are to be pumped. Where reducers are used, eccentric reducers are to be fitted in suction lines and straight taper reducers in discharge and vertical lines (See Fig.5). Misuse of reducers may cause the formation of air pockets in the pipe and thus preventing the smooth operation of the pump.

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

The discharge pipe is usually preceded by a non-return valve or check valve and a discharge gate valve (See Fig. 5). The check valve is to protect the pump from excessive back pressure and reverse rotation of the unit and to prevent back flow into the pump in case of stoppage or failure of the driver. The discharge valve is useful for priming, starting and when shutting down the pump.

4.0 OPERATION

4.1 Before Starting

Before initial starting of the pump, make the following inspection:

4.1.1 The unit baseplate is grouted and bolted to the foundation.

4.1.2 Alignment between pump and motor.

4.1.3 Motor is correctly wired to starting device, check voltage, phase and frequency on motor nameplate with line circuit.

Ensure correct direction of rotation prior to coupling to pump. Check by starting motor and switching off immediately. Observe rotation is the same as the arrow direction on the pump casing.

4.1.4 Bearing lubrication is provided (see lubrication section), also check driver lubrication.

4.1.5 Mechanical seal has been fitted or stuffing box has been packed.

4.1.6 All rotating parts are found to be free when turned by hand.

4.1.7 Pump is primed. Never run the unit dry. The liquid in the pump serves as a lubricant for close running fits within the pump and the pump may be damaged if operated dry. The pump may be primed by using an ejector, exhauster or vacuum pump. If a foot valve is used in the suction line, the pump may be primed by venting and filling the casing with liquid.

4.2 Starting

4.2.1 Close valve in discharge line.

4.2.2 Open fully all valves in the suction line.

4.2.3 Turn on seal water to the stuffing box where external pipe supplied.

4.2.4 Prime the pump.

4.2.5 Start the pump driver.

4.2.6 When the pump is operating at full speed, open the discharge valve slowly.

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

The pump should be shut down at once and the trouble corrected if the pump is running at its rated speed and found to have any of the following defects:

a) No liquid delivered.

b) Not enough liquid delivered.

- c) Not enough pressure.
- d) Loss of liquid after starting.
- e) Excess vibration.
- f) Motor runs hot.
- g) Pump bearing overheating.

4.3 Operating

While the pump is running, a periodic inspection should be made of:

- a) Driver/Pump rotation. Each time the motor leads are disconnected ensure the driver operates in the direction indicated by the arrow on the pump casing.
- b) Stuffing box (soft packed pumps only). Ensure there is sufficient leakage to lubricate the packing.
- c) Bearings. Check the bearings for temperature, which should not exceed pumped liquid temperature or 80 Deg. C whichever is the lower.
- d) With mechanical seal fitted pumps, check that there is no leakage from the stuffing box.
- e) Suction and discharge gauge readings.

4.4 Stopping

- a) Slowly close delivery valve and shut down driving unit in accordance with manufacturer's instructions.
- b) Shut off external sealing liquid supply, if supplied, to relieve stuffing box pressure.
- c) Successful operation of the pump depends on accurate alignment. It is recommended to re-check the alignment after preliminary run.

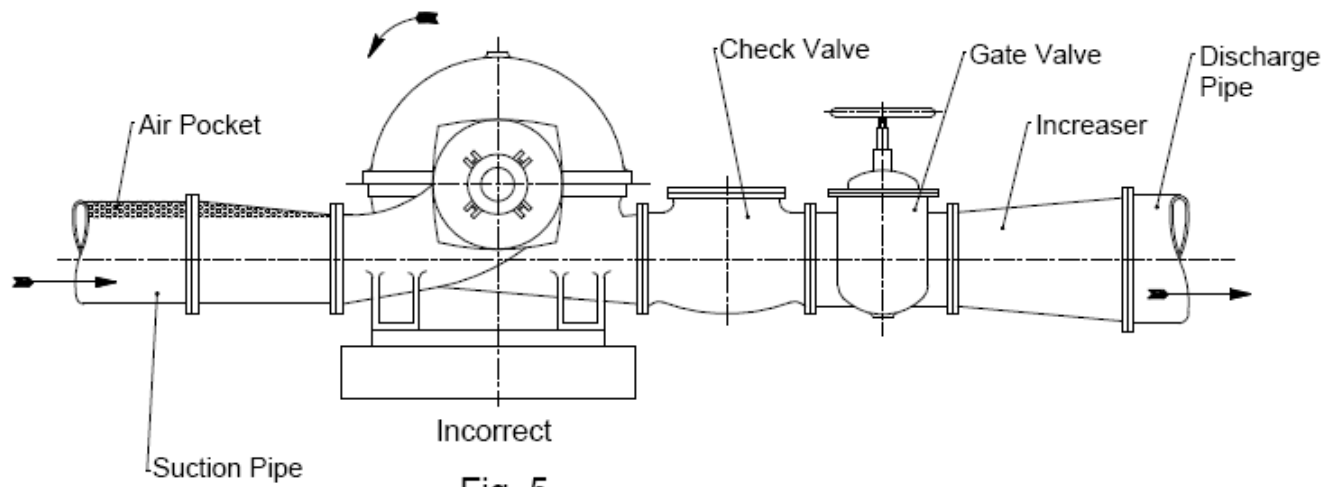
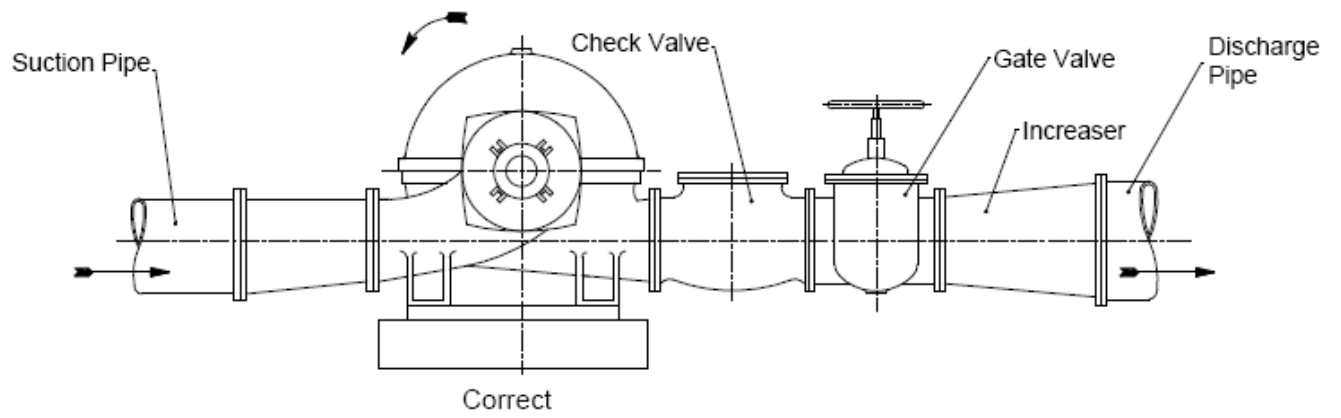


Fig. 5

5 TECHNICAL DATA

5.1 Direction of Rotation

The standard direction of rotation is anticlockwise when viewed from driving side. The pumps with reverse direction of rotation (Clockwise) can be supplied on request.

The direction of rotation can be reversed easily without changing any part except in case of **UP 150/56** pumps.

5.2 Bearings

The pumps are fitted with antifriction heavy duty ball bearings at driving and non-driving ends. The details of the bearings are as under:

PUMP TYPE	BEARING MODEL
UP150/56	SKF 6312 for DE & 7312 BG for NDE
UP 200/56	SKF 6312 OR EQ
UP 200/64M	SKF 6314 OR EQ
UP 250/33	SKF 6309 OR EQ
UP 250/35	SKF 6309 OR EQ
UP 250/46	SKF 6312 OR EQ
UP 250/57	SKF 6314 OR EQ
UP 250/66	SKF 6317 OR EQ
UP 300/34	SKF 6309 OR EQ
UP 300/39	SKF 6312 OR EQ
UP 300/46	SKF 6314 OR EQ
UP 300/57	SKF 6317 OR EQ
UP 350/54	SKF 6314 OR EQ
UP 350/66	SKF 6317 OR EQ
UP 400/46	SKF 6312 OR EQ
UP 400/48	SKF 6317 OR EQ
UP 400/51	SKF 6317 OR EQ
UP 400/67	SKF 6320 OR EQ
UP 500/51	SKF 6320 OR EQ
UP 500/68	SKF 6322 OR EQ
UP300/34D1	SKF 6309 OR EQ
UP250/46M	SKF 6312 OR EQ

The designations of bearings are as per SKF catalogue. However, bearing of other Make / equivalent are also used.

5.3 Special care for Bearings

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

Care and maintenance of bearings is a matter of ensuring that they are:

- a) Correctly lubricated at intervals as laid down in routine maintenance chart.
- b) Removed, cleaned and refitted with care.
- c) Tools used and work areas should be cleaned.

To remove a bearing, use correctly suited withdrawal equipment.

CAUTION: Damage can be caused by exerting force against the outer ring of a ball bearing. Ball bearings should not be dismantled.

Clean bearings thoroughly with an approved fluid.

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

Inspect the bearing for wear, fractures, cracks, corrosion or other damage which may necessitate bearing replacement.

Pack both sides of bearing with grease.

Check that the bearing, shaft and housing are cleaned and undamaged.

Recharge with grease to a maximum of 2/3rd of full.

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

5.4 Lubrication Details

Initially bearings are lubricated during assembly. In the regreasing period these bearings should be repacked with a high quality, lithium soap base, ball and roller bearing grease free from resin and acid, not liable to harden or crumble and possessing rust preventive properties. Re-greasing interval depends upon the operating speed of the unit.

Operating speed	Regreasing Interval
1450 RPM	4000 hours
2000 RPM	3000 hours

To recharge the bearings with fresh grease, use a grease gun and feed through the two grease nipples provided.

DO NOT APPLY LUBRICANT WHEN PUMP IS RUNNING.

After 10,000 hours or two years whichever is earlier remove bearings from pumps, degrease, thoroughly clean, recharge with fresh grease and refit in accordance with reassembly instructions.

Recommended Grease specifications

Manufacturer	Trade name
IOCL	SERVOGEM-3 OR EQ
IOCL	SERVOGEM-2 OR EQ
SHELL	ALVANIA EP 2
EXXON	POLYREX
CHEVRON	SRI GREASE NLGI 2
CHEVRON	BLACK PEARL NLGI 2
TEXACO	MULTIFAK EP2
PHILIPS	POLYTAC
HPCL	NATRA 3 OR LITHON 3

5.5 Wearing ring Details

Pumps are supplied with casing wear rings. The Diametrical clearances between Impeller and casing rings should be minimum: 0.25 mm and maximum 0.70 mm.

5.6 Impeller Details

Except UP150/56 model all models have double entry impellers.

5.7 Stuffing Box Details

- **Packing (Non Asbestos)**

On packed pumps the packing is installed prior to shipment. All packing used are the highest grade material. Before pump is put into operation check the condition of the packing. If pump is installed within sixty (60) days after shipment the packing will be in good condition with a sufficient supply of lubrication. If pump is stored for a longer period it may be necessary to repack the stuffing box. In all cases, however, we recommend an inspection of the packing before pump is started. The standard pump packing is made from graphite solid plate cotton packing (non asbestos).

A soft, well-lubricated packing reduces stuffing box resistance and prevents excessive wear on the shaft or shaft sleeve. Many brands of packing on the market have the desired qualities.

NOTE: Eccentricity of the shaft or sleeve through the packing could result in excess leakage that cannot be compensated for. Correction of this defect is very important.

Packing should be checked frequently and replaced as service indicates. Six months might be a reasonable expected life, depending on operating conditions. It is impossible to give any exact predictions. A packing tool should be used to remove all old packing from the stuffing box. Never reuse old and lifeless packing or merely add some new rings. Make sure the stuffing box is thoroughly cleaned before new packing is installed. Also check the condition of the shaft or sleeve for possible scoring or eccentricity, make replacements where necessary.

New packing (non-asbestos) should be placed carefully into the stuffing box. If molded rings are used, the rings should be opened sideways and the joints pushed into the stuffing box first. The rings are installed one at a time, each ring seated firmly and the joints staggered at about a 90° rotation from each preceding joint.

Champion Style – 3116 – Graphited cotton greasy packing is used in the standard supply. However packing suitable for liquid handled is also supplied against specific requirement.

Size of gland packing and position of lantern ring:

Gland packing are fitted with 2 + L + 2 arrangement L = Lantern Ring.

Size:	12 mm sq.	16 mm sq.	20 mm sq.
	UP 200/56	UP 300/46, UP 250/57	UP 500/68
	UP 250/33 & UP 250/35	UP 350/54, UP 400/46	
	UP 250/46	UP 350/66, UP 300/57	
	UP 300/34	UP 200/64M, UP 250/66	
	UP300/39	UP400/48, UP400/51	
	UP150/56	UP 400/67, UP 500/51	

MECHANICAL SEAL:

General instructions for operation of the various mechanical sealing arrangements are included below. It is not feasible to include detailed instructions for all mechanical seals

in this booklet because of the almost unlimited number of possible combinations and arrangements. Instead, seal manufacturer's instructions will be included as a separate supplement to this book, where required.

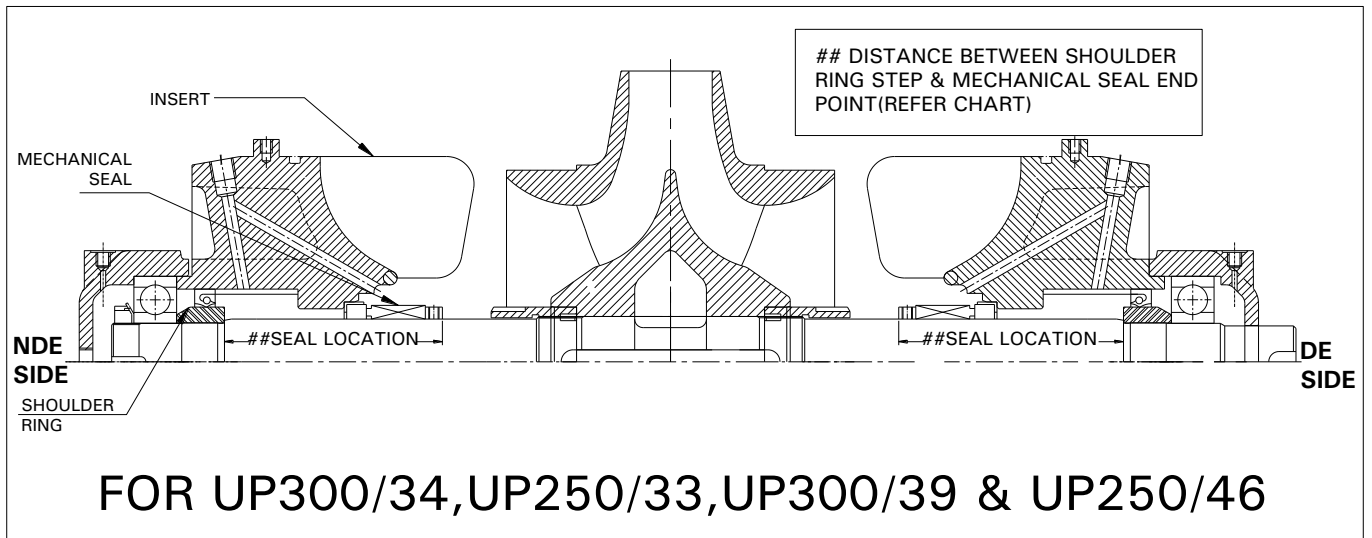
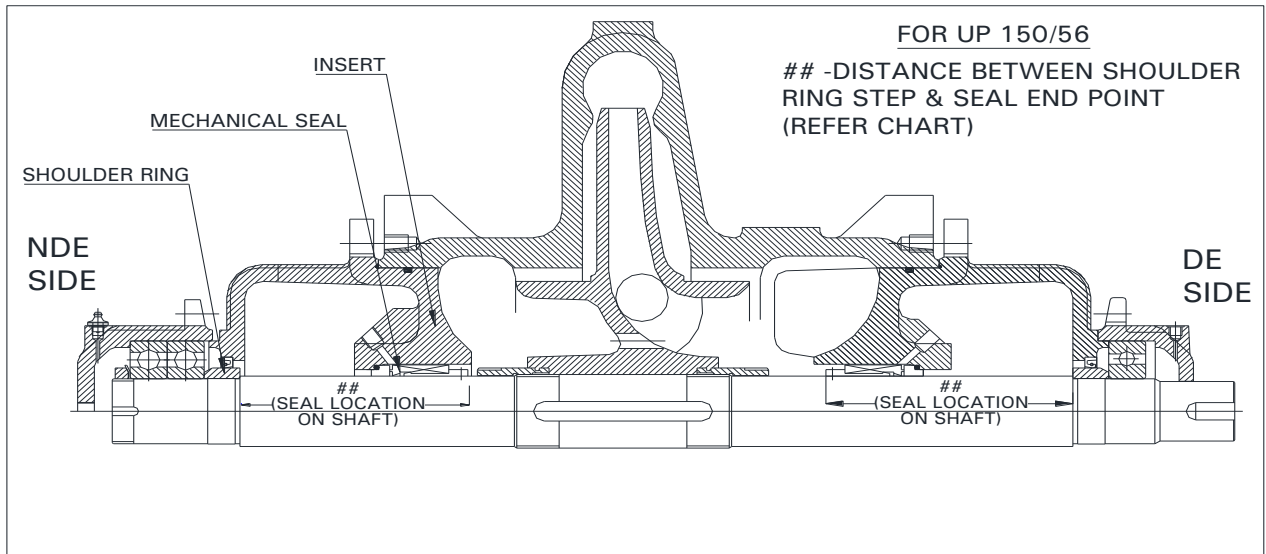
- a. Mechanical seals are precision products and should be treated with care. Use special care when handling seals. Clean oil and clean parts are essential to prevent scratching the finely lapped sealing faces. Even light scratches on these faces could result in leaky seals.
- b. Normally, mechanical seals require no adjustment or maintenance except routine replacement of worn or broken parts.
- c. A mechanical seal which has been used should not be put back into service until the sealing faces have been replaced or relapped. (Relapping is generally economical only in seals two inches in size and above.)

Four important rules which should always be followed for optimum seal life are:

1. Keep the seal faces as clean as possible.
2. Keep the seal as cool as possible.
3. Assure that the seal always has proper lubrication.
4. If seal is lubricated with filtered fluid, clean filter frequently.

MECHANICAL SEAL FITTMENT CHART

Sr.No.	PUMP TYPE	## DIMENSION	
		DE SIDE	NDE SIDE
1	UP 150/56(CW)	191	175
2	UP 150/56(CCW)	178	192
3	UP 300/34	169.5	165.5
4	UP 250/33 & UP250/35	89.5	85.5
5	UP 300/39	176	172
6	UP 250/46	176	172



5.8 Coupling Details

Pumps will be supplied with snap wrap coupling as a standard scope of supply however other types like pin bush, tyre type, spacer coupling can also be provide on request.

5.9 Minimum safe flow

The pump should not run against closed discharge valve as this will cause an increase in temperature/formation of steam in the pump. This may cause shaft damage, impeller erosion, short life of bearings and damage to stuffing boxes or mechanical shaft seals due to stress or vibration. The minimum flow rate must be at least 30 % of the best efficiency point flow rate.

5.10 NPSHA (Net Positive Suction Head Available) and NPSHR (Net Positive Suction Head Required)

NPSHA should be at least greater than 0.5m than NPSHR for satisfactory operation of the pump. If $NPSHA < NPSHR$ then pump cavitation may occurs which in turns damage the impeller.

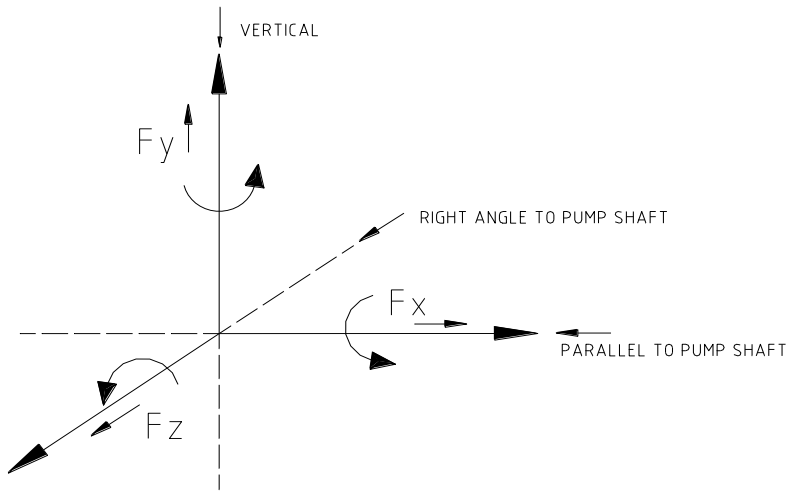
5.11 Pipe line velocities

For satisfactory operation of pumps and to minimize frictional losses, it is recommended to maintain velocity in suction pipe line as 1.5 to 2 m/s and in delivery pipe line it should be 2.5 to 3 m/s by providing higher pipe diameters than pump suction / delivery size.

5.12 Tapping details:

Tapping Description	Size (in inch-BSP) except (for UP400/48, UP400/51, UP400/67, UP500/51 and UP 500/68)	Size (in inch-BSP) for UP400/48, UP400/51, UP 400/67, UP500/51 and UP 500/68
Air vent	Rp 3/8	Rp 3/8
Priming connection (plugged)	Rp 1/2	Rp 1.25
Sealing connection	Rp 1/4	Rp 3/8
Suction & delivery pressure gauge connection (plugged)	Rp 3/8	Rp 3/8
Casing drain	Rp 1/2	Rp 1

5.13 Allowable forces and moments on pump flanges:



NOZZLE SIZE(mm)	Forces kg			Moment kg m		
	F_x	F_y	F_z	F_x	F_y	F_z
150	133	334	267	204	102	102
200	178	445	356	272	136	136
250	210	525	420	320	160	160
300	226	566	453	345	172	172
350	241	603	483	368	184	184
400	256	641	513	391	195	195
450	270	680	540	420	215	215
500	286	717	573	437	218	218
600	317	792	634	483	241	241

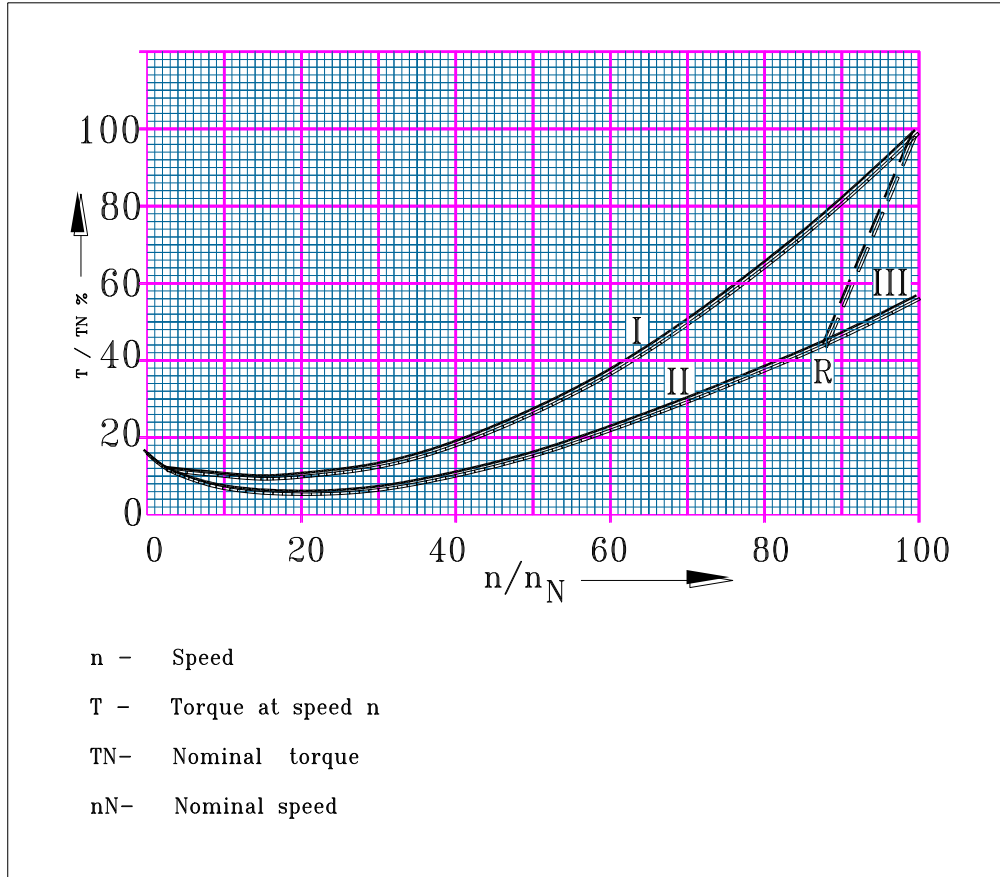
5.14 Suction & Delivery Size:

SR.NO	PUMP TYPE	SUCTION BORE	DELIVERY BORE
		mm	mm
1	UP 150/56	200	150
2	UP 200/56	250	200
3	UP 250/33	300	250
4	UP 250/35	300	250
5	UP 250/66	300	250
6	UP 200/64M	250	200
7	UP 250/46	300	250
8	UP 250/57	300	250
9	UP 300/34	350	300
10	UP 300/39	350	300
11	UP 300/46	350	300
12	UP 300/57	350	300
13	UP 350/54	400	350
14	UP 350/66	400	350
15	UP 400/46	400	400
16	UP400/48	450	400
17	UP400/51	450	400
18	UP400/67	500	400
19	UP500/51	600	500
20	UP500/68	600	500
21	UP250/46M	300	250
22	UP300/34D1	350	250

5.15 Maximum allowable Speed and water fill capacity

SR. NO.	PUMP TYPE	WATER FILL CAPACITY in LITRES	NOMINAL SPEED IN RPM	MAX.ALLOWABLE SPEED IN RPM
1	UP 150/56	69.5	1450	1800
2	UP 200/56	70	1450	1500
3	UP 250/33	75	1450	1500
4	UP 250/35	70	1450	1500
5	UP 250/46	143	1450	1500
6	UP 250/57	148	1450	1500
7	UP 300/34	150	1450	1650
8	UP 300/39	150	1450	1650
9	UP 300/46	170	1450	1650
10	UP 300/57	175	1450	1500
11	UP 350/54	180	980	1150
12	UP 350/66	200	980	1150
13	UP 400/46	160	980	1000
14	UP 200/64	80	1450	1500
15	UP 250/66	149	1450	1500
16	UP 400/67	400	980	1000
17	UP 500/68	850	980	1000
18	UP 400/48	350	980	1000
19	UP 400/51	350	980	1000
20	UP 500/51	800	980	1000
21	UP250/46M	143	1450	1500
22	UP300/34D1	150	1450	1650

5.16 Starting Torque:



CASE 1 starting up with open isolating or regulating valve on delivery side.

CASE 2 starting up with closed isolating or regulating valve with opening the valve when nominal speed is attained.

CASE 3 starting up with open isolating or regulating valve but against static delivery head acting on non-return valve.

5.17 Weights and GD² values:

Sr no	Pump type	Approx net weight (Kg)	GD ² value In Kg-cm ²
1	UP 150/56	588	18168
2	UP 200/56	740	35688
3	UP 250/33	570	24512
4	UP 250/35	578	24512
4	UP 250/46	670	49124
5	UP 250/57	790	84584
6	UP 300/34	700	24824
7	UP 300/39	780	30964
8	UP 300/46	1000	49132
9	UP 300/57	1152	101676
10	UP 350/54	1230	104516
11	UP 350/66	1566	158800
12	UP 400/46	1305	87120
13	UP 200/64	1170	129968
14	UP 250/66	1600	13100
15	UP 400/67	1800	192080
16	UP 500/68	2747	270164
17	UP 400/48	1600	287004
18	UP 400/51	1650	287004
19	UP 500/51	2400	681336
20	UP250/46M	700	49124
21	UP300/34D1	730	24824

5.18 Consumable Items Spare Codes (For '01 MOC'):

PUMP TYPE	SET OF O RING	SET OF GASKET	SET OF OIL BEARING	SET OF OIL SEAL
UP 250/46	17C01SUBSOR1S001	17C01SUBSOG1S001	17C01SUBSOB1S001	17C01SUBSOOSS001
UP 250/57	17C02SUBSOR1S001	17C02SUBSOG1S001	17C02SUBSOB1S001	17C02SUBSOOSS001
UP 300/34	17C03SUBSOR1S001	17C03SUBSOG1S001	17C03SUBSOB1S001	17C03SUBSOOSS001
UP 300/39	17C04SUBSOR1S001	17C04SUBSOG1S001	17C04SUBSOB1S001	17C04SUBSOOSS001
UP 300/46	17C05SUBSOR1S001	17C05SUBSOG1S001	17C05SUBSOB1S001	17C05SUBSOOSS001
UP 300/57	17C06SUBSOR1S001	17C06SUBSOG1S001	17C06SUBSOB1S001	17C06SUBSOOSS001
UP 350/54	17C07SUBSOR1S001	17C07SUBSOG1S001	17C07SUBSOB1S001	17C07SUBSOOSS001
UP 350/66	17C08SUBSOR1S001	17C08SUBSOG1S001	17C08SUBSOB1S001	17C08SUBSOOSS001
UP 400/46	17C09SUBSOR1S001	17C09SUBSOG1S001	17C09SUBSOB1S001	17C09SUBSOOSS001
UP 400/48	17C10SUBSOR1S001	17C10SUBSOG1S001	17C10SUBSOB1S001	17C10SUBSOOSS001
UP 400/51	17C11SUBSOR1S001	17C11SUBSOG1S001	17C11SUBSOB1S001	17C11SUBSOOSS001
UP 400/67	17C12SUBSOR1S001	17C12SUBSOG1S001	17C12SUBSOB1S001	17C12SUBSOOSS001
UP 500/68	17C13SUBSOR1S001	17C13SUBSOG1S001	17C13SUBSOB1S001	17C13SUBSOOSS001
UP 250/35	17C14SUBSOR1S001	17C14SUBSOG1S001	17C14SUBSOB1S001	17C14SUBSOOSS001
UP250/33	17494SUBSOR1S001	17494SUBSOG1S001	17494SUBSOB1S001	17494SUBSOOSS001
UP 500/51	17C15SUBSOR1S001	17C15SUBSOG1S001	17C15SUBSOB1S001	17C15SUBSOOSS001
UP150/56	17474SUBSOR1S001	17474SUBSOG1S001	17474SUBSOB1S001	17474SUBSOOSS001
UP200/56	17489SUBSOR1S001	17489SUBSOG1S001	17489SUBSOB1S001	17489SUBSOOSS001
UP200/64	17092SUBSOR1S001	17092SUBSOG1S001	17092SUBSOB1S001	17092SUBSOOSS001
UP250/66	17074SUBSOR1S001	17074SUBSOG1S001	17074SUBSOB1S001	17074SUBSOOSS001

5.19 Interchangeability of Components

PART CODE	NAME OF THE PART	TOTAL NO OF PARTS	200/56	300/34	300/34D1	250/46	250/46M	300/39	300/46	250/33	250/35	250/57	350/54	400/46	350/66	300/57	150/56	200/64	250/66	400/67	500/68	500/51	400/48	400/51
1220001	UPPER HALF CASING	18	1	2	2	3	3	4	5	6	6	7	8	9	10	11	12	13	14	15	16	17	18	18
1230001	LOWER HALF CASING	18	1	2	2	3	3	4	5	6	6	7	8	9	10	11	12	13	14	15	16	17	18	18
1590001	IMPELLER	20	1	2	2	3	3	4	5	6	20	7	8	9	10	11	12	13	14	15	16	17	18	19
1800101	PUMP SHAFT	19	1	2	18	3	19	4	5	6	6	5	7	8	9	10	11	12	13	14	15	16	17	17
1900001	WEAR RING	19	1	2	2	3	3	4	5	6	6	7	8	9	10	11	19	12	13	14	15	16	17	18
1990001	SHOULDER RING	6	1	2	2	1	1	1	NA	2	2	NA	NA	NA	NA	NA	1	3	4	NA	5	6	NA	NA
2230001	GLAND	10	1	2	2	1	1	1	3	2	2	3	3	3	4	4	1	5	10	6	7	8	9	9
2270001	LANTERN RING	9	1	2	2	1	1	1	3	2	2	3	3	3	4	4	1	5	9	6	7	6	8	8
2360001	DEFLECTOR	11	1	2	2	1	1	1	3	2	2	3	3	5	4	4	1	6	7	8	9	10	11	11
2400101	BEARING HOUSING DE	14	1	2	13	1	14	1	3	2	2	3	3	4	5	6	1	7	8	9	10	11	12	12
2400201	BEARING HOUSING NDE	15	1	2	14	1	15	1	3	2	2	3	3	4	5	6	7	8	9	10	11	12	13	13
2600001	BALL BEARING DE	8	1	2	2	1	1	1	3	2	2	3	3	5	4	4	1	3	4	6	7	6	8	8
2600002	BALL BEARING NDE	9	1	2	2	1	1	1	3	2	2	3	3	5	4	4	6	3	4	7	8	7	9	9
2700001	BEARING COVER DE	8	NA	NA	7	NA	8	NA	1	NA	NA	1	1	3	2	2	NA	NA	NA	4	5	4	6	6
2710101	BEARING COVER NDE	8	NA	NA	7	NA	8	NA	1	NA	NA	1	1	3	2	2	NA	NA	NA	4	5	4	6	6
2710201	BEARING COVER DE & N	9	NA	NA	8	NA	9	NA	1	NA	NA	1	1	3	2	2	NA	NA	NA	4	5	6	7	7
3100001	SHAFT SLEEVE DE	16	1	2	2	3	3	4	5	6	6	5	7	8	9	9	10	11	12	13	14	15	16	16
3100002	SHAFT SLEEVE NDE	16	1	2	2	3	3	4	5	6	6	5	7	8	9	9	10	11	12	13	14	15	16	16
3200001	IMPELLER KEY	14	1	2	2	1	1	3	4	5	5	4	6	7	8	8	1	9	10	11	12	13	14	14
3210001	COUPLING KEY	10	1	2	2	1	1	1	3	2	2	3	3	4	5	5	6	7	5	8	9	8	10	10
3360001	BEARING LOCK NUT	9	1	2	2	1	1	1	3	2	2	3	3	1	4	4	1	5	6	7	8	7	9	9
5000001	OIL SEAL	11	1	2	2	1	1	1	3	2	2	3	3	4	5	5	2	6	7	8	9	10	11	11
5220101	"O"RING INSERT	10	1	2	2	2	1	2	3	1	1	3	3	3	4	5	1	2	6	7	8	9	10	10
5220201	"O"RING SHAFT SLEEVE	9	1	2	2	1	1	1	3	2	2	3	3	4	5	5	2	3	5	6	7	8	9	9
9790001	INSERT DE	15	1	2	14	3	15	3	4	5	5	4	4	4	6	7	1	8	9	10	11	12	13	13
9790001	INSERT NDE	16	1	2	15	3	16	3	4	5	5	4	4	4	6	7	8	9	10	11	12	13	14	14

6. MAINTENANCE.

6.1 Maintenance EHS (Environmental Hazard Safety) 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 contaminate.



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 vapours, 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.

6.2 Routine Maintenance Chart

Preventive maintenance schedule is a periodical checks and precautions by which possibilities of failure and breakdown will be rare.

EVERY WEEK	<p>Visually check for leaks</p> <p>Check for vibration.</p> <p>Adjust gland as necessary to maintain slight leakage.</p> <p>Hand test bearing housing for any sign of temperature.</p> <p>Voltage and current.</p>
EVERY MONTH	<p>Check bearing temperature with thermometer.</p>
EVERY 3 MONTHS	<p>Check grease lubricated bearings for saponification.</p>
EVERY 6 MONTHS	<p>Check the packing and replace if necessary.</p> <p>Check shaft or shaft sleeve for scoring.</p> <p>Check alignment of pump and motor.</p> <p>Check holding down bolts for tightness.</p> <p>Check coupling bush/rubber star.</p>
EVERY YEAR	<p>Check rotating element for wear.</p> <p>Check wear ring clearances.</p> <p>Clean and regrease bearings.</p> <p>Measure total suction and discharge Head as a test of pipe connection</p>

7. 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. Please refer to the cross sectional drawing while dismantling and reassembling the pump. Please also refer to chart given at end of this booklet.

7.1 Dismantling Procedure

Note – Store all loose components carefully in a wooden box. Remove sealing connection given to lantern ring / mechanical seal, temperature indicator, etc.

7.1.1 For UP150/56, UP200/56, UP200/64M, UP250/33, UP250/66, UP300/34, UP300/39:

7.1.1.1 Disengage pump coupling from motor coupling.

Drain the pump by removing drain plug (60100) and opening air vent valve (45000).

7.1.1.2 Remove the nuts (58001) and locating pin (61100) joining the upper half casing and lower half casing.

7.1.1.3 Remove all insert joint nuts at both ends (58002).

7.1.1.4 Insert a screw driver or peg bar into the slot between the two halves and separate two halves, lifting off the upper half casing (12200). Remove the upper half casing, taking enough care not to damage the impeller and casing (wear) ring.

7.1.1.5 Tap the inserts (97900) with a soft hammer to break the seat between the insert and lower half casing (12300) and lift the rotating unit out of the lower half casing so that none of the parts will be damaged. Take out the rotating unit & keep it on rubber or wooden sheet in clean & dry place for further dismantling purpose.

7.1.1.6 Remove the pump coupling and coupling key.

7.1.1.7 Remove four hex screws (57100) from each bearing housing (24001 and 24002) and remove the bearing housing from bearings & take it off the shaft.

7.1.1.8 Remove bearing lock nut (33600) and lock washer (41500) from NDE side.

Remove NDE bearing (26000) from the shaft by the use of bearing puller. Remove driving end bearing in the same manner.

7.1.1.9 Remove oil seals (50000) from the insert from DE & NDE side. Remove shoulder rings (19900) from the shaft by using puller.

7.1.1.10 Remove liquid deflector (23600) from the shaft.

7.1.1.11 Remove gland nuts (58200) from each gland. Remove gland (22300) gland packing (43000) & lantern rings (22700) from each insert.

7.1.1.12 Slide inserts (97901, 97902) off the shaft.

7.1.1.13 Take out casing rings (19000) on DE & NDE side.

7.1.1.14 For counter clockwise (CCW) direction of rotation of pump viewed from driving end, follow steps (i & ii) and then go to point no. 7.1.1.16:

i) Unscrew DE side shaft sleeve and slide it off the shaft from DE side.
Remove impeller from shaft. Remove impeller key.

ii) Unscrew the NDE side shaft sleeve and slide it off the shaft from NDE side.

7.1.1.15 For clockwise (CW) direction of rotation of pump viewed from driving end, follow steps (i & ii) then go to point no. 7.1.1.16:

i) Unscrew NDE side shaft sleeve and slide it off the shaft from NDE side. Remove impeller from shaft. Remove impeller key.

ii) Unscrew the DE side shaft sleeve and slide it off the shaft from DE side.

7.1.1.16 Store all parts of rotating assembly in clean and dry place and arrange to store the parts in well oiled condition.

7.1.1.17 mechanical seal arrangement –

UP150/56, UP200/56, UP200/64M, UP250/33, UP250/66, UP300/34 & UP300/39 pumps are fitted with bare mechanical seal only.

a) Dismantling procedure for mechanical seal fitted pump is same as above except step no. 7.1.1.11. After step no. 7.1.1.10, slide inserts (97901, 97902) off the shaft.

b) Remove grub screws holding mechanical seal & slide off mechanical seal on both sides from the shaft.

c) Then follow steps 7.1.1.13 to 7.1.1.16.

This completes the dismantling of the pump.

7.1.2 For UP250/57, UP300/46, UP300/57, UP350/54, UP350/66, UP400/46:

7.1.2.1 Disengage pump coupling from motor coupling.

Drain the pump by removing drain plug (60100) and opening air vent valve (45000).

7.1.2.2 Remove the nuts (58001) and locating pin (61100) joining the upper half casing and lower half casing. Remove sealing / flush piping.

- 7.1.2.3 Remove hex screws (57100) for bearing cover (DE, NDE & stuffing box side).
- 7.1.2.4 Remove hex screws (57101) for bearing housing & upper & lower half casing.
- 7.1.2.5 Insert a screw driver or peg bar into the slot between the two halves and separate two halves, lifting off the upper half casing (12200). Remove the upper half casing, taking enough care not to damage the impeller and casing (wear) ring.
- 7.1.2.6 Tap the inserts-DE & NDE side (97901 & 97902) - with a soft hammer to break the seat between the insert and lower half casing (12300) and lift the rotating unit out of the lower half casing so that none of the parts will be damaged. Take out the rotating unit & keep it on rubber or wooden sheet in clean & dry place for further dismantling purpose.
- 7.1.2.7 Remove the pump coupling and coupling key.
- 7.1.2.8 Remove bearing cover-DE & NDE side (27101 & 27000) from the shaft.
- 7.1.2.9 Remove hex screws (57101) joining bearing housing & insert (58002). Release bearing housing (24001 & 24002) from insert & take it off the shaft.
- 7.1.2.10 Remove bearing lock nut (33600) and lock washer (41500) from NDE side. Remove NDE bearing (26000) from the shaft by the use of bearing puller. Remove driving end bearing in the same manner.
- 7.1.2.11 Remove oil seals (50000) from the bearing covers (stuffing box side) from DE & NDE side.
- 7.1.2.12 Take off stuffing box side bearing covers from the shaft from DE & NDE side.
- 7.1.2.13 Remove liquid deflector (23600) from the shaft.
- 7.1.2.14 Remove gland nuts (58200) from each gland. Remove gland (22300), gland packing (43000) & lantern rings (22700) from each insert.
- 7.1.2.15 Slide inserts (97901, 97902) of the shaft.
- 7.1.2.16 Take out casing rings (19000) on DE & NDE side.
- 7.1.2.17 **For counter clockwise (CCW) direction of rotation of pump viewed from driving end, follow steps (i & ii) and then go to point no. 7.1.2.19:**
- i) Unscrew DE side shaft sleeve and slide it off the shaft from DE side.
Remove impeller from shaft. Remove impeller key.
 - ii) Unscrew the NDE side shaft sleeve and slide it off the shaft from NDE side.
- 7.1.2.18 **For clockwise (CW) direction of rotation of pump viewed from driving end, follow steps (i & ii) then go to point no. 7.1.2.19:**

i) Unscrew NDE side shaft sleeve and slide it off the shaft from NDE side. Remove impeller from shaft. Remove impeller key.

ii) Unscrew the DE side shaft sleeve and slide it off the shaft from DE side.

7.1.2.19 Store all parts of rotating assembly in clean and dry place and arrange to store the parts in well oiled condition.

7.1.2.20 Mechanical seal arrangement –

UP250/57, UP300/46, UP300/57, UP350/54, UP350/66 & UP400/46 pumps are fitted with cartridge type mechanical seal only.

a) Dismantling procedure for mechanical seal fitted pump is same as above except step no. 7.1.2.14.

b) Remove screws holding mechanical seal. Push assembly fixture into slot provided in seal cover. Push mechanical seal back on the shaft & take it off the shaft from DE & NDE side.

c) Then follow steps 7.1.2.15 to 7.1.1.19.

This completes the dismantling of the pump.

7.1.3 For UP400/48, UP400/51, UP400/67, UP500/51 & UP500/68:

7.1.3.1 Disengage pump coupling from motor coupling.

Drain the pump by removing drain plug (60100) and opening air vent valve (45000).

7.1.3.2 Remove the nuts (58001) and locating pin (61100) joining the upper half casing and lower half casing. Remove sealing / flush piping.

7.1.3.3 Remove hex screws (57100) for bearing cover (DE, NDE & stuffing box side).

7.1.3.4 Remove hex screws (57101) for bearing housing & upper & lower half casing.

7.1.3.5 Insert a screw driver or peg bar into the slot between the two halves and separate two halves, lifting off the upper half casing (12200). Remove the upper half casing, taking enough care not to damage the impeller and casing (wear) ring.

7.1.3.6 Tap the inserts-DE & NDE side (97901 & 97902) - with a soft hammer to break the seat between the insert and lower half casing (12300) and lift the rotating unit out of the lower half casing so that none of the parts will be damaged. Take out the rotating unit & keep it on rubber or wooden sheet in clean & dry place for further dismantling purpose.

7.1.3.7 Remove the pump coupling and coupling key.

7.1.3.8 Remove bearing cover-DE & NDE side (27101 & 27000) from the shaft.

7.1.3.9 Remove Hex screws (57101) joining bearing housing & insert (58002). Release bearing housing (24001 & 24002) from insert & take it off the shaft.

7.1.3.10 Remove bearing lock nut (33600) and lock washer (44500) from NDE side. Remove NDE bearing (26000) from the shaft by the use of bearing puller. Remove driving end bearing in the same manner.

7.1.3.11 Remove oil seals (50000) from the bearing covers (stuffing box side) from DE & NDE side.

7.1.3.12 Take off stuffing box side bearing covers from the shaft from DE & NDE side.

7.1.3.13 Remove liquid deflector (23600) from the shaft.

7.1.3.14 Remove gland nuts (58200) from each gland. Remove gland (22300), gland packing (43000) & lantern rings (22700) from each insert.

7.1.3.15 Slide inserts (97901, 97902) off the shaft.

7.1.3.16 Take out casing rings (19000) on DE & NDE side.

7.1.3.17 Unscrew DE side shaft sleeve (31000) & impeller nut (33001) and slide it off the shaft from DE side.

7.1.3.18 Remove impeller from shaft. Remove impeller key.

7.1.3.19 Unscrew the NDE side shaft sleeve & impeller nut and slide it off the shaft from NDE side.

7.1.3.20 Store all parts of rotating assembly in clean and dry place and arrange to store the parts in well oiled condition.

7.1.3.21 Mechanical seal arrangement –

UP400/48, UP400/51, UP400/67, UP500/51 & UP500/68 pumps are fitted with cartridge type mechanical seal only.

- a) Dismantling procedure for mechanical seal fitted pump is same as above except step no. 7.1.3.13.
- b) Remove screws holding mechanical seal. Push assembly fixture into slot provided in seal cover. Push mechanical seal back on the shaft & take it off the shaft from DE & NDE side.
- c) Then follow steps 7.1.3.15 to 7.1.3.18.

This completes the dismantling of the pump.

7.2 Reassembly Procedure -

7.2.1 For UP150/56, UP200/56, UP200/64M, UP250/33, UP250/66, UP300/34 & UP300/39:

7.2.1.1 Check 'O' ring (52202) for cut or flaws, discard if faulty, lubricate and roll 'O' ring in groove of each shaft sleeve.

7.2.1.2 Wipe over shaft (18001) with clean light oil.

7.2.1.3 Keep shaft so that coupling end extension is in correct position looking from position of suction and delivery branches.

7.2.1.4 **For counter clockwise (CCW) direction of rotation of pump viewed from driving end, follow steps (i, ii & iii) and then go to point no.7.2.1.6:**

- i) Locate the locking shaft sleeve (31000) at NDE side with the help of impeller key (32000) and tighten it on the shaft. Please check that the "o" ring is fitted in groove of sleeve.
- ii) **Check impeller vanes for correct direction of rotation.** Slide the impeller on the shaft. Check that keyway provided on shaft extends equally outside the hub of impeller on both sides.
- iii) Slide DE side adjusting sleeve in the shaft and tight it against impeller hub with the help of set screw.

7.2.1.5 **For clockwise (CW) direction of rotation of pump viewed from driving end, follow steps (i, ii & iii) and then go to point no.7.2.1.6.**

- i) Locate the locking shaft sleeve (31000) at DE side with the help of impeller key and tighten it on the shaft. Please check that the "o" ring is fitted in groove of sleeve.
- ii) **Check impeller vanes for correct direction of rotation.** Slide the impeller on the shaft. Check that keyway provided on shaft extends equally outside the hub of impeller on both sides.
- iii) Slide the NDE side adjusting sleeve in the shaft and tight it against impeller hub with the help of set screw.

7.2.1.6 Apply a hand of light oil on casing rings (19000) and place casing rings on the impeller.

7.2.1.7 Check 'O' rings (52201) for cracks or flaws, discard if faulty. Lubricate and roll 'O' ring (52201) into the groove in each insert (97901, 97902).

7.2.1.8 Slide inserts (97901, 97902) over shaft with guide vane at top position.

7.2.1.9 Slide glands (22300) over the shaft / slide bare mechanical seal over the shaft and locate the same on the shaft with the help of grub screws.

7.2.1.10 Slide the liquid deflector on the shaft from DE & NDE side.

7.2.1.11 Fit shoulder ring (19900) onto shaft, then fit oil seal (50000) into insert. Ensure that no foreign particle should enter in bearing assembly. See sectional drawing.

7.2.1.12 Heat the ball bearing (26000) to approximately 100°C (212°F) using heating oil bath.

NOTE: DO NOT EXCEED 120°C (250°F).



7.2.1.13 Use hand gloves while handling heated bearings.

Slide the heated bearing on to the shaft to about shoulder ring (19900) at non driving end. Place locking washer (44500) onto shaft & screw bearing lock nut (31500) using hook spanner. Tight the lock nut against bearing. Bend the washer in the slot of bearing lock nut.

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

7.2.1.15 Coat the inside of the bearing housing (24002) with grease and slide into place over bearing. Secure bearing housing to insert with four hex head screws (57100).

7.2.1.16 At coupling end heat the bearing (26000) to approximately 100°C (212°F) using heating oil bath.

NOTE: DO NOT EXCEED 120°C (250°F).

7.2.1.17 Slide the heated bearing onto the shaft to about shoulder ring (19900) at coupling end.



Use hand gloves while handling heated bearings.

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

7.2.1.19 Coat the inside of the bearing house (24002) with grease and slide into place over bearing. Secure bearing housing to insert with four hex screws (57100).

7.2.1.20 Fit cylindrical pins (61000) in their respective holes.

7.2.1.21 Lift the rotating unit by means of crane. Set the rotating unit in the lower casing half. Locate both insert tongues at top position. Correct any excessive 'O' ring buckling. Check whether Impeller is centrally placed in volute and there is no rubbing between impeller and casing.

7.2.1.22 Ensure that casing rings are located in cylindrical pins fitted in lower half casing. Install gasket (51900) between upper & lower half casing with a light coat of grease on both gasket surfaces.

Carefully align the inner edge of gasket with the insert 'O' rings.

7.2.1.23 Lift upper half casing (12200) and place it on lower half casing and engage casing joint nuts loosely.

NOTE: When installing casing half upper make sure that the 'O' rings (52201) are not cut or punched.

7.2.1.24 Insert locating pins (61100) for upper & lower half casing and drive them home. Tighten upper half casing to lower half casing by studs and nuts.

7.2.1.25 Fit insert at DE & NDE side & tight it to upper & lower half casing with the help of hex screws.

7.2.1.26 Fill the gland packing along with lantern ring in the correct sequence as given in technical data. Then fit gland to the insert with studs & hex nut. (This step is not applicable for mechanical seal fitted pump.)

7.2.1.27 Mount all the accessories such as grease nipple, sealing / flushing connection etc.

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

7.2.1.29 Mount the pump coupling key and fit the pump coupling on the shaft from DE side.

7.2.1.30 Align motor coupling with pump coupling within 0.05 mm to each other.

Note - UP150/56, UP200/56, UP200/64M, UP250/33, UP250/66, UP300/34 & UP300/39 pumps are fitted with bare mechanical seal only.

This completes the reassembly of the pump.

7.2.2 For UP250/57, UP300/46, UP300/57, UP350/54, UP350/66, UP400/46:

7.2.2.1 Check 'O' ring (52202) for cut or flaws, discard if faulty, lubricate and roll 'O' ring in groove of each shaft sleeve.

7.2.2.2 Wipe over shaft (18001) with clean light oil.

7.2.2.3 Keep shaft so that coupling end extension is in correct position looking from position of suction and delivery branches.

7.2.2.4 For counter clockwise (CCW) direction of rotation of pump viewed from driving end, follow steps (i, ii & iii) and then go to point no.7.2.1.6:

- i) Locate the locking shaft sleeve (31000) at NDE side with the help of impeller key (32000) and tighten it on the shaft. Please check that the "o" ring is fitted in groove of sleeve.
- ii) **Check impeller vanes for correct direction of rotation.** Slide the impeller on the shaft. Check that keyway provided on shaft extends equally outside the hub of impeller on both sides.
- iii) Slide DE side adjusting sleeve in the shaft and tight it against impeller hub with the help of set screw.

7.2.2.5 For clockwise (CW) direction of rotation of pump viewed from driving end, follow (i, ii & iii) and then go to point no.7.2.1.6:

- i) Locate the locking shaft sleeve (31000) at DE side with the help of impeller key and tighten it on the shaft. Please check that the "o" ring is fitted in groove of sleeve.
- ii) **Check impeller vanes for correct direction of rotation.** Slide the impeller on the shaft. Check that keyway provided on shaft extends equally outside the hub of impeller on both sides.
- iii) Slide the NDE side adjusting sleeve in the shaft and tight it against impeller hub with the help of set screw.

7.2.2.6 Apply a hand of light oil on casing rings (19000) and place casing rings on the impeller.

7.2.2.7 Check 'O' rings (52201) for cuts or flaws, discard if faulty. Lubricate and roll 'O' ring (52201) into the groove in each insert (97901, 97902).

7.2.2.8 Slide inserts (97901, 97902) over shaft with guide vane at top position.

7.2.2.9 Slide clamping plates / Cartridge type mechanical seal over the shaft from DE & NDE side.

7.2.2.10 Slide the liquid deflector on the shaft from DE & NDE side.

7.2.2.11 Insert stuffing box side bearing cover (27102) on the shaft from DE & NDE side. Fit oil seal (50000) into the stuffing box side bearing cover. Ensure that no foreign particle should enter in bearing assembly. See sectional drawing.

7.2.2.12 Heat the ball bearing (26000) to approximately 100°C (212°F) using heating oil bath.

NOTE: DO NOT EXCEED 120°C (250°F).



7.2.2.13 Use hand gloves while handling heated bearings.

Slide the heated bearing on to the shaft to about shoulder ring (19900) at non driving end. Place locking washer (44500) onto shaft & screw bearing lock nut (31500) using hook spanner. Tight the lock nut against bearing. Bend the washer in the slot of bearing lock nut.

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

7.2.2.15 Coat the inside of the bearing housing (24002) with grease and slide into place over bearing. Secure bearing housing to insert with hex screws (57100).

7.2.2.16 At coupling end heat the bearing (26000) to approximately 100°C (212°F) using heating oil bath.

NOTE: DO NOT EXCEED 120°C (250°F).

7.2.2.17 Slide the heated bearing onto the shaft to about shoulder ring (19900) at coupling end.



Use hand gloves while handling heated bearings.

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

7.2.2.19 Coat the inside of the bearing house (24002) with grease and slide into place over bearing. Secure bearing housing to insert with hex screws (57100).

7.2.2.20 Fit cylindrical pins (61000) in their respective holes.

7.2.2.21 Lift the rotating unit by means of crane. Set the rotating unit in the lower casing half. Locate both insert tongues at top position. Correct any excessive 'O' ring buckling.

Check whether Impeller is centrally placed in volute and there is no rubbing between impeller and casing.

7.2.2.22 Ensure that casing rings are located in cylindrical pins fitted in lower half casing. Install gasket (51900) between upper & lower half casing with a light coat of grease on both gasket surfaces.

Carefully align the inner edge of gasket with the insert 'O' rings.

7.2.2.23 Lift upper half casing (12200) and place it on lower half casing and engage casing joint nuts loosely.

NOTE: When installing casing half upper make sure that the 'O' rings (52201) are not cut or punched.

7.2.2.24 Insert locating pins (61100) for upper & lower half casing and drive them home. Tighten upper half casing to lower half casing by studs and nuts.

7.2.2.25 Fit bearing housing at DE & NDE side & tight it to upper & lower half casing with the help of hex screws.

7.2.2.26 Fit bearing cover to bearing housing on DE & NDE side with the help of hex screws.

7.2.2.27 Fill the gland packing along with lantern ring in the correct sequence as given in technical data. Then fit split gland along with clamping plate to insert with studs & hex nuts on DE & NDE side. / Fit mechanical seal to insert on DE & NDE side maintaining correct pressure between seal faces.

7.2.2.28 Mount all the accessories such as grease nipple, sealing / flushing connection etc.

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

7.2.2.30 Mount the pump coupling key and fit the pump coupling on the shaft from DE side.

7.2.2.31 Align motor coupling with pump coupling within 0.05 mm to each other. This completes the reassembly of the pump.

7.2.3 For UP400/48, UP400/51, UP400/67, UP500/51 & UP500/68:

7.2.3.1 Check 'O' ring (52202) for cut or flaws, discard if faulty, lubricate and roll 'O' ring in groove of each impeller nut.

7.2.3.2 Wipe over shaft (18001) with clean light oil.

- 7.2.3.3 Keep shaft so that coupling end extension is in correct position looking from position of suction and delivery branches.
- 7.2.3.4 Screw impeller nut (33000) onto the shaft from non drive end.
- 7.2.3.5 Fit impeller key (32000) into keyway on pump shaft. **Check impeller vanes for correct direction of rotation.** Slide the impeller on the shaft from drive end.
- 7.2.3.6 Screw the impeller nut (33001) on the pump shaft at drive end & using spanner, tight the impeller nut against impeller hub.
- 7.2.3.7 Screw shaft sleeve onto the shaft from DE & NDE side & tight against impeller nut.
- 7.2.3.8 Apply a hand of light oil on casing rings (19000) and place casing rings on the impeller.
- 7.2.3.9 Check 'O' rings (52201) for cuts or flaws, discard if faulty. Lubricate and roll 'O' ring (52201) into the groove in each insert (97901, 97902).
- 7.2.3.10 Slide inserts (97901, 97902) over shaft with guide vane at top position.
- 7.2.3.11 Slide clamping plates / Cartridge type Mechanical seal over the shaft from DE & NDE side.
- 7.2.3.12 Slide the liquid deflector on the shaft from DE & NDE side.
- 7.2.3.13 Insert stuffing box side bearing cover (27102) on the shaft from DE & NDE side. Fit oil seal (50000) into the stuffing box side bearing cover. Ensure that no foreign particle should enter in bearing assembly. See sectional drawing.
- 7.2.3.14 Heat the ball bearing (26000) to approximately 100°C (212°F) using heating oil bath.

NOTE: DO NOT EXCEED 120°C (250°F).



- 7.2.3.14 Use hand gloves while handling heated bearings.

Slide the heated bearing on to the shaft to about shoulder ring (19900) at non driving end. Place locking washer (44500) onto shaft & screw bearing lock nut (31500) using hook spanner. Tight the lock nut against bearing. Bend the washer in the slot of bearing lock nut.

- 7.2.3.15 Cool the bearing to room temperature and coat both sides with grease.

7.2.3.16 Coat the inside of the bearing housing (24002) with grease and slide into place over bearing. Secure bearing housing to insert & upper & lower half casing with hex screws (57100).

7.2.3.17 At coupling end heat the bearing (26000) to approximately 100°C (212°F) using heating oil bath.

NOTE: DO NOT EXCEED 120°C (250°F).

7.2.3.18 Slide the heated bearing onto the shaft to about shoulder ring (19900) at coupling end.



Use hand gloves while handling heated bearings.

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

7.2.3.20 Coat the inside of the bearing house (24002) with grease and slide into place over bearing. Secure bearing housing to insert & upper & lower half casing with hex screws (57100).

7.2.3.21 Fit cylindrical pins (61000) in their respective holes.

7.2.3.22 Lift the rotating unit by means of crane. Set the rotating unit in the lower casing half. Locate both insert tongues at top position. Correct any excessive 'O' ring buckling. Check whether Impeller is centrally placed in volute and there is no rubbing between impeller and casing.

7.2.3.23 Ensure that casing rings are located in cylindrical pins fitted in lower half casing. Install gasket (51900) between upper & lower half casing with a light coat of grease on both gasket surfaces.

Carefully align the inner edge of gasket with the insert 'O' rings.

7.2.3.24 Lift upper half casing (12200) and place it on lower half casing and engage casing joint nuts loosely.

NOTE: When installing casing half upper make sure that the 'O' rings (52201) are not cut or punched.

7.2.3.25 Insert locating pins (61100) for upper & lower half casing and drive them home. Tighten upper half casing to lower half casing by studs and nuts.

7.2.3.26 Fit bearing housing at DE & NDE side & tight it to upper & lower half casing with the help of hex screws.

7.2.3.27 Fit bearing cover to bearing housing on DE & NDE side with the help of hex screws.

7.2.3.28 Fill the gland packing along with lantern ring in the correct sequence as given in technical data. Then fit split gland along with clamping plate to insert on DE & NDE side with studs & hex nuts. / Fit mechanical seal to insert on DE & NDE side maintaining correct pressure between seal faces.

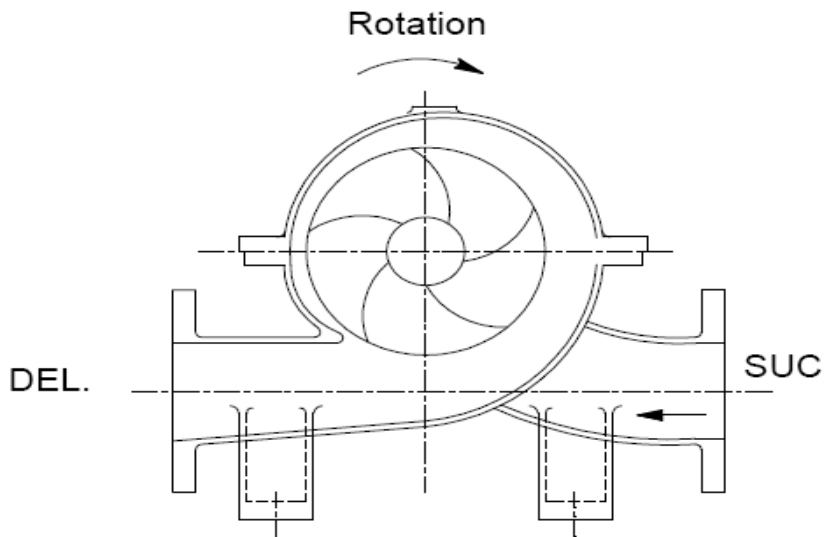
7.2.3.29 Mount all the accessories such as grease nipple, sealing / flushing connection etc.

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

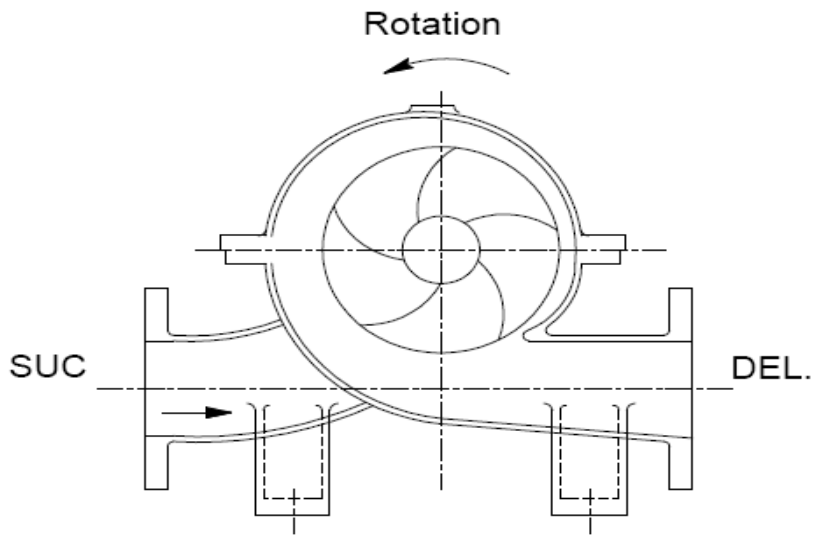
7.2.3.31 Mount the pump coupling key and fit the pump coupling on the shaft from DE side.

7.2.3.32 Align motor coupling with pump coupling within 0.05 mm to each other.

This completes the reassembly of the pump.



CLOCKWISE ROTATION VIEWED FROM THE COUPLING END



COUNTER CLOCKWISE ROTATION VIEWED FROM THE COUPLING END

JOINT FLANGE

TIGHTENING TORQUES AND SEQUENCE

Stud and Nut use in this main joint flange of UP pumps should be tightened to the torques stated in table 1 and in the sequence stated in Fig.

STUD SIZE	TIGHTENING TORQUES
M12	250Kg-CM
M16	650Kg-CM
M20	1270Kg-CM
M24	2200Kg-CM

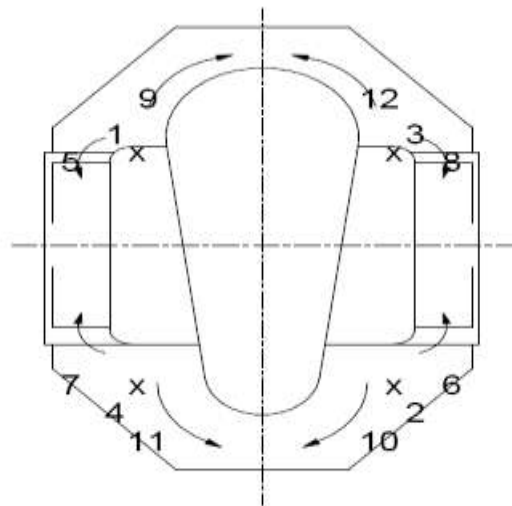
2. Tightening sequence.

2.1 Tighten the four corner stud marked 'X' 1, 2, 3, and 4

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

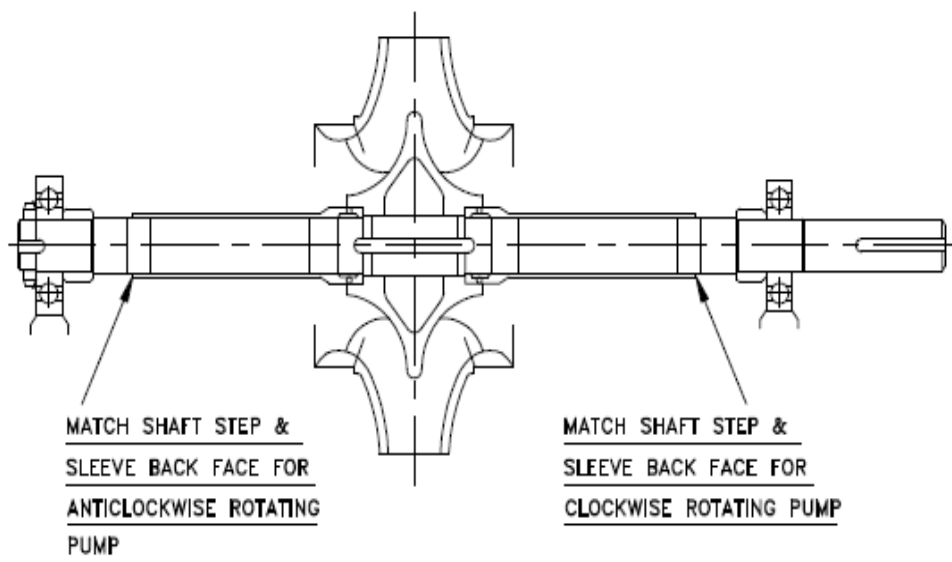
2.3 Work outwards along the branch and in opposite quarters tightening nuts in regions 9, 10, 11, and 12.

2.4 Repeat the whole sequence.



FIG

SLEEVE LOCATION



INSTALLING STUFFING BOX PACKING

1. Refer to stuffing box data to ascertain size and number of rings required.
2. If the packing is to be cut from a coil or long length:-
 - a) Wrap the packing around a dummy shaft, equal to the shaft sleeve diameter.
 - b) To assist in cutting rings, two guide lines parallel to the shaft axis and separated by a distance equal to the packing section may be drawn on the spiral.
 - c) **Cut the rings from the spiral at an angle of 45° diagonally across the guide lines no gap is left between the ends.**
3. Insert the first ring and tap it to the bottom of the stuffing box. Each following ring should be installed in the same manner and positioned in the stuffing box so that the split is advanced 90 Deg.

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

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

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

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

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

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

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

CAUTION:

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

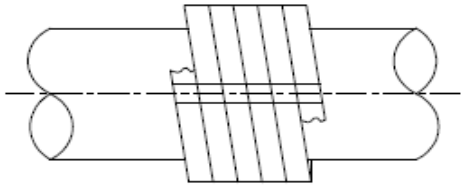


Fig. A

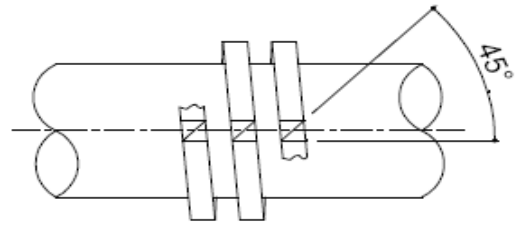
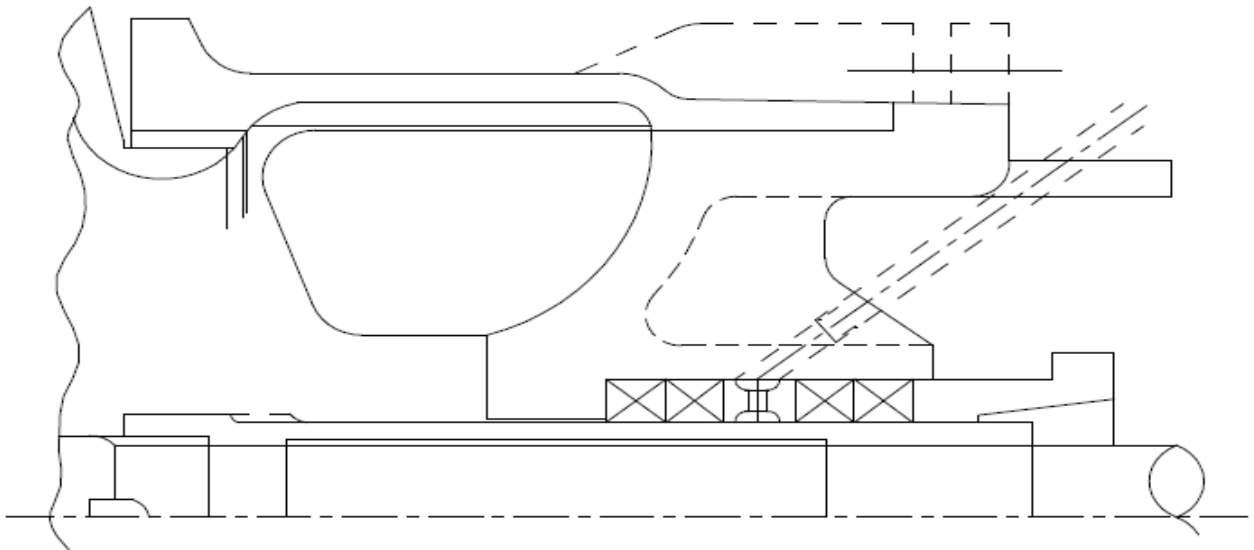
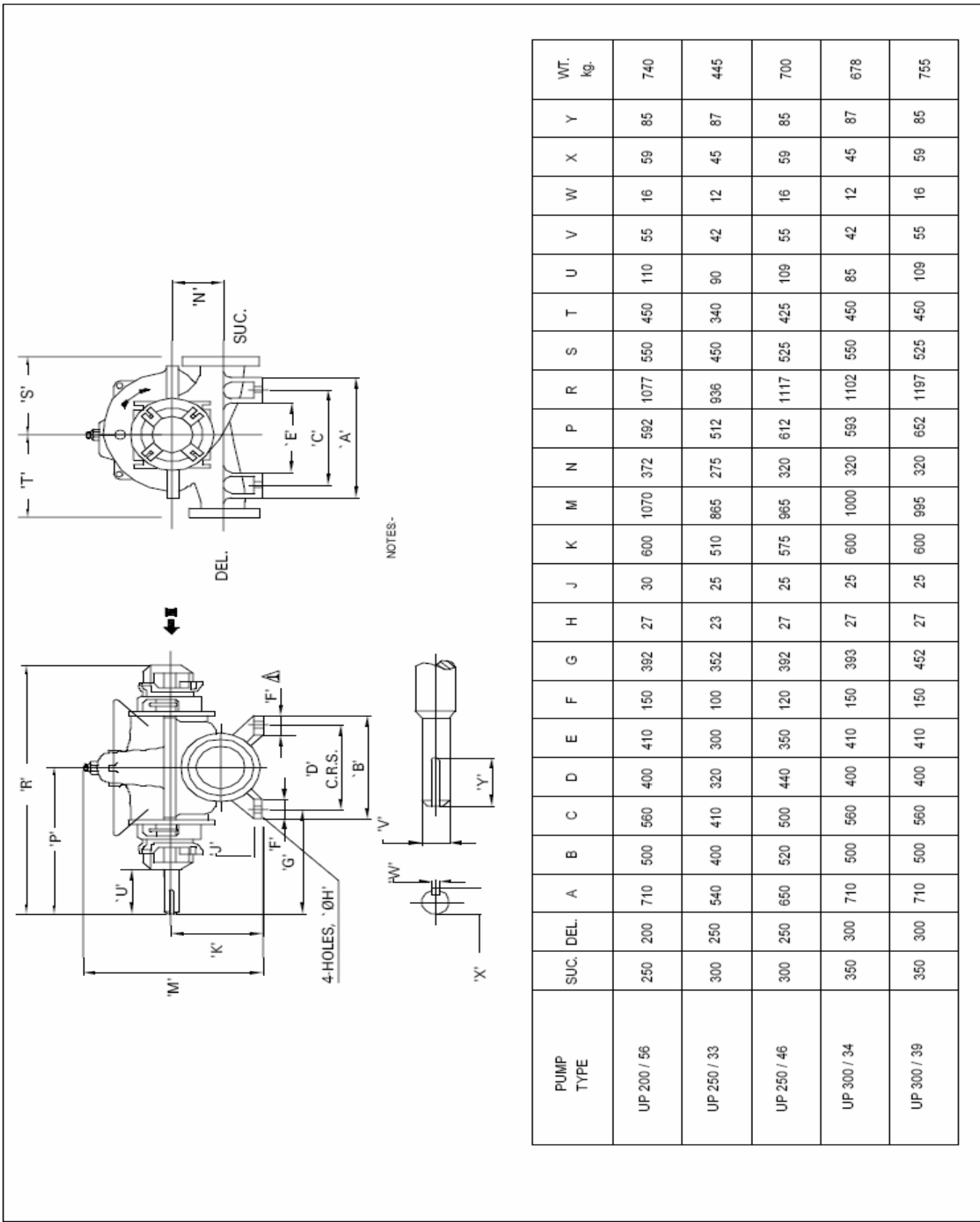


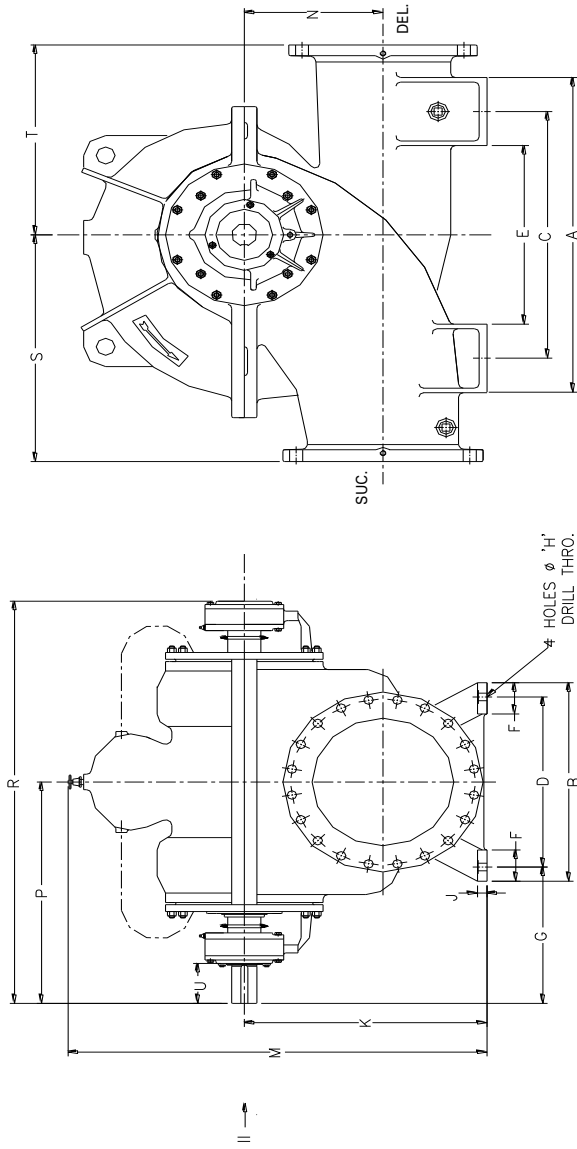
Fig. A



STUFFING BOX

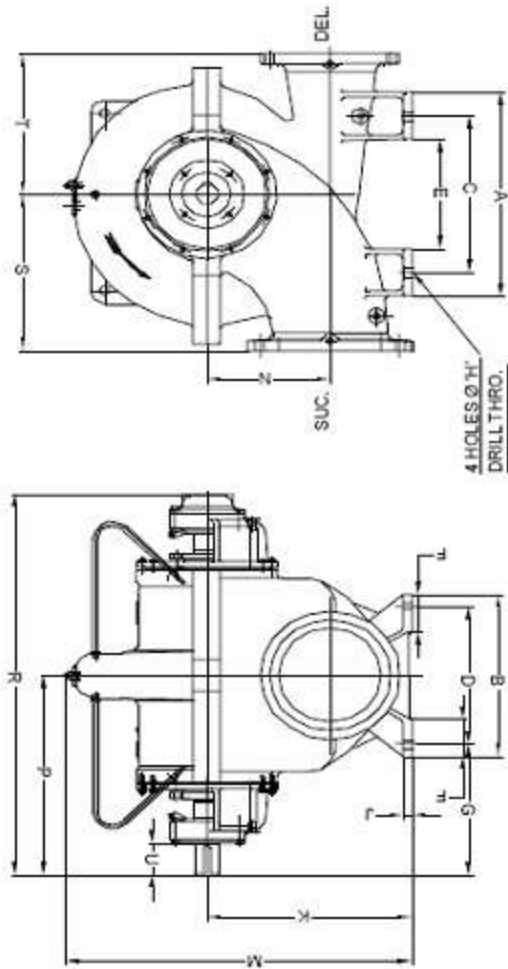
8.0 GENERAL OUTLINE DIMENSIONS:





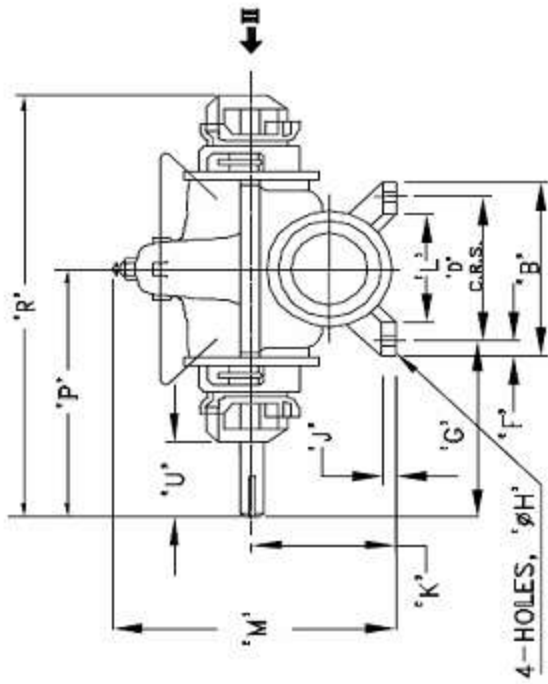
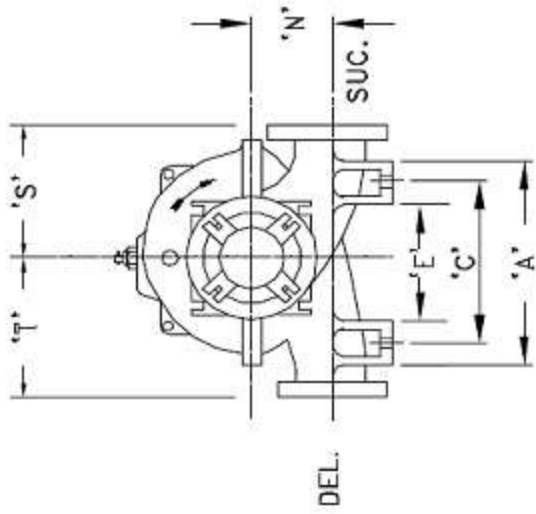
VIEW FROM DRIVING END (ARROW-II)

PUMP TYPE	SUC	DEL	A	B	C	D	E	F	G	H	J	K	M	N	P	R	S	T	U	V	W	X	Y
UP250/46M	300	250	650	520	500	440	350	120	392	27	25	575	965	320	612	1110	525	425	132	55	16	59	85
UP300/34D1	350	300	710	500	560	400	410	150	427	27	25	600	1000	320	627	1137	550	450	108	42	12	45	87

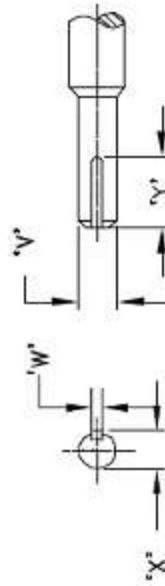


- 1) STANDARD DIRECTION OF ROTATION : COUNTER CLOCKWISE FROM DRIVING END
- 2) NO CHANGE IN DIMENSIONS FOR CLOCKWISE DIRECTION OF ROTATION.
- 3) NO CHANGE IN DIMENSIONS FOR MECH SEAL ARRGT EXCEPT UP 250 / 33 PUMP.
- 4) STANDARD FLANGE DRILLING BS4504 PN16FF
- 5) DIMENSIONS ARE IN mm

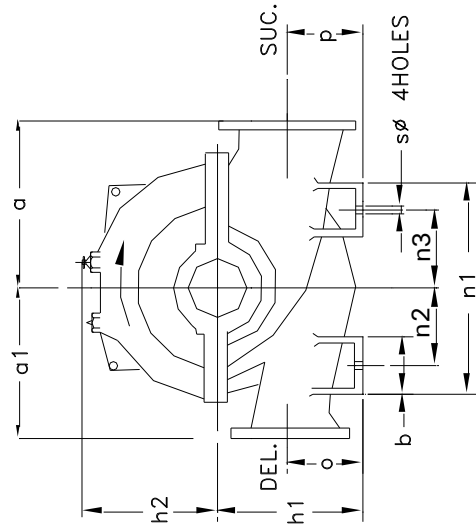
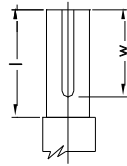
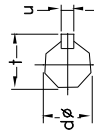
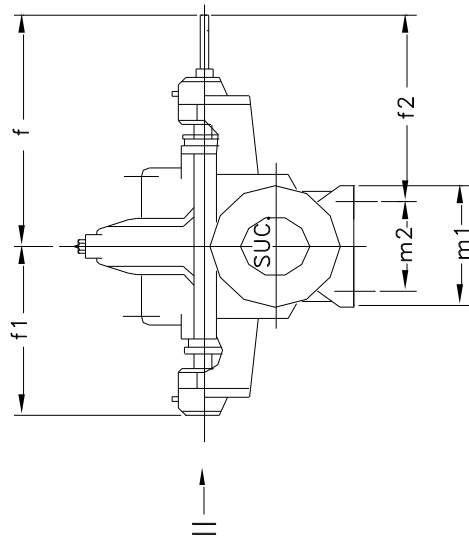
PUMP TYPE	SUC.	DEL.	A	B	C	D	E	F	G	H	J	K	M	N	P	R	S	T	U	V	W	X	Y
UP 250 / 57	300	250	650	520	500	440	350	120	418	27	25	600	1025	360	638	1218	500	450	100	68	20	72.5	72
UP 300 / 46	350	300	710	500	560	400	410	150	438	27	25	630	1065	350	638	1218	575	475	100	68	20	72.5	72
UP 300 / 57	350	300	890	590	750	500	590	120	460	27	35	650	1120	385	710	1300	650	550	135	80	22	85	131
UP 350 / 54	400	350	850	600	700	500	450	130	428	27	25	740	1230	420	678	1298	725	525	100	68	20	72.5	72
UP 350 / 66	400	350	950	600	750	500	550	120	525	27	25	760	1300	455	775	1415	725	575	150	80	22	85	146
UP 400 / 46	400	400	850	600	700	500	450	110	445	27	25	720	1260	420	695	1326	700	550	90	55	16	59	78



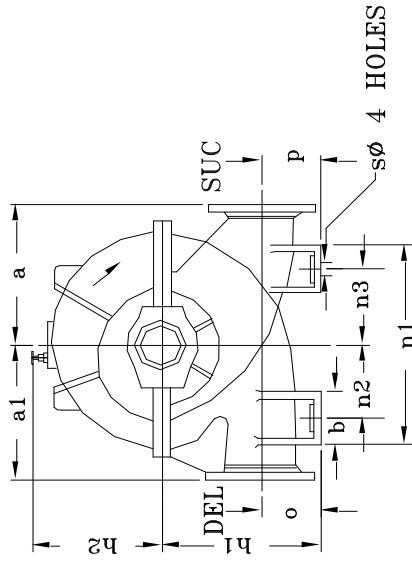
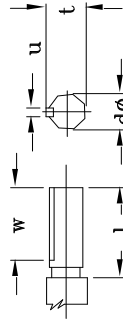
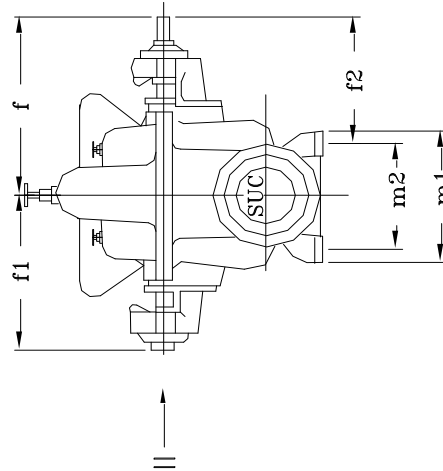
- NOTES :-
- 1) ALL DIMENSIONS ARE IN mm
 - 2) FLANGES DRILLED TO BS 4504 PN 16 (FF)
 - 3) STANDARD DIRECTION OF ROTATION :-
COUNTER CLOCKWISE FROM DRIVING END



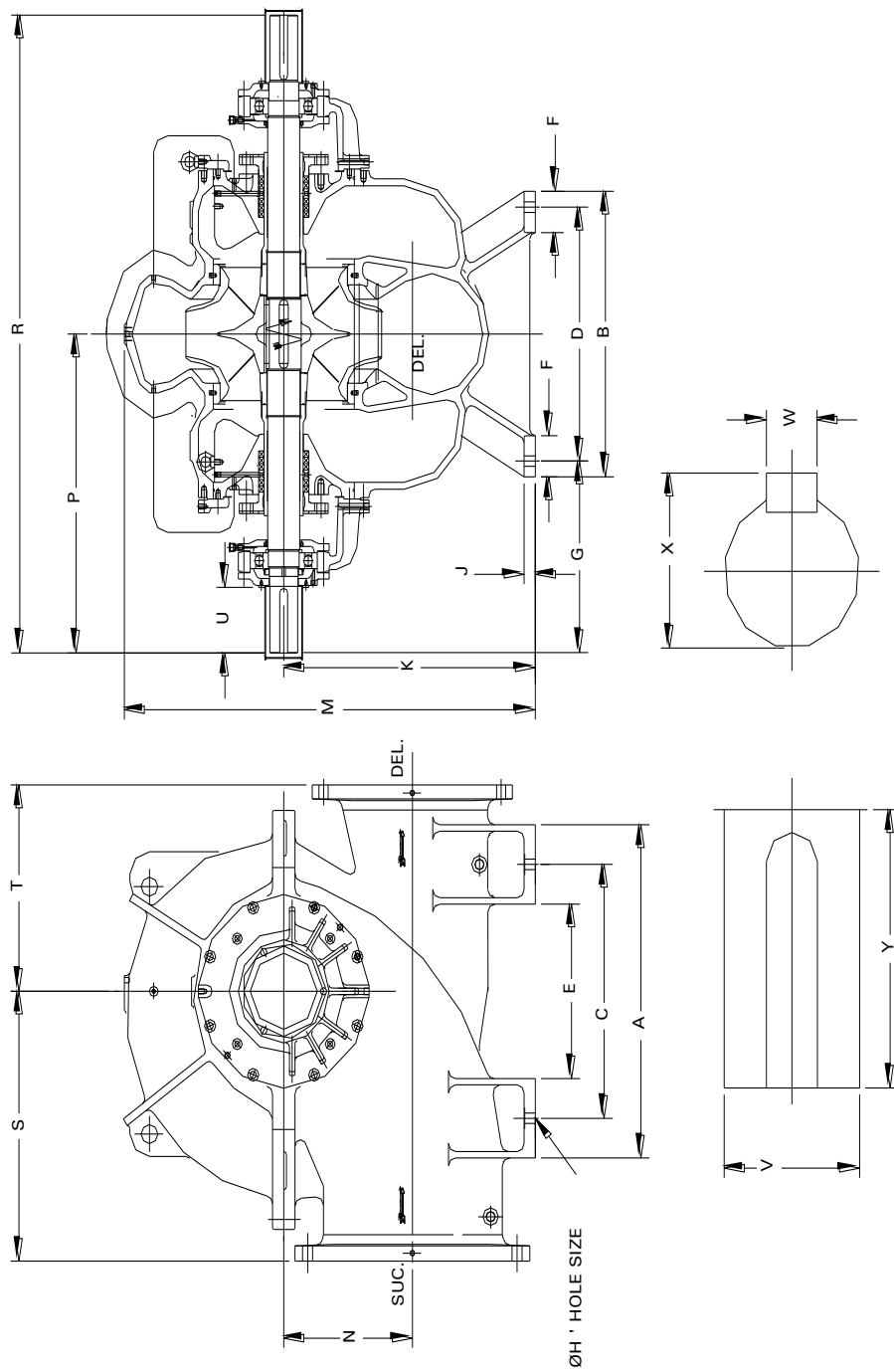
DOR	SUCDEL	A	B	C	D	E	F	G	J	K	L	M	N	P	R	S	T	U	V	W	X	Y	
UP 150/56(CCW)	200	150	650	400	525	320	400	40	367	25	500	200	900	325	527	1038	500	400	109	55	12	58.5	85
UP 150/56 (CW)	200	150	650	400	525	320	400	40	423	25	500	200	900	325	583	1038	500	400	109	55	12	58.5	85



PUMP MODEL	PUMP MOUNTING DIMENSION														SHAFT END				WT. KG.					
	SUC Ø	DEL Ø	a	a1	f	f1	f2	h1	h2	b	m1	m2	n1	n2	n3	sØ	o	p		dØ	l	t	u	w
UP200/64	250	200	550	525	700	618	500	595	455	160	480	400	715	265	290	27	225	225	65	100	69	18	94	1170



PUMP MODEL	SUC Ø	DEL Ø	PUMP MOUNTING DIMENSION													SHAFT END			WT. KG.				
			a	a1	f	f1	f2	h1	h2	o	p	b	m1	m2	n1	n2	n3	sØ		dØ	l	t	u
UP250/66	300	250	650	600	820	690	600	620	490	275	200	540	440	850	300	350	27	80	150	85.5	22	142	1600



PUMP TYPE	SUC. DEL.	A	B	C	D	E	F	G	H	J	K	M	N	P	R	S	T	U	V	W	X	Y
UP500/68 (17C13)	600	1050	900	800	800	550	130	605	33	40	900	1470	460	1005	2010	850	650	210	100	28	106	210
UP400/67 (17C12)	500	1020	720	820	600	620	130	593	27	35	900	1465	530	893	1788	850	650	170	95	25	100	170
UP400/48 (17C10)	450	1110	700	870	600	630	110	465	27	30	770	1280	440	781	1530	800	670	125	80	22	85	140
UP400/51 (17C11)	450	1110	700	870	600	630	110	465	27	30	770	1280	440	781	1530	800	670	125	80	22	85	140
UP500/51 (17C15)	600	1000	900	750	760	500	150	603	30	40	925	1505	495	983	1968	850	700	162	85	25	100	170

9.0 SPARE PART LIST AND CROSS SECTIONAL DRAWINGS

* Marked part code nos. are recommended spares.

Part code no.	Part description
12200	CASING HALF UPPER
12300	CASING HALF LOWER
15900*	IMPELLER
19000*	WEARING RING
19900	SHOULDER RING
24001	BEARINF HOUSING DE
24002	BEARING HOUSING NDE
26000*	BALL BEARING
27000	BEARING COVER DE
27101	BEARING COVER NDE
27102	BEARING COVER DE & NDE
32000*	KEY (IMPELLER)
32100	KEY (COUPLING)
33001	Impeller Nut(DE)
33002	Impeller Nut(NDE)
33600	LOCK NUT (BEARING)
41500	LOCK WASHER (BEARING)
44101	GREASE NIPPLE
45000	VENT VALVE
47101	PROTECTION COVER (SUC)
47102	PROTECTION COVER (DEL)
50000	OIL SEAL
51900	GASKET (CASING)
52200*	O RING (INSERT)
52202*	ORING (SLEEVE)
57100	SCREW (BRG.HOUSING)
57101	SCREW (BRG. HSG & CASING)
57102	SCREW (BRG. HSG & INSERT)
58001	NUT (CASING)
58002	NUT (INSERT)
59001	STUD (CASING)
59002	STUD (INSERT)
60500	PIPE PLUG (BEARING HOUSING NDE)
60600	PIPE PLUG (PRIMING)
61000	LOCKING PIN (CASING RING)
61100	LOCATING PIN (CASING)
64000	RIVET (NAME PLATE)
67000	DUTY NAME PLATE
69100	NUT (LOCATING PIN)
84901	WASHER (LOCATING PIN)
84902	WASHER (INSERT)
84903	WASHER (BEARING HOUSING)
60000	GAUGE PLUG
60100	DRAIN PLUG

Soft packed pump components

18001*	PUMP SHAFT (SOFT PACKED)
22300	GLAND
22700	LANTERN RING
23600	DEFLECTOR
31000*	SHAFT SLEEVE (SOFT PACKED)
43000*	GLAND PACKING
58200	NUT (GLAND)
59200	STUD (GLAND)
59404	WAHSER (GLAND)
97901	INSERT DE(SOFT PACKED)
97902	INSERT NDE(SOFT PACKED)

Common for Mechanical Seal & Gland Pack

a) Internal Flushing Components

55902	STUD COUPLING
56002	TUBE FLUSHING

b) External Flushing Components

60200	SEALING PLUG (CASING)
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Soft Packed Components Grease Sealing (If Ordered)

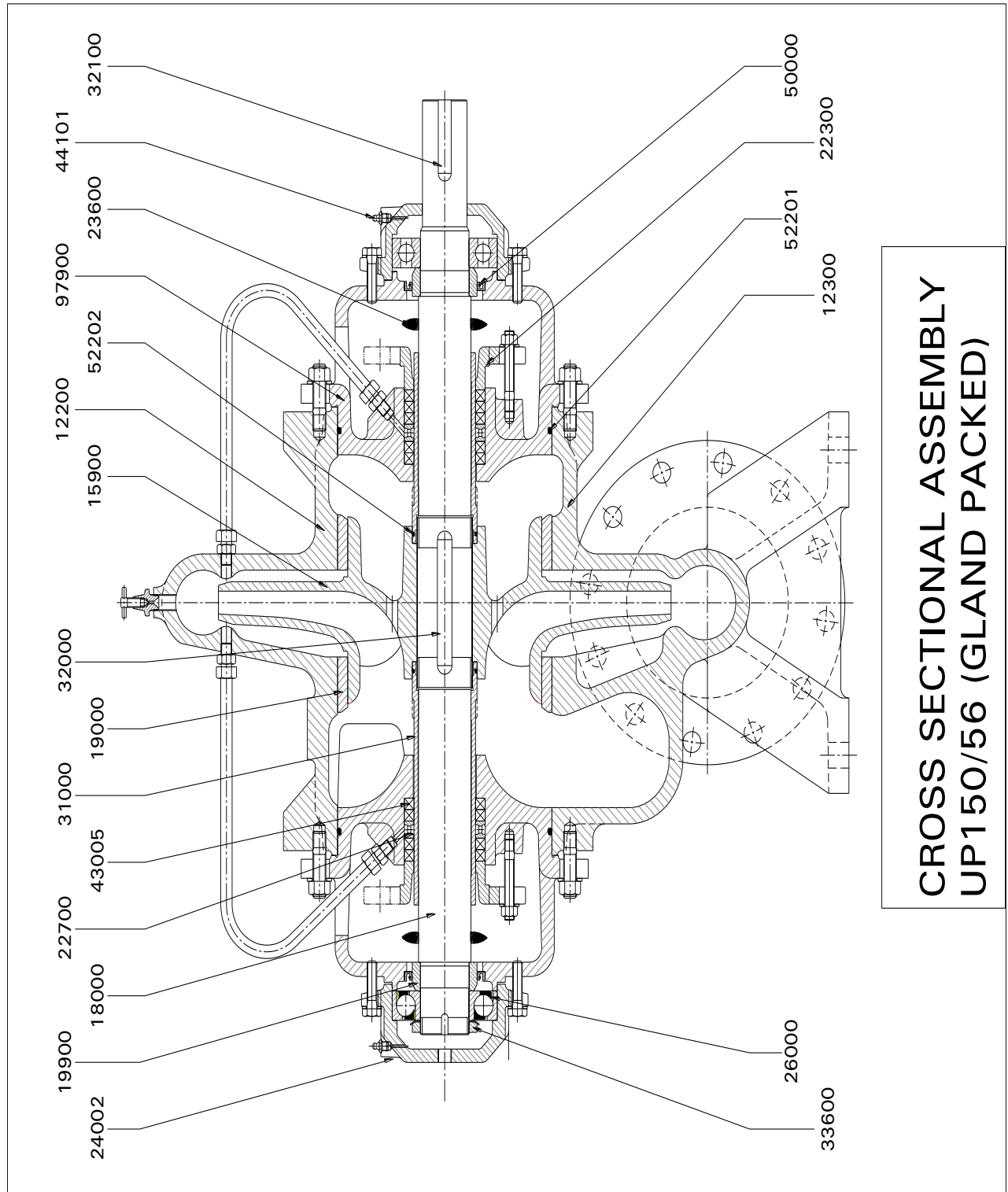
60200	SEALING PLUG (CASING)
44102	GREASE NIPPLE

Gauge and drain connection (If Ordered)

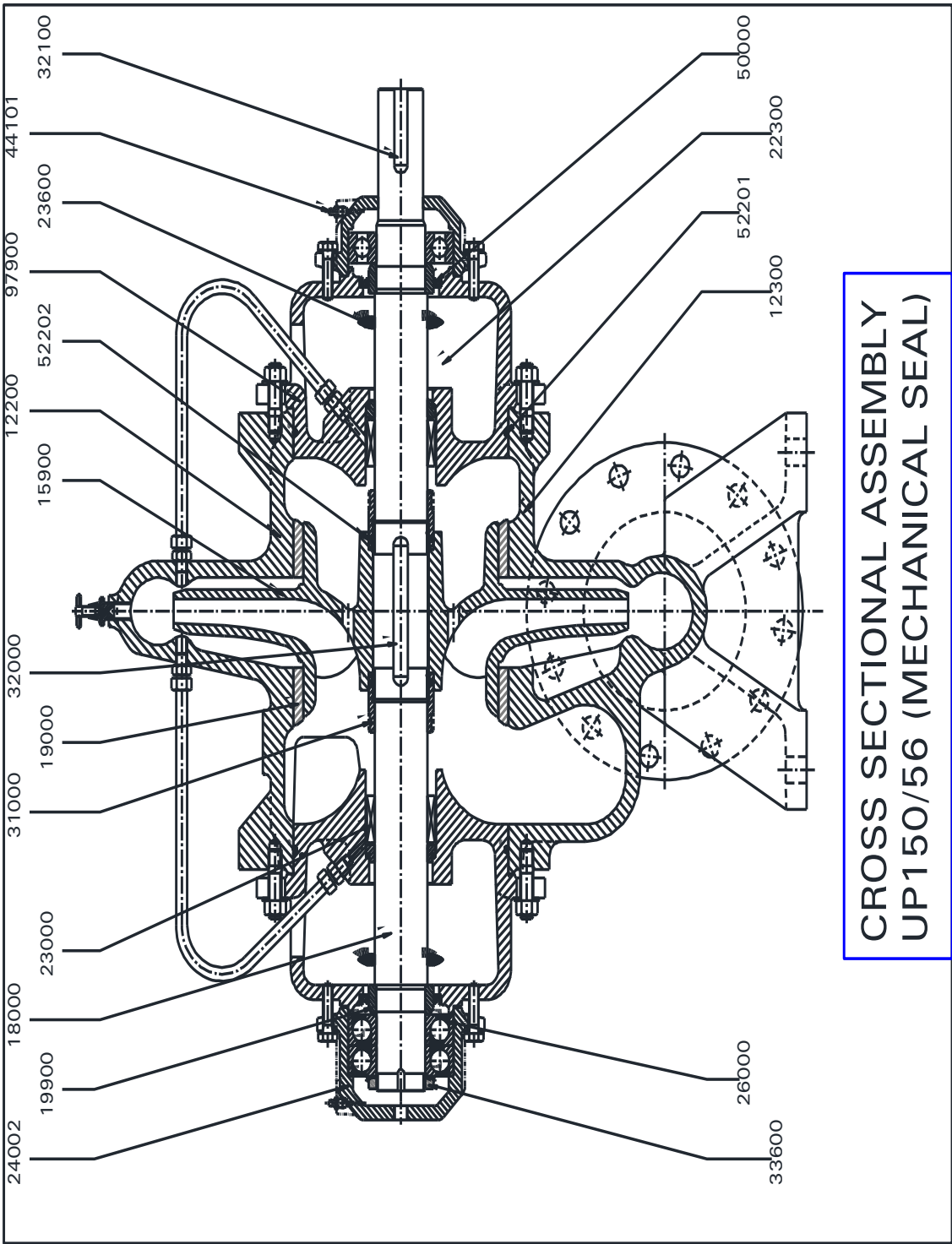
60000	GAUGE PLUG
60600	DRAIN PLUG

Mechanical Seal Components

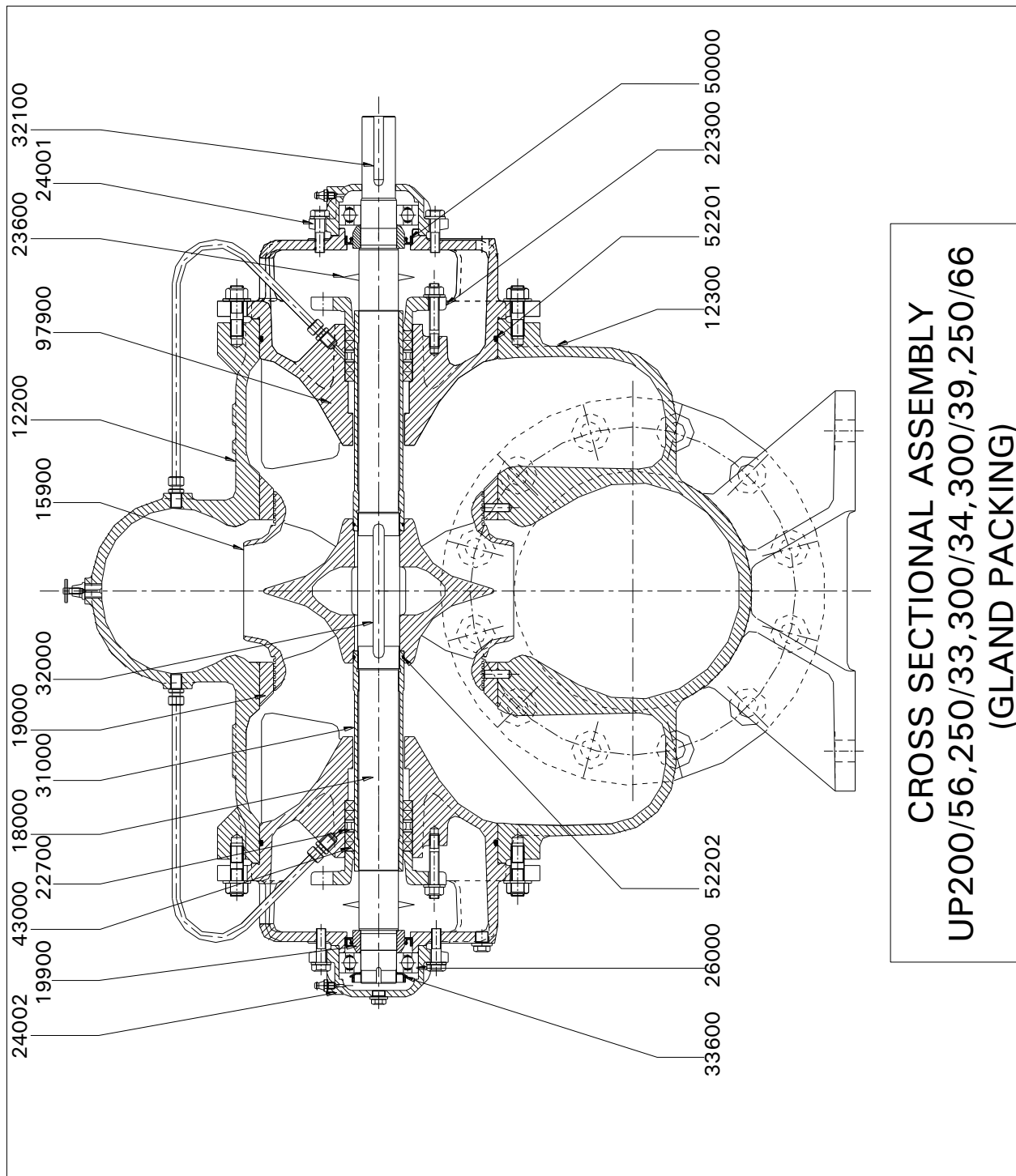
18000*	PUMP SHAFT (MECH.SEAL)
23000*	MECH.SEAL
31500*	SHAFT-SLEEVE(MECH.SEAL)AGAINST ORDER
97900	INSERT (MECH.SEAL)



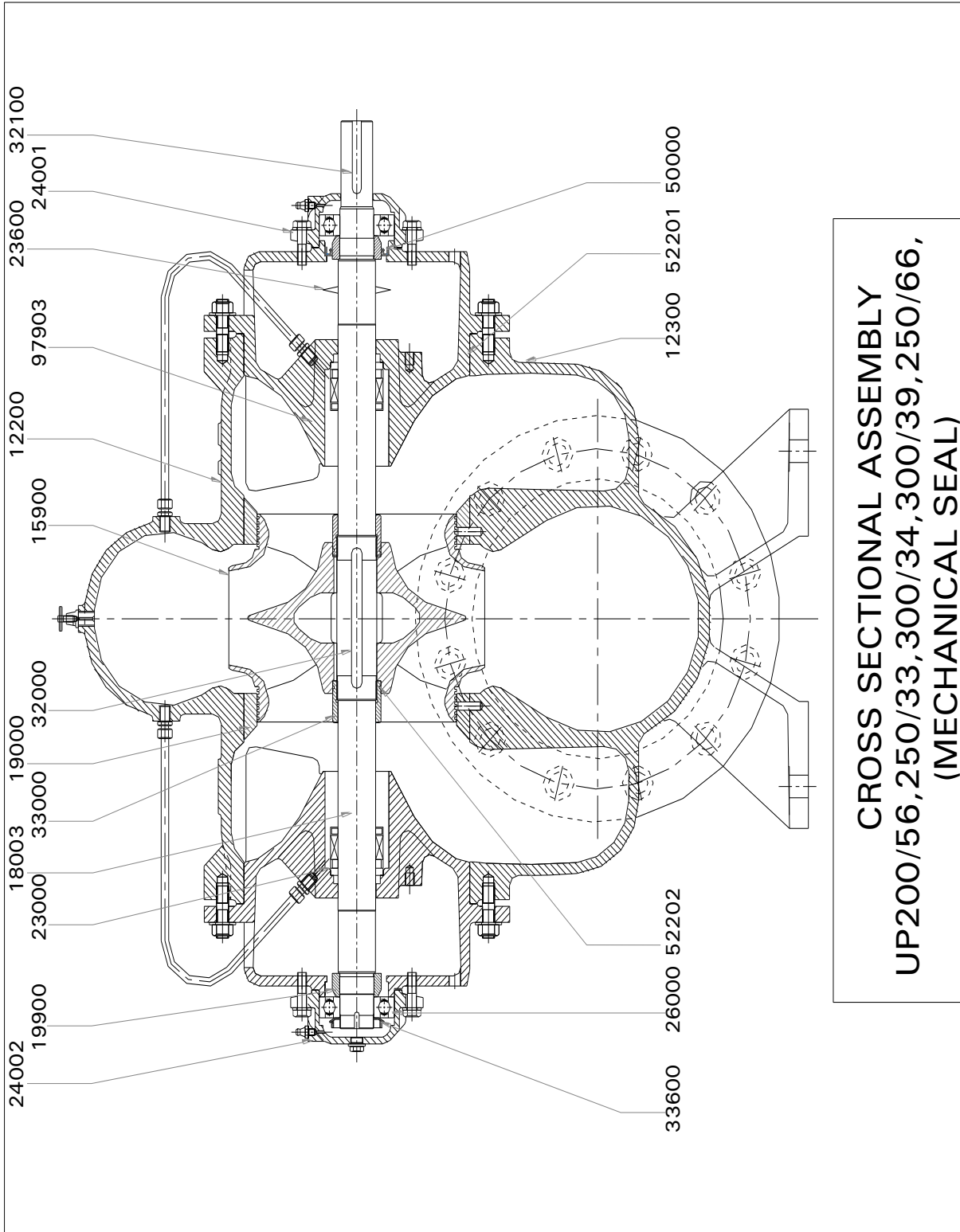
**CROSS SECTIONAL ASSEMBLY
UP150/56 (GLAND PACKED)**



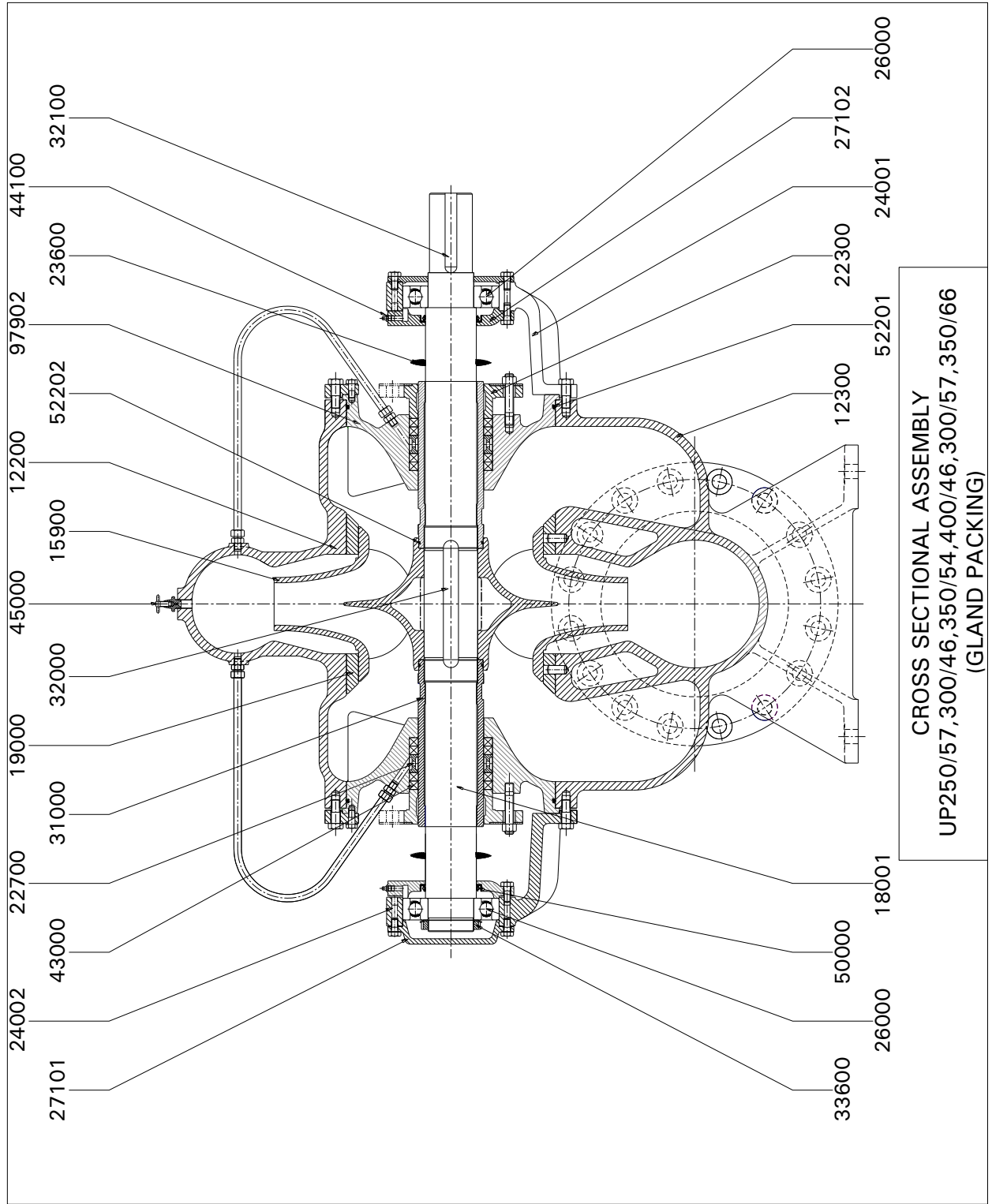
CROSS SECTIONAL ASSEMBLY
UP150/56 (MECHANICAL SEAL)



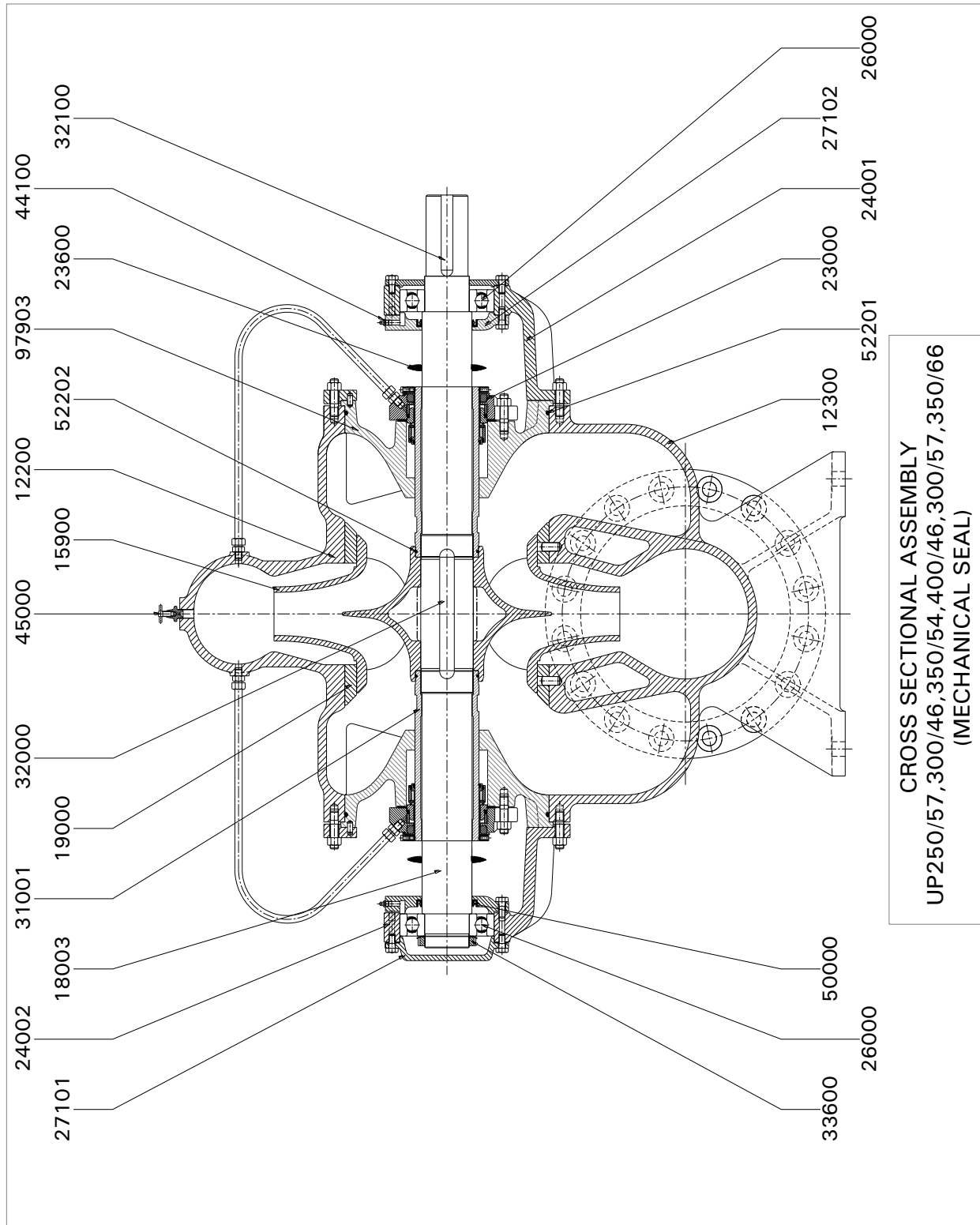
**CROSS SECTIONAL ASSEMBLY
UP200/56,250/33,300/34,300/39,250/66
(GLAND PACKING)**



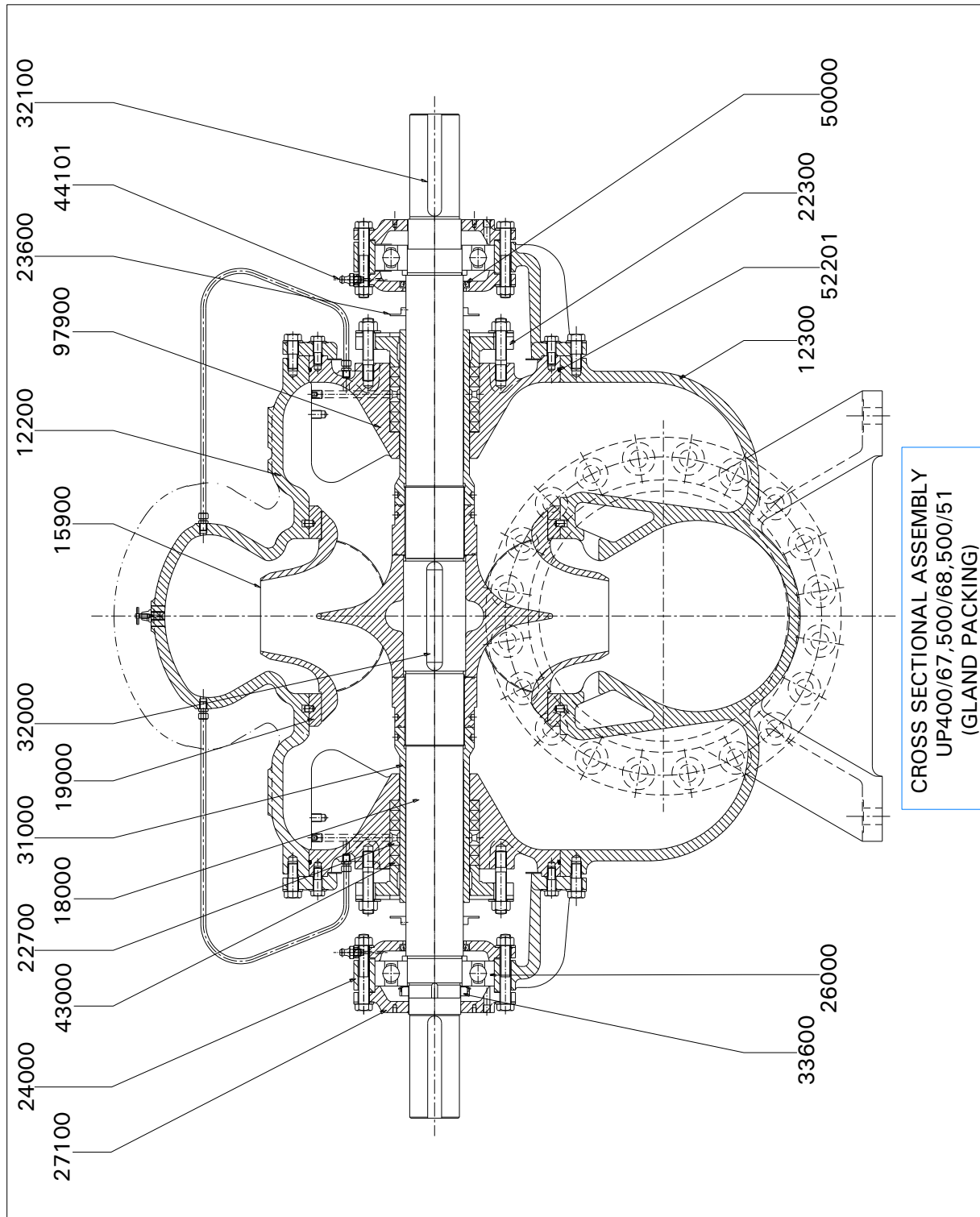
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(MECHANICAL SEAL)**

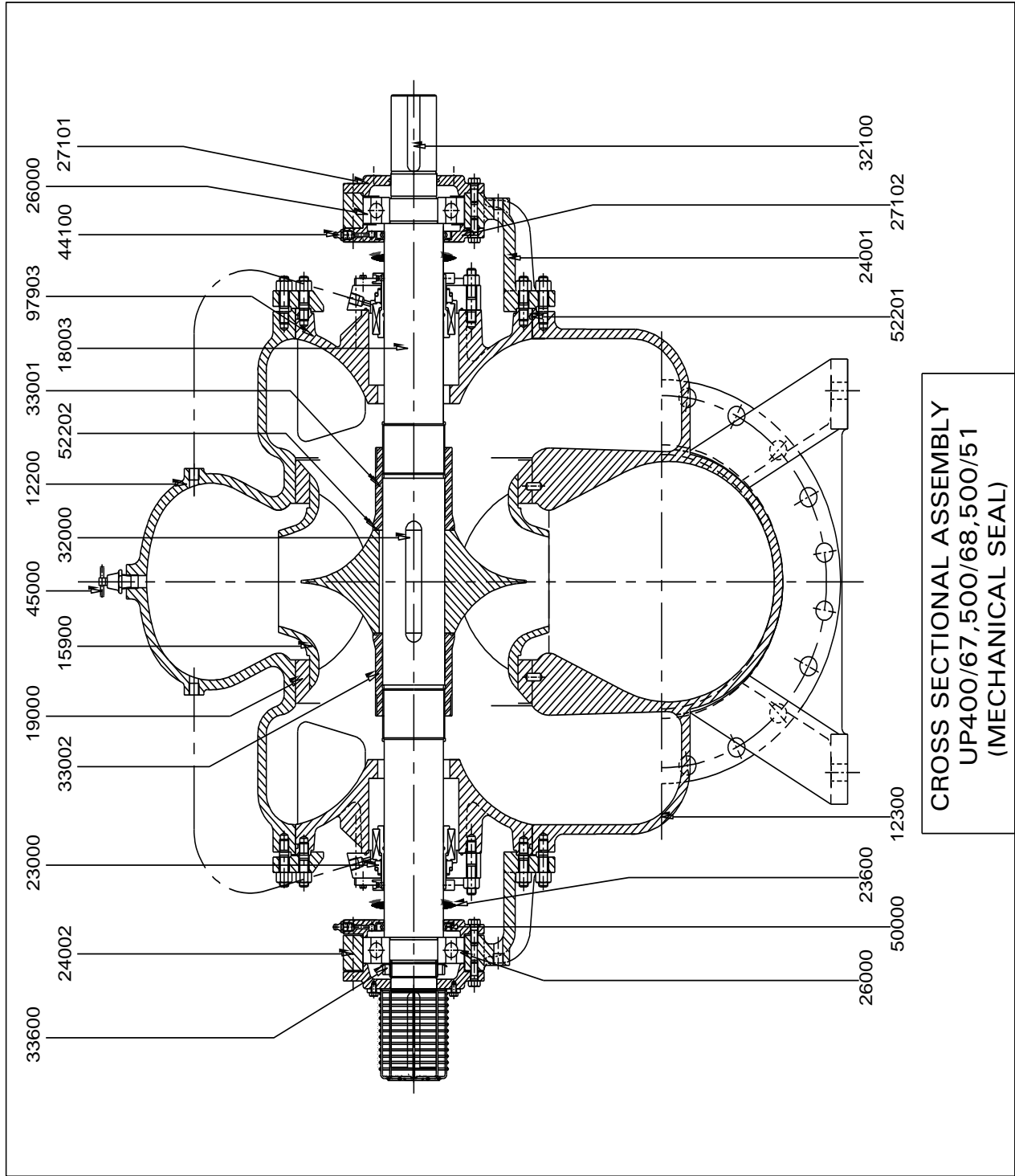


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 (GLAND PACKING)

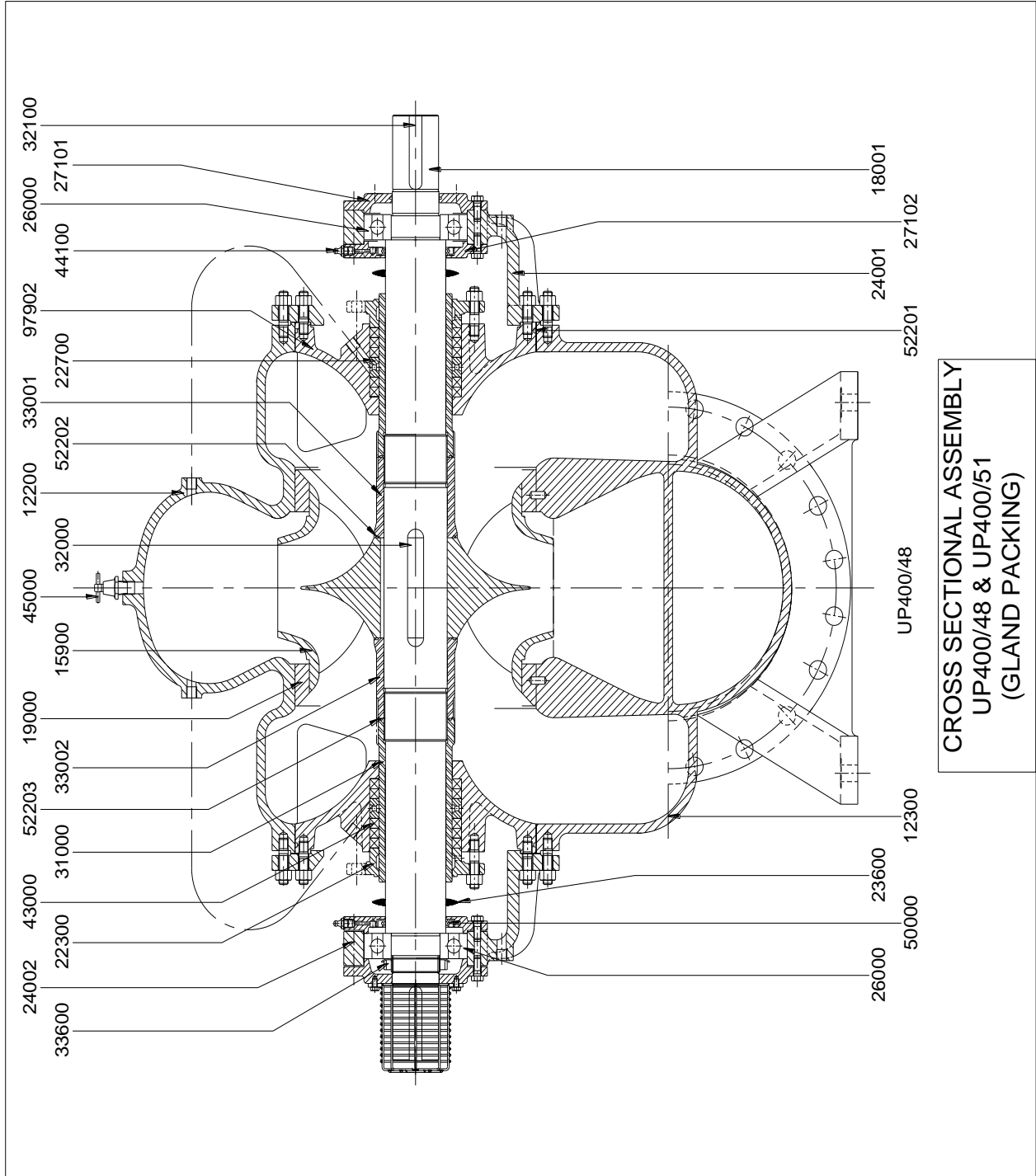


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 (MECHANICAL SEAL)

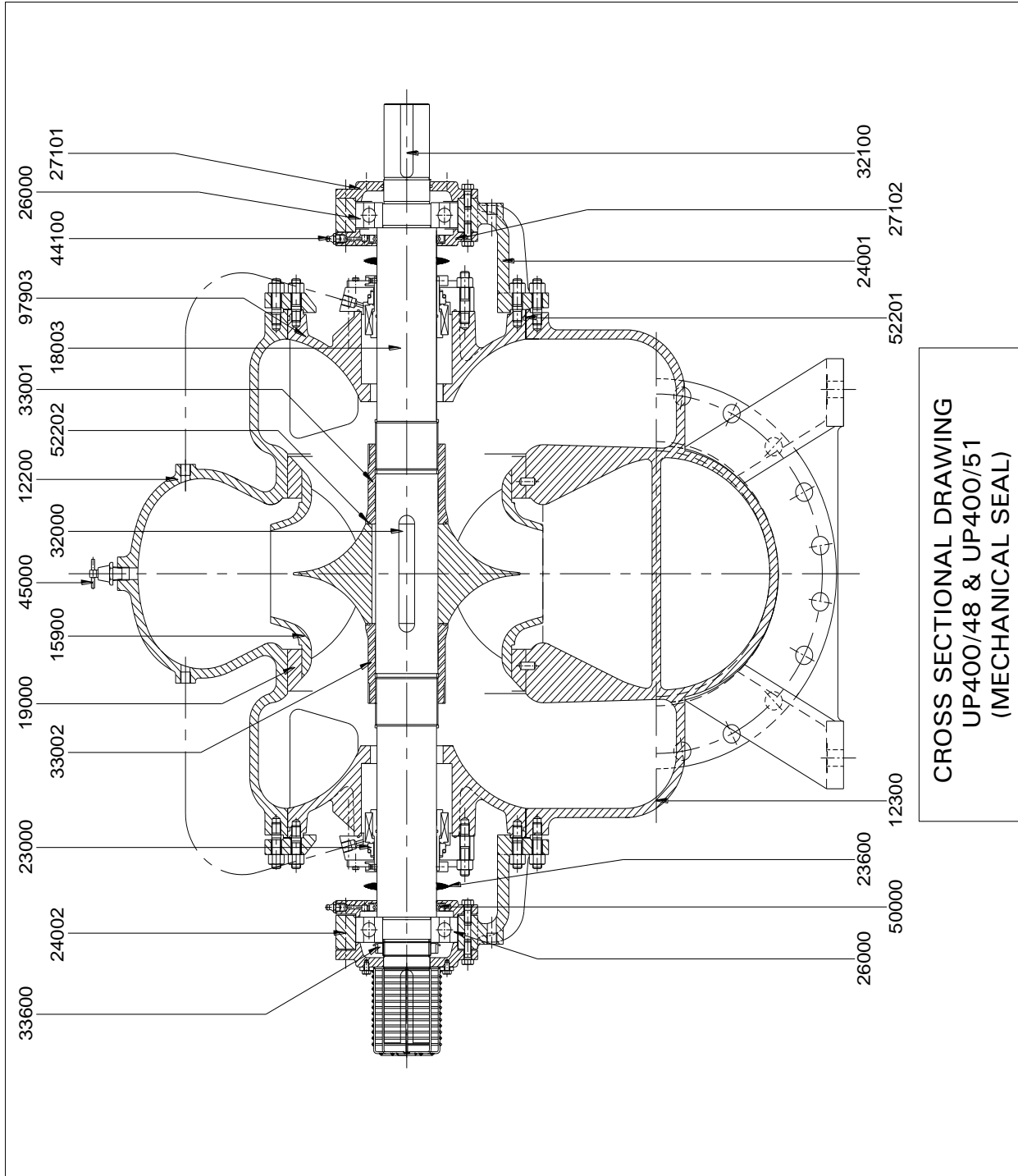




CROSS SECTIONAL ASSEMBLY
 UP400/67,500/68,500/51
 (MECHANICAL SEAL)

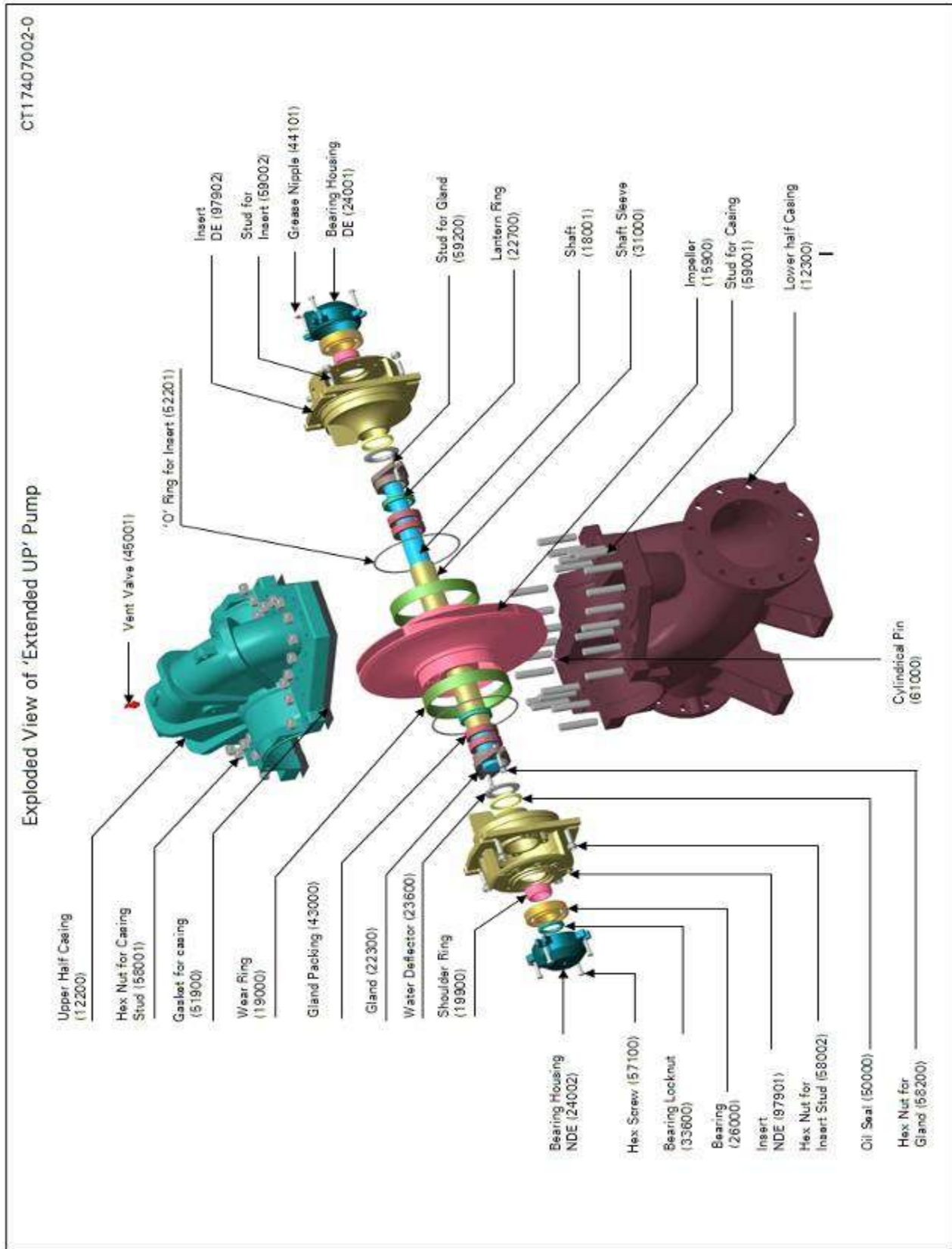


**CROSS SECTIONAL ASSEMBLY
UP400/48 & UP400/51
(GLAND PACKING)**



CROSS SECTIONAL DRAWING
 UP400/48 & UP400/51
 (MECHANICAL SEAL)

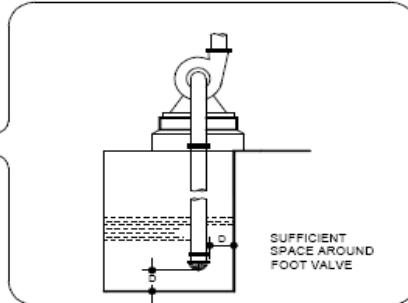
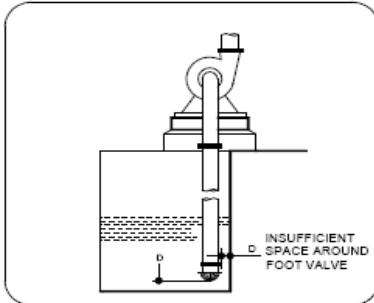
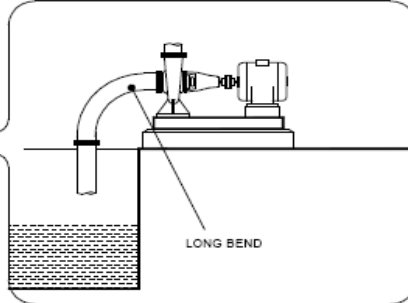
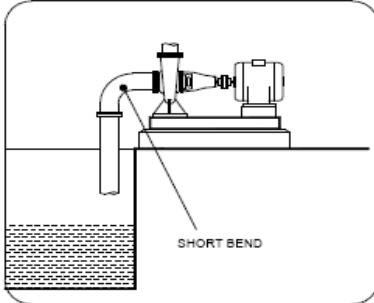
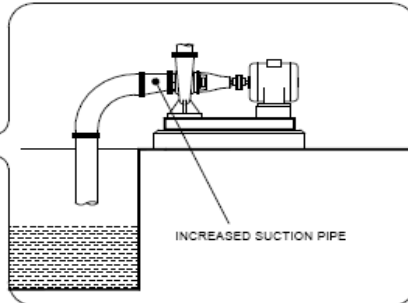
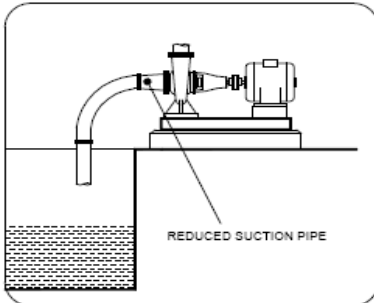
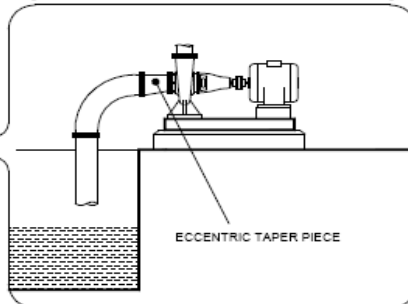
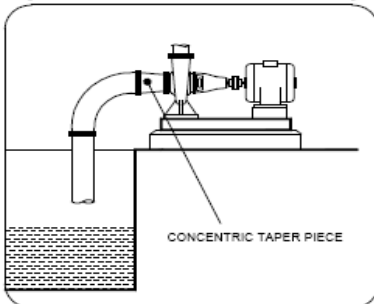
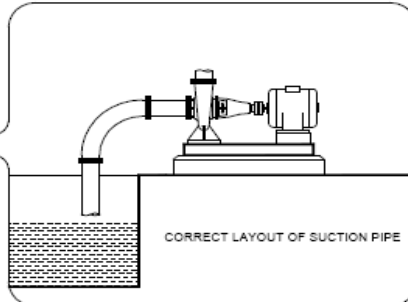
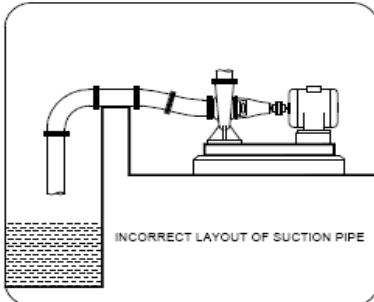
10.0 EXPLODED VIEW





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

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**GENERAL INSTRUCTIONS
FOR INSTALLATION, OPERATION
& MAINTENANCE OF**

KIRLOSKAR CENTRIFUGAL PUMPS

WARNING

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

LOCATION

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

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

FOUNDATION

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

ALIGNMENT

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

FLEXIBLE COUPLING

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

TYPE OF MISALIGNMENT (SEE FIGURE 1)

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

- (a) Angular misalignment : Shafts with axis concentric but not parallel.
- (b) Parallel misalignment : Shafts with axis Parallel but not concentric.

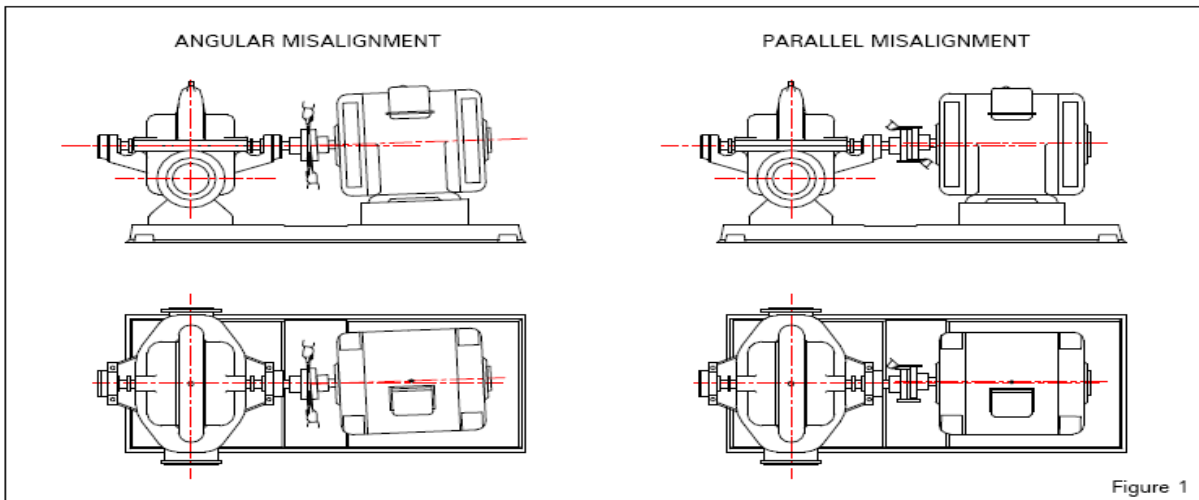


Figure 1

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.

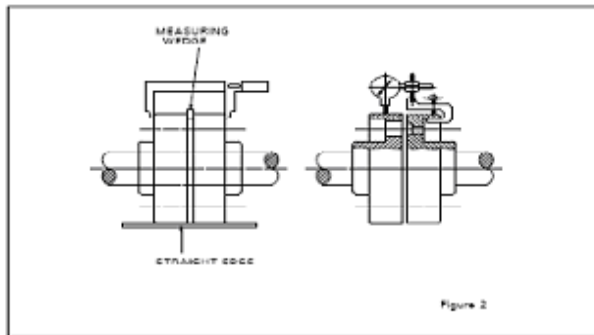
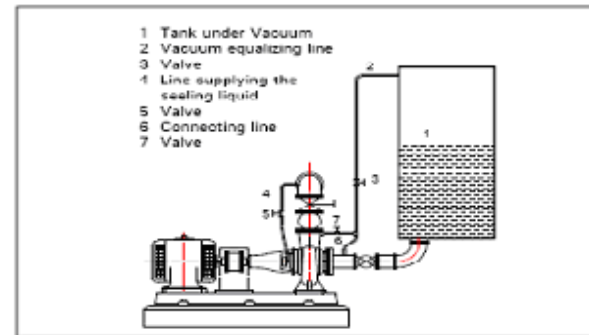


Figure 2



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. Parallel alignment is correct when the measurements show that all points of the coupling faces are within ± 0.2 mm of each other.

A check for angular alignment is made by using an outside caliper across the width of the coupling faces at various points. Angular alignment is correct when the measurements show that all points of the coupling faces are within ± 0.2 mm of each other.

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

GROUTING

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

FACTORS THAT MAY DISTURB ALIGNMENT

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

- (a) Setting, seasoning of the foundation
- (b) Pipe strains distorting or shifting the machines
- (c) Wear of the bearings

PIPING

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

SUCTION PIPE

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

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

DELIVERY PIPE

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

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

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

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

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

FOOT VALVE

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

STUFFING BOXES AND PACKING

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

BALL BEARINGS

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

Three monthly when on continuous duty.

Six monthly when on eight-hour per duty.

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

PRIMING

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

(1) Liquid level above pump level

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

(2) Priming with foot valve

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

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

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

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

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

STARTING

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

RUNNING

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

STOPPING

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

STUFFING BOXES

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

CASING RINGS

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

SPARE PARTS

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

PUMP TROUBLE

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

BREAK DOWN-CAUSE-CHECK POINTS

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

BREAKDOWN	CHECK POINTS									
Pump does not deliver	1	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
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
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
Stuffing box leaks excessively	55	58								
	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
Motor will not start	47	48	49	51	54	55	58			
	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 vapour pressure too low).
13. Delivery liquid contains too much gas and/or air.
14. Delivery liquid too viscous.
15. Insufficient venting.
16. Number of revolutions too high.
17. Number of revolutions too low.
18. Incorrect direction of rotation (electric motor incorrectly connected, leads of phases on the terminal block interchanged).
19. Impeller clogged.
20. Impeller damaged.
21. Casing rings worn out.
22. Separation of crystals from the flow of pumping liquid (falling below the temperature limit/equilibrium temp).
23. Sealing liquid line obstructed.
24. Sealing liquid contaminated.
25. Lantern ring in the stuffing box is not positioned below the sealing liquid inlet.
26. Sealing liquid omitted.
27. Packing incorrectly fitted.
28. Gland tightened too much/slanted.
29. Packing not suitable for operating conditions.
30. Shaft sleeve worn in the region of the packing.
31. Bearing worn out.
32. Specified oil level not maintained.
33. Insufficient lubrication of bearings.
34. Ball bearings over-lubricated.
35. Oil/Grease quality unsuitable.
36. Ball bearing incorrectly fitted.
37. Axial stress on ball bearings (no axial clearance for rotor).
38. Bearings dirty.
39. Bearings rusty (corroded).
40. Axial thrust too great because of worn casing rings, relief holes obstructed.
41. Insufficient cooling water supply to stuffing box cooling.
42. Sediment in the cooling water chamber of the stuffing box cooling.
43. Alignment of coupling faulty or coupling loose.
44. Elastic element of coupling worn.
45. Pump casing under stress.
46. Pipeline under stress.
47. Shaft runs untrue.
48. Shaft bent.
49. Rotor parts insufficiently balanced.
50. Rotor parts touching the casing.
51. Vibration of pipe work.
52. Non-return valve gets caught.
53. Contaminated delivery liquid.
54. Obstruction in delivery line.
55. Delivery flow too great.
56. Pump unsuitable for parallel operation.
57. Type of pump unsuitable.
58. Incorrect choice of pump for existing operating conditions.
59. Voltage too low/power supply overloaded.
60. Short circuit in the motor.
61. Setting of starter of motor too high.
62. Temperature delivery liquid too high.

GENERAL INFORMATION & SAFETY INSTRUCTIONS

1. The products supplied by KBL have 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. Installation, operation and maintenance personnel must use safe working practices at all the times.

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

A pump duty nameplate is fitted to each unit and must not be removed. Loss of this plate could make identification impossible. This in turn could affect safety and cause difficulty in obtaining spare parts. If accidental loss or damage occur, contact KBL immediately.

1.2 Access to the equipment should be restricted to the person net responsible for installation, operation and maintenance and they must be trained, adequately qualified and supplied with appropriate tools for their respective tasks.

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

1.4 KBL requires that, all personnel that are responsible for installation, operation or maintenance of the equipment, have access to and study the product instruction manual **BEFORE** any work is done and that they will comply with all local and industry based safety instructions and regulations.

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

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

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

- 1.8 Note the "Limits of product application permissible use" specified in the manual. Operation of the equipment beyond these limits will increase the risk from hazards noted below and may lead to premature and hazardous pump failure.
- 1.9 Clear and easy access to all controls, gauges and dials etc must be maintained at all times. Hazardous or flammable materials must not be stored in pump rooms unless safe areas or racking and suitable container have been provided.
- 1.10 Use suitable earthing and tripping devices for electrical equipments.

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

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

3. SAFETY INSTRUCTIONS WHILE HANDLING AND STORAGE

When lifting the pump, use the lifting points specified on general arrangement drawing, if provided. Use lifting equipment having a safe working load rating suitable for the weight specified. Use suitable slings for lifting pump, which is not provided, with lifting points. The use of forklift truck and chain crane sling equipment is recommended but locally approved equipment of suitable rating may be used. While lifting, the equipment adjusts the center of gravity, so that it is balanced properly.

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

4. SAFETY INSTRUCTIONS WHILE ASSEMBLY & INSTALLATION

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

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

5. SAFETY INSTRUCTIONS WHILE COMMISSIONING & OPERATION

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

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

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

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

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

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

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

Be aware of the hazards relating to the pump 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.

6. SAFETY INSTRUCTIONS WHILE MAINTENANCE & SERVICING

Do not attempt repairs of the pump or its accessories which you do not know. Use proper tools.

Before attempting any maintenance on a pump particularly if it has been handling any form of hazardous liquid, it should be ensured that the unit is safe to work on. The pump must be flushed thoroughly with suitable cleaner to purge away any of the product left in the pump components.

This should be carried out by the plant operator and a certificate of cleanliness obtained before starting work. To avoid any risk to health it is also advisable to wear protective clothing as recommended by the site safety officer especially when removing old packing, which may be contaminated.

Isolate the equipment before any maintenance work is done. Switch off the main supply, remove fuses, apply lockouts where applicable and affix suitable isolation warning signs to prevent inadvertent reconnection. In order to avoid the possibility of maintenance personnel inhaling dangerous fumes or vapours locations by removal of bearing housing and shaft assembly to a suitable maintenance area.

Check and ensure that the pump operates at below the maximum working pressure specified in the manual or on the pump nameplate and before maintenance, ensure that the pump is drained down.

Wear a suitable mask or respirator when working with packing and gasket contain fibrous material, as these can be hazardous when the fibrous dust is inhaled. Be cautious, if other supplier's components have been substituted for genuine KBL parts, these may then contain hazardous materials.

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

Dispose of all wastes like gaskets, gland packing, oil, batteries, packing material etc in accordance with local regulation.

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

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