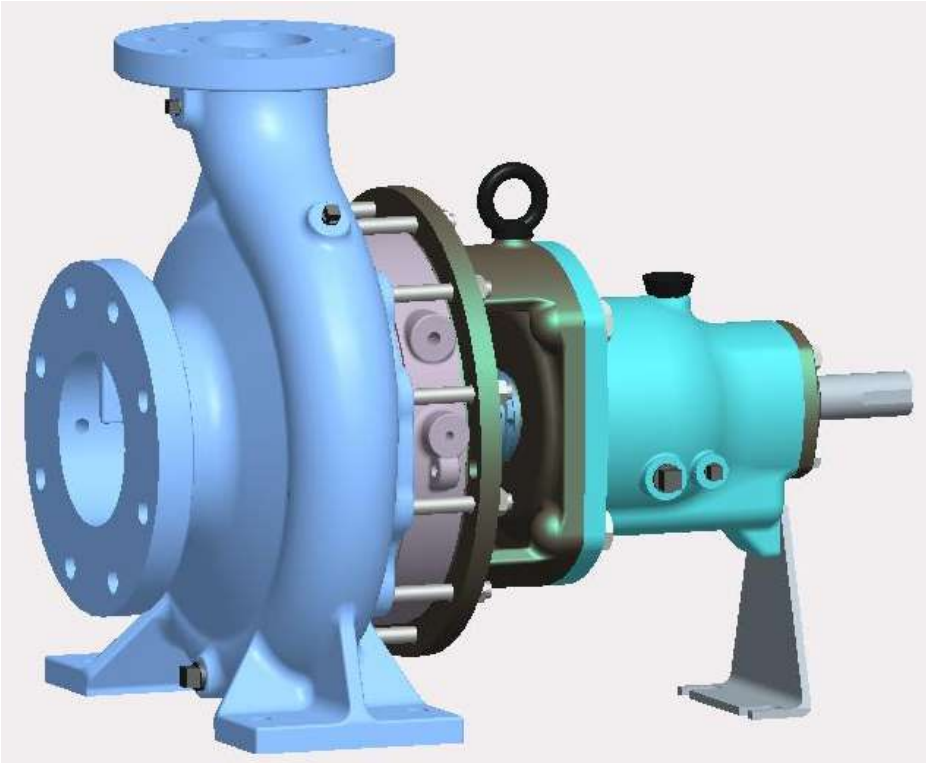
Enriching Lives

INSTRUCTIONS ON INSTALLATION, OPERATION AND MAINTENANCE FOR KIRLOSKAR PUMP TYPE KPD - KPDQF



KIRLOSKAR BROTHERS LIMITED

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WARRANTY

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

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

KIRLOSKAR BROTHERS LIMITED

CONTENTS:

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

1.0 GENERAL

1.1 *'KIRLOSKAR'* make KPD - KPDQF pumps are used for handling various types of chemical liquids. These pumps are manufactured to close tolerance and are of rigid construction, However proper installation, operation and maintenance are equally important to ensure trouble free service. This booklet covers important guidelines and instructions for installation, operation and maintenance. These instructions should be followed carefully for satisfactory performance of the pumping unit. Only mechanical aspects are dealt within this booklet.

1.2 Applications:
KPD pumps are mainly used in process industries like petrochemicals, nuclear, refinery, fertilizer, paper, sugar etc. and power plants. The pump can handle corrosive acids, alkalies, salt solutions, caustics, hydro-carbons, oils, liquefied gases, condensates, viscous liquids etc.

1.3 Nomenclature: KPD32/13
KPD – Kirloskar Process Development
32 - Delivery size in mm
13 - Impeller diameter in cm.

1.4 This booklet covers instructions for following models in KPD, KPDQF, KPD-J, KPD-CLM, of KPD series

UNIT – 4	UNIT – 5		UNIT – 7		UNIT – 9		UNIT – 11
20/13*	25/16*	40/20A#	25/26A#	65/26N#	65/32	125/40	125/26 at 2900 rpm
20/16*	32/13	50/13	32/26	80/16	80/32	125/40N#	
20/20*	32/16	50/16	40/26	80/20	80/40	150/32	
	32/16A#	50/16A#	40/32	80/26	80/40N#	150/32N#	80/40DV#
	32/20	50/20	50/26	100/16#	100/26	150/40#	100/40DV#
	32/20A#	65/13	50/32	100/20	100/32	65/43#	200/26#
	40/13		65/16		100/40	125/20#	
	40/16		65/20		125/26	150/26#	
	40/20		65/26		125/32	100/32N	

UNIT -11A	UNIT -11B	UNIT -11C	UNIT – 13		UNIT – 15	UNIT – 19
125/45	150/43	200/33	200/38M#	250/33A#	250/50#	150/56
			200/46#	250/33B	250/40#	350/40
			150/52#	125/32 at 2900 rpm #		
			150/28#			
			200/36#			

Notes:

a) * marked pumps are supplied with semi-open type impeller as a standard supply.

b) # marked pumps are supplied with "Enclosed" type impeller only.

1.5 Description KPD pumps.

KPD-	KPD pumps with enclosed impeller (with casing cover for heating/cooling arrangement.)
KPD-QF	KPD pumps with semi open impeller.
KPD-J-	KPD pumps with jacketed delivery, casing and casing cover.
KPD-CLM	KPD pumps with center line mounting arrangement (Above 180^0C
KPD-V	KPD pumps with vertical execution arrangement.

1.5 Nameplate information:

Every pump has the following nameplate fitted to bearing housing (24000) provided with necessary identification of the pump and its specific hydraulic characteristics.

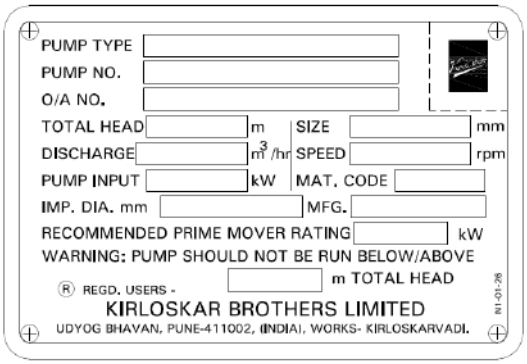

Fig. 1. Duty name plate

The nameplate 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.

1.6 The complete range of 'KPD' pump is covered by eleven driving units for achieving interchangeability and thereby reducing inventory.

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

1.8 When the pump is received, it should be inspected & located in dry place before the actual use of pump. The coupling should be rotated once in a month to prevent pitting of bearing surfaces.

2.0 Safety Instructions:

2.1: **General Information**

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

Whenever the equipment is operated, maintained or used in any way, the procedures detailed within these instructions shall be followed. The pump supplied by Kirloskar Brothers Limited (KBL) has been designed with safety in mind; where hazards cannot be eliminated, the risk has been minimized by the use of guards and other design features. Some hazards cannot be guarded against and the instructions below MUST BE COMPLIED WITH for safe operation. These instructions cannot cover all circumstances. It is the responsibility of the user of the equipment for maintaining safe working practices at all times. The pumps are supplied with stickers for hazard, caution and safety wherever these are applicable.

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

Hazard.

This symbol refers to general mechanical aspects of safety.

Hazard.

This symbol refers to electrical safety.

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

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

2.1.3 KBL firmly insists that all personnel responsible for installation, operation and maintenance of the equipment must read the manual before any work is done. Before commissioning, the operating staff have to be instructed in the guidelines for correct and safe operation of the product as stated in these instructions.

2.1.4 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. The scope of responsibilities and supervision of the personnel must be exactly defined by the plant operator.

2.1.5 This product must be serviced by qualified personnel who are familiar with the design and operation of this product and the system with the essential safety aspects involved.

2.1.6 Our guarantee will be valid only if the installation, operation, maintenance and repairs of this pump are carried out in accordance with these instructions. The plant operator is to make sure that the contents of these instructions are fully understood by the operating personnel. During operation, periodic inspections should be made to assure safe operation under the prevailing conditions.

2.1.7 Any modification may be made to the product only after consultation with the manufacturer. Using spare parts and accessories authorized by the manufacturer is a relevant safety aspect. Only genuine spare parts which are in accordance with the original delivery (in the parts list) are to be used.

2.1.8 Ear defenders should be worn where the specified equipment noise level exceeds locally defined safe levels. Safety glasses or goggles should be worn where working with pressurized systems and hazardous substances. Other personal protection equipment must be worn where local rules apply.

2.2 **Caution** *DO NOT* wear loose or frayed clothing or jewellery, which could catch on the controls or 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 **Caution** In case of KPD CLM pumps which are handling fluid at very high temperature, the operator should avoid touching the pump in running condition. Use safety equipments like hand gloves and safety shoes while operating KPDCLM pumps.

2.6: Transport handling and storage instructions:

2.6.1: Transport.

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

2.6.2: Handling

Crushing hazard

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

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

Pump should be slung as shown.

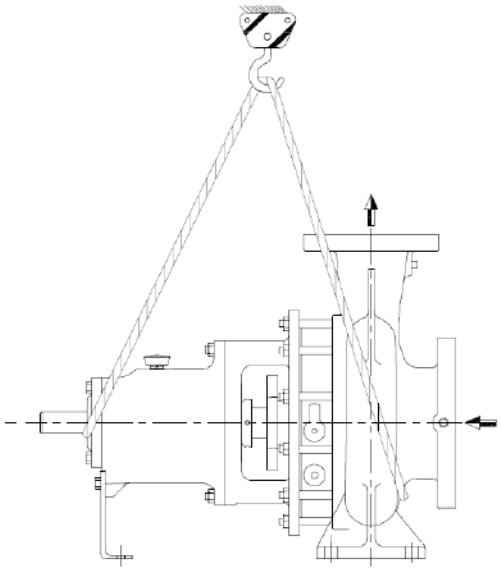

Fig. 2. Lifting of bare shaft pump

Caution

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

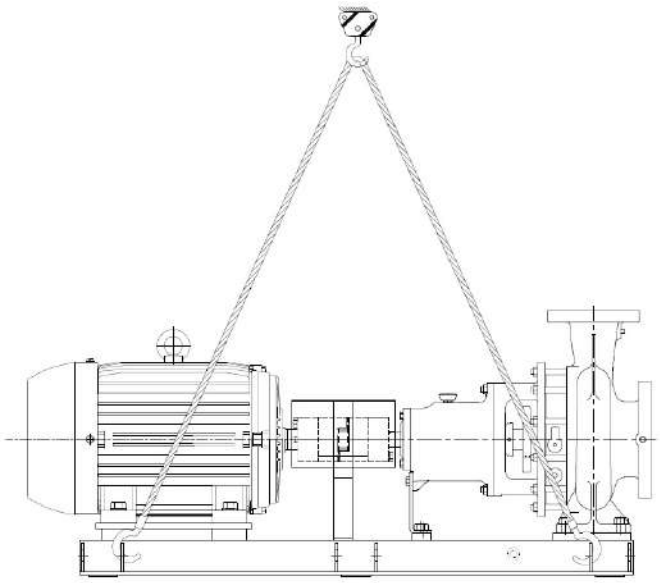

Fig. 3 Lifting of Pumpset

2.6.3: Storage.

2.6.3.1: Temporary storage for 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 and dry location.

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

2.6.3.2: Long Term Storage.

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 precautions to be taken:

a) Ensure that the bearings are packed with the recommended grease, to prevent moisture from entering around the shaft.
b) Remove the glands, packings 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 pump shaft should be manually rotated periodically to prevent pitting of the bearing surfaces due to 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 oil to ensure that the shaft and bearings remain rust free.

2.6.3.3: Exposed or Extreme Conditions Storage.

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

3.0 Equipment schedule:

3.1 Installation:

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

drawing liquid from the vessel under vacuum, then vacuum equalizing connection piping must be made as per instruction given in above publication. The external sealing connection to the pump, if applicable, must be made after installing and before commissioning the pump. Pump on hot service must have final coupling alignment made with the unit at its operating temperature.

3.1.2 Receiving pump

Upon receipt of the pump, a visual check should be made to determine if any 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 of shaft
c) Broken motor end bells, bent eyebolts or damaged boxes of motor
d) Missing parts.
e) Pump shaft rotates freely.

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.

Caution DO NOT LIFT ONLY THE DRIVER OR PUMP.

3.1.3 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. The bearings should then be flushed with carbon tetrachloride or kerosene and relubricated.

3.1.4 Location

- The pump should be installed as near the liquid source as possible, with the shortest and most direct suction pipe practically.
- The pump should be installed with sufficient accessibility for inspection and maintenance. Ample space and head room should be allowed for the use of an overhead crane or hoist sufficiently strong to lift the unit.
- Make sure there is a suitable power source available for the pump driver. If motor driven, electrical characteristics should be identical to those shown on motor data/ name plate.

3.1.5 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. 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.

3.1.6 Base plate 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 the 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

- Build strong form around foundation to content grout.
- Soak top of concrete foundation thoroughly, then remove surface water.
- Base plate should be completely filled with grout and, if necessary, drill vent holes to remove trapped air.
- After grout has thoroughly hardened, check the foundation bolts and tighten if necessary.
- Check the alignment after the foundation bolts are tightened.
- 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 from air and moisture coming in contact with the grout.

3.8 Suction and Discharge Piping

When installing the pump piping, make sure to observe the following precautions:-

- Piping should always run to 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.
- Install piping as straight as possible, avoiding unnecessary bends. Where necessary, use long sweep 90 degree bend 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.
- Misuse of reducers may cause the formation of air pockets in the pipe and thus preventing the correct 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. 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 used in priming, starting and when shutting down the pump.

3.2 MOUNTING AND ALIGNMENT

A spacer type flexible coupling is used to connect pump shaft to the driver. By using spacer type of coupling, the complete rotating unit can be removed from the volute without removing pump casing or rotor and without disconnecting piping connections. This also avoids any realignment of pump and motor after re-assembly of rotating unit. However other types of coupling can be supplied against request.

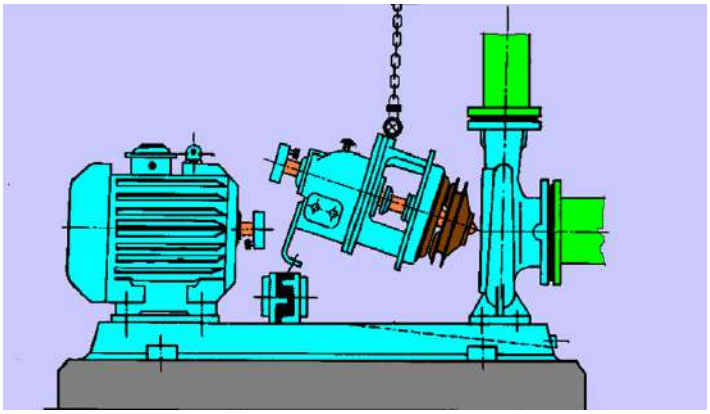

Fig.4 Back pull out assembly of KPD pump

3.2.1 ALIGNMENT

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.

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

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

1) **Angular misalignment** – shaft with axis concentric, but not parallel.
Maximum allowable misalignment is 1°

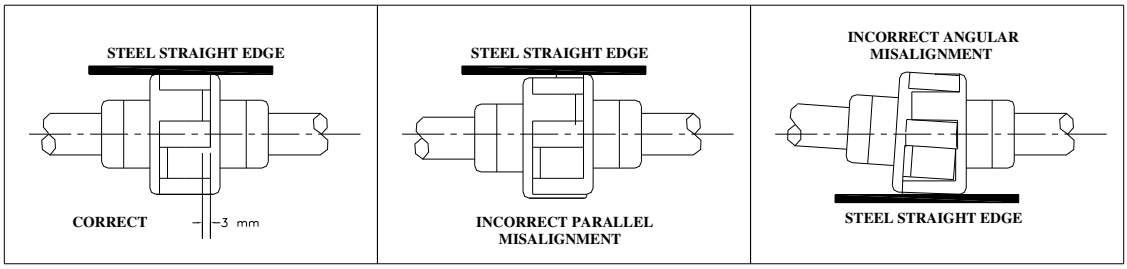

Fig. 5 Checking coupling alignment with straight edge

2) **Parallel misalignment** – shaft with axis parallel, but not concentric.
Maximum allowable misalignment is 0.2 mm

This misalignment is checked by using a straight edge as shown in figure 1 given above. Coupling alignment can be checked with dial gauge Indicator. 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 baseplate.

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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.

3.2.1.1. Before commissioning the pump set, please ensure:

3.2.1.2. The pipe connections are flushed and tightened properly.

A) Alignment is proper.
B) Auxiliary piping connections such as sealing connections, cooling connections etc are made.
Please refer to Figure 2 given below for plugs and piping connections.

KPD PUMPS – TAPPING CONNECTION CHART

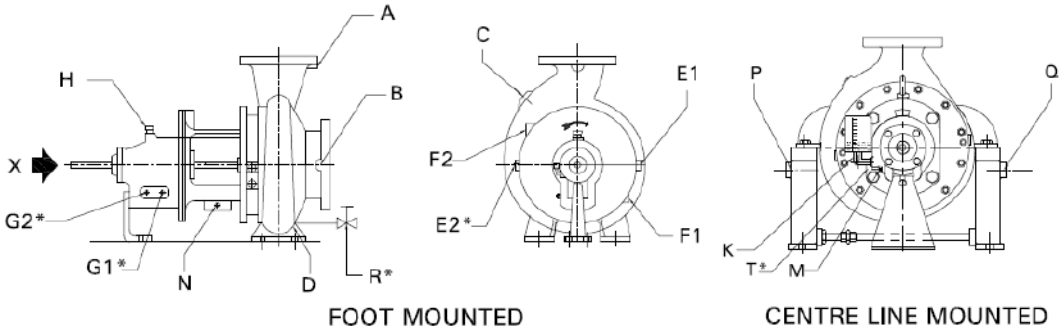


Fig. 6 KPD Pump tapping details

Code	Description	Location of connection when viewed from driving end
A	Gauge connection discharge side.	On pump discharge flange.
B	Gauge suction side.	On suction flange right.
C	Flushing line connection.	On casing top left.
D	Pump casing drain.	On pump casing bottom side towards suction.
E1	Stuffing box Flushing inlet.	On casing cover, top left.
E2*	Stuffing box Flushing outlet.	On casing cover, bottom right.
F1	Stuffing box cooling water inlet.	On casing cover, bottom right.
F2	Stuffing box cooling water outlet.	On casing cover, top left.
G1*	Bearing housing cooling water inlet.	On bearing housing right.
G2*	Bearing housing cooling water outlet.	On bearing housing right.
H	Breather cap.	On bearing housing top.
J1 -	St. box jacket heating steam inlet.	Casing cover top left (in place of F2).
J2 -	St. box jacket heating steam outlet.	Casing cover right bottom (in place F1).
K	Constant level oiler.	On bearing housing left.
M	Bearing housing oil drain.	On bearing housing left.
N*	Drip pan drain.	On lantern bracket bottom right.
P	Pad cooling water inlet for centerline mounted pumps.	On pad for centerline mounted pump casing.
Q	Pad cooling water outlet for centerline mounted pumps.	On pad for centerline mounted pump casing.
R*	For drain cock and piping.	On pump casing bottom.
S	Drain taping for drain rim type base.	Base.
T*	Thermowell (Temperature gauge)	On bearing housing left near constant level oiler.
W1-	Pump casing jacket drain.	On pump casing jacket bottom left.
W2-	Pump casing jacket heating water / steam outlet.	On pump casing jacket bottom right.
W3-	Pump casing jacket heating water / steam inlet.	On pump casing jacket top left.

Tapping size details for KPD pump:

SR. NO.	CODE OF PIPE CONN	DESCRIPTION	SIZE OF CONNECTION					
			UNIT-4	UNIT-5	UNIT-7	UNIT-9,11, 11A,11B,11C	UNIT -13	UNIT -15
1	A	Gauge connection discharge side	1/4	1/4	1/4	1/2	1/2	1/2
2	B	Suc. Gauge / Vaccum equilising conn						
3	C	Flushing/Sealing conn. From pump casing.	1/4	1/2	1/4	1/4	1/2	1/2
4	D	Pump casing drain	1/2	1/2	1/2	1/2	1/2	1/2
5	E	Stuffing box sealing	3/8	3/8	3/8	3/8	1/2	1/2

		inlet						
6	E1*	Stuffing box sealing outlet						
7	F	Stuffing box cooling water inlet	1/2	1/2	1/2	1/2	1/2	1/2
8	F1	Stuffing box cooling water outlet						
9	G1*	Bearing housing cooling water inlet	1/2	1/2	1/2	1/2	1/2	1/2
10	G2*	Bearing housing cooling water outlet						
11	H	Air breather plug	20 mm hole					
12	K	Constant level oiler	1/4 BSP					
13	M	Baring housing oil drain						
14	N*	Drip pan drain	1/2	1	1/2	1/2	1/2	1/2
15	P Q	Pad cooling for centerline mounted pump outlet & inlet.	1	1/2	1	1	1	-
16	R*	Drain cock and piping	1/2	1/2	1/2	1/2	1/2	1/2
17	S	Drain tapping for drain rim type base	1	1	1	1	1	1
18	T*	Thermowell (Temperature gauge)	1/2	1/2	1/2	1/2	1/2	1/2

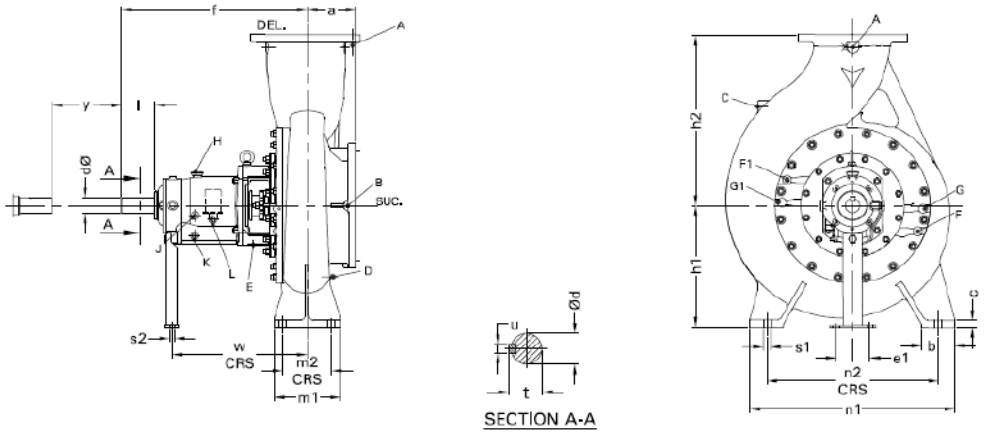
Notes :

All tappings are in inches and location of connections are specified looking from arrow "X".

* This special provision on request only and at extra cost.

All connections are NPT except specified.

TAPPING CONNECTION CHART- KPD PUMPS - UNIT19



TAG.	CONNECTION DETAILS	CONNECTION SIZE	
	PUMP TYPE	KPD 150/56	KPD 350/40
A	DISCHARGE PRESSURE GAUGE	G 1/2" NPT/BSP	G 1/2" NPT/BSP
B	SUCTION PRESSURE GAUGE	G 1/2" NPT/BSP	G 1/2" NPT/BSP
C	CIRCULATION LIQUID INLET	G 1/2" NPT/BSP	G 1/2" NPT/BSP
D	CASING DRAIN	G 1/2" NPT/BSP	G 3/4" NPT/BSP
E	LEAKAGE DRAIN	G 1/2" NPT/BSP	G 1/2" NPT/BSP
F	ST. BOX. COOLING WATER INLET	G 1/2" NPT/BSP	G 1/2" NPT/BSP
F1	ST. BOX. COOLING WATER OUTLET	G 1/2" NPT/BSP	G 1/2" NPT/BSP
G	SEALING LIQUID INLET	G 1/2" NPT/BSP	G 1/2" NPT/BSP
G1	SEALING LIQUID OUTLET	G 1/2" NPT/BSP	G 1/2" NPT/BSP
H	BEARING HOUSING VENT / OIL FILLING PLUG	Ø20	Ø20
L	CONSTANT LEVEL OILER	G 1/4" NPT/BSP	G 1/4" NPT/BSP
J	OIL LEVEL INDICATOR	G 1/2" NPT/BSP	G 1/2" NPT/BSP
K	OIL DRAIN PLUG	G 1/2" NPT/BSP	G 1/2" NPT/BSP

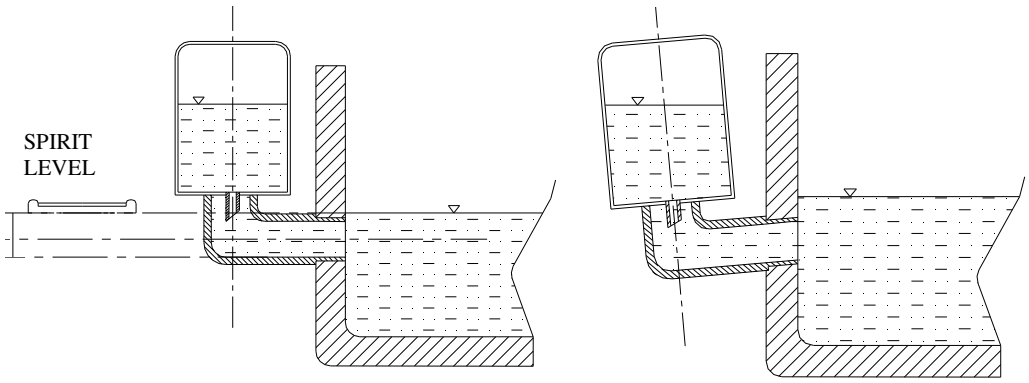
3.2.1.1 CONSTANT LEVEL OILER

KPD pumps are oil lubricated as standard scope of supply. Pump is provided with constant level oiler.

Fix the constant level oiler and fill the oil. Procedure for fitting the constant level oiler and the method of filling oil is given below.
Constant level oiler has plastic container in aluminum body as a standard supply. Connection stem is ¼ inch BSP tapped and its capacity is 70 ml approximately. If the constant level oiler is properly fitted and oil is filled as per instructions given, practically no attention is required as far as lubrication of bearing is concerned other than to replenish the visible reserve supply of the oil in the container ref figure given below.

3.2.1.2 METHOD OF FITTING

Screw constant level oiler stem into the tapped hole of the bearing housing reservoir. Before fitting oiler, check the level of the tapped hole with the help of a turned bar with ¼ inch BSP tapping at one end and a spirit level. See figure, if the level is incorrect and oiler tilts downward, oil will not flow from oiler into the reservoir (see fig given below.). Hence it is necessary to check the level before fitting in the constant level oiler.



CORRECT METHOD **INCORRECT METHOD**

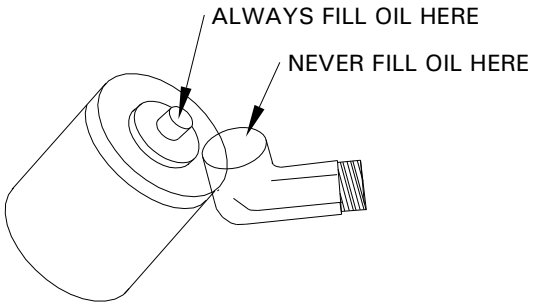


Fig. 7 Method of fitting constant level oiler

3.2.1.3 Method of filling the oil.

Tilt the container and fill it with oil through stem of the oiler. Replace the container and allow oil to flow into reservoir. The oil in the container shall flow into the bearing housing reservoir and shall become empty. Repeat above procedure till the level in the reservoir is equal to the level of which the oiler is adjusted. When the desired level is attained, the oil in the container shall remain steady at a position. Visible level of the oil in the container indicates that bearing housing is filled up to mark.

Caution

1) In no case oil should be filled directly in to the bearing housing reservoir, through breather cap.
2) Replenish the visible reserve supply of oil in the container as oil is used up.
3) Please ensure that air 'GROOVE' provided on Aluminum body on which plastic container rests is not clogged with dust / fiber oil film etc. this groove allows atmospheric air to enter inside the body, to maintain oil level in bearing housing.

4.0 Operation.

4.1 EQUIPMENT DESCRIPTION:

End suction centrifugal pump type KPD is from KBL manufactured process pump series which dimensionally conforms to DIN 24256 / ISO 2858.
The mechanical assembly comprises a rigid shaft, supported by a pair of bearings with a double / single shrouded impeller mounted in a removable bearing housing assembly. This is attached to an end suction volute casing fitted with wear rings / wear plate. The bearing housing, shaft and impeller assembly can be withdrawn from the volute for maintenance without disconnection of pipe work.
The discharge branch is positioned vertically upwards while suction branch is horizontal and is at 90° to discharge nozzle. An additional mounting foot is fitted at the outer bearing position for stability.
The complete assembly is of rigid construction, being intended for mounting on suitable base plate with electric motor / internal combustion engine. A suitable coupling is provided to transmit the rotational drive between pump and motor. A spacer coupling most suitable to use, because it allows the removal of the pump rotating assembly without disconnecting suction pipe, discharge pipe and motor.
Gland packing or mechanical seal is used to seal the leakage of pumped liquid across the shaft.

4.2 EQUIPMENT OPERATION.

4.2.1 Before starting the pump check the following:

1) The pump rotates freely by hand.
2) The level of the oil in the constant level oiler is up to the mark.
3) The sealing liquid and cooling water connections are properly tightened and adjusted.
4) The direction of rotation of driver. It should correspond to the direction of rotation of pump.
5) The pump casing and the suction pipeline is fully primed with the liquid.
6) Valve on delivery side is closed.
7) The cock for pressure gauge connection is closed.
8) The gland bolts are properly tightened.
9) For KPD-J pumps before each start up of pump, circulate steam/hot water to pump casing and casing cover jacket for a period of about ½ hour to ensure that all solidified liquid is melted.

4.2.2 Starting the pump

1) In case of external liquid for sealing/ quenching, start the liquid supply before starting the pump.
2) Start the pump. Let the prime mover pickup its full speed.
3) Open the valve on delivery line gradually.
4) Regulate the required flow by adjusting the delivery valve.
5) Open the cock for pressure gauge connection.

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

1) The pump is running smooth.
2) The flow of sealing liquid and cooling / heating water is uninterrupted. If necessary, provide sight glass in the piping.
3) The bearings are not getting abnormally hot.
4) The gland is properly tightened to ensure sufficient leakage to dissipate heat generated. Maximum permissible leakage is 60 to 80 drops per minute.
5) Head and capacity developed by the pump is as specified.
6) Power consumption is within limit.
7) Ensure that there is no mechanical friction in the pump.
8) Stop the pump immediately, if any, defects are detected. Do not start the pump unless the defects are rectified. If it is not possible to rectify the defects then report immediately to the supplier or authorized dealer or nearest KBL office.

4.2.4 During stopping the pump

1) Close the valve on the delivery line. Ensure that pump will not run for more than few seconds in this condition.
2) Stop the motor.
3) Close the cooling water and sealing liquid connections.
4) If the pump is not required to be operated for a long time, drain the pump casing completely. If the pump is required to be stored for a long time, the bearing housing should be dried internally with hot air and should be flushed with moisture free protective such as light oil or kerosene.
5) If any cooling and flushing arrangements are provided then it must be drained and dried.

5.0 MAINTENANCE MANUAL.

5.1 MAINTENANCE EHS INSTRUCTIONS

Following hazards may arise during maintenance work.

Fluid Pressure Jet Hazards

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

Hazardous materials:

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

Hazardous Gases, Mists, Sprays and Leaks.

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

Before attempting any maintenance on a pump, particularly if it has been handling any form of hazardous liquid; ensure that the unit is safe to work on. The pump must be flushed thoroughly with suitable cleaner to purge away any of the product left in the pump components. The plant operator should carry this out and a certificate of cleanliness obtained before starting work. To avoid any risk to health it is also advisable to wear protective clothing as recommended by the site safety officer, especially when removing old packing that may be contaminated.

Electric shock and accidental starting hazard:

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

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

5.2 GENERAL MAINTENANCE DOCUMENTS:

1) Maintenance documents:

i) Pump Sectional assembly drawing with part list
ii) Pump Outline dimension drawing
iii) Mechanical seal assembly / GA drawing
iv) Foundation plan drawing
v) Pump datasheet

2) Specific maintenance data:

5.2.1: Overhauling:

Procedure for dismantling and re-assembly

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

5.2.1.1 Dismantling:

Follow the following simple steps to dismantle the pump.

5.2.1.1.1 Isolate power supply to motor.

5.2.1.1.2 Shut off the valves controlling flow to and from the pump.

5.2.1.1.3 Drain the liquid from pump by removing the drain plug (60100), or open the pump casing drain cock.

5.2.1.1.4 Remove all auxiliary tubing and piping. Remove safety mesh guard.

5.2.1.1.5 Drain the lubricating oil from the bearing housing (24000) and remove constant level oiler (44300).

5.2.1.1.6 We recommend matching the punch mark of the coupling halves.

5.2.1.1.7 In case of the pumps with spacer type flexible couplings, disconnect coupling (pump half and motor half) from the coupling spacer and remove coupling spacer. In case of ordinary flexible couplings, remove the motor from the base.

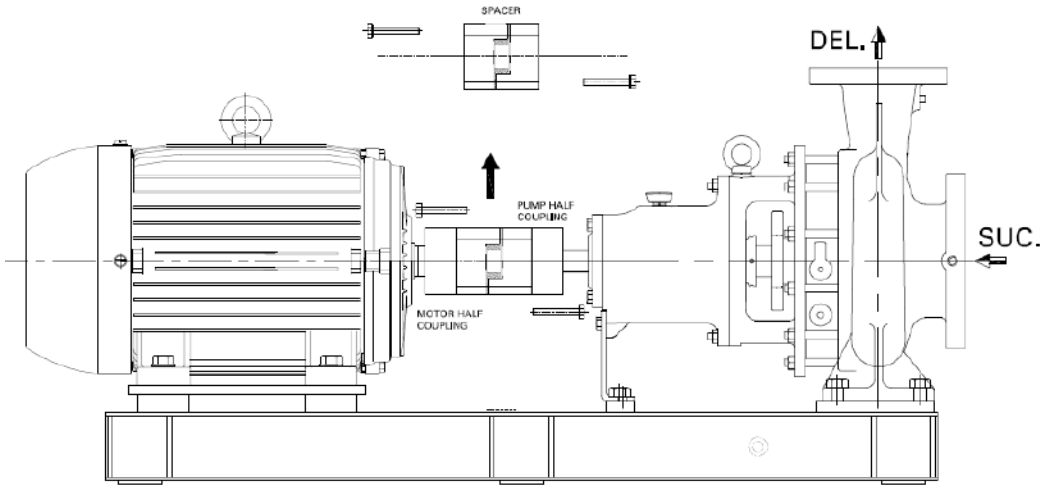


Fig. 8. Removal of coupling

5.2.1.1.8 Remove the support foot (25100) hold down bolts.

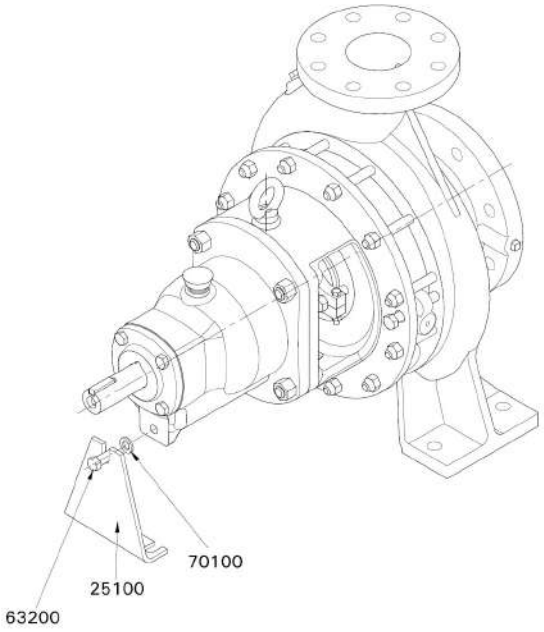


Fig. 9. Removal of support foot

5.2.1.1.9 Adjust string or chain tension to support the weight of the back pull out assembly.

5.2.1.1.10 In case of casing cover sandwiched between casing and lantern bracket, remove the hexagonal nuts from casing stud holding the lantern bracket (24800) to pump casing (10500).

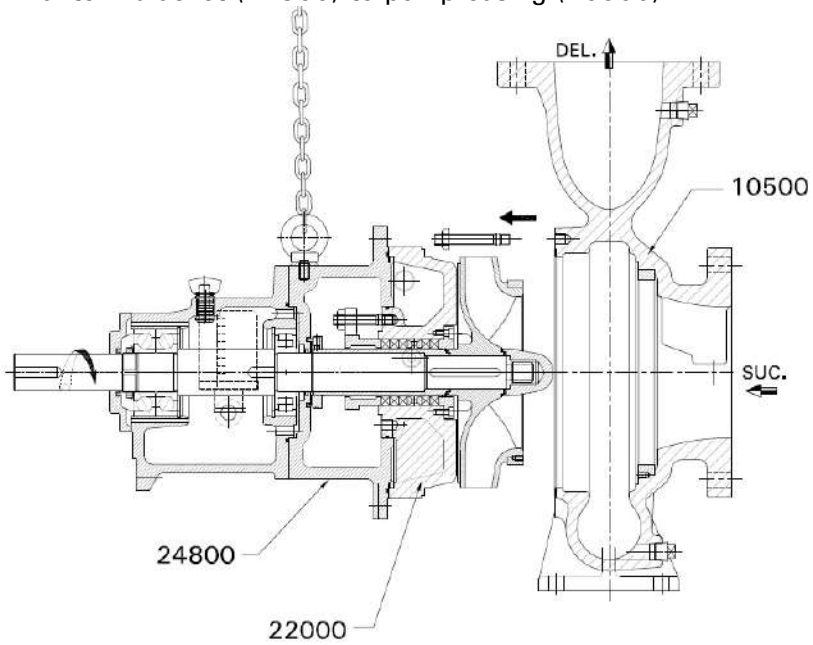


Fig. 10. Removal of back pull out assembly – casing cover is sandwiched

5.2.1.1.11 In case of casing cover is tightened directly to casing (i.e. casing cover is not sandwiched between casing and lantern bracket),

remove the hexagonal nuts from casing stud holding the casing cover (22000) to pump casing (10500).

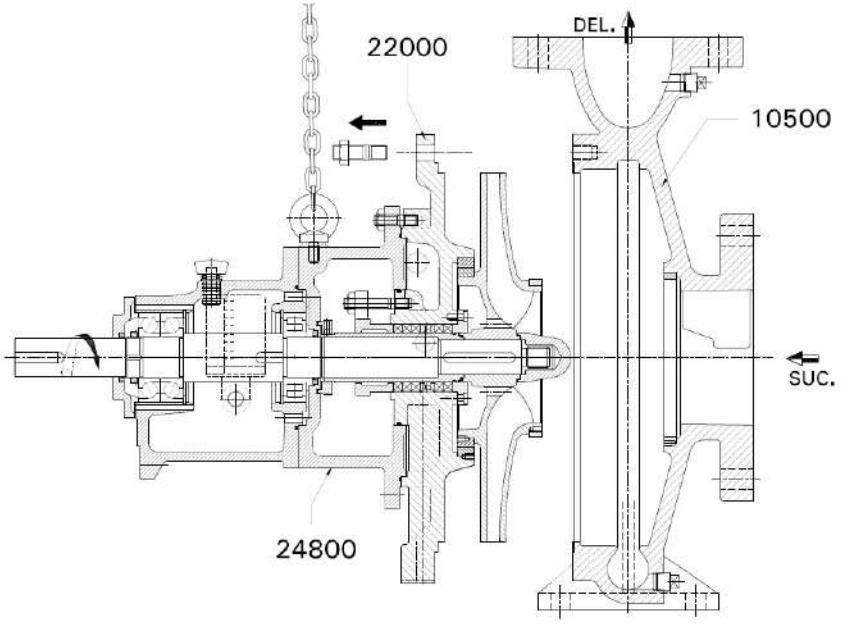


Fig. 11 Removal of back pull out assembly – casing cover is not sandwiched

5.2.1.1.12 Screw the release bolts provided in casing cover. Turn bolts evenly through a quarter turn at both sides.

5.2.1.1.13 Slightly pull out the driving unit till impeller (15100) clears the pump casing (10500).

5.2.1.1.14 Place this rotating unit on a table or clean and dry place for further dismantling.

5.2.1.1.15 Remove casing gasket (51101).

5.2.1.1.16 Unscrew the impeller nut (33000 / 33001). Remove the gasket between impeller and impeller nut (68201).

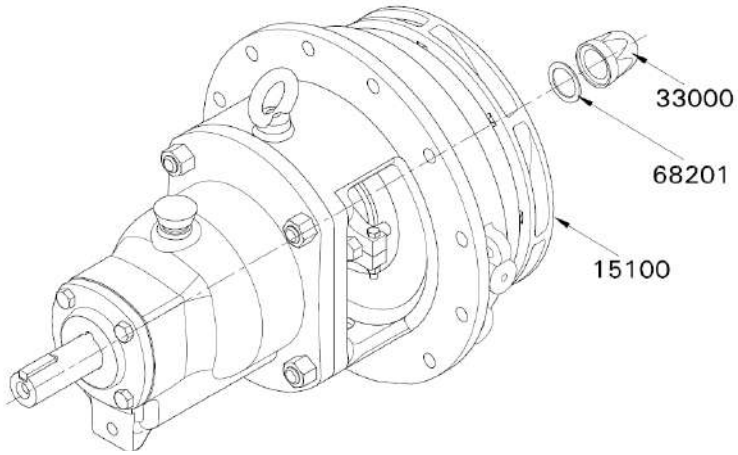


Fig. 12. Removal of impeller nut and gasket

5.2.1.1.17 Take out the impeller (15100) from pump shaft (18002). Remove the gasket between impeller and shaft sleeve (51501).

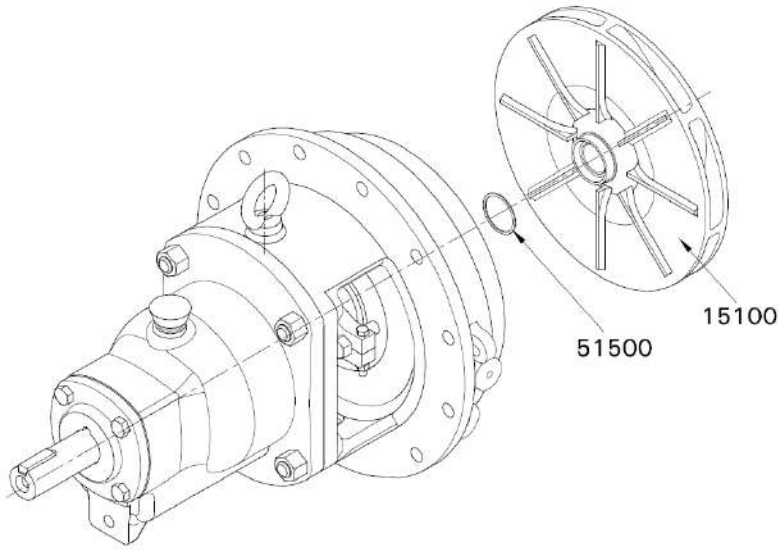


Fig. 13. Removal of impeller

5.2.1.1.18 **Removal of stuffing box with gland packing:**

For this following steps should be followed –

a) Remove split gland (22900) by loosening the nuts used for tightening the gland.
b) Take out casing cover (22000) along with stuffing box bush (35000), gland packing (43000), lantern ring (22700), 'O' ring for casing cover (52501) will also come out along with it.
c) Take out 'O' ring for lantern bracket (52502).
d) Unscrew the hex socketted screw clamping stuffing box bush (35000) to casing cover (22000) and remove the stuffing box bush (35000).

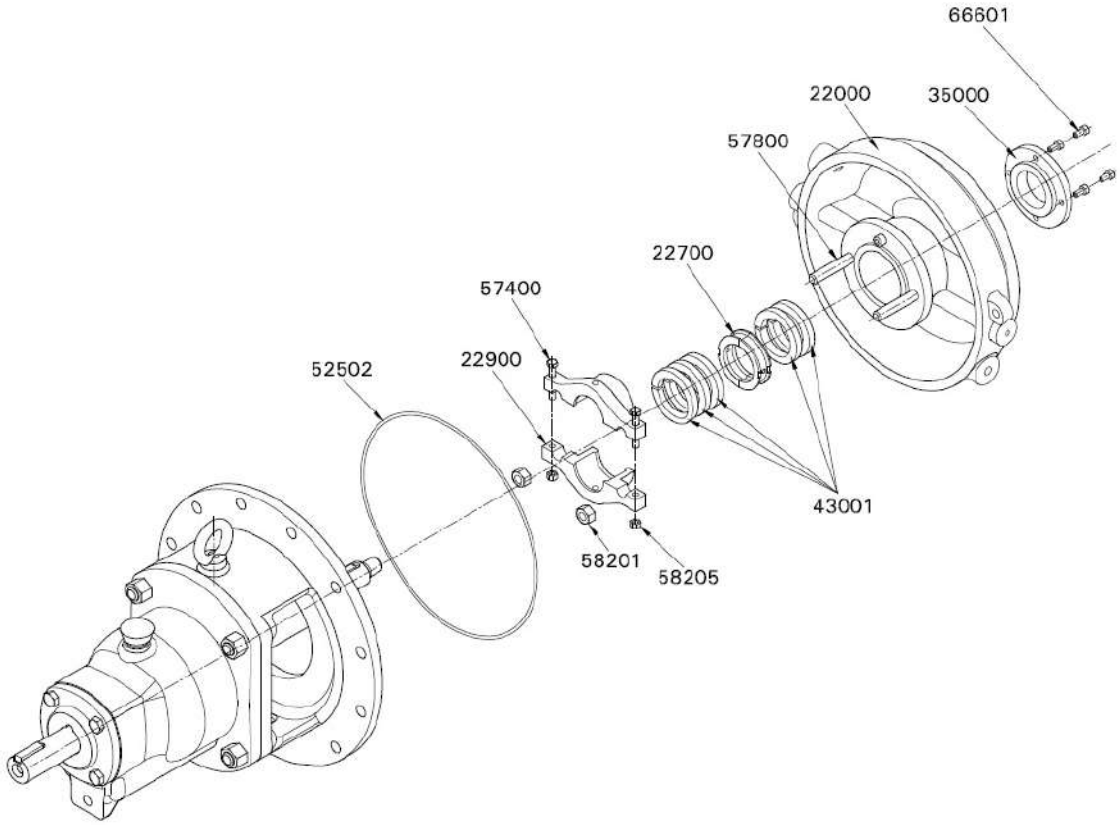


Fig. 14. Removal of stuffing box bush, gland, gland packing& lantern ring

e) Remove gland packing rings (43000) and lantern ring (22700).
f) Remove shaft sleeve (31100) along with liquid deflector (23600).

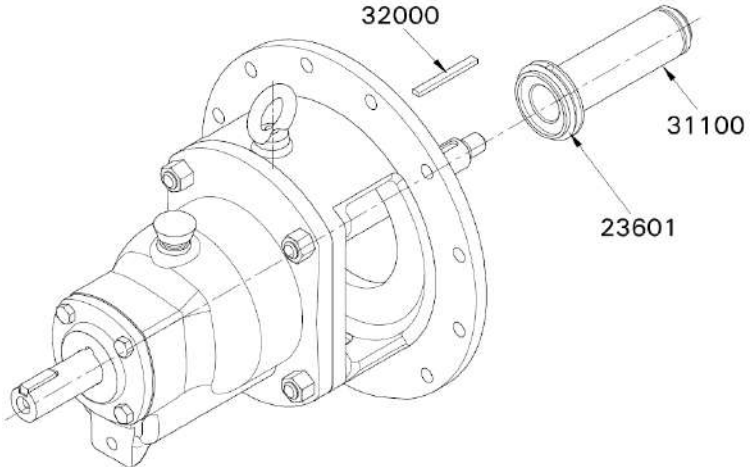


Fig. 15 Removal of sleeve and deflector

g) Remove impeller key.

5.2.1.1.19 **A) Removal of single mechanical seal from stuffing box**:

For this, following steps should be taken – (Refer mechanical seal drawing)

a) Remove auxiliary piping connections viz. sealing, flushing, of mechanical seal cover.
b) Before any action to be taken for cartridge seal removal, FIRST SLIDE THE SLIDING WASHERS AND ENGAGE THEM IN THE GROOVE ON DRIVE COLLAR FIRMLY.
c) Remove Impeller from rotating unit.
d) Remove Stuffing box bush (35000) from casing cover (22000) by removing cap screws.
e) Remove hex. nuts from casing cover (22000) studs holding the cover of mechanical seal.
f) Then remove Casing cover (22000) from rotating unit.

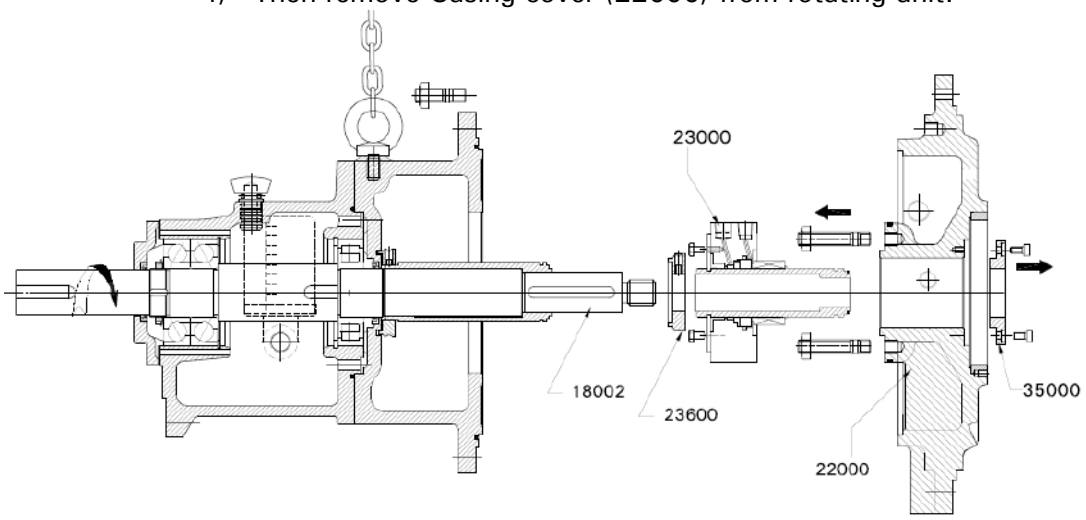


Fig.16 Removal of mechanical seal

g) Remove Cartridge seal assembly from shaft.
h) Loosen grub screw holding the liquid deflector (23600). Take out liquid deflector.

B) **Removal of Double mechanical seal from stuffing box:**

For this, following steps should be taken – (Refer mechanical seal drawing)

i) Remove auxiliary piping connections viz. sealing, flushing, of mechanical seal cover.
j) (Refer- mechanical seal drawing) Remove Mating ring carrier Inboard (IB) along with mating ring (IB) from casing cover (22000) by removing cap screws.
k) Remove IB mating ring from mating ring carrier and keep aside.
l) Remove sleeve alongwith rotating seal ring assemblies (IB & OB).
m) Remove seal ring assemblies IB & Outboard (OB) from sleeve by loosening screws and keep them such that IB & OB seal ring assembly can be identified easily.

n) Then remove Casing cover (22000) alongwith gland from rotating unit.
o) Remove hex. nuts from casing cover (22000) studs holding the gland (seal cover) of mechanical seal.
p) Remove gland from casing cover & then remove OB mating ring from gland and keep aside.
q) Check the condition of sleeve, mating ring / seal ring faces, packings, o-rings & replace them if necessary. Handle all seal parts with care; they are manufactured to precise tolerances.
r) Loosen grub screw holding the liquid deflector (23600). Take out liquid deflector.

5.2.1.1.20 Remove impeller key (32000)

5.2.1.1.21 Remove the nuts holding the lantern bracket (24800) and bearing housing (24000).

5.2.1.1.22 Take out lantern bracket (24800).

5.2.1.1.23 Take out 'o' ring for bearing housing (52310) carefully.

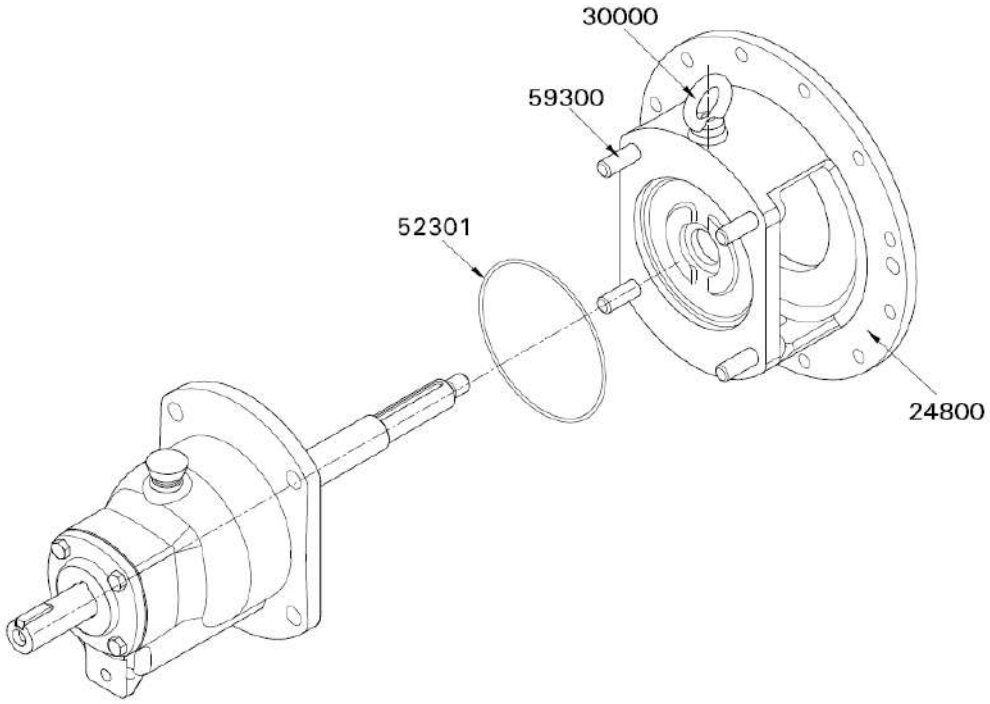


Fig. 17. Removal of Lantern bracket & 'O'ring

5.2.1.1.24 Remove pump half coupling (39700) after unscrewing grub screw.

Caution Coupling half should be removed with the help of suitable extraction device. To avoid damage to the bearings, coupling half should not be knocked out of shaft.

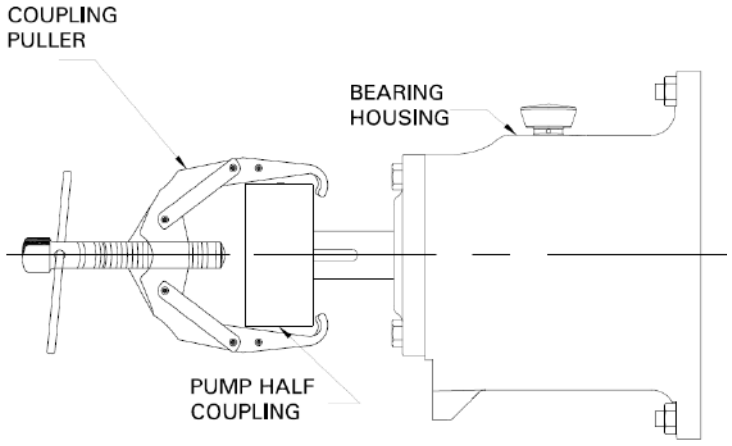


Fig. 18 Removing coupling half from driving end

5.2.1.1.25 Take out coupling key (32100).

5.2.1.1.25.1 Loosen the bolts holding bearing cover (27000) (driving end) Remove carefully bearing cover along with the oil seal (50001) if applicable. In Labyrinth type sealing arrangement at DE side first remove labyrinth type liquid deflector from shaft & then follow above procedure.

5.2.1.1.26 Take out the gasket (51400).

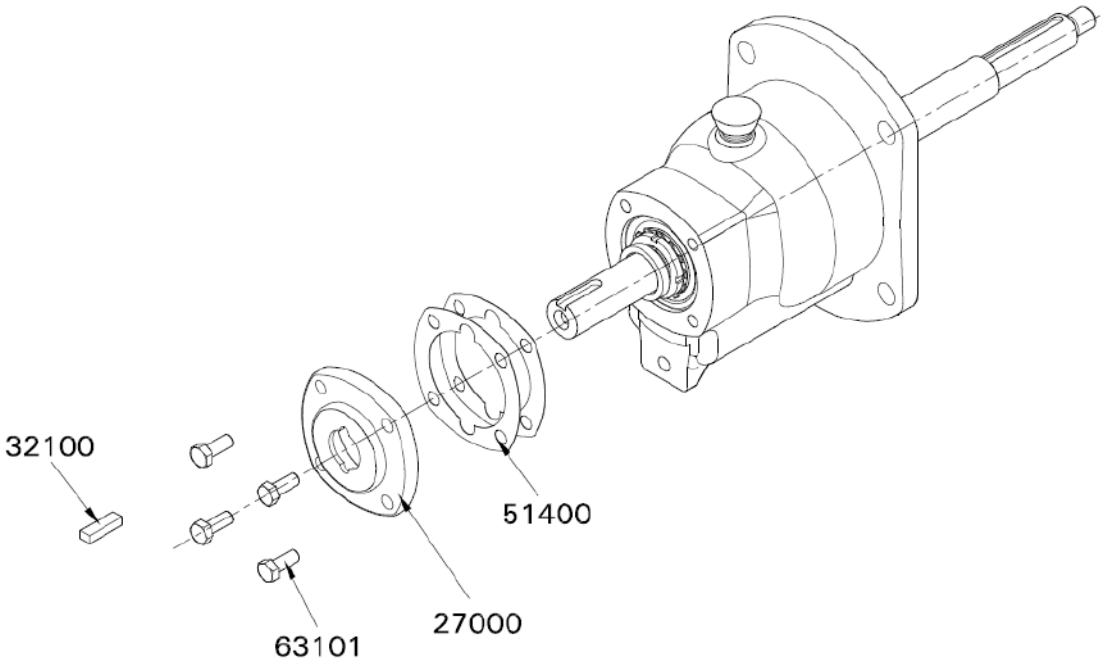


Fig. 19 Removal of bearing cover & gasket

5.2.1.1.27 Force shaft (18001 / 18002) carefully in the direction of driving end. Shaft will come out along with the bearings.

5.2.1.1.28 Unlock the lock washer (41500) and remove lock nut.

5.2.1.1.29 Take out the driving end bearing (26300) with the help of puller.

5.2.1.1.30 Take out inner race of roller bearing at non-driving end (26400) with the help of suitable sleeve.

5.2.1.1.31 Take out outer race of the roller bearing at non-driving end from bearing housing.

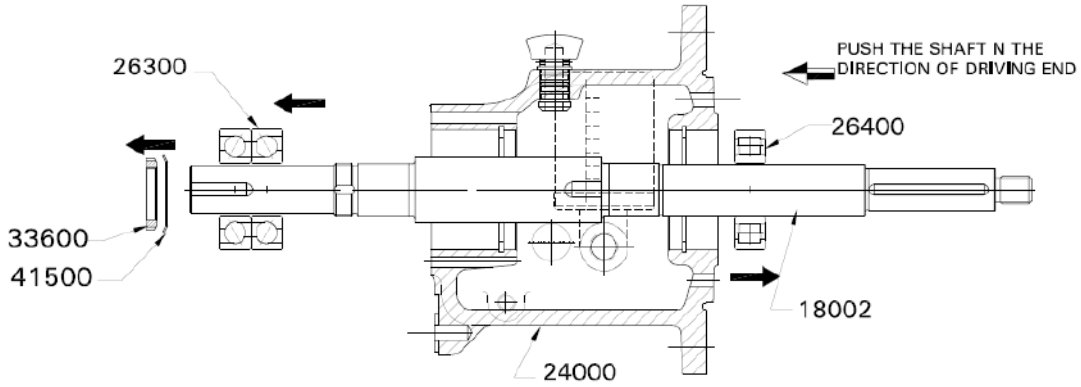


Fig. 20. Dismantling the bearings from bearing housing

Caution

1) Push the sleeve on arbour press with uniform pressure.
2) Steps 5.3.1.1.28 to 5.3.1.1.31 are to be followed only if bearings are damaged and to be replaced.

5.2.1.1.32 Oil seal in the driving end bearing cover (50001) should be removed if the oil seal lips are worn out or spring has lost tension.

5.2.1.1.33 Take out circlips (48500) at driving end and non-driving end fitted in bearing housing, if found damaged.

5.2.1.1.34 Casing ring suction side (19000), casing ring delivery side (19100) are to be removed only, if they are worn out and need replacement.

In case of pump with semi-open impellers

5.2.1.1.35 Remove wear plate (46000) if required. Wear plate is fixed to pump casing and it should not be taken out unless it is to be replaced. Wear plate is press fitted to pump casing and hence it will have to be machined out on center lathe to take it out.

5.2.1.1.36 Change wear plate (46000) if worn out.

For pumps with bearing housing cooling arrangement, following steps should be followed to dismantle the cooling arrangement.

5.2.1.1.37 Take out cover for bearing hosing cooling arrangement (36700) along with copper tube coil (37000) by loosening the screw.

5.2.1.1.38 Take out Gasket (68500).

For CLM pumps:

5.2.1.1.39 The Procedure of dismantling KPD Centre line mounted pump is same upto step no. 5.2.1.1.38

5.2.1.1.40 Remove the pedestal cooling pipings by loosening the union joint.

5.2.1.1.41 Remove the pump casing from the pedestals by removing the hex screw between pump casing and CLM pads.

5.2.1.1 RE-ASSEMBLY :

This procedure covers re-assembly of pump after complete dismantling of the pump. Before re-assembly, all the parts should be thoroughly cleaned in kerosene, petrol or benzene to remove the dust, rust etc. After cleaning the necessary parts should be replaced.

5.2.1.2.1 Mount the pair of angular contact ball bearings back to back (26300) at driving end. Please refer to any standard bearing catalogue for back-to-back arrangement of angular contact ball bearings. (The arrangement is as shown in figure).

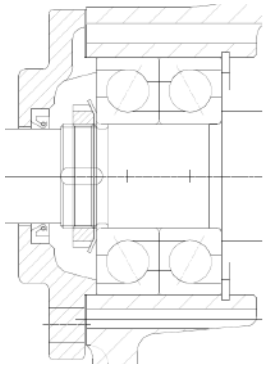


Fig. 21 Back to back arrangement of Angular contact bearings at DE end

a) Use arbour press while fitting the bearings. However it is recommended that bearings should be heated in oil bath at temperature 70 to 80^{0}C and then fitted. (If hot oil bath is not available then ARBOUR PRESS must be used).

Use gloves while fitting bearings from hot oil bath.

b) Slide inboard bearing on shaft by hand; make sure that it is square with shaft. Press evenly the inner race of the bearing until bearing is seated firmly against the shaft shoulder.

c) Don't use hammer to fit the bearings. Do not damage the shaft surface especially where it is in contact with oil seal.

5.2.1.2.2 Mount at non-driving end side of shaft the inner race of roller bearings (26400). Follow the procedure and watch the cautions given in 5.2.1.2.1.

5.2.1.2.3 Push outer race of roller bearing (26400) at non-driving end in to bearing housing (24000).

5.2.1.2.4 Tighten bearing lock nut (33600) after inserting washer for bearing locking in proper position. Fold one lip of lock washer in slot of bearing lock nut to lock it.

5.2.1.2.5 Insert circlips at driving end (48500) in the grooves of the bearing housing (24000 / 24200). Check returning duct holes in bearing housing and bearing cover at driving end are clean.

5.2.1.2.6 Insert shaft (18001 / 18002) along with bearings (viz. angular contact bearings at driving end and inner race of roller bearing at non-driving end) in to the bearing housing from driving end.

5.2.1.2.7 Replace oil seals (if applicable) in bearing cover (27000) if they are removed.

5.2.1.2.8 Put gasket (51400) of bearing cover at driving end (27000) and tighten bearing cover (27000) with the aid of hexagonal headed screws. Fix DE side labyrinth liquid deflector on shaft with grub screw over DE bearing cover.

5.2.1.2.9 Place 'O' ring (52300) on bearing housing (24000). Lubricate 'O' ring with grease or with an 'O' ring lubricant before placing it on the bearing housing.

5.2.1.2.10 Mount lantern bracket (24800) on bearing housing (24000) and tighten the nuts.

5.2.1.2.11 Put the drip pan (22600) if it was removed from lantern bracket. (if applicable)

5.2.1.2.12 For pumps with gland packing arrangement, follow the instructions given below.

a) Mount liquid deflector (23601) on shaft sleeve (31100) with the help of grub screws (65400).
b) Apply some oil or grease on the shaft under sleeve position. Mount impeller key (32000) on the shaft and insert shaft sleeve (31100) along with deflector (65400) mounted on it.
c) Fit the hex socketted screw clamped on stuffing box bush (35000) to casing cover (22000).
d) Insert gland packing (43000) and lantern ring (22700) in order of 2 rings first, then lantern ring and finally 3 ring joints should be staggered in casing cover.
e) Put gland in two halves (22900), clamp them with gland bolts (57400). Tighten gland stud nuts on casing cover.

Caution

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

5.2.1.2.13 For fitting cartridge type single mechanical seal, follow the instructions given below –(Refer mechanical seal drawing)

a) Mount deflector (23600) on shaft (18002).

b) Mount impeller key (32000) on the shaft.

c) Take the complete cartridge from its package. Do not disassemble or alter the unit. Gently insert assembly of the cartridge on the shaft and let it rest on shaft.

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

d) Then put casing cover (22000) & guide it into the lantern bracket (24800) over the shaft.

e) Fix stuffing box bush (35000) with the help of cap screw in casing cover.

f) Tighten the mechanical seal cover with casing cover stud only finger tight. Do not distort the gland by over tightening.

g) Put the impeller (15100) over shaft and rest it on shaft sleeve face. Complete the pump assembly.

h) Then loosen the bolt hex head of sliding washers and then offset it so as to clear the slots in the drive collar. Then tighten the hex bolts completely to avoid falling of sliding washers and rubbing on drive collar in running condition.

i) Connect the auxiliary piping connections viz. sealing, flushing of mechanical seal cover.

For fitting double mechanical seal, follow the instructions given below – (Refer mechanical seal drawing)

j) Mount deflector (23600) on shaft (18002).

k) Mount impeller key (32000) on the shaft.

l) Identify & take the Inboard (IB) & Outboard (OB) seal ring assemblies.

m) Mark in the sleeve location of inboard and outboard seal ring assemblies with respect to casing cover guide diameter as shown on the drawing based on operating length as specified on the drawings.

n) Mount / fix seal ring IB & OB assemblies on marked location. Apply lightly grease or oil on sleeve to slide seal ring assembly.

o) Install Inboard o-ring, gasket, mating ring in inboard mating ring carrier at location as shown in drawing. Similarly install out board o-ring, gasket, mating ring in the gland plate at location as shown in drawing.

p) Apply lightly grease on gasket / 'O' ring of the gland / mating ring carrier to prevent them to fall off.

q) Mount gland along with mating ring carrier (OB) on casing cover studs keeping in view the barrier fluid outlet direction as shown in drawing. Tighten the gland with casing cover stud. Do not distort the gland by over tightening.

r) Place 'O' ring (52501) on casing cover (22000) after lubricating it properly. Then put casing cover (22000) & guide it into the lantern bracket (24800) over the shaft.

s) Slide seal sleeve assembly on the shaft.

IMPORTANT: While sliding up the seal sleeve assembly, ensure the sleeve slides forward easily to avoid the seals getting over compressed and damaged.

t) Mount mating ring carrier (IB) in casing cover & tight the same with the help of cap screws.

u) Put the impeller (151) over shaft and rest it on shaft sleeve face keeping in between gasket as shown in drawing. Then follow procedure from 5.2.1.2.17

For reassembly of the bearing housing cooling arrangement follow steps given below.

a) Fit the oil well cover for bearing housing cooling arrangement (36700) along with cooling tube coil (37000) with Gasket (685) in between and tighten screws.

5.2.1.2.14 **P**lace 'O' ring (52501) on casing cover (22000) after lubricating it properly.

5.2.1.2.15 Insert casing cover (22000) with 'O' ring (52502) on Driving unit & lantern bracket assembly. Tighten nuts on studs of casing cover.

5.2.1.2.16 Put gasket (51500) on impeller hub in proper position.

5.2.1.2.17 Push impeller (15300) on shaft till it touches the shaft sleeve.

5.2.1.2.18 Fix the impeller nut (33000) along with helicoil insert (47900) with gasket in between impeller hub and impeller nut and gradually tighten it.

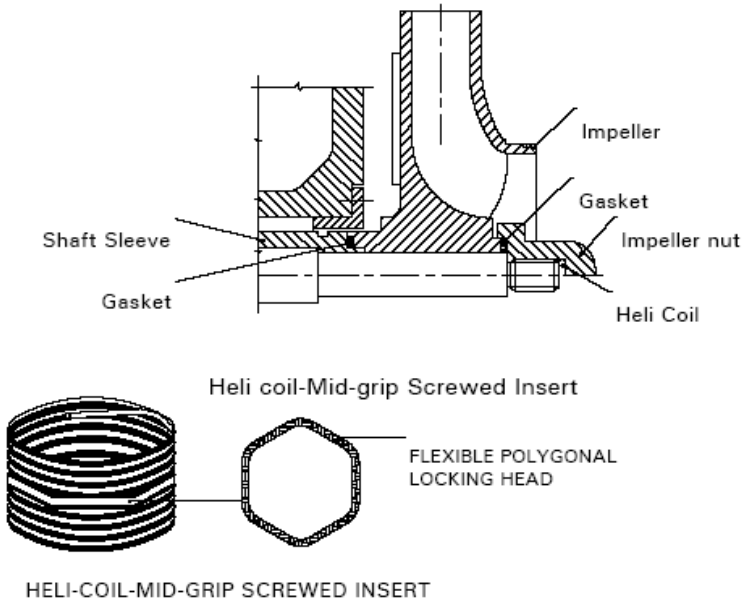


Fig. 22 Helicoil Insert

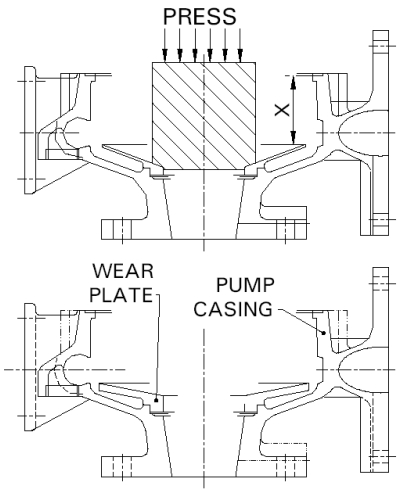
This will complete back pull out assembly.

5.2.1.2.19 In case of KPD-QF pumps only, following procedure is to be followed.

a) If wear plate is removed and is to be replaced, this should be done very carefully. Apply the pressure on the portion shown in diagram

shown below; otherwise the wear plate may warp. Use of arbour press is recommended.

After tilting of wear plate, measure distance 'X' and ensure that it is within +/- 0.1 mm along the entire periphery of wear plate. It is recommended that wear plate together with casing be



drilled and

Fig. 23 Fitment of wear plate in KPDQF pump

tapped to fit minimum two no. of countersunk head screws to prevent rotation of wear plate during actual pump operation.

5.2.1.2.20 Rotating unit - General assembly procedure for all pumps

a) Slide complete, back pull out assembly into pump casing. (10500/10600)

b) Tighten all the nuts on casing studs firmly and evenly.

Caution

In case of KPD-QF pumps, Clearance between impeller and wear plate is recommended to be 0.3 to 0.5 mm as hydraulic performance of pump depends upon this clearance. If clearance is more head capacity of the pump drops down. Adjust the telescopic arrangement to maintain clearance between impeller and wear plate.

5.2.1.2.21 Fit constant level oiler (44300), Breather cap (44400) & support foot (25100) to bearing housing.

5.2.1.2.22 Fit pump half coupling (39700).

5.2.1.2.23 Rotate shaft by hand and ensure free rotation.

5.2.1.2.24 Fit all accessories such as sealing and flushing liquid, cooling water connection, hot water/ steam circulation, safety guard etc.

5.2.1.2.25 Fit coupling spacer between pump half and motor half coupling in case of spacer type flexible couplings.

5.2.1.2.26 Mount motor on the base in case of standard flexible coupling and align the unit.

5.2.1.2.27 Fit coupling guard.

SPECIAL IMPORTANT INSTRUCTIONS

1) The instructions given in this book are of general nature. This manual is to be read in contest with C/S (cross-sectional) drawing supplied against order.
2) In case of mechanical seal arrangement, KBL invariably supply C/S (cross-sectional) drawing indicating mechanical seal arrangement. This drawing should be referred while commissioning of pumps and carrying out any maintenance work.
3) In case of KPD-J and KPD QF-J pumps, the steam/hot water circulation to casing and casing cover should be started well in advance to actual start of the pump. Pump should be started only after ensuring that the liquid inside the casing and suction line is in liquid form. Check free rotation of pump shaft prior to starting of the pump.
4) Pumps in all **CN 7MS** material of construction and with K-monel shaft are supplied with impeller nut in two parts i.e. impeller nut and lock nut arrangement as shown in the figure.
   While fitting impeller nut in this case ensure the following.
   a) Tighten nut 'A' (impeller lock nut) fully.
   b) Tighten nut 'B' (impeller nut) fully.
   c) Hold nut 'B' firmly in position and slightly loosen nut 'A'. This will ensure positive locking of impeller nuts.

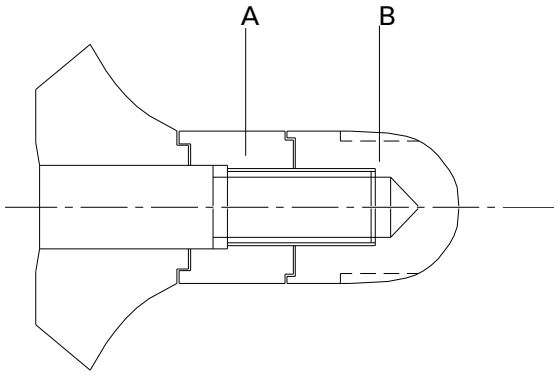


Fig. 24 Impeller nut and lock nut arrangement

5) Impeller nut (33000) together with helicoil mid grip insert should be treated as one part only. Please do not try to take out helicoil mid grip insert out of impeller nut. If helicoil mid grip insert is damaged, please replace impeller nut by new one. Spare impeller nut is always supplied with helicoil mid grip insert duly fitted in it.

- **Maintenance tools required:**
  No special tools are required for dismantling and reassembling. Toolbox containing a general set of tools such as different size ring spanners, torque wrenches, open ended spanners, light ball peen hammer, wooden

mallet, various sizes Allen keys etc serves the purpose. It is important to ensure that the suitable lifting equipment is available and that the work is carried out in clean area.

5.3 PREVENTIVE MAINTENANCE:

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

5.3.1 Daily checks:

5.3.1.1 Hourly record of suction and delivery pressure, discharge quantity input to the pump driver should be maintained.

5.3.1.2 Bearing temperature, oil level, stuffing box leakage / stuffing box temperature, cooling water inlet and outlet temperature should be checked. This gives an idea of mechanical performance of the pump.

5.3.1.3 Noise and vibrations are the first signs of impending troubles like cavitations, air lock, bearing failure, choking of impeller or casing and such other operating troubles. The pump performance should therefore be checked for noise and vibrations.

5.3.2 Periodical checks:

5.3.2.1 The temperature of the bearing should be measured by thermometer. Safe maximum working temperature of the bearing is 80°C.

5.3.2.2 The lubricants of the bearing should be checked. The lubricant might get contaminated with foreign material or get blackened due to overheating. In such cases, bearings should be flushed and charged with fresh lubricants.

5.3.2.3 Check for the stuffing box leakage. If the pumps are fitted with mechanical seal, there should not be any product leakage from stuffing box.

5.3.2.4 The alignment of the pump unit should be checked. Due to operational vibrations, atmospheric temperature or stress induced by the weight of the piping, the alignment may get disturbed.

5.3.2.5 Sufficient quantity of suitable type of lubricant should be ready for daily and emergency use.

5.3.2.6 Calibrate the measuring instrument.

5.3.3 Annual checks:

5.3.3.1 The pump should be overhauled completely to check the clearance and to replace worn-out parts. Clearance between impeller and casing rings, clearance between impeller and wear plate, shaft sleeves and stuffing box bush, lantern ring and shaft sleeve etc are very important. The bearings should be cleaned thoroughly and lubricated.

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

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

5.3.3.4 The measuring instruments, gauges etc should be recalibrated.

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

5.3.3.6 Piping supports should be checked so that the pipes do not induce unwanted stresses on the pump.

5.3.4: Mechanical seal in pump:

The mechanical seal is a precision product having been subjected to quality control throughout all stages of manufacture. The seals are designed to accommodate reasonable tolerances in the equipment, however in order to obtain the maximum life with trouble free performance, the equipment should be adequately maintained.

When mechanical seal is functioning satisfactorily without any leakage, the preventive maintenance is not advocated. If leakage occurs, a through check up is needed. While fitting the mechanical seals in the pump initially by KBL, due care is taken for its proper fitment.

Like other parts in the equipment the mechanical seals are subject to wear at the mating faces of the rotating and stationary ring. The rate of wear will differ with the operating conditions and various other factors such as lubricating property of the liquid pumped, the presence of impurities in liquid and other operating conditions. In view of this no firm recommendations can be given for renewal of seal rings / complete seals.

KPD pumps are supplied with cartridge type factory assembled mechanical seals and no further operating length adjustments are required.

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

Throttle bush: Throttle bush is pressed in mechanical seal cover. This bush gives protection in case of seal's failure. Due to close clearance between bush and the shaft sleeve, if the seal fails, the pressure of the product is reduced before it escapes. This bush also minimizes the quench leakage along the shaft. To avoid possibility of the sparking, the bush is made of non-ferrous materials as per API 610 specifications.

5.4 CORRECTIVE MAINTENANCE

PUMP TROUBLE

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

majority of troubles with centrifugal pumps result from faulty conditions on the suction side.

BREAK DOWN-CAUSE-CHECK POINTS

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

6.0 TECHNICAL DATA:

6.1 Direction of rotation:

The direction of rotation is clockwise when viewed from driving end.

6.2 Specification of oil seal and quantity of oil.

Sr. No	Description	Unit no.						
		No 5	No 7	No 9	No 11	No 13	No 15	No 19
50001	Oil seal DS	25x37x7	32x45x7	72x42x10	72x50x10	60x85x13	--	--
	*Oil seal PS	25x37x7	35x47x7	60x45x8	72x50x10	65x85x13	--	--
	Quantity of oil in bearing housing (approximate)	0.4 Liter	0.5 Liter	0.7 Liter	1.0 Liter	1.5 Liter	1.8 Liter	2.5 Liter

* supplied against order.

6.3 Bearings:

a) Bearings of SKF make or equivalent and with C3 clearance are used.
b) Bearings are oil lubricated. Oil level in the bearing housing should be maintained with the help of constant level oiler. Constant level oiler is a standard scope of supply.
c) Maximum allowable temperature of bearings: 80°C
d) In case of pumping liquids above 180° C, cooling of lubricant oil shall be necessary. Bearing housing cooling arrangement provided, quantity of cooling water required is 0.25 m^3/hr at 6 kg/cm^2.
e) In case of new bearings, renew the oil after about 200 hours and then about once a year, if the bearing temperature is always below 50°C and there is only small risk of contamination. If the bearing temperature is upto 80°C and if there is danger of contamination, the oil should be renewed about every six months.

A) Bearing details for KPD:

Driving unit no.	Speed in RPM	Bearing size	
		Driving end	Non driving end

5	Upto 3000 rpm	SKF-7206 BG (2 Nos/1pair)	SKF-NU305 (1 No.)
7	Upto 1500 rpm	SKF-7307 BG (2 Nos/1 pair)	SKF-NU307 (1 No.)
	Above 1500 and upto 3000 rpm	SKF-7307 BG (2 Nos./ 1 pair)	SKF-NU307 (1 No.)
9	Upto 3000 rpm	SKF-7309 BG (2 Nos./ 1 pair)	SKF-NU309 (1 No.)
11	Upto 3000 rpm (only for 125/26 @2900 rpm)	SKF-3311 (1 No.)	SKF-NU311 (1 No.)
11A	Upto 1750 rpm	SKF-7311 BECB (2 Nos/ 1 pair)	SKF-NU311 (1 No.)
11B	Upto 1750 rpm	SKF-7311 BECB (2 Nos/ 1 pair)	SKF-NU311 (1 No.)
11C	Upto 1750 rpm	SKF-7311 BECB (2 Nos/ 1 pair)	SKF-NU311 (1 No.)
13	Upto 1500 rpm	SKF-7313 BG (2 Nos/ 1 pair)	SKF-NU313 (1 No.)
15	Upto 1500 rpm	SKF-7315 BECBP (2 Nos/ 1 pair)	SKF-NU413 (1 No.)
19	Upto 1500 rpm	SKF-7319 BECBM (2 Nos/ 1 pair)	SKF-NU416 (1 No.)

B) Bearing details for KPD-QF (i.e. semi-open impellers)

Driving unit no.	**Speed in RPM**	**Bearing arrangement**	**Bearing size**	
			Driving end	**Non-driving end**
4	Upto 3000 rpm	Standard supply	SKF-6304 (1 No.) & SKF-7304 (1 No.)	SKF-6304 (1 No.)
5	Upto 3000 rpm	Standard supply	SKF-7206 BG (2 Nos./ 1 pair)	SKF-NU305 (1 No.)
7	Upto 3000 rpm	Standard supply	SKF-7307 BG (2 Nos./ 1 pair)	SKF-NU307 (1 No.)
9	Upto 3000 rpm	Standard supply	SKF-7309 BG (2 Nos./ 1 pair)	SKF-NU309 (1 No.)

Notes:

1. The bearing arrangements mentioned above are suitable for suction pressure less than 5 kg/cm^2. For applications involving suction pressure above 5 kg/cm^2, please refer to Unit sales, Kirloskarvadi.
2. Axial running clearance shall be less than 0.45 mm for all above bearing arrangements.

6.4 Lubrication

The oil used should be highly refined straight mineral product of high demulsibility, free from running and acid forming tendencies. Detergent oil may cause foaming and emulsion difficulties, hence should not be used. The oil should be filled in with the help of constant level oiler. For fitting and operating instructions, please refer instructions mentioned in this manual. The lubrication oil should confirm to the following grades of oil available in market.

Manufacturers	**Speed - 1450 rpm**	**Speed - 2900 rpm**
Indian oil	SERVOSYSTEM 57/68	SERVOSYSTEM 57/68
Hindustan petroleum	ENKLO-57	ENKLO-57
Shell	TELLUS 68	TELLUS 68
Veedol	ATLINE 68	ATLINE 68

6.5 Cooling of stuffing box, bearing housing and pump pads:

6.5.1 Cool the gland packed stuffing box when pumping liquid temperature is above 105^0 C.

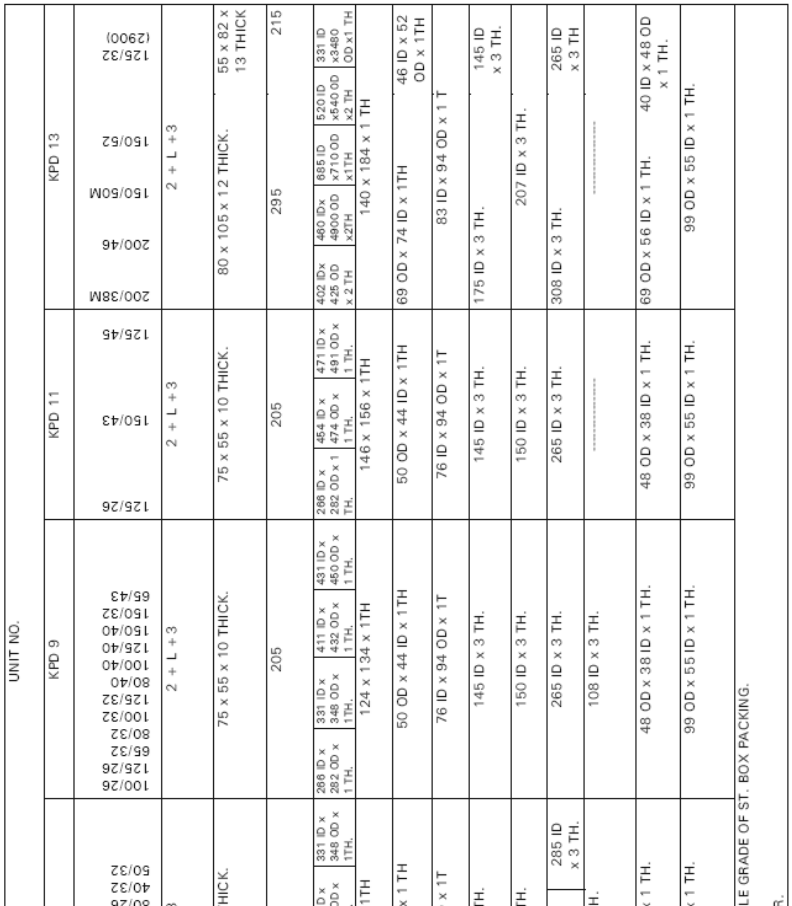
6.5.2 Cool the mechanical seal, stuffing box when pumping liquid temperature is above 140^0 C.

6.5.3 Quantity of stuffing box cooling water with respect to temperature and nominal impeller diameter.

Full nominal impeller dia. in cm	**Cooling water quantity at various pumping liquid temperatures m^3/hr.**				
	110^0 C	**150^0 C**	**200^0 C**	**250^0 C**	**300^0 C**
13	0.16	0.18	0.24	0.31	0.43
16	0.16	0.18	0.24	0.31	0.43
20	0.16	0.18	0.24	0.31	0.43
26	0.21	0.24	0.31	0.40	0.54
32	0.23	0.28	0.37	0.48	0.63
38/40	0.26	0.31	0.43	0.55	0.71

46/50	0.45	0.55	0.65	0.75	1.00
51/56	0.50	0.60	0.70	0.80	1.10

Maximum temperature of cooling water at outlet = 50^0 C.
Maximum permissible cooling water pressure = 6.0 kg/cm



Specification of Stuffing box packing, gasket, O-ring for driving unit 15 and 19

Part No.	Description	KPD unit 15	KPD unit 19
	Gland packed arrangement with lantern ring	3+L+2	3+L+2
430001	Gland packing size (OD x ID x TH)	80 x105 x12 thick	108x140 x16 thick
	Straight length of gland packing in mm	295	395
5110001	Gasket for casing & casing cover	520IDX540ODX2T	410IDX430ODX2T
5140001	Gasket for Bearing cover	192IDX205ODX1T	205IDX245ODX1T
5150001	Gasket for impeller & shaft sleeve	69 IDX74 ODX1T	95 IDX102 ODX1T
5250101	O ring for Casing cover	175 IDX3T	212 IDX3T
5231101	O ring for Bearing housing	207 IDX3T	245 IDX3T
5250201	O ring for Lantern bracket	328 IDX3T	333 IDX3.25T
5230301	O ring for Bearing cartridge	----	----
6820001	Gasket for impeller & impeller nut	70IDX80ODX1T	98IDX86ODX1T
6850001	Gasket for Oil well cover	99ODX55IDX1T	----

6.8 Cooling to pump pads

Centerline mounted pumps are supported on pads through which cooling water should be circulated. Centerline mounted pumps are recommended for pumping liquids of temperature above 180^0 C. Pump with centerline mounted delivery casing is optional.

Quantity of cooling water to pad – 0.2 to 0.3 m^3/hr.
Maximum permissible cooling water pressure – 6.0 kg/cm^2.

6.9 Clearance between impeller

6.9 Steam or hot water circulation in KPD jacketed pump:
Before start up the pump hot water circulation should be started through casing jacket, casing cover jacket, and mechanical seal cover (in case of pump with mechanical seal) for a period of minimum half an hour to ensure that all solidified liquid shall melt.

6.10 Interchangeability:
Parts standardization is optimized utilizing interchangeable components to cover a very wide performance. This unique feature enables the customer to have a very low spare parts inventory even though he may have many sizes of these pumps.

PART NUMBER AND DESCRIPTION

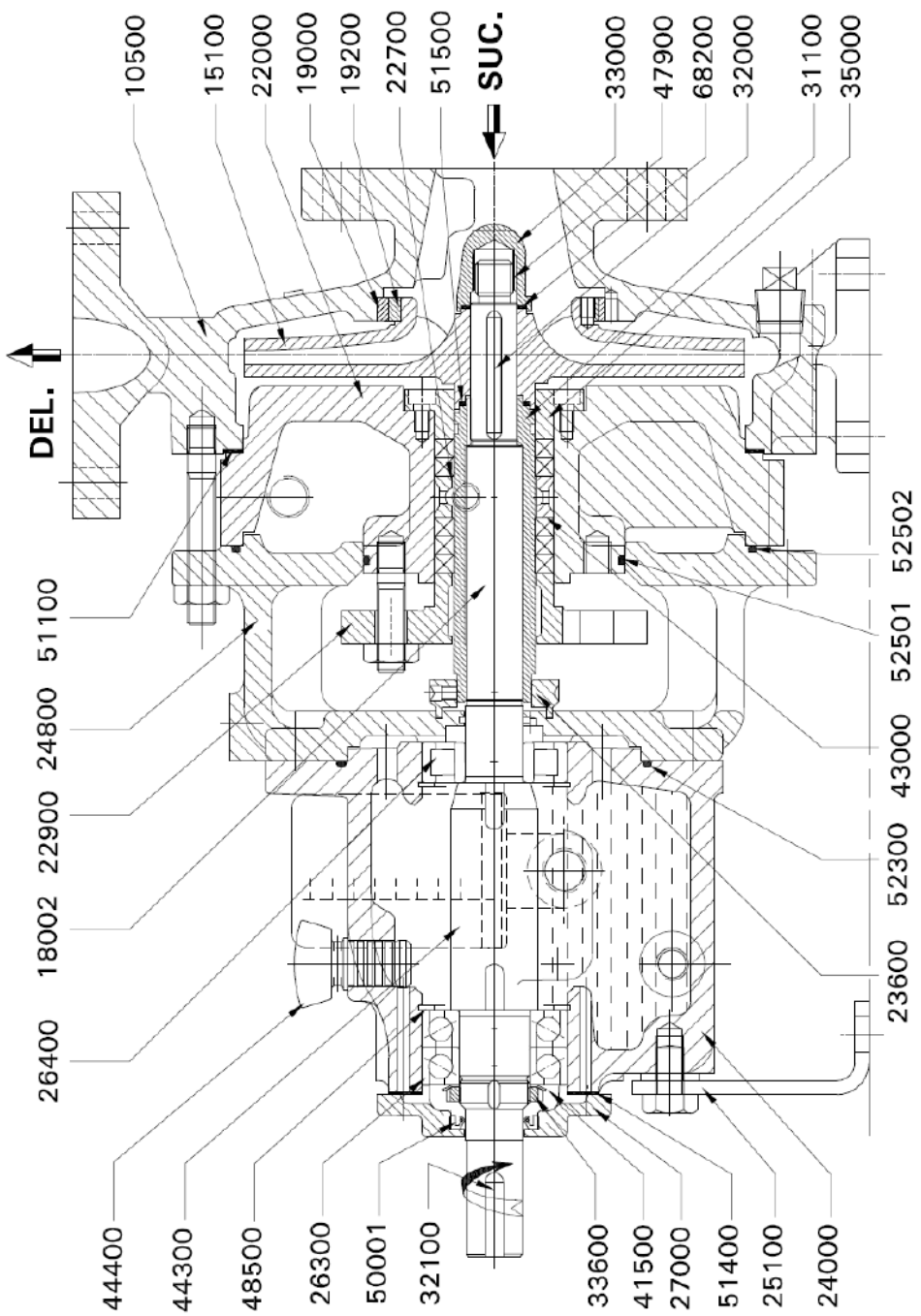
Sr. No.	Part no	Description
1	10500	Pump Casing (Foot Mounted)
2	10600	Pump Casing (Centre Line Mounted)
3	15100*	Impeller
4	15300*	Semiopen Impeller
5	18001*	Pump Shaft Std Brg Arrgt.
6	18002*	Pump Shaft Reinforced Brg Arrgt.
7	19000*	Casing Ring (Suction Side)
8	19100*	Casing Ring (Delivery Side)
9	19200*	Impeller Ring (Suction Side)
10	19300*	Impeller Ring (Delivery Side)
11	19800	Spacer
12	19900	Shoulder Ring
13	20900	Spacer Ring
14	22000	Casing Cover
15	22600	Drip Pan
16	22700	Lantern Ring
17	22900	Split Gland
18	23000*	Mechanical Seal
19	23100	Mechanical Seal Cover
20	23600	Liquid Deflector (Mechanical Seal Arrg.)
21	23601	Liquid Deflector (Gland Packed Arrg.)
22	24000	Bearing Housing

Sr. No.	Part no	Description
23	24100	Bearing Cartridge,Unit-7qf
25	24800	Lantern Bracket
26	25100	Support Foot
27	25200	Bearing Housing (With Cooling Arrg.)
28	26000*	Deep Groove Ball Bearing (De & Nde)
29	26300*	Angular Contact Bearing (De)
30	26400*	Cylindrical Roller Bearing (Nde)
31	27000	Bearing Cover (De)
32	27100	Bearing Cover (Nde)
33	28501	Taper Piece (CONCENTRIC)- DEL
34	28501	Taper Piece (ECCENTRIC)- SUC.
35	30000	Lifting Eye Bolt
36	31100*	Shaft Sleeve (Gland Packed Arrangement)
37	31500*	Shaft Sleeve (Mechanical Seal Arrangement)
38	32000	Key For Impeller
39	32100	Key For Coupling
40	33000*	Impeller Nut
41	33001*	Impeller Lock Nut
42	33600*	Bearing Lock Nut
43	33601	Lock Nut For CLM PAD COOLING PIPING
44	35000*	Stuffing Box Bush
45	36000	Quenching Bush
46	36700	Oil Well Cover
47	37000	Cooling Coil
48	38401	Fabricated Pad
49	41500*	Lock Washer For Bearing Lock Nut
50	43001*	Gland Packing
51	44100	Grease Nipple
52	44300	Constant Level Oiler
53	44400	Oil Feeding Plug
54	45000	Vent Valve
55	46000*	Wear Plate-QF
56	47900*	Helicoil Insert
57	48500*	Internal Circlip
58	49000*	Flange For Csg Drain
59	50000*	Oil Seal D.S
60	50001*	Oil Seal P.S.
61	51101	Gasket For Csg & Csg Cover
62	51400*	Gasket For De Bearing Cover
63	51500*	Gasket For Sleeve & Imp.

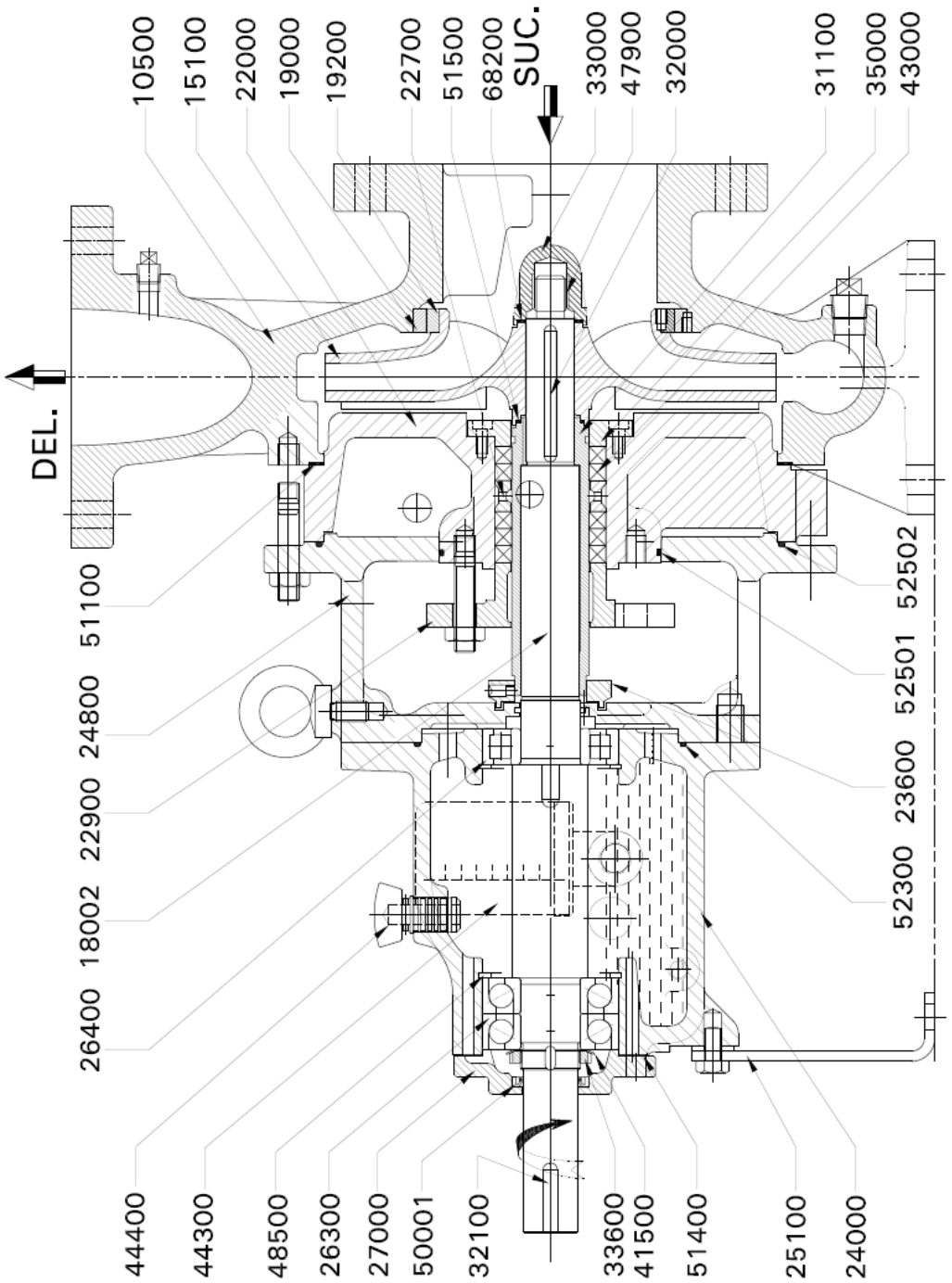
64	51600*	Gasket For Mech.Seal Cover
65	51800*	Gasket For Adapter And Sealing Connection
66	52301	O-Ring For Bearing Housing and Lantern Bracket
67	52501*	O-Ring For C.Cover & Lant. Bracket
68	52502*	O-Ring For Lan.Bkt.& Csg.Cover(Hot Model)
69	53101	Pipe Nipple For Pad Cooling Piping
70	53102	Pipe Nipple For Pad Cooling Piping
71	53200	Flexible Pipe For Flushing
72	53301	Pipe Nipple From Casing To Elbow
73	53302	Pipe Nipple From Elbow To Valve
Sr. No.	Part no	Description
74	53303	Pipe Nipple From Valve To Flange
75	54201	Elbow For Casing Drain
76	54202	Elbow For Socket Weld Casing Drain Piping
77	54400	Reducer
78	54500	Union Joint For Pad Cooling Piping
79	55000	Wheel Cock For Casing Drain Piping
80	57400	Hex Bolt For Gland Clamping
81	57800	Hex Screw For Gland
82	58100	Hex Nuts For Casing Studs
83	58201	Hex Nuts For Gland Studs
84	58202	Hex Nuts For Studs Of Mechanical Seal Cover
85	58203	Hex Nuts For Studs Receiv.Lant.Bkt.& Csg.Cover
86	58204	Hex Nuts For Brg. Cartridge (For Locking Arrgt.)
87	58205	Hex Nuts For Hex Bolts Receiving Gland
88	58600	Hex Nuts For Studs Receiv.Brg.Hsg.& Lant.Bkt.
89	58602	Hex Nuts For Studs On Pump Casing Flange Suc.& Del.
90	59002	Studs On Casing To Receiv.Csg.Cover & Lant.Bkt.
91	59100	Studs On Pump Casing To Receive Casing Cover
92	59101	Studs On Casing Cover To Receive Lant.Bkt.
93	59102	Studs On Csg.Cover To Receive Split Gland
94	59103	Studs On Csg.Cover To Receive Mech.Seal Cover
95	59300	Studs On Lant.Bracket To Receive Brg.Housing
96	60001	Plug For Pressure Gauge Conn. (Suction Side)
97	60002	Plug For Pressure Gauge Conn. (Delivery Side)
98	60100	Plug For Pump Casing Drain
99	60201	Plug For Sealing Conn. Of Pump Casing
100	60202	Plug For Sealing Inlet Conn. Of Csg.Cover
101	60203	Plug For Sealing In.& Out.Conn.Of Csg.Cover
102	60204	Plug For External Flushing Conn.
103	60300	Pipe plug for cooling

104	60301	Plug For Cooling Inlet Conn.On Csg.Cover
105	60302	Plug For Cooling Outlet Conn.On Csg.Cover
106	60400	Plug For Drip Pan
107	60501	Plug For Bearing Housing Drain
108	60502	Locking plug for bearing housing
109	60901	Plug For Flusing On Mech.Seal Cover (Inlet)
Sr. No.	Part no	Description
110	60902	Plug For Quenching (Inlet & Outlet)
111	63000	Hex Release Screw For Casing Cover
112	63101	Hex Screw For De Bearing Cover
113	63102	Hex Screw For Oil Well Cover
114	63200	Hex Screw For Support Foot
115	64000	Rivets For Name Plate
116	64001	Hammer Drive Screw
117	65001	Grub Screw For Csg.Ring & Imp.Ring (Suc.Side)
118	65002	Grub Screw For Csg.Ring & Imp.Ring (Del.Side)
119	65400	Grub Screw For Liquid Deflector
120	66601	Hex Socketed Cap Screw For Stuffing Box Bush
121	66602	Socketed Grub Screw For Casing Cover
122	66603	Hex Socketed Grub Screw
123	66604	Hex Socketed Head Cap Screw
124	67000	Duty Name Plate
125	67101	Co0ling Water Name Plate (Inlet)
126	67102	Co0ling Water Name Plate (Outlet)
127	67105	Steam Inlet Nameplate
128	67105	Steam Outlet Nameplate
129	67200	Direction Of Rotation Arrow Name Plate
130	67601	Sealing Water Name Plate (Inlet)
131	67602	Sealing Water Name Plate (Outlet)
132	67900	Quenching Name Plate (Inlet)
133	67901	Quenching Name Plate (Outlet)
134	68200*	Gasket Betw.Impeller Nut & Impeller Lock Nut
135	68201*	Gasket Between Impeller & Impeller Nut
136	68500*	Gasket For Oil Well Cover
137	70100	Spring Washer For Support Foot
138	71500	Hex Screw For Pad
139	71700	Hex Screw For Clm Pad & Pump Casing
140	72700	Locking Plug For Clm Pad Cooling
141	78100	Flushing Name Plate (Inlet)
142	78101	Flushing Nameplate (Outlet)

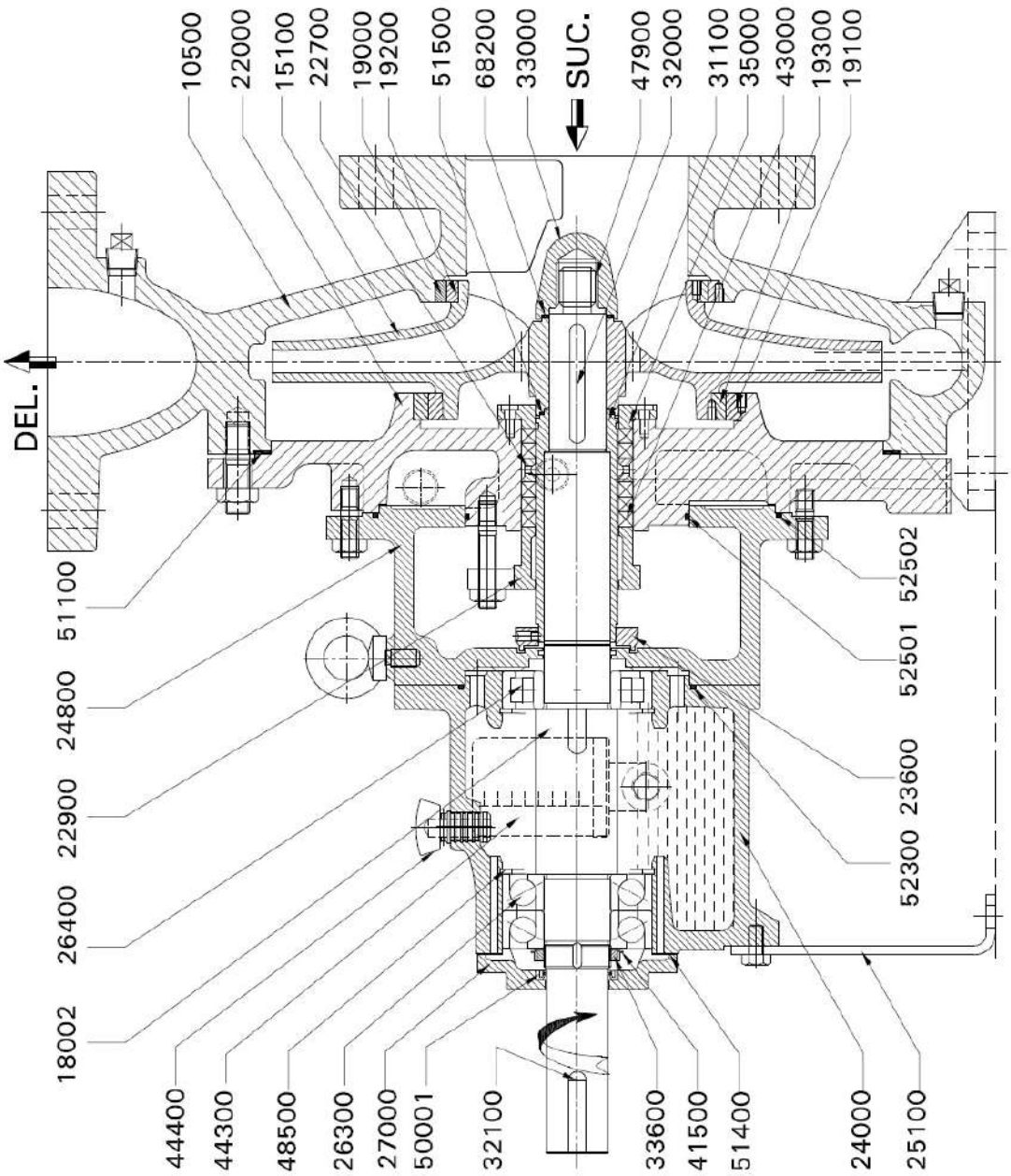
1. KPD32/13, 50/13



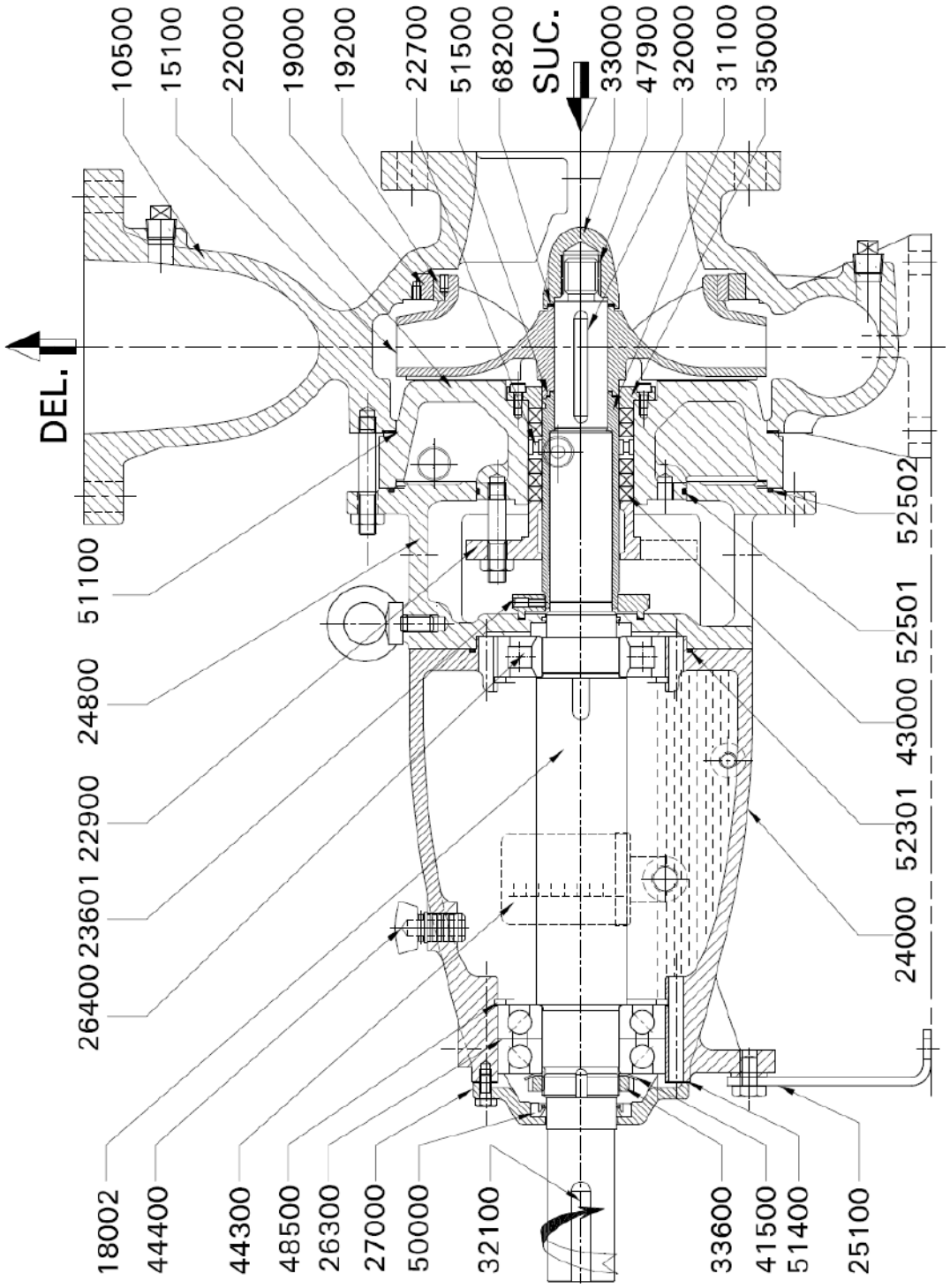
2. KPD32-80/16,32-100/20,32-125/26 (Lifting eye bolts supplied only for KPD32-125/26



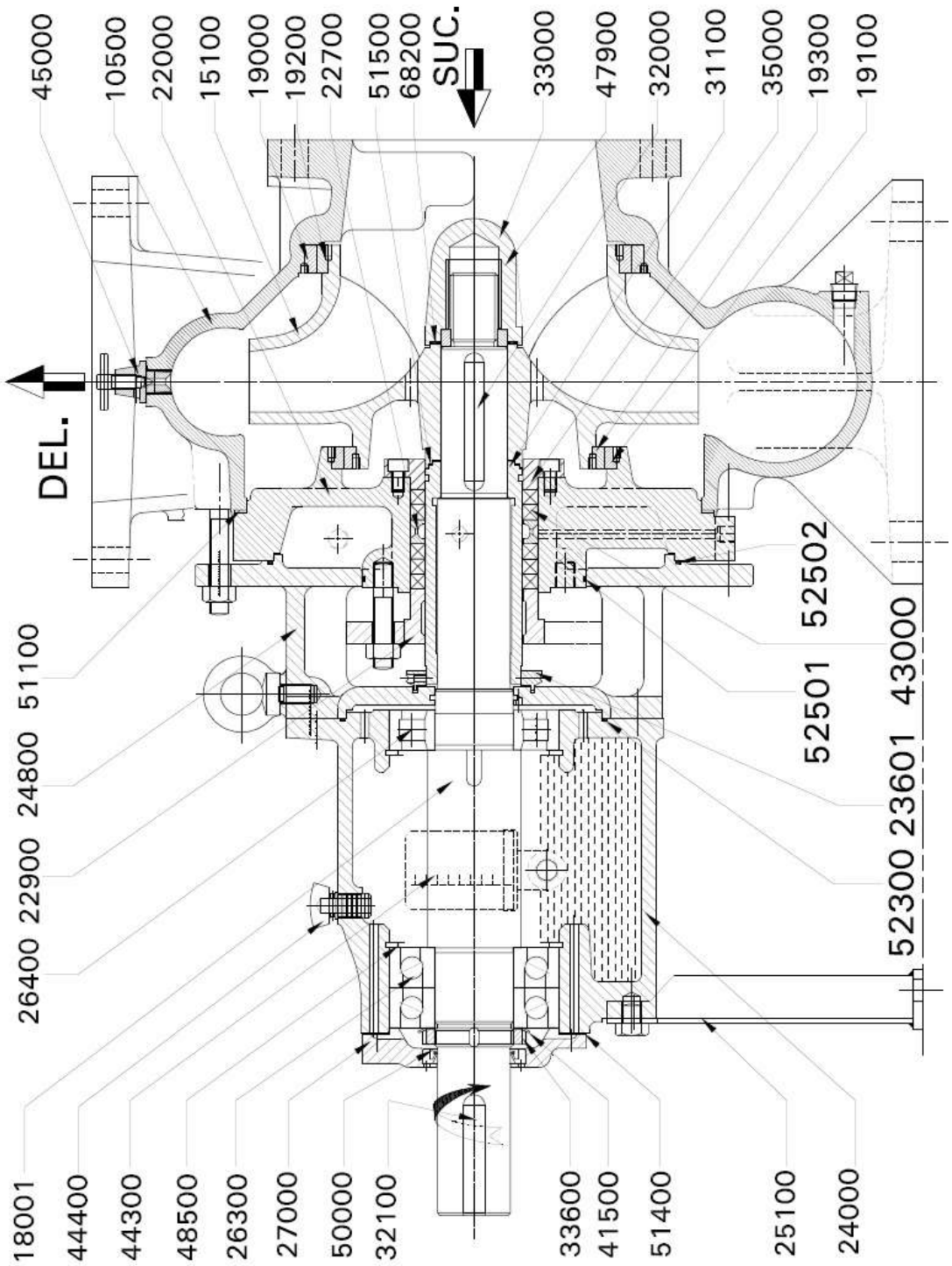
3. KPD40-150/32,80-150/40,KPD65/43,KPD125/45,KPD150/43,KPD150/52 KPD200/38M, KPD200/46



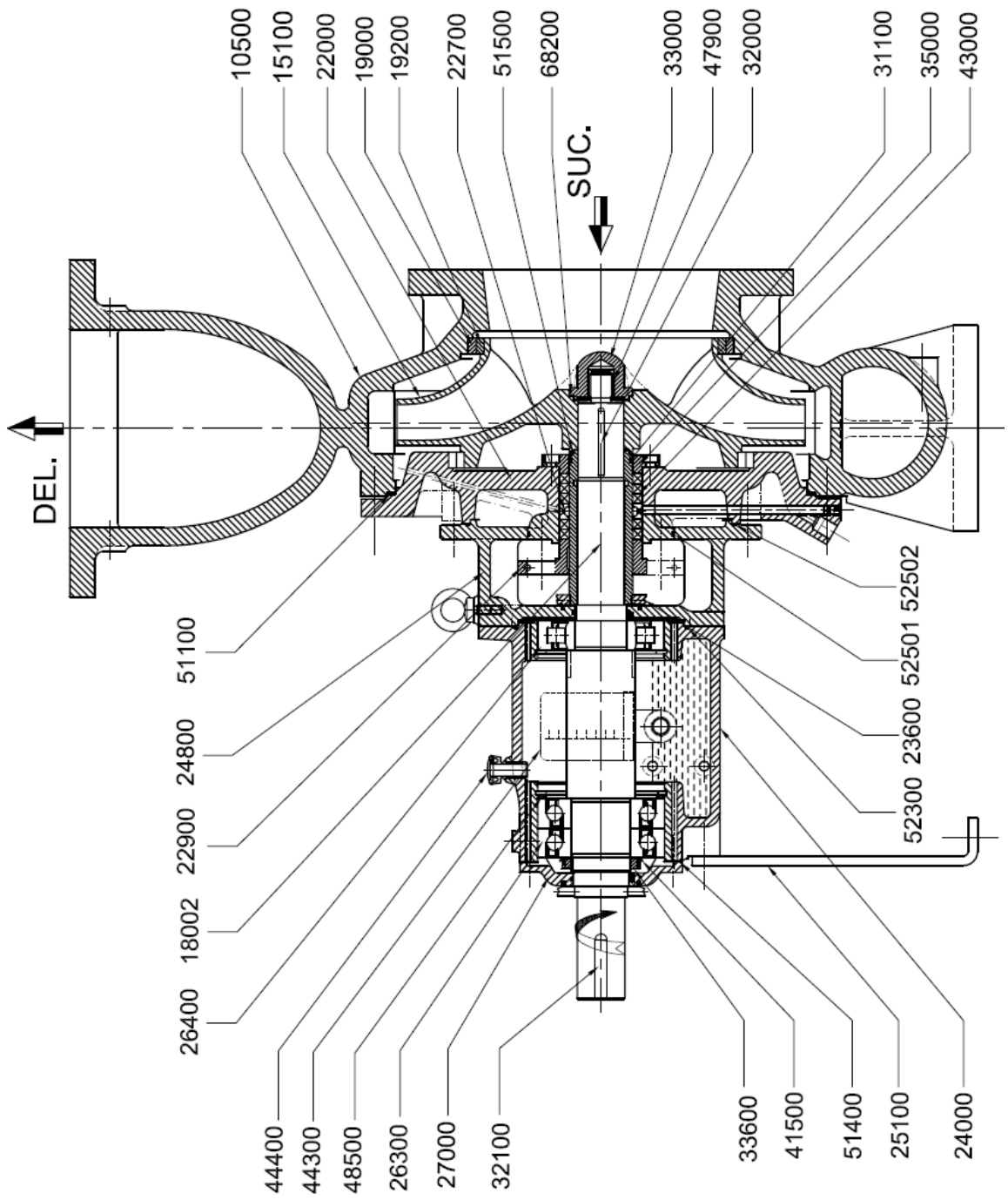
4. KPD125/26 at 2900 rpm



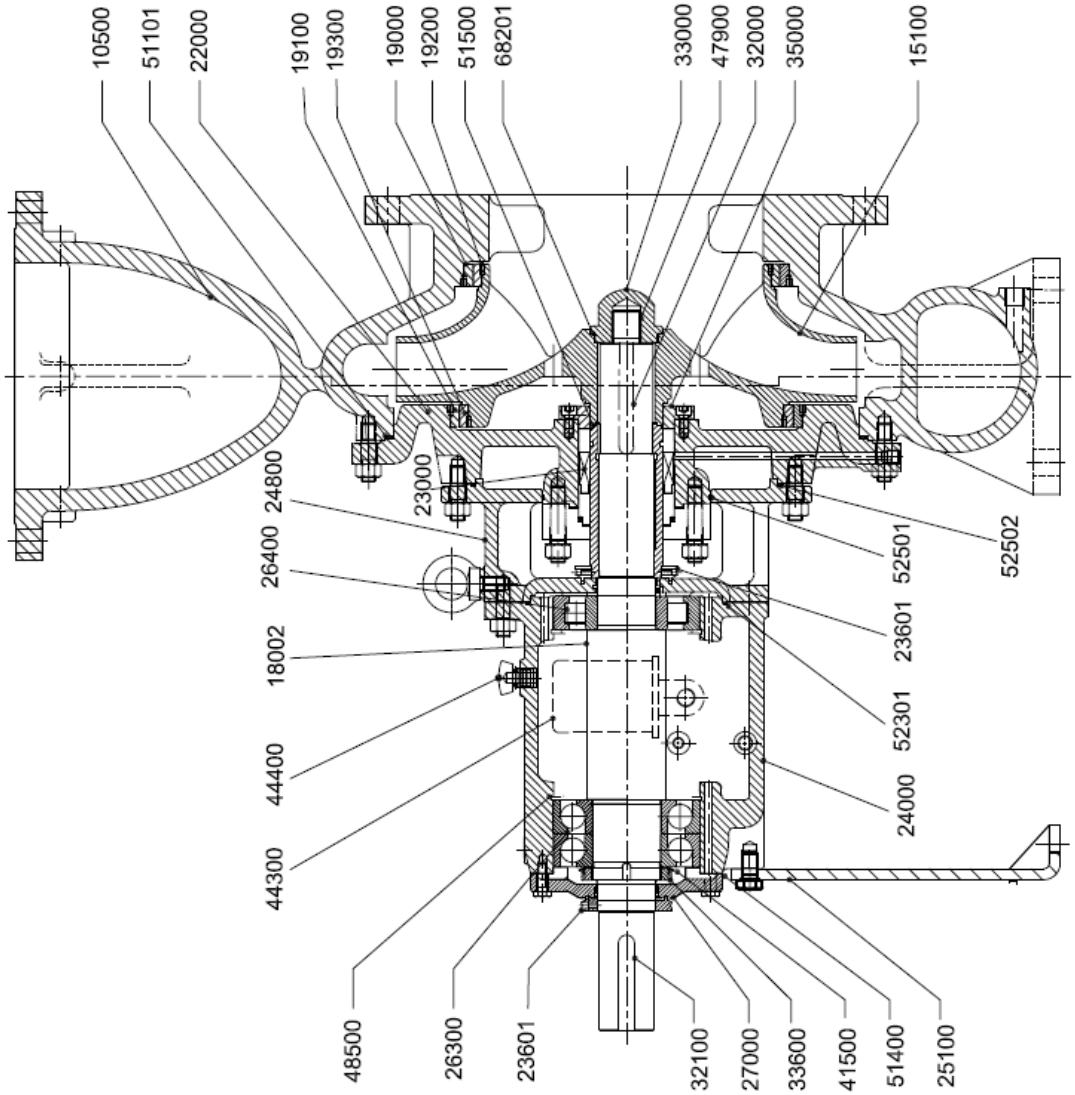
5. KPD200/26,200/33,200/36,250/33A & B



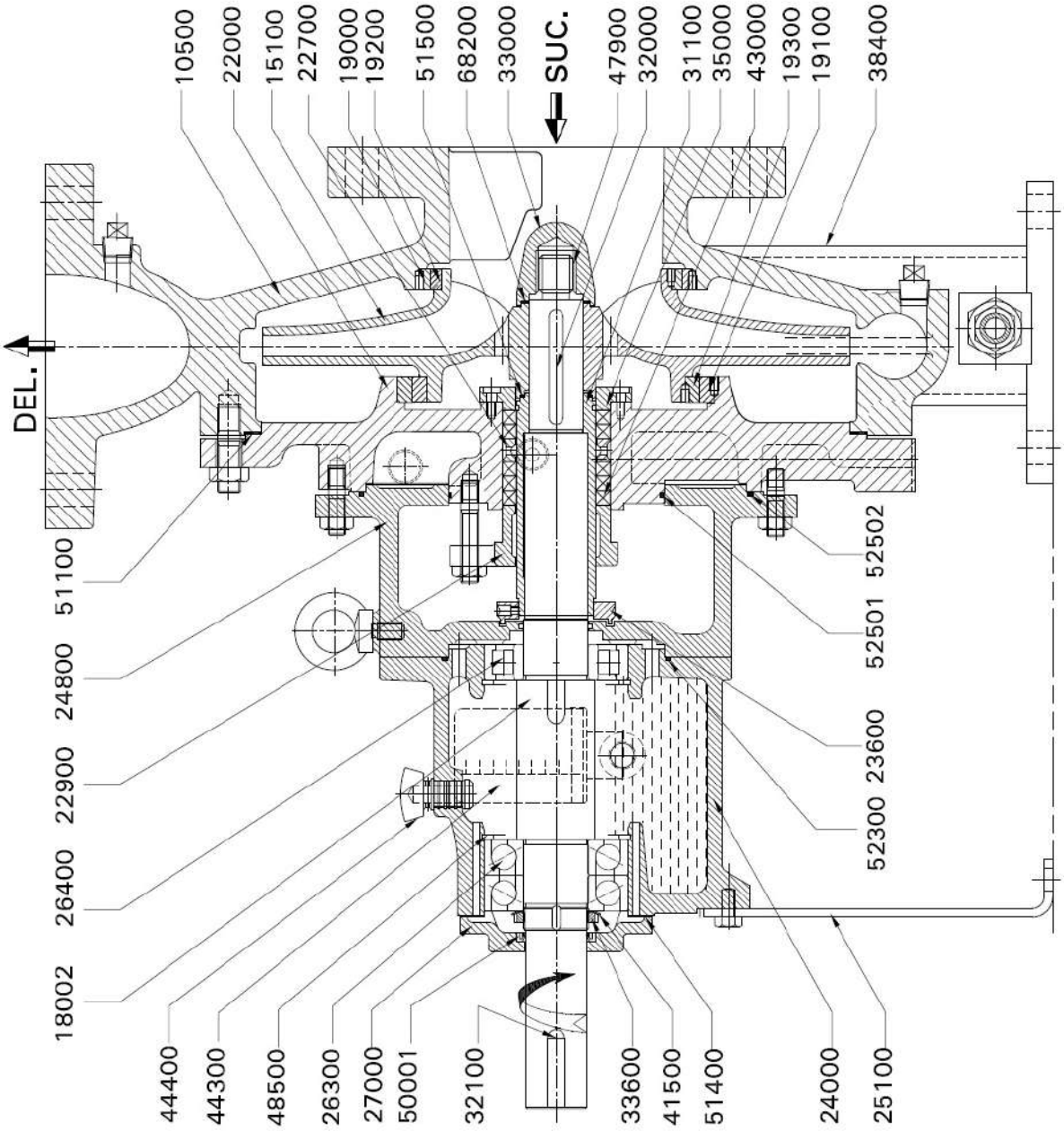
6. KPD250/50, 250/40



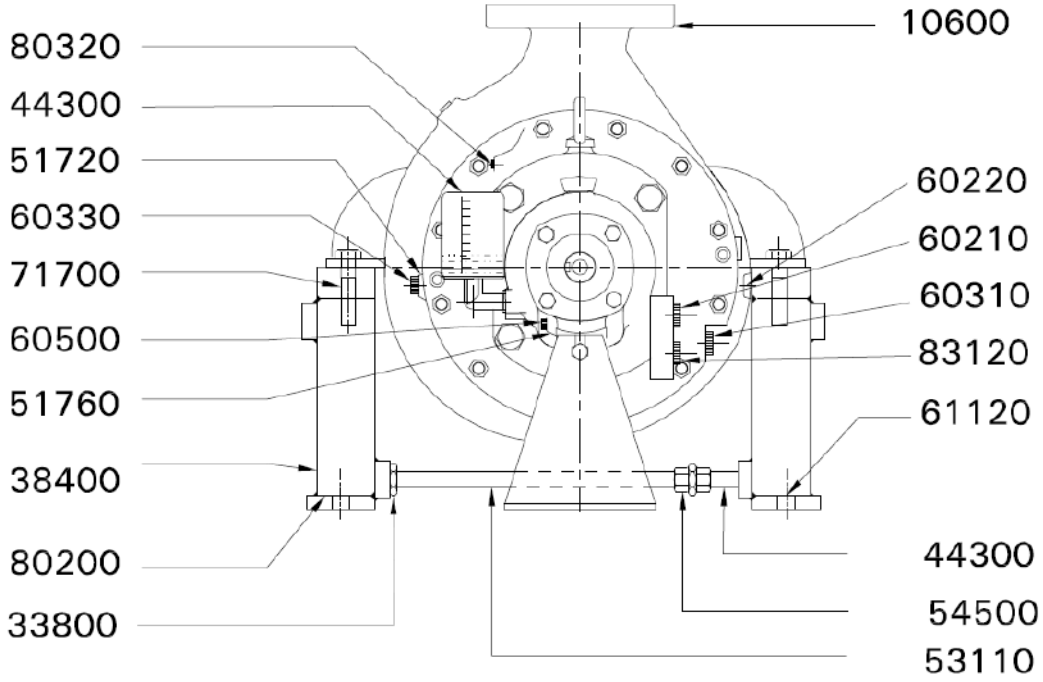
7. KPD150/56, KPD 350/40



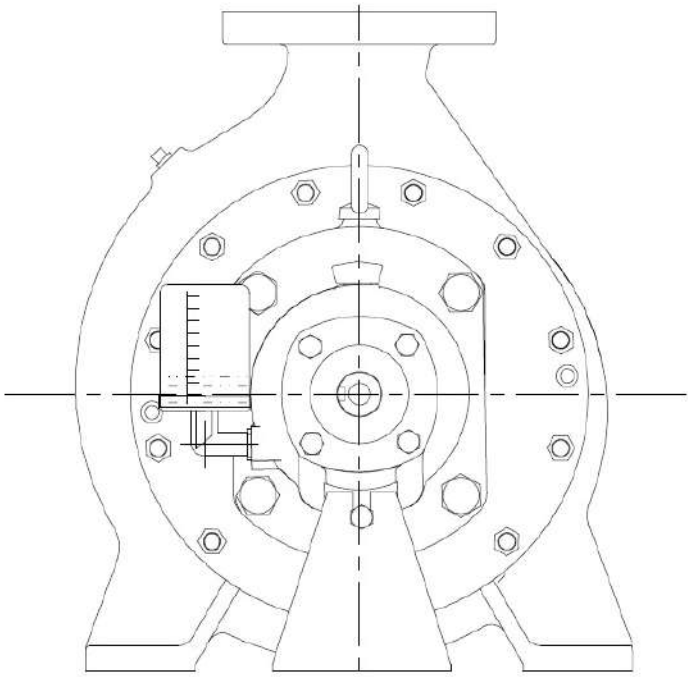
8. KPD CLM pump



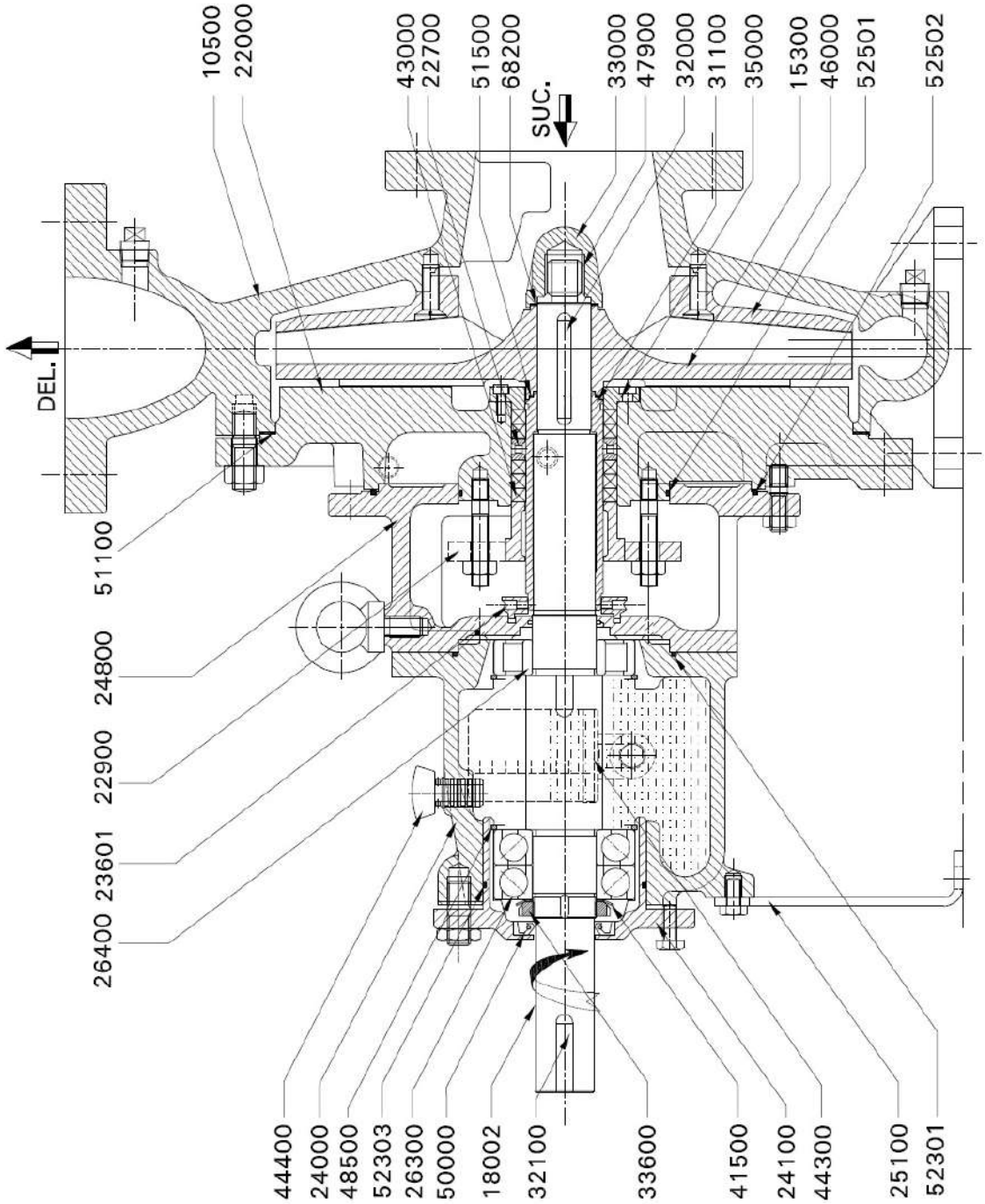
9. KPD CLM PUMP End view



10. KPD Standard pump End view



11. General KPDQF pump


10500
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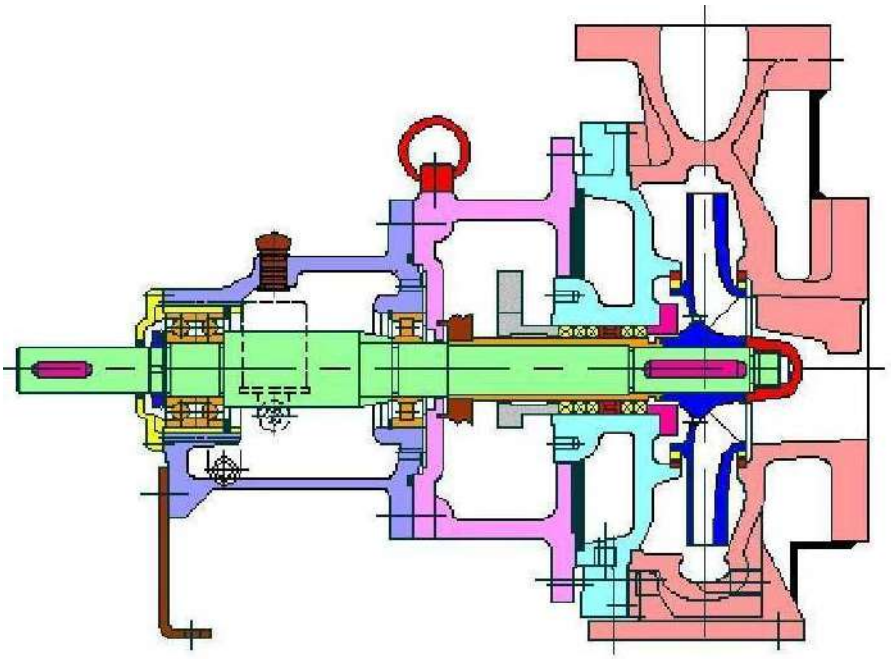
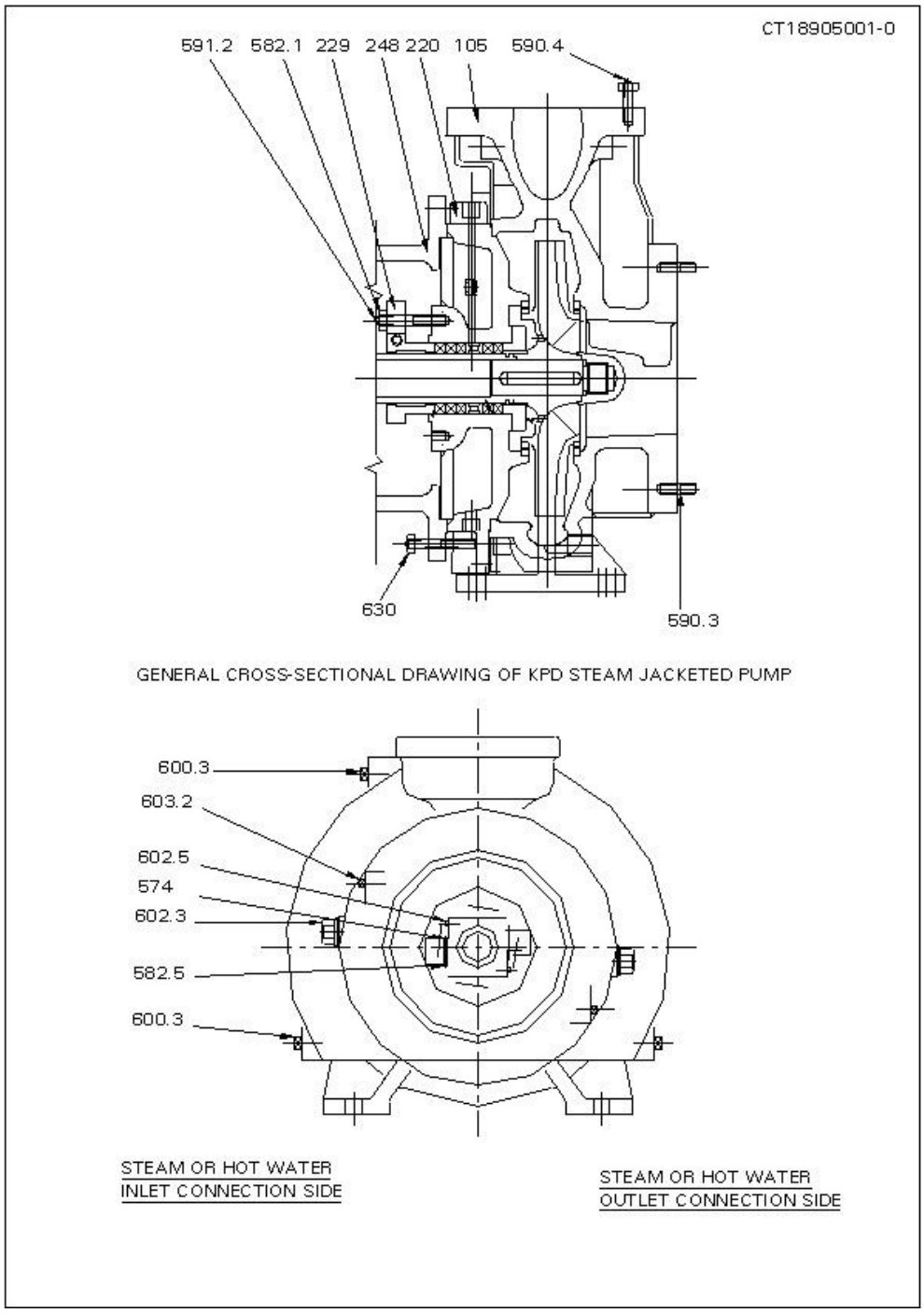
33000
47900
32000
31100
35000
15300
46000
52501
52502
DEL.
51100
24800
22900
23601
26400
44400
24000
48500
52303
26300
50000
18002
32100
33600
41500
24100
44300
25100
52301

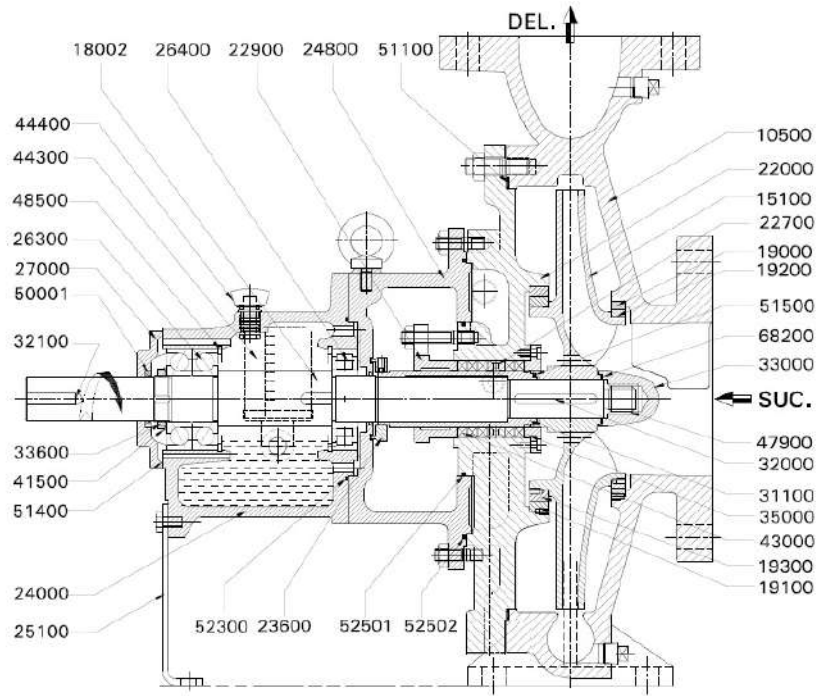
12. KPDJ pump



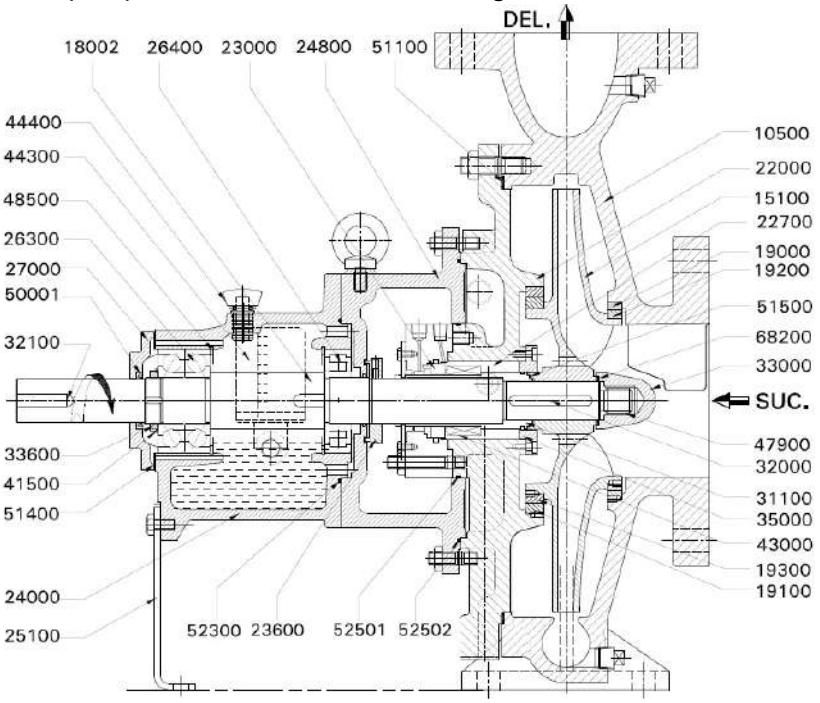
13. KPDJ pump General cross section:



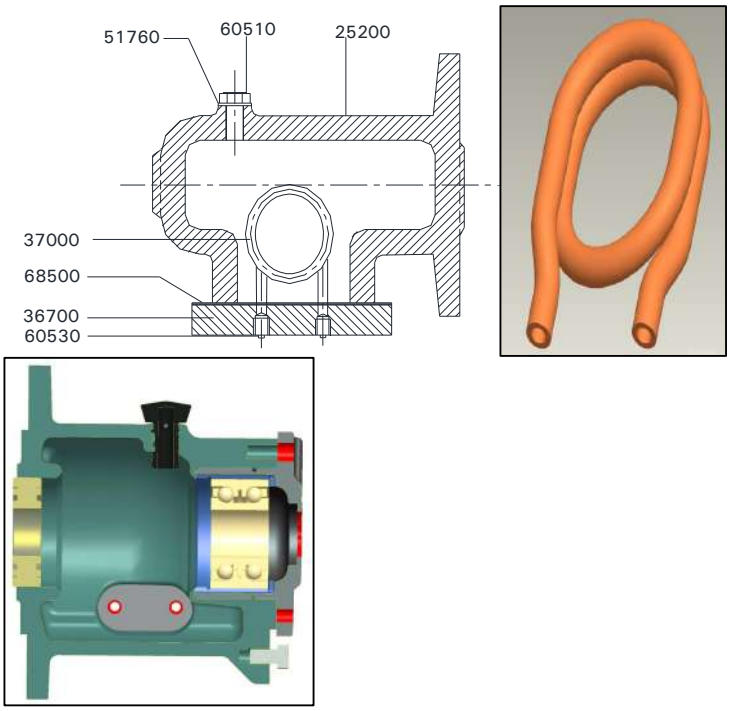
14. KPD pump with gland packing.



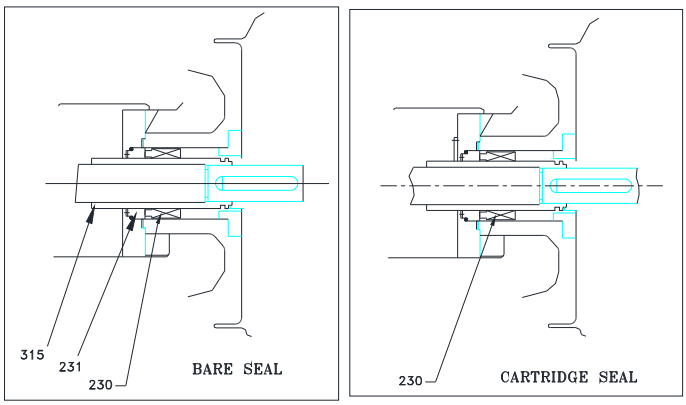
15. KPD pump with mechanical seal arrangement:



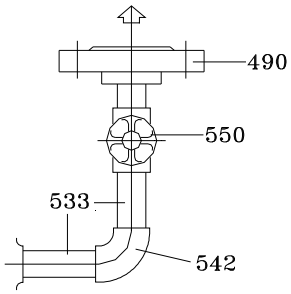
16. Bearing cooling arrangement



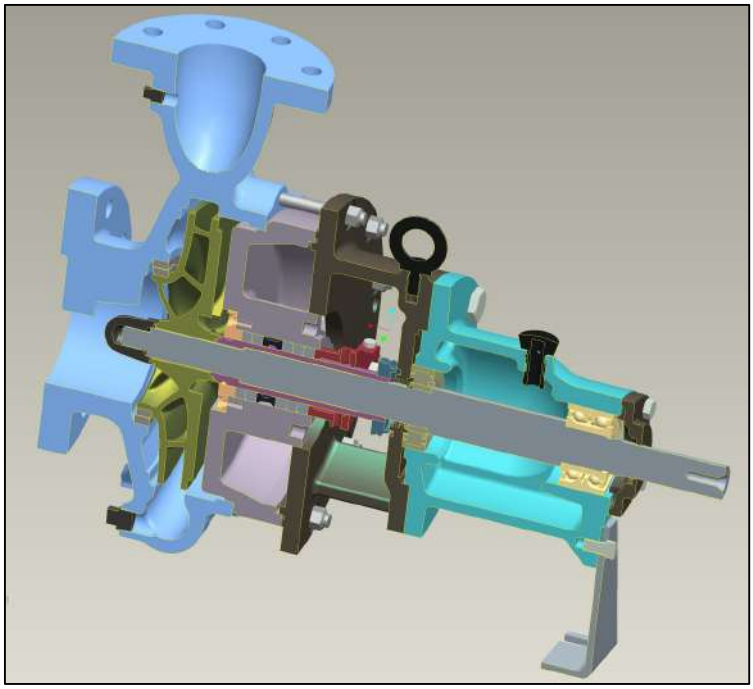
17. Mechanical seal:



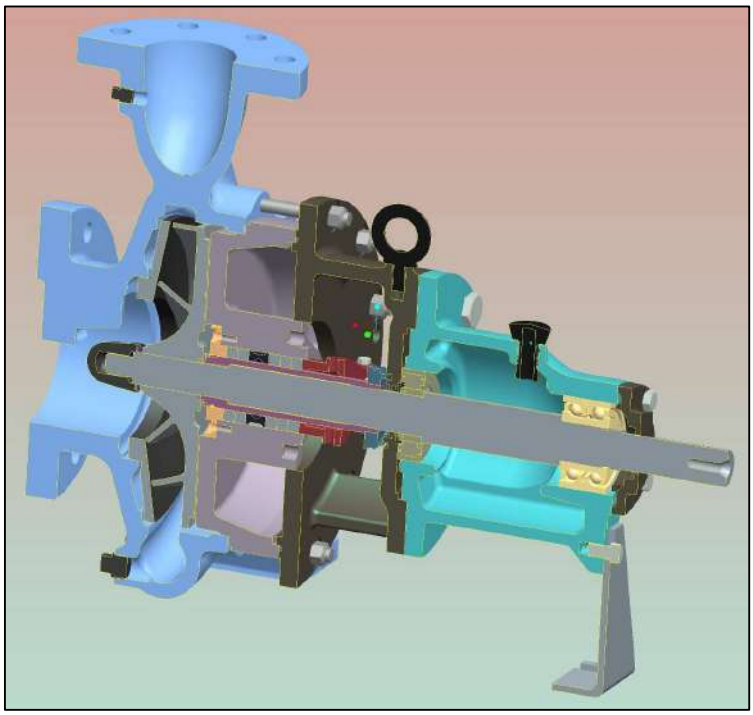
18. Casing drain piping:



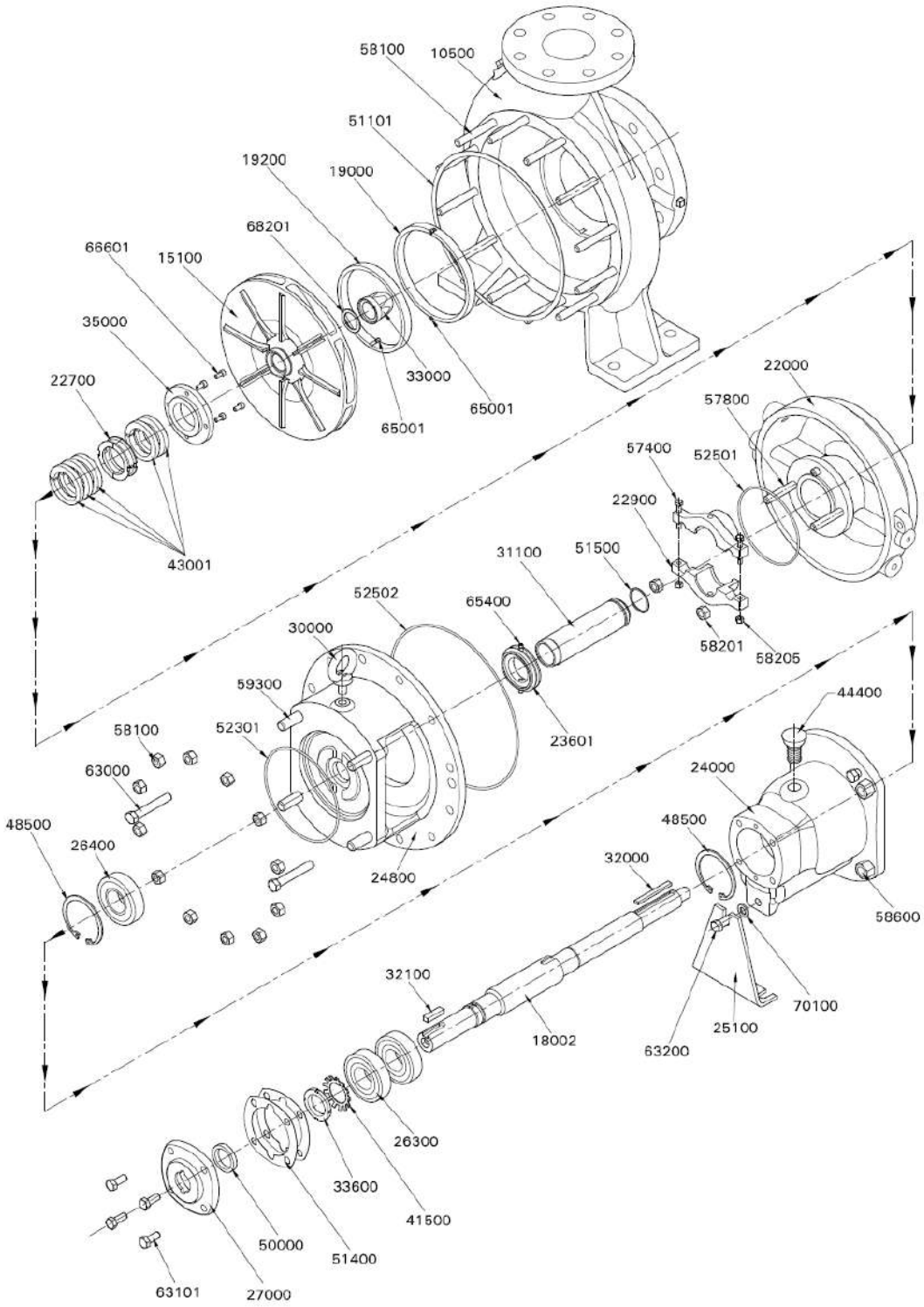
19. KPD pump cut section view



20. Cut section view of KPDQF pump:



21. Exploded view of KPD pump:


58100
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19000
68201
66601
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22700
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65001
22000
57800
57400
52501
22900
43001
31100
51500
52502
65400
30000
58201
58205
59300
23601
44400
58100
52301
63000
24000
48500
48500
26400
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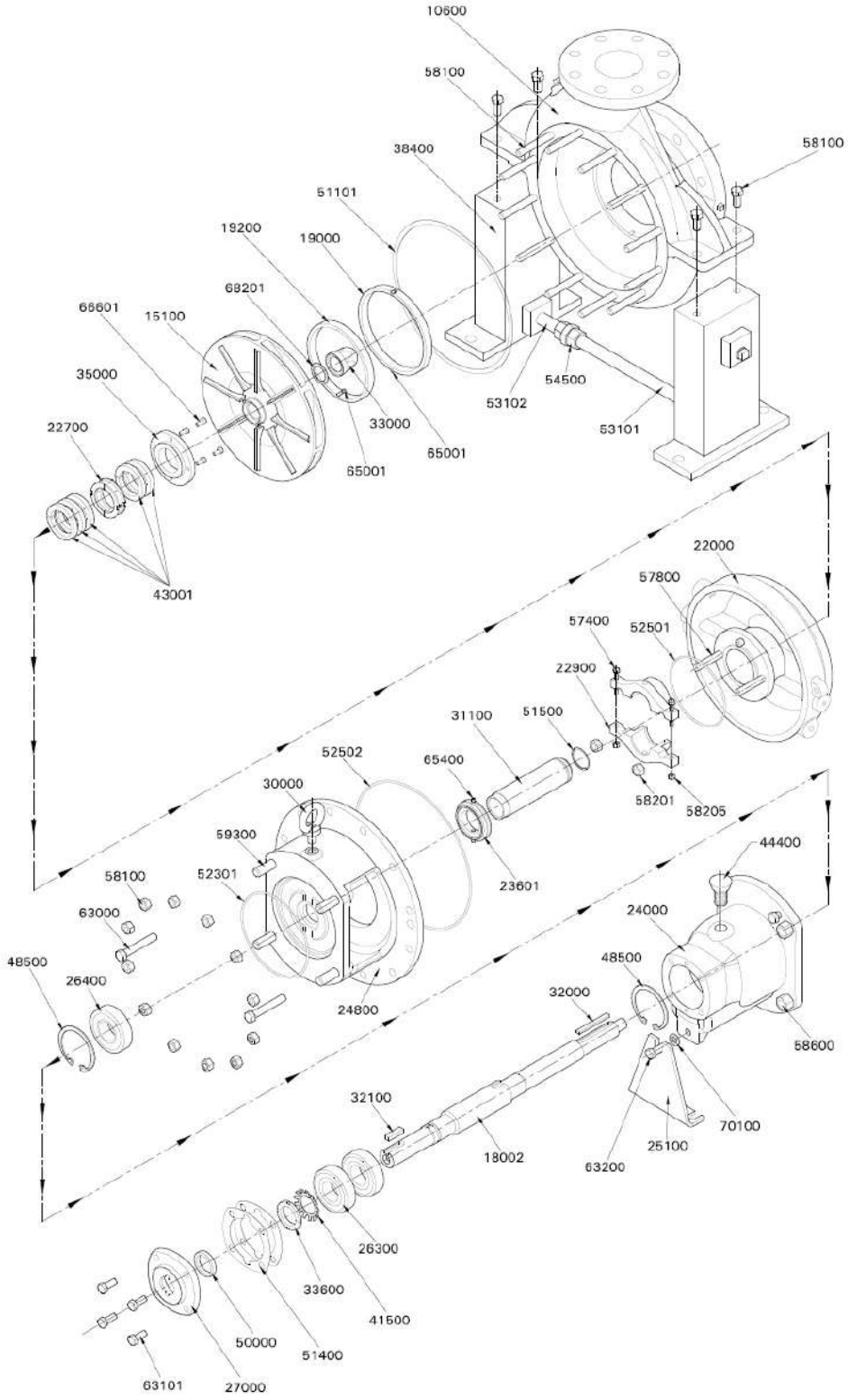
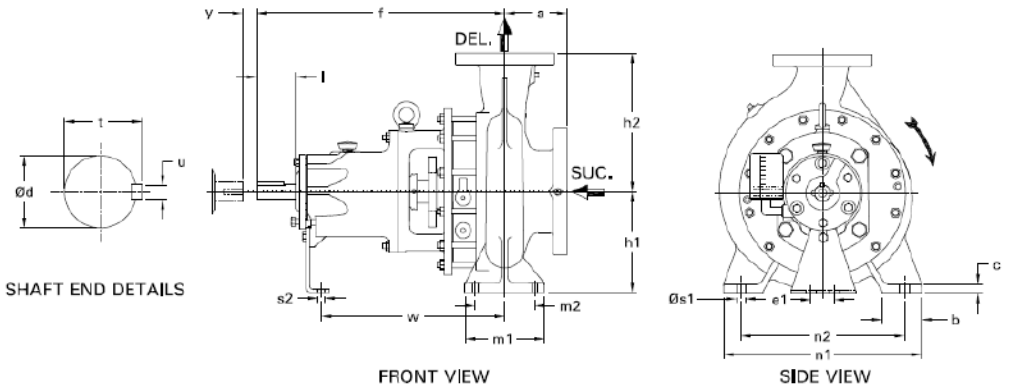
50000
51400
63101
27000

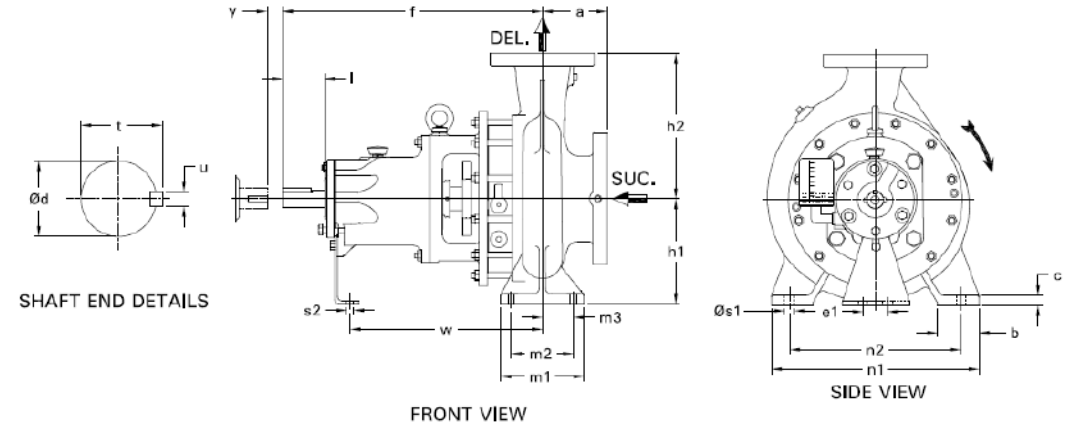


GENERAL OUTLINE DIMENSIONS OF KPD/KPDQF PUMPS (FM)

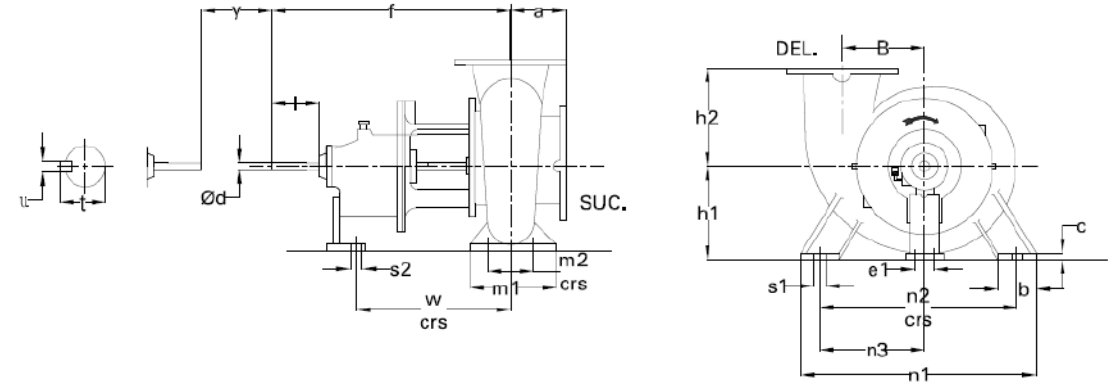
1. Figure A



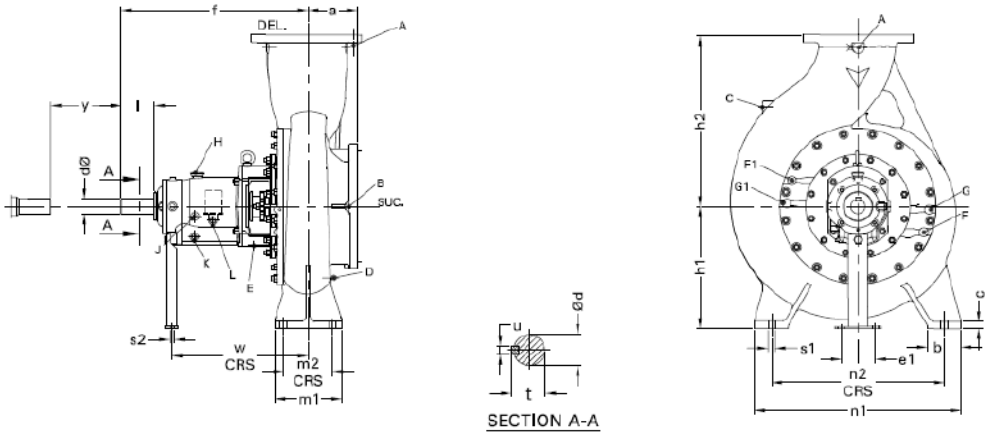
2. Figure B



3. Figure C



4. Figure D



GENERAL OUTLINE DIMENSIONS OF KPD PUMPS (CLM)

1. Figure E .

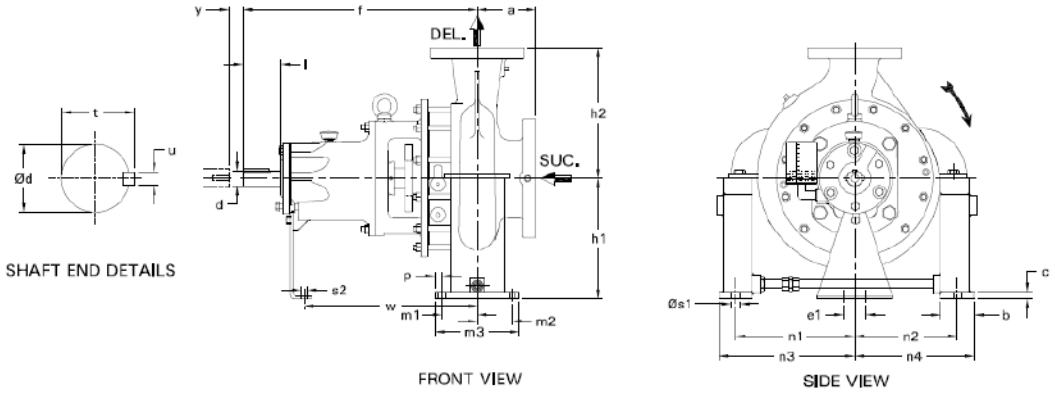
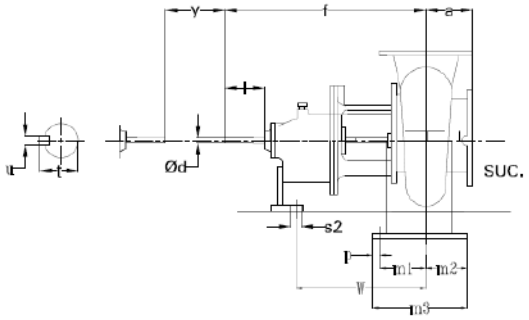
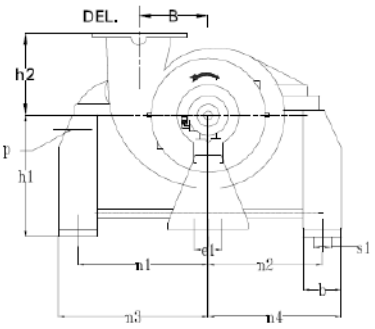


Figure F.


y
f
a
Ød
SUC.
s2
m1
m2
W
m3


DEL.
B
h2
p
h1
n1
n2
n3
n4
s1

GENERAL OUTLINE DIMENSIONS OF KPD/KPDOF PUMPS (KPD UNIT 4, 5, 7)

PRODCD1	PUMP	FIG	SUC	DEL	UNIT	a	f	h1	h2	B	b	c	m1	m2	m3	n1	n2	n3	w	s1	s2	ø1	d	l	t	u	y
13F41	KPD20/13OF	A	25	20	4	80	385	100	140	NA	50	10	80	50	NA	190	140	NA	285	14	14	110	18	40	21	6	100
13F42	KPD20/16OF	A	25	20	4	80	385	132	150	NA	50	10	100	70	NA	210	160	NA	285	14	14	110	18	40	21	6	100
13F43	KPD20/20OF	A	25	20	4	80	386	160	170	NA	50	10	100	70	NA	240	190	NA	285	14	14	110	18	40	21	6	100
13F37	KPD25/16OF	A	40	25	5	100	386	132	165	NA	50	14	100	70	NA	210	160	NA	285	14	15	110	24	8	27	50	100
13701	KPD32/13	A	50	32	5	80	385	112	140	NA	50	14	100	70	NA	190	140	NA	285	14	15	110	24	50	27	8	100
13702	KPD32/16	A	50	32	5	80	385	132	160	NA	50	14	100	70	NA	240	190	NA	285	14	15	110	24	50	27	8	100
13703	KPD32/20	A	50	32	5	80	385	160	180	NA	50	14	100	70	NA	240	190	NA	285	14	15	110	24	50	27	8	100
14402	KPD32/16A	A	50	32	5	80	385	132	160	NA	50	14	100	70	NA	240	190	NA	285	14	15	110	24	50	27	8	100
14403	KPD32/20A	A	50	32	5	80	386	160	180	NA	50	14	100	70	NA	240	190	NA	285	14	15	110	24	50	27	8	100
14407	KPD40/20A	A	65	40	5	100	386	180	180	NA	50	14	100	70	NA	285	212	NA	285	14	15	110	24	50	27	8	100
14411	KPD50/16A	A	80	50	5	100	385	160	180	NA	50	14	100	70	NA	285	212	NA	285	14	15	110	24	50	27	8	100
13705	KPD40/13	A	65	40	5	80	385	112	140	NA	50	14	100	70	NA	210	160	NA	285	14	15	110	24	50	27	8	100
13706	KPD40/16	A	65	40	5	80	385	132	160	NA	50	14	100	70	NA	240	190	NA	285	14	15	110	24	50	27	8	100
13707	KPD40/20	A	65	40	5	100	385	160	180	NA	50	14	100	70	NA	285	212	NA	285	14	15	110	24	50	27	8	100
13710	KPD50/13	A	80	50	5	100	385	132	160	NA	50	14	100	70	NA	240	190	NA	285	14	15	110	24	50	27	8	100
13711	KPD50/16	A	80	50	5	100	386	160	180	NA	50	14	100	70	NA	285	212	NA	285	14	15	110	24	50	27	8	100
13712	KPD50/20	A	80	50	5	100	386	180	200	NA	50	14	100	70	NA	285	212	NA	285	14	15	110	24	50	27	8	100
13715	KPD65/13	A	100	65	5	100	385	160	180	NA	65	14	125	95	NA	280	212	NA	285	14	15	110	24	50	27	8	100
13745	KPD32/26	A	50	32	7	100	500	180	225	NA	65	14	125	95	NA	320	250	NA	370	14	15	110	32	80	35	10	140
13746	KPD40/26	A	65	40	7	100	500	180	225	NA	65	14	125	95	NA	320	250	NA	370	14	15	110	32	80	35	10	140
13747	KPD40/32	A	65	40	7	125	500	200	250	NA	65	14	125	95	NA	345	280	NA	370	14	15	110	32	80	35	10	140
13748	KPD50/26	A	80	50	7	125	500	180	225	NA	65	14	125	95	NA	320	250	NA	370	14	15	110	32	80	35	10	140
13749	KPD50/32	A	80	50	7	125	500	225	280	NA	65	14	125	95	NA	345	280	NA	370	14	15	110	32	80	35	10	140
13750	KPD65/16	A	100	65	7	100	500	180	200	NA	65	14	125	95	NA	280	212	NA	370	14	15	110	32	80	35	10	140
13751	KPD65/20	A	100	65	7	100	500	180	225	NA	65	14	125	95	NA	320	250	NA	370	14	15	110	32	80	35	10	140
13752	KPD65/26	A	100	65	7	125	500	200	250	NA	80	16	160	120	NA	360	280	NA	370	18	15	110	32	80	35	10	140
13753	KPD80/16	A	125	80	7	125	500	180	225	NA	65	14	125	95	NA	320	250	NA	370	14	15	110	32	80	35	10	140
13754	KPD80/20	A	125	80	7	125	500	180	250	NA	65	14	125	95	NA	345	280	NA	370	14	15	110	32	80	35	10	140
13755	KPD80/26	A	125	80	7	125	500	225	280	NA	80	16	160	120	NA	400	315	NA	370	18	15	110	32	80	35	10	140
13770	KPD100/16	A	125	100	7	150	500	225	280	NA	65	14	125	95	NA	320	250	NA	370	14	15	110	32	80	35	10	140
13756	KPD100/20	A	125	100	7	125	500	200	280	NA	80	16	160	120	NA	360	280	NA	370	18	15	110	32	80	35	10	140
13757	KPD65/26N	A	100	65	7	125	500	200	250	NA	80	16	160	120	NA	360	280	NA	370	18	15	110	32	80	35	10	140
13793	KPD25/26A	A	50	25	7	100	500	180	225	NA	65	14	125	95	NA	320	250	NA	370	14	15	110	32	80	35	10	140

GENERAL OUTLINE DIMENSIONS OF KPD/KPDQF PUMPS (KPD UNIT 9,11,13,15,19)

PRODCD1	PUMP	FIG	SUC	DEL	UNIT	a	f	h1	h2	B	b	c	m1	m2	m3	n1	n2	n3	w	s1	s2	e1	d	l	t	u	y
13719	KPD65/32 1.45ORPM	A	100	65	9	125	530	225	280	NA	80	16	160	120	NA	400	315	NA	370	18	15	110	42	110	45	12	140
3723	KPD80/32	A	125	80	9	125	530	250	315	NA	80	16	160	120	NA	400	315	NA	370	18	15	110	42	110	45	12	140
3724	KPD80/40	A	125	80	9	125	530	280	355	NA	80	16	160	120	NA	435	355	NA	370	18	15	110	42	110	45	12	140
3726	KPD100/26	A	125	100	9	140	530	225	280	NA	80	16	160	120	NA	400	315	NA	370	18	15	110	42	110	45	12	140
3727	KPD100/32	A	125	100	9	140	530	250	315	NA	80	16	160	120	NA	400	315	NA	370	18	15	110	42	110	45	12	140
3728	KPD100/32N	A	125	100	9	140	530	250	315	NA	80	16	160	120	NA	400	315	NA	370	18	15	110	42	110	45	12	140
3726	KPD100/40 KPD125/28	A	125	100	9	140	530	280	355	NA	100	18	200	150	NA	500	400	NA	370	23	15	110	42	110	45	12	140
3729	1.45ORPM	A	150	125	9	140	530	250	355	NA	80	16	160	120	NA	400	315	NA	370	18	15	110	42	110	45	12	140
3730	KPD125/32	A	150	125	9	140	530	280	355	NA	100	18	200	150	NA	500	400	NA	370	23	15	110	42	110	45	12	140
3731	KPD125/40	A	150	125	9	140	530	315	400	NA	100	18	200	150	NA	500	400	NA	370	23	15	110	42	110	45	12	140
3732	KPD150/32	A	200	150	9	160	530	315	400	NA	100	22	200	150	NA	500	450	NA	370	23	15	110	42	110	45	12	140
3733	KPD150/40 KPD65/32	A	200	150	9	160	530	315	450	NA	100	18	200	150	NA	550	450	NA	370	23	15	110	42	110	45	12	140
3740	2900RPM	A	100	65	9	125	530	225	280	NA	80	16	160	120	NA	400	315	NA	370	18	15	110	42	110	45	12	140
3744	KPD150/32N	A	200	150	9	160	530	315	400	NA	100	22	200	150	NA	500	400	NA	370	23	15	110	42	110	45	12	140
3758	KPD80/40N	A	125	80	9	125	530	280	355	NA	80	16	160	120	NA	435	355	NA	370	18	15	110	42	110	45	12	140
3759	KPD125/40N	A	150	125	9	140	530	315	400	NA	100	18	200	150	NA	500	400	NA	370	23	15	110	42	110	45	12	140
3762	KPD65/43	B	100	65	9	160	530	280	365	NA	80	18	160	120	60	435	355	NA	370	18	15	110	42	110	45	12	140
3771	KPD125/20	A	150	125	9	140	530	250	315	NA	80	16	160	120	NA	400	315	NA	370	18	15	110	42	110	45	12	140
3782	KPD150/26	A	200	150	9	160	530	280	375	NA	100	20	200	150	NA	500	400	NA	370	23	16	110	42	110	45	12	140
3761	KPD125/45	B	150	125	11	160	670	350	460	NA	100	20	180	120	70	550	450	NA	500	23	19	140	48	110	51.4	14	180
3764	KPD150/43	B	200	150	11	160	685	350	475	NA	100	20	180	120	70	550	450	NA	514	23	19	140	48	110	51.4	14	180
3797	KPD125/26 2900RPM	A	150	125	11	140	670	250	355	NA	80	16	160	120	NA	400	315	NA	500	18	19	140	48	110	51.5	14	180
3768	KPD80/40DV	A	125	80	11	125	670	280	355	NA	80	16	160	120	NA	435	355	NA	500	18	19	140	48	110	51.5	14	180
3767	KPD100/40D	A	150	100	11	140	670	280	355	NA	100	18	200	150	NA	500	400	NA	500	23	19	140	48	110	51.5	14	180
3780	KPD200/33	C	200	200	11C	200	720	370	315	NA	100	25	335	265	NA	630	560	NA	550	27	19	140	48	110	51.5	14	180
3781	KPD200/26	C	200	200	11	200	718	350	300	250	110	25	260	200	NA	640	530	295	548	27	19	140	48	110	51.5	14	180
3789	KPD125/32 2900RPM	A	150	125	13	140	643	280	355	NA	100	18	200	150	NA	500	400	NA	457	23	15	140	60	110	64.4	18	160
3798	KPD200/38M	A	250	200	13	200	670	400	500	NA	120	30	240	180	NA	550	430	NA	483.5	27	19	140	60	110	64.4	18	180
3795	KPD200/46	A	250	200	13	200	670	425	550	NA	120	30	240	180	NA	640	540	NA	483	27	19	140	60	110	64.4	18	180
3760	KPD150/52	A	200	150	13	200	670	400	550	NA	150	30	240	180	NA	650	530	NA	483.5	27	19	140	60	110	64.4	18	180
37A1	KPD150/28	A	200	150	13	178	670	280	375	NA	100	20	200	150	NA	500	400	NA	484	27	19	140	60	123	64.4	18	180
3782	KPD200/36	C	200	200	13	200	690	370	315	282	100	25	335	265	NA	630	560	NA	503.5	33	19	140	60	122.5	64.4	18	180
37C1	KPD250/33A	C	250	250	13	220	690	400	320	295	120	30	350	280	NA	750	630	350	503.5	33	19	140	60	123	64.4	18	180
37C2	KPD250/38	C	250	25	13	220	690	430	350	310	120	30	350	280	NA	800	680	380	504	33	19	140	60	123	64	18	180
37C3	KPD250/50	A	300	250	15	200	720	475	670	NA	130	30	280	190	NA	800	670	NA	515	28	18	140	60	130	64.4	18	180
37C4	KPD250/40	A	300	250	15	200	720	425	600	NA	130	30	260	190	NA	800	670	NA	515	28	19	140	60	130	64.4	18	180
37G2	KPD 150/56	D	200	150	19	200	930	415	575	NA	200	32	250	180	NA	900	750	NA	710	28	18	140	75	147	79.9	20	250
37G1	KPD 350/40	D	400	350	19	300	930	500	675	NA	225	40	400	300	NA	1250	1170	NA	710	28	18	140	75	147	79.9	20	315

INTERCHANGEABILITY CHART OF KPDF, KPD CLM, KPDQF-J PUMPS...(DRIVING UNIT NO. KPD - 4)

PART NO.	PUMP SIZE / PART DESCRIPTION	TOTAL NO.OF PARTS	20/12			20/16			20/20		
			KPD-QF	CLM	KPD-QF-J	KPD-QF	CLM	KPD-QF-J	KPD-QF	CLM	KPD-QF-J
105	PUMP CACING FOOT MOUNTED	3	1			2			3		
106	PUMP CACING CENTRE LINE MOUNTED	3	1			2			3		
153	SEMI OPEN IMPELLER	3	1			2			3		
180.1	PUMP SHAFT WITH DEEP GROOVE BRG.	1	1			1			1		
180.2	PUMP SHAFT WITH REINFORCED DRG. ARRGT.	1	1			1			1		
190	CASING WEAR RING (SUCTION)	NA	NA			NA			NA		
191	CASING WEAR RING (DEL)	NA	NA			NA			NA		
192	IMPELLER WEAR RING (SUC)	NA	NA			NA			NA		
193	IMPELLER RING (DEL)	NA	NA			NA			NA		
209	SPACER RING	1	1			1			1		
220	CASING COVER	3	1			2			3		
226	DRIP PAN	1	1			1			1		
227	LANTERN RING	1	1			1			1		
229	SPIT GLAND	1	1			1			1		
236	LIQUID DEFLECTOR	1	1			1			1		
240	BEARING HOUSING (STD.)	1	1			1			1		
241	BEARING CARTRIDGE	1	1			1			1		
252	BEARING HOUSING (WITH COOLING)	1	1			1			1		
251	SUPPORT FOOT FOR FOOT MOUNTED	3	1			2			3		
251	SUPPORT FOOT FOR CENTRE LINE MOUNTED	3	1			2			3		
260.1,260.2	DEEP GROOVE BALL BEARING D.S. & P.S.	1	1			1			1		
263	ANGULAR CONTACT BALL BEARING	1	1			1			1		
264	CYLINDRICAL ROLLER BEARING	1	1			1			1		
270	BEARING COVER N.D.S.	1	1			1			1		
311	SHAFT SLEEVE	1	1			1			1		
330	IMPELLER NUT	NA	NA			NA			NA		
350	ST. BOX BUSH	1	1			1			1		
367	OIL WELL COVER FOR BRG.OIL COOLING	1	1			1			1		
430	GLAND PACKING	1	1			1			1		
443	CONSTANT LEVEL OILER	1	1			1			1		
460	WEAR PLATE SUC. SIDE	NA	NA			NA			NA		
511	GASKET FOR CASING COVER	3	1			2			3		
514	GASKET FOR BRG.COVER D.S	1	1			1			1		
515	GASKET FOR SHAFT SLEEVE	1	1			1			1		
523	O-RING FOR BEARING HOUSING AND LANTERN BRACKET	1	1			1			1		
525.1	'O' RING FOR CASING COVER	1	1			1			1		
525.2	O' RING FOR LANTERN BRACKET	1	1			1			1		

INTERCHANGEABILITY CHART OF KPD, KPDQF, KPD CLM, KPD-J, AND KPDQF-J PUMPS...(DRIVING UNIT NO. KPD - 5)

PART NO.	PUMP SIZE / PART DESCRIPTION	TOTAL NO. OF PARTS	32/13				40/13				50/13				65/13				25/16				32/16				40/16				50/16				32/20				40/20				50/20			
			KPD	KPD-QF	CLM	KPD-QF-J	KPD	KPD-QF	CLM	KPD-QF-J	KPD	KPD-QF	CLM	KPD-QF-J	KPD	KPD-QF	CLM	KPD-QF-J	KPD	KPD-QF	CLM	KPD-QF-J	KPD	KPD-QF	CLM	KPD-QF-J	KPD	KPD-QF	CLM	KPD-QF-J	KPD	KPD-QF	CLM	KPD-QF-J	KPD	KPD-QF	CLM	KPD-QF-J	KPD	KPD-QF	CLM	KPD-QF-J	KPD	KPD-QF	CLM	KPD-QF-J
105	PUMP CACING FOOT MOUNTED	22	1	1	-	2	3	3	-	4	5	5	-	6	7	7	-	8	9	9	-	10	11	11	-	12	13	13	-	14	15	15	-	16	17	17	-	18	19	19	-	20	21	21	-	22
106	PUMP CACING CENTRE LINE MOUNTED	11	-	-	1	-	-	-	2	-	-	-	3	-	-	-	4	-	-	-	5	-	-	-	6	-	-	-	7	-	-	8	-	-	-	9	-	-	-	10	-	-	-	11	-
151	ENCLOSED IMPELLER	10	1				2				3				4				-				5				6				7				8				9				10			
153	SEMI OPEN IMPELLER	11	1				2				3				4				5				6				7				8				9				10				11			
180.1	PUMP SHAFT WITH DEEP GROOVE BRG.	1	1				1				1				1				1				1				1				1				1				1				1			
180.2	PUMP SHAFT WITH REINFORCED DRG. ARRGT.	1	1				1				1				1				1				1				1				1				1				1				1			
190	CASING WEAR RING (SUCTION)	4	1	-	1	-	1	2	-	2	-	2	3	-	3	-	3	4	-	4	-	4	-					1	-	1	-	1	2	-	2	-	2	3	-	3	-	3	2	-	2	-	2	2	-	2	-	2	3	-	3	-	3
191	CASING WEAR RING (DEL)	NA	NA																																											
192	IMPELLER WEAR RING (SUC)	4	1	-	1	-	1	2	-	2	-	2	3	-	3	-	3	4	-	4	-	4	-					1	-	1	-	1	2	-	2	-	2	3	-	3	-	3	2	-	2	-	2	2	-	2	-	2	3	-	3	-	3
193	IMPELLER RING (DEL)	NA	NA																																										
220	CASING COVER	18	1	2	1	3	4	1	2	1	3	4	1	2	1	3	4	1	2	1	3	4	-	5	5	6	7	8	8	8	9	9	8	10	8	11	12	8	10	8	11	12	13	14	13	15	16	13	14	13	15	16	13	17	13	18	16
226	DRIP PAN	3	1				1				1				1				1				1				1				1				2				2				2			
227	LANTERN RING	1	1				1				1				1				1				1				1				1				1				1				1			
229	SPIT GLAND	1	1				1				1				1				1				1				1				1				1				1				1			
236	LIQUID DEFLECTOR	1	1				1				1				1				1				1				1				1				1				1				1			
240	BEARING HOUSING (STD.)	1	1				1				1				1				1				1				1				1				1				1				1			
241	BEARING CARTRIDGE	1	1				1				1				1				1				1				1				1				1				1				1			
252	BEARING HOUSING (WITH COOLING)	1	1				1				1				1				1				1				1				1				1				1				1			
248	LANTERN BRACKET	3	1				1				1				1				2				2				2				2				3				3				3			
251	SUPPORT FOOT FOR FOOT MOUNTED	3	1				1				2				3				2				2				2				3				3				3				3			
251	SUPPORT FOOT FOR CENTRE LINE MOUNTED	1	1				1				1				1				1				1				1				1				1				1				1			
260.1,260.2	DEEP GROOVE BALL BEARING D.S. & P.S.	1	1				1				1				1				1				1				1				1				1				1				1			
263	ANGULAR CONTACT BALL BEARING	1	1				1				1				1				1				1				1				1				1				1				1			
264	CYLINDRICAL ROLLER BEARING	1	1				1				1				1				1				1				1				1				1				1				1			
270	BEARING COVER D.S.	1	1				1				1				1				1				1				1				1				1				1				1			
311	SHAFT SLEEVE	1	1				1				1				1				1				1				1				1				1				1				1			
330	IMPELLER NUT	1	1				1				1				1				1				1				1				1				1				1				1			
350	ST. BOX BUSH	1	1				1				1				1				1				1				1				1				1				1				1			
367	OIL WELL COVER FOR BRG.OIL COOLING	1	1				1				1				1				1				1				1				1				1				1				1			
430	GLAND PACKING	1	1				1				1				1				1				1				1				1				1				1				1			
443	CONSTANT LEVEL OILER	1	1				1				1				1				1				1				1				1				1				1				1			
460	WEAR PLATE SUC. SIDE	11	-	1		1	-	2		2	-	3		3	-	4		4	-	5		5	-	6		6	-	7		7	-	8		8	-	9		9	-	10		10	-	11		11	-
511	GASKET FOR CASING COVER	3	1				1				1				1				2				2				2				2				3				3				3			
514	GASKET FOR BRG.COVER D.S	1	1				1				1				1				1				1				1				1				1				1				1			
515	GASKET FOR SHAFT SLEEVE	1	1				1				1				1				1				1				1				1				1				1				1			
525.1	'O' RING FOR CASING COVER	1	1				1				1				1				1				1				1				1				1				1				1			
525.2	O' RING FOR LANTERN BRACKET	3	1				1				1				1				2				2				2				2				3				3				3			
682	GASKET FOR IMPELLER NUT	1	1				1				1				1				1				1				1				1				1				1				1			

INTERCHANGEABILITY CHART OF KPD, KPDQF, KPD CLM, KPD-J, AND KPDQF-J PUMPS...(DRIVING UNIT NO. KPD -7)

PART NO.	PUMP SIZE	TOTAL NO.OF	25/26A					32/26					40/26					40/32					50/26				
	PART DESCRIPTION		KPD	KPD-QF	CLM	KPD-QF-J	KPD-J	KPD	KPD-QF	CLM	KPD-QF-J	KPD-J	KPD	KPD-QF	CLM	KPD-QF-J	KPD-J	KPD	KPD-QF	CLM	KPD-QF-J	KPD-J	KPD	KPD-QF	CLM	KPD-QF-J	KPD-J
105	PUMP CACING FOOT MOUNTED	28	1	NA	-	NA	2	3	3	-	4	4	5	5	-	6	6	7	7	-	8	8	9	9	-	10	10
106	PUMP CACING CENTRE LINE MOUNTED	15	-	-	1	-	-	-	-	2	-	-	-	-	3	-	-	-	-	4	-	-	-	-	5	-	-
151	ENCLOSED IMPELLER	15	1	-	1	-	1	2	-	2	-	2	3	-	3	-	3	4	-	4	-	4	5	-	5	-	5
153	SEMI OPEN IMPELLER	12	-	NA	-	NA	-	-	1	-	1	-	-	2	-	2	-	-	3	-	3	-	-	4	-	4	-
180.1	PUMP SHAFT WITH DEEP GROOVE BRG.	1	1					1					1					1					1				
180.2	PUMP SHAFT WITH REINFORCED DRG. ARRGT.	1	1					1					1					1					1				
190	CASING WEAR RING (SUCTION)	11	1	NA	1	NA	1	2	NA	2	NA	2	3	NA	3	NA	3	2	NA	1	NA	2	4	NA	4	NA	4
191	CASING WEAR RING (DEL)	2	NA					NA					NA					1					NA				
192	IMPELLER WEAR RING (SUC)	11	1	NA	1	NA	1	2	NA	2	NA	2	3	NA	3	NA	3	2	NA	2	NA	2	4	NA	4	NA	4
193	IMPELLER RING (DEL)	2	NA					NA					NA					1					NA				
220	CASING COVER		1	NA	1	NA	2	3	4	3	4	3	3	3	3	3	3	6	7	6	7	6	3	3	3	3	3
226	DRIP PAN	3	1					1					1					1					1				
227	LANTERN RING	1	1					1					1					1					1				
229	SPIT GLAND	1	1					1					1					1					1				
236	LIQUID DEFLECTOR	1	1					1					1					1					1				
240	BEARING HOUSING (STD.)	2	1	2	-	2	1	1	2	-	2	1	1	2	-	2	1	1	2	-	2	1	1	2	-	2	1
241	BEARING CARTRIDGE	1	-	NA	-	NA	-	-	1	-	1	-	-	1	-	1	-	-	1	-	1	-	-	1	-	1	-
252	BEARING HOUSING (WITH COOLING)	1	-	-	1	-	-	-	-	1	-	-	-	-	1	-	-	-	-	1	-	-	-	-	1	-	-
248	LANTERN BRACKET	3	1	NA	-	NA	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
251	SUPPORT FOOT FOR FOOT MOUNTED	5	1	NA	-	NA	1	1	1	-	1	1	1	1	-	1	1	2	2	-	2	2	1	1	-	1	1
251	SUPPORT FOOT FOR CENTRE LINE MOUNTED	3	-	-	NA	-	-	-	-	1	-	-	-	-	1	-	-	-	-	1	-	-	-	-	1	-	-
260	DEEP GROOVE BALL BEARING D.S. & P.S.	NA	NA					NA					NA					NA					NA				
263	ANGULAR CONTACT BALL BEARING	1	1					1					1					1					1				
204	CYLINDRICAL ROLLER BEARING	1	1					1					1					1					1				
270	BEARING COVER D.S.	1	1	-	1	-	1	1	-	1	-	1	1	-	1	-	1	1	-	1	-	1	1	-	1	-	1
311	SHAFT SLEEVE	1	1					1					1					1					1				
330	IMPELLER NUT	1	1					1					1					1					1				
350	ST. BOX BUSH	1	1					1					1					1					1				
367	OIL WELL COVER FOR BRG.OIL COOLING	1	1					1					1					1					1				
430	GLAND PACKING	1	1					1					1					1					1				
443	CONSTANT LEVEL OILER	1	1					1					1					1					1				
460	WEAR PLATE SUC. SIDE	12	NA					-	1	-	1	-	-	2	-	2	-	-	3	-	3	-	-	4	-	4	-
511	GASKET FOR CASING COVER	9	1	2	1	1	2	1	2	1	1	2	1	2	1	1	2	3	4	3	3	4	1	2	1	1	2
514	GASKET FOR BRG.COVER D.S	1	1					1					1					1					1				
515	GASKET FOR SHAFT SLEEVE	1	1					1					1					1					1				
525.1	'O' RING FOR CASING COVER	1	1					1					1					1					1				
525.2	O' RING FOR LANTERN BRACKET	1	1					1					1					1					1				
682	GASKET FOR IMPELLER NUT	1	1					1					1					1					1				

PART NO.	PUMP SIZE	TOTAL NO.OF	50/32					65/16					65/20					65/26					65/26N				
	PART DESCRIPTION		KPD	KPD-QF	CLM	KPD-QF-J	KPD-J	KPD	KPD-QF	CLM	KPD-QF-J	KPD-J	KPD	KPD-QF	CLM	KPD-QF-J	KPD-J	KPD	KPD-QF	CLM	KPD-QF-J	KPD-J	KPD	KPD-QF	CLM	KPD-QF-J	KPD-J
105	PUMP CACING FOOT MOUNTED	28	11	11	-	12	12	13	13	-	14	14	15	15	-	16	16	17	17	-	18	18	17	NA	-	NA	18
106	PUMP CACING CENTRE LINE MOUNTED	15	-	-	6	-	-	-	-	7	-	-	-	-	8	-	-	-	-	9	-	-	-	-	10	-	-
151	ENCLOSED IMPELLER	15	6	-	6	-	6	7	-	7	-	7	8	-	8	-	8	9	-	9	-	9	10	-	10	-	10
153	SEMI OPEN IMPELLER	12	-	5	-	5	-	-	6	-	6	-	-	7	-	7	-	-	8	-	8	-	-	NA	-	NA	-
180.1	PUMP SHAFT WITH DEEP GROOVE BRG.	1	1					1					1					1					1				
180.2	PUMP SHAFT WITH REINFORCED DRG. ARRGT.	1	1					1					1					1					1				
190	CASING WEAR RING (SUCTION)	11	5	NA	5	NA	5	6	NA	6	NA	6	7	NA	7	NA	7	4	NA	4	NA	4	4	NA	4	NA	4
191	CASING WEAR RING (DEL)	2	2					NA					NA					NA					NA				
192	IMPELLER WEAR RING (SUC)	11	5	NA	5	NA	5	6	NA	6	NA	6	7	NA	7	NA	7	4	NA	4	NA	4	4	NA	4	NA	4
193	IMPELLER RING (DEL)	2	2					NA					NA					NA					NA				
220	CASING COVER		8	7	8	7	8	9	9	9	9	9	10	10	10	10	10	3	3	3	3	3	3	NA	3	NA	3
226	DRIP PAN	3	1					2					3					1					1				
227	LANTERN RING	1	1					1					1					1					1				
229	SPIT GLAND	1	1					1					1					1					1				
236	LIQUID DEFLECTOR	1	1					1					1					1					1				
240	BEARING HOUSING (STD.)	2	1	2	-	2	1	1	2	-	2	1	1	2	-	2	1	1	2	-	2	1	1	NA	-	NA	1
241	BEARING CARTRIDGE	1	-	1	-	1	-	-	1	-	1	-	-	1	-	1	-	-	1	-	1	-	-	1	-	1	-
252	BEARING HOUSING (WITH COOLING)	1	-	-	1	-	-	-	-	1	-	-	-	-	1	-	-	-	-	1	-	-	-	-	1	-	-
248	LANTERN BRACKET	3	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	1	1	1	1	1	1	NA	1	NA	1
251	SUPPORT FOOT FOR FOOT MOUNTED	5	3	3	-	3	3	4	4	-	4	4	1	1	-	1	1	2	2	-	2	2	2	2	-	2	2
251	SUPPORT FOOT FOR CENTRE LINE MOUNTED	3	-	-	1	-	-	-	-	1	-	-	-	-	1	-	-	-	-	1	-	-	-	-	1	-	-
260	DEEP GROOVE BALL BEARING D.S. & P.S.	NA	NA					NA					NA					NA					NA				
263	ANGULAR CONTACT BALL BEARING	1	1					1					1					1					1				
204	CYLINDRICAL ROLLER BEARING	1	1					1					1					1					1				
270	BEARING COVER D.S.	1	1	-	1	-	1	1	-	1	-	1	1	-	1	-	1	1	-	1	-	1	1	-	1	-	1
311	SHAFT SLEEVE	1	1					1					1					1					1				
330	IMPELLER NUT	1	1					1					1					1					1				
350	ST. BOX BUSH	1	1					1					1					1					1				
367	OIL WELL COVER FOR BRG.OIL COOLING	1	1					1					1					1					1				
430	GLAND PACKING	1	1					1					1					1					1				
443	CONSTANT LEVEL OILER	1	1					1					1					1					1				
460	WEAR PLATE SUC. SIDE	12	-	5	-	5	-	-	6	-	6	-	-	7	-	7	-	-	8	-	8	-	-	NA	-	NA	-
511	GASKET FOR CASING COVER	9	3	4	3	3	4	5	6	5	5	6	7	8	7	7	8	1	2	1	1	2	1	2	1	1	2
514	GASKET FOR BRG.COVER D.S	1	1					1					1					1					1				
515	GASKET FOR SHAFT SLEEVE	1	1					1					1					1					1				
525.1	'O' RING FOR CASING COVER	1	1					1					1					1					1				
525.2	O' RING FOR LANTERN BRACKET	1	1					2					3					1					1				
682	GASKET FOR IMPELLER NUT	1	1					1					1					1					1				

PART NO.	PUMP SIZE	TOTAL NO.OF	80/16					80/20					80/26					100/16					100/20				
	PART DESCRIPTION		KPD	KPD-QF	CLM	KPD-QF-J	KPD-J	KPD	KPD-QF	CLM	KPD-QF-J	KPD-J	KPD	KPD-QF	CLM	KPD-QF-J	KPD-J	KPD	KPD-QF	CLM	KPD-QF-J	KPD-J	KPD	KPD-QF	CLM	KPD-QF-J	KPD-J
105	PUMP CACING FOOT MOUNTED	28	19	19	-	20	20	21	21	-	22	22	23	23	-	24	24	25	25	-	26	26	27	27	-	28	28
106	PUMP CACING CENTRE LINE MOUNTED	15	-	-	11	-	-	-	-	12	-	-	-	-	13	-	-	-	-	14	-	-	-	-	15	-	-
151	ENCLOSED IMPELLER	15	11	-	11	-	11	12	-	12	-	12	13	-	13	-	13	14	-	14	-	14	15	-	15	-	15
153	SEMI OPEN IMPELLER	12	-	9	-	9	-	-	10	-	10	-	-	11	-	11	-	-	NA	-	NA	-	-	12	-	12	-
180.1	PUMP SHAFT WITH DEEP GROOVE BRG.	1	1					1					1					1					1				
180.2	PUMP SHAFT WITH REINFORCED DRG. ARRGT.	1	1					1					1					1					1				
190	CASING WEAR RING (SUCTION)	11	8	NA	8	NA	8	9	NA	9	NA	9	9	NA	9	NA	9	10	NA	10	NA	10	11	NA	11	NA	11
191	CASING WEAR RING (DEL)	2	NA					NA					NA					NA					NA				
192	IMPELLER WEAR RING (SUC)	11	8	NA	8	NA	8	9	NA	9	NA	9	9	NA	9	NA	9	10	NA	10	NA	10	11	NA	11	NA	11
193	IMPELLER RING (DEL)	2	NA					NA					NA					NA					NA				
220	CASING COVER		9	9	9	9	9	10	10	10	10	10	3	5	3	5	3	12	NA	12	NA	12	10	11	10	11	10
226	DRIP PAN	3	2					3					1					2					3				
227	LANTERN RING	1	1					1					1					1					1				
229	SPIT GLAND	1	1					1					1					1					1				
236	LIQUID DEFLECTOR	1	1					1					1					1					1				
240	BEARING HOUSING (STD.)	2	1	2	-	2	1	1	2	-	2	1	1	2	-	2	1	1	NA	-	NA	1	1	2	-	2	1
241	BEARING CARTRIDGE	1	-	1	-	1	-	-	1	-	1	-	-	1	-	1	-	-	NA	-	NA	-	-	1	-	1	-
252	BEARING HOUSING (WITH COOLING)	1	-	-	1	-	-	-	-	1	-	-	-	-	1	-	-	-	-	1	-	-	-	-	1	-	-
248	LANTERN BRACKET	3	2	2	2	2	2	3	3	3	3	3	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3
251	SUPPORT FOOT FOR FOOT MOUNTED	5	1	1	-	1	1	1	1	-	1	1	3	3	-	3	3	5	5	-	5	5	2	2	-	2	2
251	SUPPORT FOOT FOR CENTRE LINE MOUNTED	3	-	-	1	-	-	-	-	1	-	-	-	-	2	-	-	-	-	3	-	-	-	-	1	-	-
260	DEEP GROOVE BALL BEARING D.S. & P.S.	NA	NA					NA					NA					NA					NA				
263	ANGULAR CONTACT BALL BEARING	1	1					1					1					1					1				
204	CYLINDRICAL ROLLER BEARING	1	1					1					1					1					1				
270	BEARING COVER D.S.	1	1	-	1	-	1	1	-	1	-	1	1	-	1	-	1	1	-	1	-	1	1	-	1	-	1
311	SHAFT SLEEVE	1	1					1					1					1					1				
330	IMPELLER NUT	1	1					1					1					1					1				
350	ST. BOX BUSH	1	1					1					1					1					1				
367	OIL WELL COVER FOR BRG.OIL COOLING	1	1					1					1					1					1				
430	GLAND PACKING	1	1					1					1					1					1				
443	CONSTANT LEVEL OILER	1	1					1					1					1					1				
460	WEAR PLATE SUC. SIDE	12	-	9	-	9	-	-	10	-	10	-	-	11	-	11	-	-	NA	-	NA	-	-	12	-	12	-
511	GASKET FOR CASING COVER	9	5	6	5	5	6	7	8	7	7	8	1	2	1	1	2	9	NA	9	NA	9	7	8	7	7	8
514	GASKET FOR BRG.COVER D.S	1	1					1					1					1					1				
515	GASKET FOR SHAFT SLEEVE	1	1					1					1					1					1				
525.1	'O' RING FOR CASING COVER	1	1					1					1					1					1				
525.2	O' RING FOR LANTERN BRACKET	1	2					3					1					3					3				
682	GASKET FOR IMPELLER NUT	1	1					1					1					1					1				

INTERCHANGEABILITY CHART OF KPD, KPDQF, KPD CLM, KPD-J, AND KPDQF-J PUMPS...(DRIVING UNIT NO. KPD - 9)

PART NO.	PUMP SIZE	TOTAL NO.OF	65/32					80/32					80/40				
	PART DESCRIPTION		KPD	KPD-G	CLM	KPD-G-J	KPD-J	KPD	KPD-G	CLM	KPD-G-J	KPD-J	KPD	KPD-G	CLM	KPD-G-J	KPD-J
105	PUMP CASING FOOT MOUNTED	25	1	1	-	2	2	3	3	-	4	4	5	6	-	7	8
106	PUMP CASING CENTRE LINE MOUNTED	14	-	-	1	-	-	-	-	2	-	-	-	-	3	-	-
151	ENCLOSED IMPELLER	17	1	-	1	-	1	2	-	2	-	2	3	-	3	-	3
153	SEMI OPEN IMPELLER	10	-	1	-	1	-	-	2	-	2	-	-	3	-	3	-
180.1	PUMP SHAFT WITH DEEP GROOVE BRG.	1	1					1					1				
180.2	PUMP SHAFT WITH REINFORCED DRG. ARRGT.	1	1					1					1				
190	CASING WEAR RING (SUCTION)	9	1	NA	1	NA	1	1	NA	1	NA	1	2	NA	2	NA	2
191	CASING WEAR RING (DEL)	5	1	NA	1	NA	1	1	NA	1	NA	1	2	NA	2	NA	2
192	IMPELLER WEAR RING (SUC)	9	1	NA	1	NA	1	1	NA	1	NA	1	2	NA	2	NA	2
193	IMPELLER RING (DEL)	4	1	NA	1	NA	1	1	NA	1	NA	1	2	NA	2	NA	2
220	CASING COVER	17	1	2	1	3	4	1	2	1	3	4	5	6	5	7	8
226	DRIP PAN	2	1					1					1				
227	LANTERN RING	1	1					1					1				
229	SPIT GLAND	1	1					1					1				
236	LIQUID DEFLECTOR	2	1					1					1				
240	BEARING HOUSING (STD.)	2	1	2	-	2	1	1	2	-	2	1	1	2	-	2	1
241	BEARING CARTRIDGE	1	-	-	1	-	-	-	-	1	-	-	-	-	1	-	-
252	BEARING HOUSING (WITH COOLING)	1	-	-	1	-	-	-	-	1	-	-	-	-	1	-	-
248	LANTERN BRACKET	3	1					1					1				
251	SUPPORT FOOT FOR FOOT MOUNTED	4	1	1	-	1	1	2	2	-	2	2	3	3	-	3	3
251	SUPPORT FOOT FOR CENTRE LINE MOUNTED	4	-	-	1	-	-	-	-	2	-	-	-	-	3	-	-
260.1,260.2	DEEP GROOVE BALL BEARING D.S. & P.S.	1	NA					NA					NA				
263	ANGULAR CONTACT BALL BEARING	1	1					1					1				
264	CYLINDRICAL ROLLER BEARING	1	1					1					1				
270	BEARING COVER D.S.	1	1					1					1				
311	SHAFT SLEEVE	2	1					1					1				
330	IMPELLER NUT	1	1					1					1				
350	ST. BOX BUSH	1	1					1					1				
367	OIL WELL COVER FOR BRG.OIL COOLING	1	1					1					1				
430	GLAND PACKING	1	1					1					1				
443	CONSTANT LEVEL OILER	1	1					1					1				
460	WEAR PLATE SUC. SIDE	10	1					2					3				
511	GASKET FOR CASING COVER	9	1	2	1	1	2	1	2	1	1	2	3	4	3	4	3
514	GASKET FOR BRG.COVER D.S	1	1					1					1				
515	GASKET FOR SHAFT SLEEVE	1	1					1					1				
525.1	'O' RING FOR CASING COVER	1	1					1					1				
525.2	O' RING FOR LANTERN BRACKET	1	1					1					1				
682	GASKET FOR IMPELLER NUT	1	1					1					1				

PART NO.	PUMP SIZE	80/40N					100/26					100/32				
	PART DESCRIPTION	KPD	KPD-G	CLM	KPD-G-J	KPD-J	KPD	KPD-G	CLM	KPD-G-J	KPD-J	KPD	KPD-G	CLM	KPD-G-J	KPD-J
105	PUMP CASING FOOT MOUNTED	5	NA	-	NA	8	9	9	-	10	10	11	11	-	12	12
106	PUMP CASING CENTRE LINE MOUNTED	-	-	3	-	-	-	-	4	-	-	-	-	5	-	-
151	ENCLOSED IMPELLER	4	-	4	-	4	5	-	5	-	5	6	-	6	-	6
153	SEMI OPEN IMPELLER	-	NA	-	NA	-	-	4	-	4	-	-	5	-	5	-
180.1	PUMP SHAFT WITH DEEP GROOVE BRG.	1					1					1				
180.2	PUMP SHAFT WITH REINFORCED DRG. ARRGT.	1					1					1				
190	CASING WEAR RING (SUCTION)	2	NA	2	NA	2	3	NA	3	NA	3	3	NA	3	NA	3
191	CASING WEAR RING (DEL)	2	NA	2	NA	2	NA					2	NA	2	NA	2
192	IMPELLER WEAR RING (SUC)	2	NA	2	NA	2	3	NA	3	NA	3	3	NA	3	NA	3
193	IMPELLER RING (DEL)	2	NA	2	NA	2	NA					2	NA	2	NA	2
220	CASING COVER	5	NA	5	NA	8	9	9	9	10	10	11	2	11	3	11
226	DRIP PAN	1					1					1				
227	LANTERN RING	1					1					1				
229	SPIT GLAND	1					1					1				
236	LIQUID DEFLECTOR	1					1					1				
240	BEARING HOUSING (STD.)	1	NA	-	NA	1	1	2	-	2	1	1	2	-	2	1
241	BEARING CARTRIDGE	-	-	1	-	-	-	-	1	-	-	-	-	1	-	-
252	BEARING HOUSING (WITH COOLING)	-	-	1	-	-	-	-	1	-	-	-	-	1	-	-
248	LANTERN BRACKET	1	NA	NA	NA	1	1					1				
251	SUPPORT FOOT FOR FOOT MOUNTED	3	NA	-	NA	3	1	1	-	1	1	2	2	-	2	2
251	SUPPORT FOOT FOR CENTRE LINE MOUNTED	-	-	3	-	-	-	-	1	-	-	-	-	2	-	-
260.1,260.2	DEEP GROOVE BALL BEARING D.S. & P.S.	NA					NA					NA				
263	ANGULAR CONTACT BALL BEARING	1					1					1				
264	CYLINDRICAL ROLLER BEARING	1					1					1				
270	BEARING COVER D.S.	1					1					1				
311	SHAFT SLEEVE	1					1					1				
330	IMPELLER NUT	1					1					1				
350	ST. BOX BUSH	1					1					1				
367	OIL WELL COVER FOR BRG.OIL COOLING	1					1					1				
430	GLAND PACKING	1					1					1				
443	CONSTANT LEVEL OILER	1					1					1				
460	WEAR PLATE SUC. SIDE	NA					4					5				
511	GASKET FOR CASING COVER	3	NA	3	NA	3	5	6	5	6	5	1	2	1	2	1
514	GASKET FOR BRG.COVER D.S	1					1					1				
515	GASKET FOR SHAFT SLEEVE	1					1					1				
525.1	'O' RING FOR CASING COVER	1					1					1				
525.2	O' RING FOR LANTERN BRACKET	1					1					1				
682	GASKET FOR IMPELLER NUT	1					1					1				

PART NO.	PUMP SIZE	100/40					125/26-1450RPM					125/32-1450RPM				
	PART DESCRIPTION	KPD	KPD-G	CLM	KPD-G-J	KPD-J	KPD	KPD-QF	CLM	KPD-QF-J	KPD-J	KPD	KPD-QF	CLM	KPD-QF-J	KPD-J
105	PUMP CASING FOOT MOUNTED	12	12	-	13	13	14	14	-	15	15	16	16	-	17	17
106	PUMP CASING CENTRE LINE MOUNTED	-	-	6	-	-	-	-	7	-	-	-	-	8	-	-
151	ENCLOSED IMPELLER	7	-	7	-	7	8	-	8	-	8	9	-	9	-	9
153	SEMI OPEN IMPELLER	-	6	-	6	-	-	7	-	7	-	-	8	-	8	-
180.1	PUMP SHAFT WITH DEEP GROOVE BRG.	1					1					1				
180.2	PUMP SHAFT WITH REINFORCED DRG. ARRGT.	1					1					1				
190	CASING WEAR RING (SUCTION)	4	NA	4	NA	4	5	NA	5	NA	5	3	NA	3	NA	3
191	CASING WEAR RING (DEL)	2	NA	2	NA	2	NA					2	NA	2	NA	2
192	IMPELLER WEAR RING (SUC)	4	NA	4	NA	4	5	NA	5	NA	5	3	NA	3	NA	3
193	IMPELLER RING (DEL)	2	NA	2	NA	2	NA					2	NA	2	NA	2
220	CASING COVER	5	12	5	12	5	9	9	9	10	10	11	2	11	3	11
226	DRIP PAN	2					1					1				
227	LANTERN RING	1					1					1				
229	SPIT GLAND	1					1					1				
236	LIQUID DEFLECTOR	1					1					1				
240	BEARING HOUSING (STD.)	1	2	-	2	1	1	2	-	2	1	1	2	-	2	1
241	BEARING CARTRIDGE	-	-	1	-	-	-	-	1	-	-	-	-	1	-	-
252	BEARING HOUSING (WITH COOLING)	-	-	1	-	-	-	-	1	-	-	-	-	1	-	-
248	LANTERN BRACKET	1					1					1				
251	SUPPORT FOOT FOR FOOT MOUNTED	3	3	-	3	3	2	2	-	2	2	3	3	-	3	3
251	SUPPORT FOOT FOR CENTRE LINE MOUNTED	-	-	3	-	-	-	-	2	-	-	-	-	2	-	-
260.1,260.2	DEEP GROOVE BALL BEARING D.S. & P.S.	NA					NA					NA				
263	ANGULAR CONTACT BALL BEARING	1					1					1				
264	CYLINDRICAL ROLLER BEARING	1					1					1				
270	BEARING COVER D.S.	1					1					1				
311	SHAFT SLEEVE	1					1					1				
330	IMPELLER NUT	1					1					1				
350	ST. BOX BUSH	1					1					1				
367	OIL WELL COVER FOR BRG.OIL COOLING	1					1					1				
430	GLAND PACKING	1					1					1				
443	CONSTANT LEVEL OILER	1					1					1				
460	WEAR PLATE SUC. SIDE	6					7					8				
511	GASKET FOR CASING COVER	3	4	3	4	3	5	6	5	6	5	7	2	7	2	7
514	GASKET FOR BRG.COVER D.S	1					1					1				
515	GASKET FOR SHAFT SLEEVE	1					1					1				
525.1	'O' RING FOR CASING COVER	1					1					1				
525.2	O' RING FOR LANTERN BRACKET	1					1					1				
682	GASKET FOR IMPELLER NUT	1					1					1				

PART NO.	PUMP SIZE	125/40					125/40N					150/32				
	PART DESCRIPTION	KPD	KPD-QF	CLM	KPD-QF-J	KPD-J	KPD	KPD-QF	CLM	KPD-QF-J	KPD-J	KPD	KPD-QF	CLM	KPD-QF-J	KPD-J
105	PUMP CASING FOOT MOUNTED	18	18	-	19	19	18	NA	-	NA	19	20	20	-	21	21
106	PUMP CASING CENTRE LINE MOUNTED	-	-	9	-	-	-	-	9	-	-	-	-	10	-	-
151	ENCLOSED IMPELLER	10	-	10	-	10	11	-	11	-	11	12	-	12	-	12
153	SEMI OPEN IMPELLER	-	9	-	9	-	-	NA	-	NA	-	-	10	-	10	-
180.1	PUMP SHAFT WITH DEEP GROOVE BRG.	1					1					1				
180.2	PUMP SHAFT WITH REINFORCED DRG. ARRGT.	1					1					1				
190	CASING WEAR RING (SUCTION)	3	NA	3	NA	3	3	NA	3	NA	3	6	NA	6	NA	6
191	CASING WEAR RING (DEL)	2	NA	2	NA	2	2	NA	2	NA	2	3	NA	3	NA	3
192	IMPELLER WEAR RING (SUC)	3	NA	3	NA	3	3	NA	3	NA	3	6	NA	6	NA	6
193	IMPELLER RING (DEL)	2	NA	2	NA	2	2	NA	2	NA	2	3	NA	3	NA	3
220	CASING COVER	5	12	5	12	5	5	NA	5	NA	5	13	14	13	14	13
226	DRIP PAN	2					2					2				
227	LANTERN RING	1					1					1				
229	SPIT GLAND	1					1					1				
236	LIQUID DEFLECTOR	1					1					1				
240	BEARING HOUSING (STD.)	1	2	-	2	1	1	NA	-	NA	1	1	2	-	2	1
241	BEARING CARTRIDGE	-	-	1	-	-	-	-	1	-	-	-	-	1	-	-
252	BEARING HOUSING (WITH COOLING)	-	-	1	-	-	-	-	1	-	-	-	-	1	-	-
248	LANTERN BRACKET	1					1	NA	NA	NA	1	1				
251	SUPPORT FOOT FOR FOOT MOUNTED	4	4	-	4	4	4	NA	-	NA	4	4	4	-	4	4
251	SUPPORT FOOT FOR CENTRE LINE MOUNTED	-	-	3	-	-	-	-	3	-	-	-	-	3	-	-
260.1,260.2	DEEP GROOVE BALL BEARING D.S. & P.S.	NA					NA					NA				
263	ANGULAR CONTACT BALL BEARING	1					1					1				
264	CYLINDRICAL ROLLER BEARING	1					1					1				
270	BEARING COVER D.S.	1					1					1				
311	SHAFT SLEEVE	1					1					1				
330	IMPELLER NUT	1					1					1				
350	ST. BOX BUSH	1					1					1				
367	OIL WELL COVER FOR BRG.OIL COOLING	1					1					1				
430	GLAND PACKING	1					1					1				
443	CONSTANT LEVEL OILER	1					1					1				
460	WEAR PLATE SUC. SIDE	9					NA					10				
511	GASKET FOR CASING COVER	3	4	3	4	3	3	NA	3	NA	3	1	2	1	2	1
514	GASKET FOR BRG.COVER D.S	1					1					1				
515	GASKET FOR SHAFT SLEEVE	1					1					1				
525.1	'O' RING FOR CASING COVER	1					1					1				
525.2	O' RING FOR LANTERN BRACKET	1					1					1				
682	GASKET FOR IMPELLER NUT	1					1					1				

PART NO.	PUMP SIZE	150/32N					150/40					65/43				
	PART DESCRIPTION	KPD	KPD-QF	CLM	KPD-QF-J	KPD-J	KPD	KPD-QF	CLM	KPD-QF-J	KPD-J	KPD	KPD-QF	CLM	KPD-QF-J	KPD-J
105	PUMP CASING FOOT MOUNTED	20	NA	-	NA	21	22	NA	-	NA	22	23	NA	-	NA	23
106	PUMP CASING CENTRE LINE MOUNTED	-	-	10	-	-	-	-	11	-	-	-	-	12	-	-
151	ENCLOSED IMPELLER	13	-	13	-	13	14	-	14	-	14	15	-	15	-	15
153	SEMI OPEN IMPELLER	-	NA	-	NA	-	-	NA	-	NA	-	-	NA	-	NA	-
180.1	PUMP SHAFT WITH DEEP GROOVE BRG.	1					1					1				
180.2	PUMP SHAFT WITH REINFORCED DRG. ARRGT.	1					1					1				
190	CASING WEAR RING (SUCTION)	6	NA	6	NA	6	6	NA	6	NA	6	7	NA	7	NA	7
191	CASING WEAR RING (DEL)	3	NA	3	NA	3	2	NA	2	NA	2	4	NA	4	NA	4
192	IMPELLER WEAR RING (SUC)	6	NA	6	NA	6	6	NA	6	NA	6	7	NA	7	NA	7
193	IMPELLER RING (DEL)	3	NA	3	NA	3	2	NA	2	NA	2	4	NA	4	NA	4
220	CASING COVER	13	NA	13	NA	13	15	NA	15	NA	15	16	NA	16	NA	16
226	DRIP PAN	2					2					2				
227	LANTERN RING	1					1					1				
229	SPIT GLAND	1					1					1				
236	LIQUID DEFLECTOR	1					1					2				
240	BEARING HOUSING (STD.)	1	NA	-	NA	1	1	NA	-	NA	1	1	NA	-	NA	1
241	BEARING CARTRIDGE	-	-	1	-	-	-	-	1	-	-	-	-	1	-	-
252	BEARING HOUSING (WITH COOLING)	-	-	1	-	-	-	-	1	-	-	-	-	1	-	-
248	LANTERN BRACKET	1	NA	NA	NA	1	1	NA	1	NA	1	2	NA	NA	NA	2
251	SUPPORT FOOT FOR FOOT MOUNTED	4	NA	-	NA	4	4	NA	-	NA	4	3	NA	-	NA	3
251	SUPPORT FOOT FOR CENTRE LINE MOUNTED	-	-	3	-	-	-	-	4	-	-	-	-	3	-	-
260.1,260.2	DEEP GROOVE BALL BEARING D.S. & P.S.	NA					NA					NA				
263	ANGULAR CONTACT BALL BEARING	1					1					1				
264	CYLINDRICAL ROLLER BEARING	1					1					1				
270	BEARING COVER D.S.	1					1					1				
311	SHAFT SLEEVE	1					1					2				
330	IMPELLER NUT	1					1					1				
350	ST. BOX BUSH	1					1					1				
367	OIL WELL COVER FOR BRG.OIL COOLING	1					1					1				
430	GLAND PACKING	1					1					1				
443	CONSTANT LEVEL OILER	1					1					1				
460	WEAR PLATE SUC. SIDE	NA					NA					NA				
511	GASKET FOR CASING COVER	1	NA	1	NA	1	3	NA	3	NA	3	6	NA	6	NA	6
514	GASKET FOR BRG.COVER D.S	1					1					1				
515	GASKET FOR SHAFT SLEEVE	1					1					1				
525.1	'O' RING FOR CASING COVER	1					1					1				
525.2	O' RING FOR LANTERN BRACKET	1					1					1				
682	GASKET FOR IMPELLER NUT	1					1					1				

PART NO.	PUMP SIZE	125/20					150/26				
	PART DESCRIPTION	KPD	KPD-QF	CLM	KPD-QF-J	KPD-J	KPD	KPD-QF	CLM	KPD-QF-J	KPD-J
105	PUMP CASING FOOT MOUNTED	24	NA	-	NA	24	25	NA	-	NA	25
106	PUMP CASING CENTRE LINE MOUNTED	-	-	13	-	-	-	-	14	-	-
151	ENCLOSED IMPELLER	16	-	16	-	16	17	-	17	-	17
153	SEMI OPEN IMPELLER	-	NA	-	NA	-	-	NA	-	NA	-
180.1	PUMP SHAFT WITH DEEP GROOVE BRG.	1					1				
180.2	PUMP SHAFT WITH REINFORCED DRG. ARRGT.	1					1				
190	CASING WEAR RING (SUCTION)	8	NA	8	NA	8	9	NA	9	NA	9
191	CASING WEAR RING (DEL)	NA					NA				
192	IMPELLER WEAR RING (SUC)	8	NA	8	NA	8	9	NA	9	NA	9
193	IMPELLER RING (DEL)	NA					NA				
220	CASING COVER	9	NA	9	NA	10	17	NA	17	NA	17
226	DRIP PAN	1					1				
227	LANTERN RING	1					1				
229	SPIT GLAND	1					1				
236	LIQUID DEFLECTOR	1					1				
240	BEARING HOUSING (STD.)	1	NA	-	NA	1	1	NA	-	NA	1
241	BEARING CARTRIDGE	-	-	1	-	-	-	-	1	-	-
252	BEARING HOUSING (WITH COOLING)	-	-	1	-	-	-	-	1	-	-
248	LANTERN BRACKET	1	NA	1	NA	1	3	NA	3	NA	3
251	SUPPORT FOOT FOR FOOT MOUNTED	2	NA	-	NA	2	3	NA	-	NA	3
251	SUPPORT FOOT FOR CENTRE LINE MOUNTED	-	-	1	-	-	-	-	2	-	-
260.1,260.2	DEEP GROOVE BALL BEARING D.S. & P.S.	NA					NA				
263	ANGULAR CONTACT BALL BEARING	1					1				
264	CYLINDRICAL ROLLER BEARING	1					1				
270	BEARING COVER D.S.	1					1				
311	SHAFT SLEEVE	1					1				
330	IMPELLER NUT	1					1				
350	ST. BOX BUSH	1					1				
367	OIL WELL COVER FOR BRG.OIL COOLING	1					1				
430	GLAND PACKING	1					1				
443	CONSTANT LEVEL OILER	1					1				
460	WEAR PLATE SUC. SIDE	NA					NA				
511	GASKET FOR CASING COVER	5	NA	5	NA	5	9	NA	9	NA	9
514	GASKET FOR BRG.COVER D.S	1					1				
515	GASKET FOR SHAFT SLEEVE	1					1				
525.1	'O' RING FOR CASING COVER	1					1				
525.2	O' RING FOR LANTERN BRACKET	1					1				
682	GASKET FOR IMPELLER NUT	1					1				

INTERCHANGEABILITY CHART OF KPD, KPD CLM, KPD-J PUMPS...IDRIVING UNIT NO. KPD - 11)																				
PART NO.	PUMP SIZE	TOTAL NO.OF	80×40DV			100×40DV			125×20-2900RPM			125×45			150×42			200×33		
	PART DESCRIPTION		KPD	CLM	KPD-J	KPD	CLM	KPD-J	KPD	CLM	KPD-J	KPD	CLM	KPD-J	KPD	CLM	KPD-J	KPD	CLM	KPD-J
105	PUMP CASING FOOT MOUNTED	12	1	-	3	3	-	4	5	-	6	7	-	8	9	-	10	11	-	12
106	PUMP CASING CENTRE LINE MOUNTED	6	-	1	-	-	2	-	-	3	-	-	4	-	-	5	-	-	6	-
151	ENCLOSED IMPELLER	6	1			2			3			4			5			6		
180.1	PUMP SHAFT WITH DEEP GROOVE BRG.	4	1			1			1			2			3			4		
180.2	PUMP SHAFT WITH REINFORCED GRD. ARRGT.	4	1			1			1			2			3			4		
190	CASING WEAR RING (SUCTION)	6	1			1			2			3			4			5		
191	CASING WEAR RING (DEL)	4	1			1			NA			2			3			4		
192	IMPELLER WEAR RING (SUC)	6	1			1			2			3			4			5		
193	IMPELLER RING (DEL)	4	1			1			NA			2			3			4		
230	CASING COVER	6	1			1			2			3			4			5		
235	DEEP PAN	1	1			1			1			1			1			1		
237	LANTERN RING	1	1			1			1			1			1			1		
239	SPIT GLAND	1	1			1			1			1			1			1		
336	LIQUID DEFLECTOR	2	1			1			1			2			2			2		
240	BEARING HOUSING (STD.)	2	NA			NA			1			2			2			2		
252	BEARING HOUSING (WITH COOLING)	2	1			1			1			2			2			2		
240	LANTERN BRACKET	2	1			1			1			2			2			2		
251	SUPPORT FOOT FOR FOOT MOUNTED	4	1			1			2			3			3			4		
251	SUPPORT FOOT FOR CENTRE LINE MOUNTED	3	1			1			2			3			3			3		
360.1,360.2	DEEP GROOVE BALL BEARING D.S. & P.S.	NA	NA			NA			NA			NA			NA			NA		
260	ANGULAR CONTACT BALL BEARING	2	1			1			1			2			2			2		
264	CYLINDRICAL ROLLER BEARING	1	1			1			1			1			1			1		
270	BEARING COVER D.S.	1	1			1			1			1			1			1		
311	SHAFT SLEEVE	3	1			1			1			2			3			3		
330	IMPELLER NUT	1	1			1			1			1			1			1		
350	ST. BOX BUSH	2	1			1			1			1			2			2		
357	OIL WELL COVER FOR BRG.OIL COOLING	1	1			1			1			1			1			1		
400	GLAND PACKING	1	1			1			1			1			1			1		
440	CONSTANT LEVEL OILER	1	1			1			1			1			1			1		
511	GASKET FOR CASING COVER	4	1			1			2			3			3			4		
514	GASKET FOR BRG.COVER D.S	1	1			1			1			1			1			1		
515	GASKET FOR SHAFT SLEEVE	1	1			1			2			2			2			2		
525.1	'O' RING FOR CASING COVER	1	1			1			1			1			1			1		
525.2	O' RING FOR LANTERN BRACKET	1	1			1			1			1			1			1		
502	GASKET FOR IMPELLER NUT	2	1			1			1			2			2			2		

Enriching Lives

PART NO.	PUMP SIZE / PART DESCRIPTION	TOTAL NO. OF	200/29			200/40			150/52			125/33M (2900 R.P.M)			150/29			200/35			250/33A			250/33B		
			KPD	CLM	KPD-J	KPD	CLM	KPD-J	KPD	CLM	KPD-J	KPD	CLM	KPD-J	KPD	CLM	KPD-J	KPD	CLM	KPD-J	KPD	CLM	KPD-J	KPD	CLM	KPD-J
100	PUMP CASING FOOT MOUNTED	16	1	-	2	3	-	4	5	-	6	7	-	8	9	-	10	11	-	12	13	-	14	15	-	16
106	PUMP CASING CENTRE LINE MOUNTED	8	-	1	-	-	2	-	-	3	-	-	4	-	-	5	-	-	6	-	-	7	-	-	8	-
151	ENCLOSED IMPELLER	6	1			2			3			4			5			6			6			6		
153	SEMI OPEN IMPELLER	NA	NA			NA			NA			NA			NA			NA			NA			NA		
180.1	PUMP SHAFT WITH DEEP GROOVE BRG.	1	1			1			1			2			1			1			1			1		
180.2	PUMP SHAFT WITH REINFORCED BRG. ASSST.	1	1			1			1			2			1			1			1			1		
190	CASING WEAR RING (SUCTION)	6	1			1			2			3			4			5			6			6		
191	CASING WEAR RING (DEL)	5	1			1			2			3			NA			4			5			5		
192	IMPELLER WEAR RING (SUC)	6	1			1			2			3			4			5			6			6		
193	IMPELLER RING (DEL)	5	1			1			2			3			NA			4			5			5		
220	CASING COVER	7	1			2			3			4			5			6			7			7		
228	DRIP PAN	3	1			1			1			1			2			3			3			2		
227	LANTERN RING	2	1			1			1			2			1			1			1			1		
229	SPIT GLAND	2	1			1			1			2			1			1			1			1		
238	LIQUID DEFLECTOR	3	1			1			2			3			1			1			1			1		
240	BEARING HOUSING (STD.)	1	1			1			1			NA			1			1			1			1		
252	BEARING HOUSING (WITH COOLING)	1	1			1			1			1			1			1			1			1		
246	LANTERN BRACKET	5	1			1			1			2			3			4			5			5		
261	SUPPORT FOOT FOR FOOT MOUNTED	7	1			2			1			3			4			5			6			7		
261	SUPPORT FOOT FOR CENTRE LINE MOUNTED	8	1			2			3			4			5			6			7			8		
260.1_260.2	DEEP GROOVE BALL BEARING D.E. & F.E.	NA	NA			NA			NA			NA			NA			NA			NA			NA		
263	ANGULAR CONTACT BALL BEARING	1	1			1			1			1			1			1			1			1		
264	CYLINDRICAL ROLLER BEARING	1	1			1			1			1			1			1			1			1		
270	BEARING COVER D.E.	1	1			1			1			1			1			1			1			1		
311	SHAFT SLEEVE	3	1			1			2			3			1			1			1			1		
330	IMPELLER NUT	2	1			1			1			2			1			1			1			1		
352	ST. BOX BUSH	2	1			1			1			2			1			1			1			1		
367	OIL WELL COVER FOR BRG.OIL COOLING	1	1			1			1			1			1			1			1			1		
400	GLAND PACKING	2	1			1			1			2			1			1			1			1		
440	CONSTANT LEVEL OILER	1	1			1			1			1			1			1			1			1		
460	WEAR PLATE SUC. SIDE	NA	NA			NA			NA			NA			NA			NA			NA			NA		
511	GASKET FOR CASING COVER	7	1			2			3			4			5			6			7			7		
514	GASKET FOR BRG.COVER D.E	1	1			1			1			1			1			1			1			1		
515	GASKET FOR SHAFT SLEEVE	2	1			1			1			2			1			1			1			1		
520.1	"O" RING FOR CASING COVER	2	1			1			1			2			1			1			1			1		
520.2	O' RING FOR LANTERN BRACKET	3	1			1			1			2			3			1			1			1		
550	GASKET FOR IMPELLER NUT	1	1			1			1			1			1			1			1			1		

Table: INTERCHANGEABILITY CHART OF KPD,KPD CLM, KPD-J PUMPS...(DRIVING UNIT NO. KPD - 12)

KIRLOSKAR PUMP
TYPE – KPDQF
(DRIVING UNIT – 4)

1.0 KPD – 4 PUMPS – TAPPING CONNECTIONS CHART
(See separate chart)

2.0 TECHNICAL DATA

2.1 Direction of rotation:
The direction of rotation is clockwise when viewed from driving end.
2.2 Specifications of oil seal and quantity of oil

Part No.	Description	size	Remark
50001	Oil seal D.S. Quantity of oil in bearing housing (Approx.)	Unit no.4 18X 35 X7 thick 0.1 liter	Std supply

2.3 Bearing:

a) Bearings of SKF make or equivalent and with C3 clearance are used. Bearings are oil lubricated. Oil level in the bearing housing should be maintained with the help of constant level oiler. Constant level oiler is a standard scope of supply.
b) Maximum allowable temperature of bearings: 80°C
c) In case of pumping liquids above 180° C, cooling of lubricant oil shall be necessary. Bearing housing cooling arrangement provided, quantity of cooling water required is 0.25 m^3/hr at 6 kg/cm^2.
d) In case of new bearings, renew the oil after about 200 hours and then about once a year, if the bearing temperature is always below 50°C and there is only small risk of contamination. If the bearing temperature is upto 80°C and if there is danger of contamination, the oil should be renewed about every six months.

Driving unit	Speed n rpm	Bearing arrange-ment	Bearing at DE	Bearing at NDE	Remarks
4	3000	Standard	SKF 6304 C3 or equi. 1 No. and SKF 7304 B or equi. 1 No.	SKF 6304 C3 1 No.	Standard supply

Note:
1. Above bearing arrangement is suitable for a pump operating on suction pressure is less than 5 kg/cm^2.
2. Applications involving suction pressure more than 5 kg/cm^2 should be referred to head office at Pune.
3. Axial running clearance shall be less than 0.45 mm for the above bearing arrangement.
4. Bearing should be lubricated with lubricating oil as indicated below:

Manufacturer	Speed 1450 rpm	Speed 2900 rpm
Indian oil Hindustan Petroleum	Servosystem 81 Enklo 57	Servosystem 57 Enklo 53

2.4 Specification for stuffing box packing, gaskets, & 'O' rings for KPD-4 pumps.

Part	Description	KPD 20/13 QF	KPD 20/16 QF	KPD 20/20 QF
	Packing arrangement with Lantern ring	2+L+3	2+L+3	2+L+3
43000	Gland packing size(ODxIDxT) straight length of one packing	44x28x8 115 mm	44x28x8 115 mm	44x28x8 115 mm
51100	Gasket for casing & casing cover (ODxIDxT)	152 OD x141 IDx1 Thick	188 OD x176 ID x 1 Thick	230 Odx216 ID x1 Thick
51400	Gasket for bearing cover (ODxIDxT)	85 OD x52 IDx1 Thick	85 OD x52 IDx1 Thick	85 OD x52 IDx1 Thick
51600	Gasket for Mech. Seal cover (ODxIDxT)	60 OD x50 Idx2 Thick	60 OD x50 Idx2 Thick	60 OD x50 Idx2 Thick
87500	Gasket for oil well cover (ODxIDxT)	128x85x1.5 T	128x85x1.5 T	128x85x1.5 T
57500	Gasket for impeller &shaft sleeve	230 OD x17 Idx1 Thick	230 OD x17 Idx1 Thick	230 OD x17 Idx1 Thick
52510	'O' ring for casing cover	96 ID x3 T	96 ID x3 T	96 ID x3 T
52310	'O' ring for bearing housing	142 ID x3T	142 ID x3T	142 ID x3T
52300	'O' ring for bearing cartridge	60 ID x3T	60 ID x3T	60 ID x3T

Note:

1. Correct liquid specification should be informed to us to recommend a suitable grade of gland packing.
2. All dimensions are in mm.

2.5 Cooling of stuffing box, bearing housing and pump pads.

2.5.1 Cool the packed stuffing box when pumping liquid temperature is above 105^0 C.

2.5.2 Cool the mechanical seal, stuffing box when pumping liquid temperature is above 140^0 C. this limit is subject to change as per seal manufacturer's recommendations.

2.5.3 Quantity of stuffing box cooling water w. r. t. temperature and nominal impeller diameter in cms.

Full nominal dia. in	Cooling water quantity at various pumping liquid temperature				
cms.	110^0 C	150^0 C	200^0 C	250^0 C	300^0 C
13	0.16	0.18	0.24	0.31	0.43
16	0.16	0.18	0.24	0.31	0.43
20	0.16	0.18	0.24	0.31	0.43

Cooling water quantities mentioned in m^3 /hour.

Maximum temperature of cooling water at outlet -50^0 C.
Maximum permissible cooling water pressure- 6.0 kg/cm^2.

2.5.4 Cooling of pump pads

Centerline mounted pumps are supported on pads through which cooling water should be circulated. Centerline mounted pumps are recommended for pumping liquid temperature above 180^0 C. pump with centerline mounted delivery casing is optional.
Quantity of cooling water to pad – 0.2 to 0.3 m^3 /hour.
Maximum pressure - 6 kg/cm^2.

2.6 Clearance between impeller vanes and wear face on pump casing suction side should be 0.3 to 0.5 mm.

2.7 Interchangeability

Parts standardization is optimized utilizing interchangeable components to cover a very wide range of requirement. This unique feature enables the customer to have a very low spare parts inventory even though he may have many sizes of these pumps. Interchangeability chart is given in 2.7.1

3.0 Maintenance :

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

3.1 Daily checks:
Same as that for other KPD pumps. (i.e. Repeat 5.3.1.1 to 5.3.1.3 of KPD data)

3.2 Periodical checks:
Same as that for other KPD pumps. (i.e. repeat 5.3.2.1 to 5.3.2.6)

3.3 Annual checks :

3.3.1 The pump should be over hauled completely to check the clearance and to replace worn out parts. Clearance between impeller vanes and pump casing wear face, shaft sleeve and stuffing box bush, lantern ring and shaft sleeve etc. are very important. The bearing should be cleaned thoroughly and lubricated. The stuffing box should be repacked by correctly locating the lantern ring. Other check points are same as that of KPD pumps.

4.0 MECHANICAL SEAL IN KPD –4 PUMPS

Same as that for other KPD pumps. (i.e. refer 5.3.4)

5.0 OVERHAULING

PROCEDURE FOR DISMANTLING AND RE-ASSEMBLING

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

5.1 Dismantling:

5.1.1 to 5.1.9 Same as that for other KPD pumps. (Repeat 5.2.1.1.1 to 5.2.1.1.9)

5.1.10 Remove the hex nuts from casing studs holding the bearing housing (24000) in case of KPD 20/13 QF pump. Remove the hex nuts from casing studs holding the casing cover (22000) in case of KPD 20/16 QF and KPD 20/20 QF pumps.

5.1.11 Screw the release bolts provided in the casing cover. Turn the bolts evenly through a quarter turn at both sides.

5.1.12 Slightly pull out the driving unit, till impeller (15300) clears the pump casing (10500/10600).

5.1.13 Place this rotating unit on a table or clear place for further dismantling.

5.1.14 Remove casing gasket (51101).

5.1.15 Unscrew the impeller (15300). Remove the gasket between impeller and shaft sleeve (51500) after taking out the impeller from pump shaft (18000).

5.1.16 Removal of stuffing box with gland packing:
For this, following steps should be taken:

a. Remove the split gland (22900) by taking out the bolts for clamping of the split positions.
b. Take out the casing cover (22000) along with stuffing box bush (35000), gland packing (43000), and lantern ring (22700), 'O' ring (52501) will also come out along with it.
c. Take out 'O' ring (52502) for bearing housing.
d. Unscrew the hex socketted screw clamping stuffing box bush (35000) to casing cover (22000) and remove the stuffing box bush (35000).
e. Remove gland packing rings (43000) and lantern ring (22700).
f. Remove shaft sleeve (31100) and key(32000) along with liquid deflector (23600).

5.1.17 Removal of stuffing box with mechanical seal.
(Applicable for single and double mechanical seals). Follow the steps given below:

a. Unscrew the hex socketted cap screw clamping the stuffing box bush (35000) to the casing cover (22000) and remove the stuffing box bush.
b. Seal seat will come out along with the throat bush (35000) in case of double mechanical seal.
c. Pull shaft sleeve under mechanical seal (31500). Use the groove on the shaft sleeve for pulling it out. Be careful while removing shaft sleeve since sleeve comes out alongwith rotating unit of the mechanical seal.
d. Remove the mechanical seal from the shaft sleeve and keep it in a clean place.
e. Remove hex nuts from casing cover (22000) studs, for 20/16 QF and 20/20 QF pumps. For 20/13 QF pump no necessity of studs is there because the casing cover is of sandwich type.
f. Take out the casing cover (22000) along with the mechanical seal cover taking care of mating ring face. 'O' ring for casing cover (52501) will also come out along with it.
g. Unscrew the nuts of mechanical seal cover studs and remove mechanical seal cover studs and remove mechanical seal covers (23100) from casing cover (22000).

h. In case of externally mounted mechanical seals, similar procedure should be followed only with the change that casing cover (22000) should be removed before removing shaft sleeve (31500) along with mechanical seal.

5.1.18 Loosen the grub screw holding the liquid deflector (23601). Take out the liquid deflector.

5.1.19 Take out "O" ring for bearing housing (52502) carefully.

5.1.20 Remove the pump half coupling (39700) carefully, after unscrewing the grub screw.

Caution Coupling half should be removed with the help of suitable extraction device. To avoid damage to the bearings, the coupling half should not be knocked off the shaft.

5.1.21 Take out the coupling key (32100).

5.1.22 Loosen the hex screws for bearing cover (NDE) (27100). Remove carefully the bearing cover (27100) and packing (51400).

5.1.23 Loosen the nuts (58600) from bearing housing studs (59300) receiving bearing cartridge (24100).

5.1.24 Force the shaft (18020) out carefully in the direction of the driving end. Shaft will come out with bearings and bearing cartridge (24100).

5.1.25 Remove circlip (48500), remove the bearing cartridge (24100) with the help of a suitable puller.

5.1.26 Unlock the washer (41500) and remove lock nut (33600).

5.1.27 Take out the driving end groove ball bearing (26000) with the help of puller.

5.1.28 Take out spacer ring (20900) between the DE bearings.

5.1.29 Take out driving end angular contact ball bearing (26300) with the help puller.

5.1.30 Take out shoulder ring (19900) for driving end bearings.

5.1.31 Take out the non-driving end ball bearing (26000) with the help of a suitable puller.

5.1.32 Take out the non-driving end shoulder ring (19900).

Caution

Steps 5.1.24 to 5.1.30 are to be followed only if bearings are damaged and to be replaced.

5.1.33 Oil seal in the bearing cartridge (50010) should be removed if the seal lips are worn out or spring has lost tension.

5.1.34 Remove the 'O' ring for bearing cartridge (52310) from it. For pumps with bearing cooling arrangement, following steps should be followed to dismantle the cooling arrangement.

5.1.35 Take out cover for bearing housing cooling arrangement (36700).

5.1.36 Take out the packing (68500).

5.2 REASSEMBLY

This procedure covers re-assembly of pump after complete dismantling of the pump. Before re-assembly, all the parts should be thoroughly cleaned in kerosene, petrol or benzene to remove the dust, rust etc. After cleaning the necessary parts should be replaced.

5.2.1 Mount the shoulder ring (19900), angular contact ball bearing (26300), spacer ring (20900) and deep groove ball bearing (26000) at the driving end in the order stated above. (Refer fig. For Brg. arrangement).

5.2.2 Mount the non-driving end deep groove ball bearing (26000).

Caution

Same as given under 5.2.1.2.1 of KPD pump manual.

5.2.3 Same clause at that of 5.2.1.2.3 of KPD pump manual except the sentence in bracket.

5.2.4 Fit the oil seal (50010) in the bearing cartridge (24100) and 'O' ring (52300) on the cartridge.

5.2.5 Insert the circlip (48500) in the groove provided for it.

5.2.6 Insert shaft (18000) along with bearings and cartridge into the bearing housing from driving end and tighten the hex. nut for studs on bearing housing for bearing cartridge till the gap between cartridge and housing is 3 mm.

5.2.7 Put the packing (54000) at non - driving end and tighten the bearing cover (271) with the help of hex. screws.

5.2.8 Place 'O' ring (52510) on bearing housing. Lubricate the ring with grease or other suitable 'O' ring lubricant before placing it on the bearing housing.

5.2.9 Put the drip pan (22600) (if applicable) & if it was removed from bearing housing.

5.2.10 For pumps with gland packing arrangements, follow the instructions given below.

a) Apply some oil or grease on the shaft at sleeve position. Mount the key for shaft sleeve (32000) on shaft and insert shaft sleeve (31100) along with deflector (23600) mounted on it.

b) Place 'O' ring (52510) on casing cover after lubricating it properly for Hot Models only.

c) Insert casing cover (22000) with 'O' ring (51510) and drip plate (21900) in proper positions.

d) Tighten the nuts on studs of casing cover in case of pump types KPD 20/16 QF and KPD20/20 QF. For KPD 20/13 QF pump, casing cover (22000) is guided on bearing housing (24000) steps.

e) Fit stuffing box bush (35000) into the casing cover and tighten the hex. socketted screws.

f) Put the gasket for shaft sleeve and impeller (51500) on shaft sleeve (31100) step.

g) Fix the impeller on the shaft with heli-coil-mid-grip insert by screwing it on the shaft. Refer to figure for impeller fixing arrangement and heli-coil-mid-grip insert.

h) Tighten the grub screws on the labyrinth type deflector.

5.2.11 For pumps with mechanical seal arrangement, follow the instructions given below. (Applicable for internally fitted seals only).

a) Mount the deflector (23610) on shaft.
b) Replace the bush for mechanical seal cover (36000) (Throttle bush) if it is worn out.
c) Place the mechanical seal cover (23100) along with stationary seal seat/insert/mating ring and gasket (51600) and tighten the nuts on studs for mechanical seal cover on casing cover evenly.
d) Remove location plates with the help of Allen screws.
e) Place 'O' ring (52501) on casing cover (22000) after lubricating it properly.
f) Insert the casing cover (22000) with 'O' rings (52501 and 52502) in proper positions, in brg. housing. Tighten the nuts on the studs of casing cover in case of KPD 20/16 QF and KPD 20/20 QF pumps. For KPD 20/13 QF pump, guide the casing cover on the steps of bearing housing.
g) Mount rotating part of mechanical seal on shaft sleeve (31500) after applying oil on it.
h) Tighten grub screws provided n rotating element of mechanical seal after resting seal against step on sleeve.
i) Mount shaft sleeve key (32000) on shaft and push the sleeve (31500) along with mechanical seal with care till the face of rotating part touches the stationary seal/seat/insert/mating ring.
j) Fit stuffing box bush (35000) into casing cover. In case of double mechanical seal fit mechanical seal seat/insert mating ring of seal towards impeller end in stuffing box bush (35000) and then fit it in casing cover. Tighten the hex. socketed grub screws.
k) Put gasket (51500) on shaft sleeve step in proper position.
l) Fix the impeller on the shaft along with the helicoil mid-grip insert avg. gradually tighten it.
m) Tighten the grub screw on the labyrinth deflector (23610) after resting its shoulder against shaft sleeve shoulder.

This will complete back pull out assembly.

For the external mechanical seals, follow similar assembling procedure with following changes.

a. Insert shaft sleeve into shaft before fitting casing cover (22000) on to the bearing housing (24000).
b. Rotating part of the mechanical sleeve should be mounted on the shaft sleeve (31500) such that working length of the mechanical seal given on cross sectional drawing supplied to you against particular pump is maintained.

For re-assembly of the bearing housing cooling arrangement, follow steps below:

a. Fit the cover for bearing housing cooling arrangement (36700) with packing (68500) and tighten the screws.

5.2.12 Rotating unit - General assembly procedure for pumps

a) Slide complete, back pull out assembly into pump casing. (10500/10600)

b) Tighten all the nuts on casing studs firmly and evenly.

Caution

The clearance between the wear face on pump casing suction side and impeller vanes is recommended to be 0.3 to 0.5 mm. Hydraulic performance of pump depends upon this clearance. If clearance is more, Head-Capacity of pump drops down. Hence the clearance should be adjusted by using the telescopic shaft arrangement. The procedure is mentioned below:

a) The clearance between the bearing cartridge (24100) and bearing housing (24000) face at driving end, is 3 mm in normal condition. So while reassembling the back-pull out assembly, keep the hex screws (63500) in loose condition and tighten the casing cover to the screws (63500) in loose condition and tighten the casing cover to the casing for KPD 20/16 QF and KPD 20/20 QF pumps.
   For KPD 20/13 QF pump, tighten the bearing housing to the casing keeping hex screws (63500) for bearing housing in loose condition.

b) Tighten the axial gap bearing cartridge (58600) so that the impeller just touches pump casing wear face.

c) Measure the hex nuts for bearing cartridge (24100) and bearing housing (24000) faces at driving end.

d) Normally, when the impeller touches the wear face, this gap should be 2.5 mm as the clearance between the impeller and wear face is 0.5 mm. Therefore if the casing or impeller and is worn, then it is necessary to adjust the clearance between the impeller and casing wear face to 0.5 mm. For this, loosen the bearing cartridge nuts (58600) and tighten the hex screws for bearing cartridge (63500) to create the necessary clearance between the casing wear face and impeller. This can be checked by rotating the shaft by hand. The hex screws should be tightened evenly till the shaft rotates freely.

e) Tighten the bearing cartridge nuts (58600) to maintain the shaft position.

f) For mechanical shaft fitted pumps, more care is required to be taken. It is required to adjust the spring compression between the stationary mating ring and rotary seal ring as it is disturbed and lessened of shaft movement.
   For this, following procedure should be followed-
   ii) Loosen the back-pull-out assembly from pump casing. Remove it.
   iii) Remove the impeller (15300) from the shaft(18020)
   iv) Remove stuffing box bush (35000) from casing cover (22000).
   v) Remove the shaft sleeve with rotary unit of the mechanical seal.
   vi) Loosen the grub screws of rotary unit and retighten the unit at a distance of 1.0 mm towards driving end side of the shaft sleeve from its original position.
   vii) Fit the shaft sleeve along with the mechanical seal rotary unit.
   viii) Fit the stuffing box bush (35000).
   ix) Fit the impeller (15300) on the shaft.
   x) Tighten the back-pull-out assembly to the pump casing by tightening casing nuts (58100).

5.2.13 In case of pump with gland packing, insert gland packing (43000)and lantern ring (22700) in order of 2 rings first and then lantern ring and finally 3 rings. Joints should be staggered.

5.2.14 Put gland in two halves (22900), clamp them with gland bolts (57400). Tighten gland stud nuts.

5.2.15 Fit constant level oiler (44300), Breather cap (44400) & support foot (25100) to bearing housing.

5.2.16 Fit pump half coupling (39700).

5.2.17 Rotate shaft by hand and ensure free rotation.

5.2.18 Fit all accessories such as sealing water, flushing water, cooling water connection, hot water/ steam circulation etc.

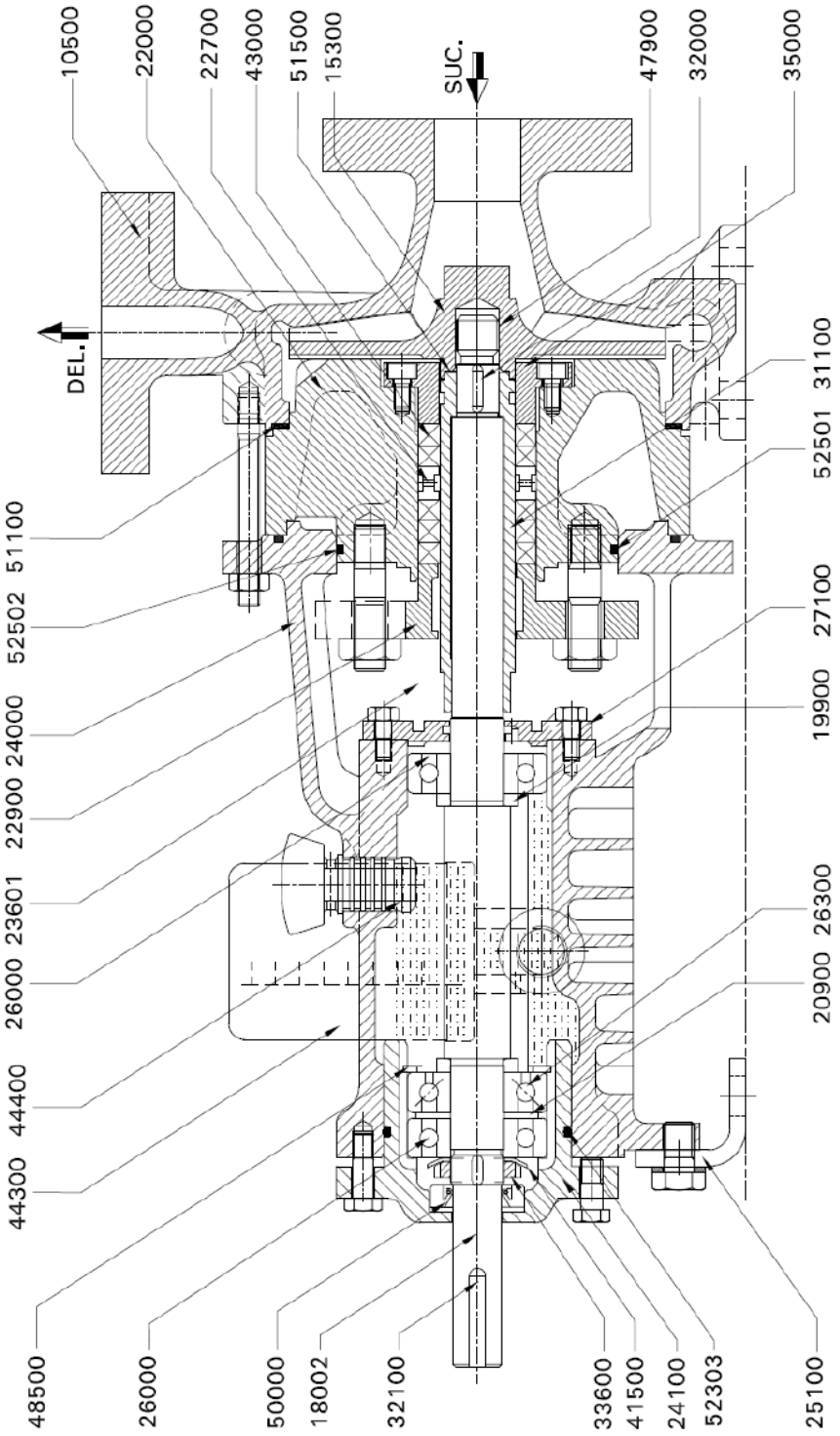
5.2.19 Fit support foot (25100) to bearing housing.

5.2.20 Fit coupling spacer between pump half and motor half coupling in case of spacer type flexible couplings.

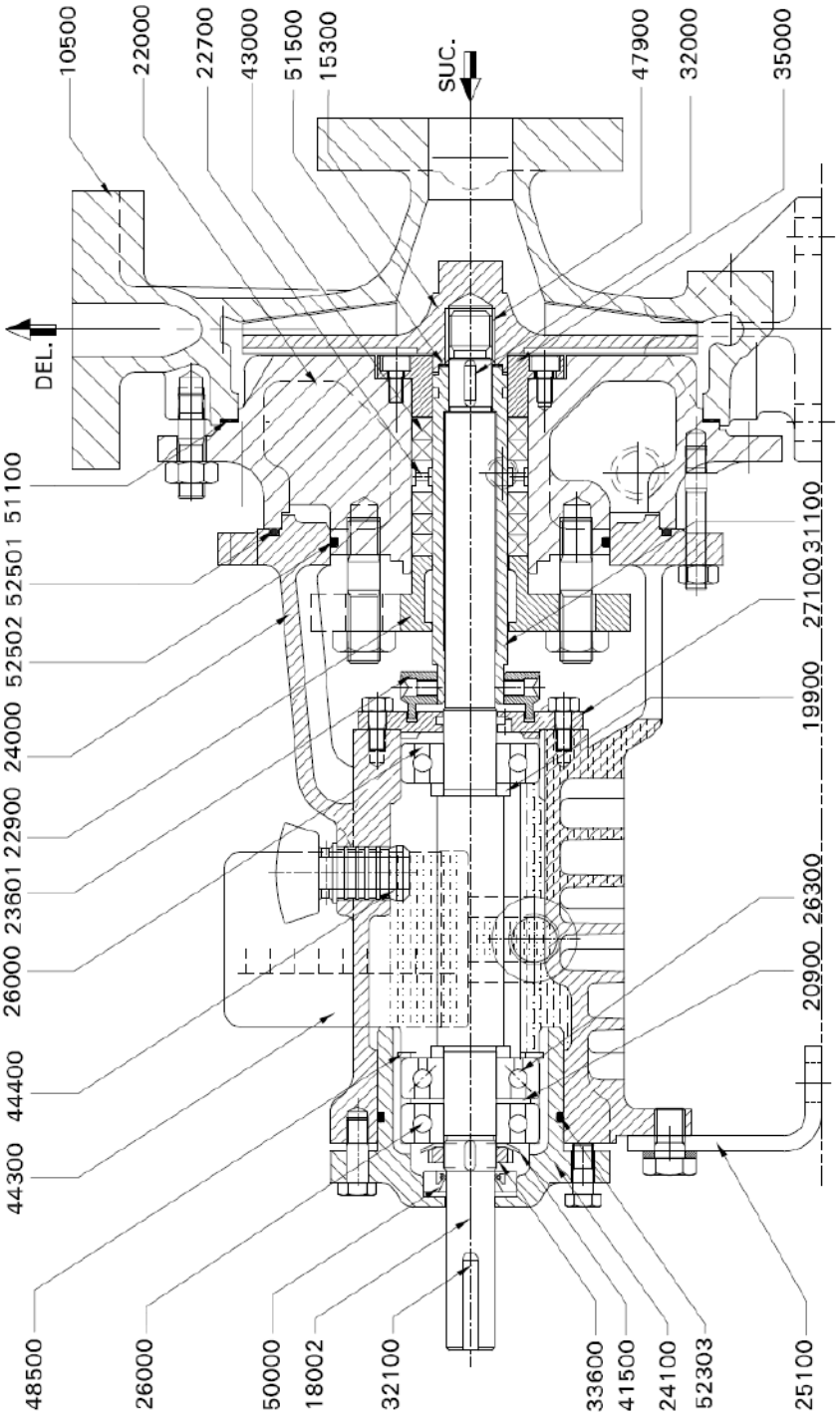
5.2.21 Mount motor on the base in case of standard flexible coupling and align the unit.

5.2.22 Fit coupling guard.

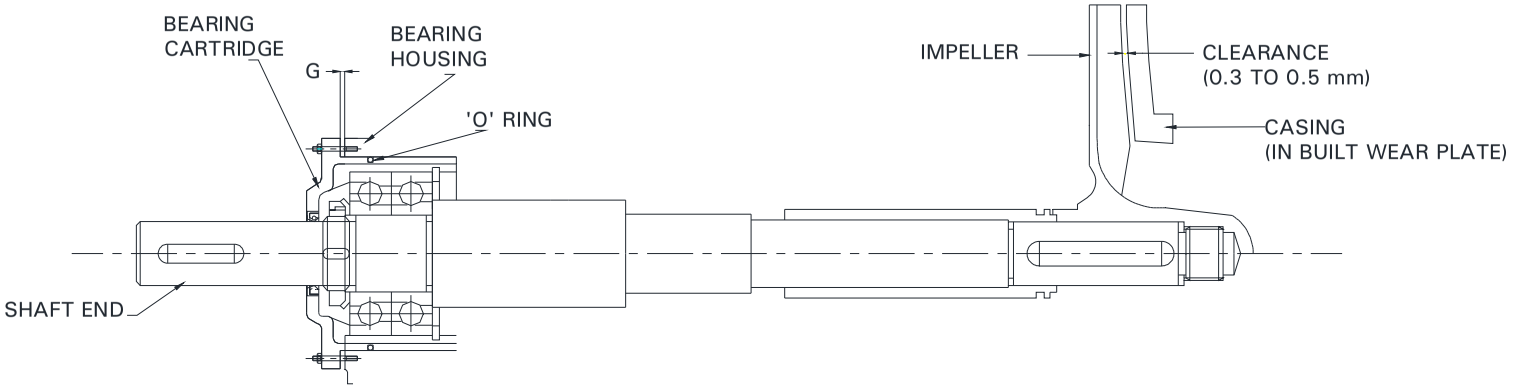
1. KPD 20/13QF

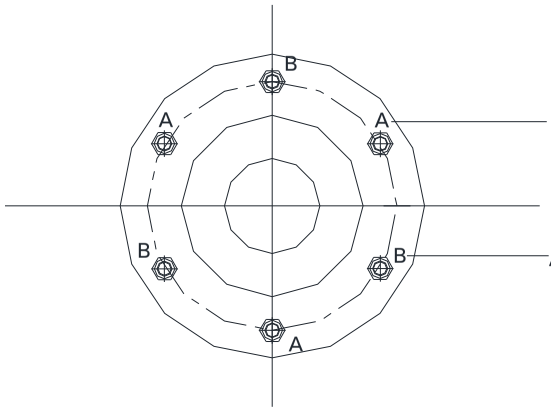


2. KPD 20/16, 20/20QF


10500
22000
22700
43000
51500
15300
SUC.
47900
32000
35000
DEL.
51100
52501
52502
24000
22900
23601
26000
44400
44300
31100
27100
19900
26300
20900
48500
26000
50000
18002
32100
33600
41500
24100
52303
25100

Partial assembly of telescopic arrangement





A) 3 Hex. screws for clearance adjustment of impeller and wear plate by gap G of bearing housing and bearing cartridge.

A) 3 studs and nuts for holding of bearing cartridge.

View from shaft end of bearing cartridge.

1.0 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 occurs, 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 car 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 namepate and before maintenance, ensure that the pump is drained down.

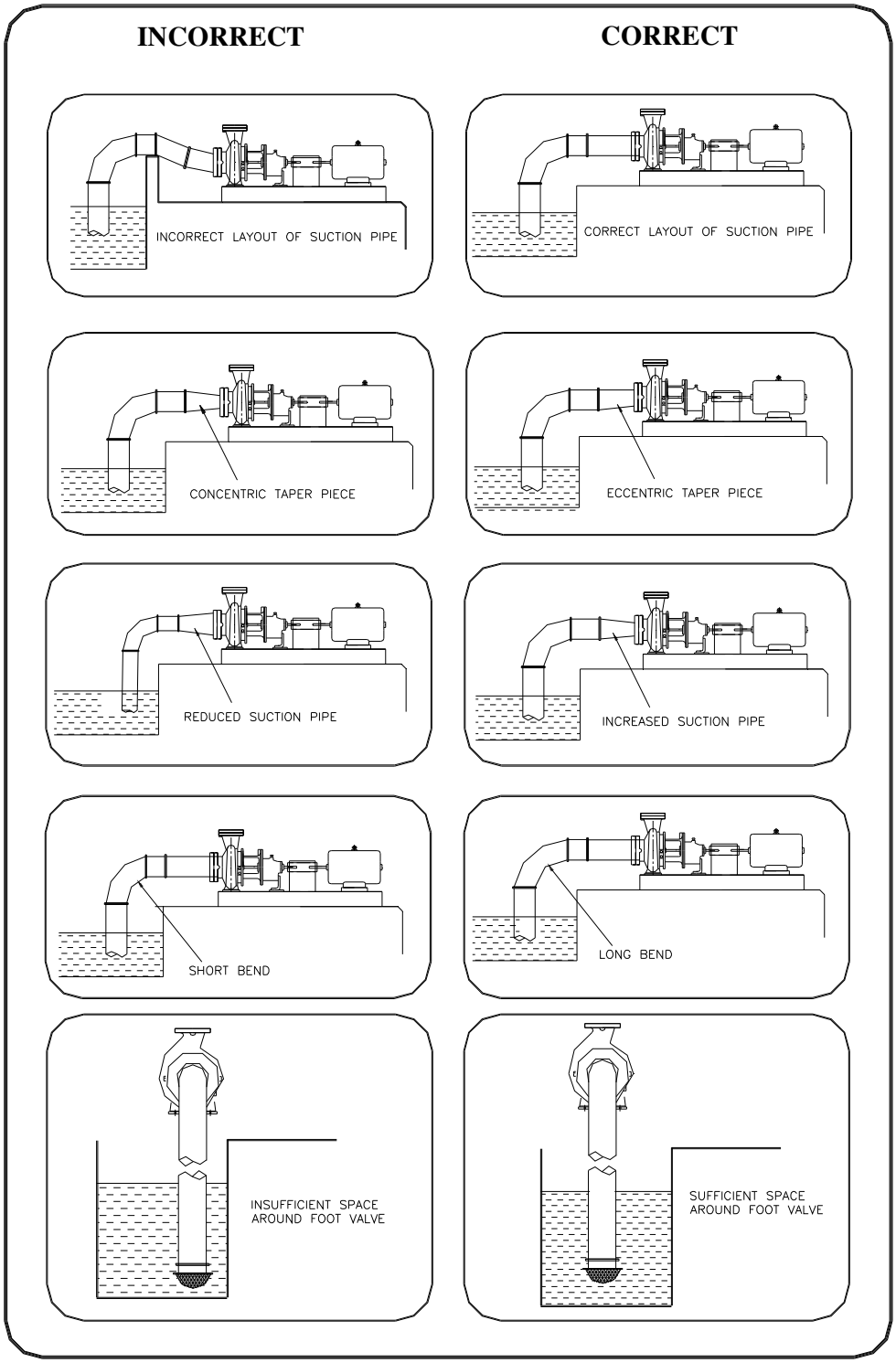
Wear a suitable mask or respirator when working with packing and gasket contain fibrous material, as these can be hazardous when the fibrous dust is inhaled. Be cautious, if other supplier's components have been substituted for genuine KBL parts, these may then contain hazardous materials.

Store all oily rags or other flammable material in a protective container in a safe place. Do not weld or flame cut on pipes/tubes that contents flammable

fluids. Clean them thoroughly with nonflammable solvent before welding or flame cutting on them. Use solvent/chemical resistant gloves for hand protection.

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

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.


INCORRECT
CORRECT
INCORRECT LAYOUT OF SUCTION PIPE
CORRECT LAYOUT OF SUCTION PIPE
CONCENTRIC TAPER PIECE
ECCENTRIC TAPER PIECE
REDUCED SUCTION PIPE
INCREASED SUCTION PIPE
SHORT BEND
LONG BEND
INSUFFICIENT SPACE AROUND FOOT VALVE
SUFFICIENT SPACE AROUND FOOT VALVE

KIRLOSKAR CENTRIFUGAL PUMPS

WARNING

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

LOCATION

The pump should be located as near the liquid source as possible. This will minimize suction lift and pump will give better performance.
Ample space should be provided on all the sides so that the pump can be inspected while in operation and can be serviced whenever required.

FOUNDATION

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

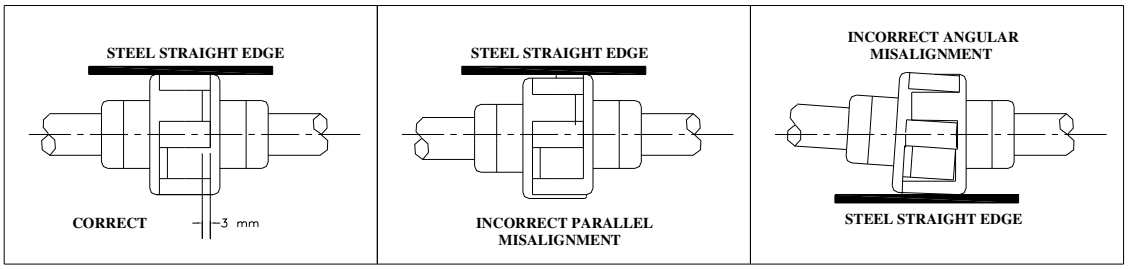
ALIGNMENT

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

FLEXIBLE COUPLING

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

1) Angular misalignment – shaft with axis concentric, but not parallel.
Maximum allowable misalignment is 1°



2) Parallel misalignment – shaft with axis parallel, but not concentric. Maximum allowable misalignment is 0.2 mm

LEVELING THE UNIT

When the unit is received with the pump and driver mounted on the base plate, it should be placed on the foundation and the coupling halves disconnected. The coupling should not be reconnected until all misalignment operations have been completed. The base plate must be supported evenly on wedges inserted under the four corners so that it will not be distorted or sprung by the uneven distribution of the weight. Adjust the wedges until the shafts of the pump and the driver are in level. Check the coupling faces, suction and discharge flanges for the horizontal and vertical position by means of spirit level.

FLEXIBLE COUPLING ALIGNMENT

The two halves of the coupling should be at least 3 mm apart so that they cannot touch each other when the driver shaft is rotated. Necessary tools for approximately checking are straight edge or an outside caliper. A check for parallel misalignment is made by placing a straight edge across both coupling periphery at the top, bottom and both the sides. The unit will be in parallel alignment when the straight edge rests evenly on the coupling periphery at all the positions. Care must be taken that the straight edge must be parallel to the axis of the shaft.

GROUTING

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

FACTORS THAT MAY DISTURB ALIGNMENT

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

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

PIPING

Both suction and delivery pipes and accessories should be independently supported near the pump, so that when the flanges, bolts are tightened no strains will be transmitted to the pump casing. It is usually advisable to increase the size

of both the suction and delivery pipe at the pump nozzles in order to decrease the loss of head due to friction and for the same reason piping should be arranged with minimum possible bends as possible, or it should be made with long radius wherever possible. The pipe lines should be free from scales, welding residuals etc., and have to be mounted in such a way that they can be connected to suction and delivery flanges without any stress on the pump. It can be achieved by supporting the pipelines at appropriate locations.

SUCTION PIPE

The suction pipe should be as short as possible. This can be achieved by placing the pump near the liquid to be pumped. The suction pipe must be kept free from air leakages. This is particularly important when the suction lift is high. A horizontal suction line must have a gradual rise to the pump. Any high point in the pipe will be filled with air and thus prevent proper operation of the pocket in the top of the reducer and the pipe. Use an eccentric piece instead.

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

DELIVERY PIPE

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

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

VACUUM EQUALIZING LINE (AND LIQUID LINE)

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

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

FOOT-VALVE

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

STUFFING BOXES AND PACKING (only for gland packed pump)

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

BALL BEARINGS

Correct maintenance of ball bearings is essential. The bearing manufacturers give the following as a guide to re-lubrication periods under normal condition.
Three monthly when on continuous duty.
Six monthly when on eight hour per day duty.
The bearings and housings should be completely cleaned and recharged with fresh grease after 2500 hrs. or the nearest pump overhaul time.

PRIMING

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

1) Liquid level above pump level.
   Pump is set below liquid level of source of supply, so that liquid always flows to pump under positive head.
2) Priming with foot-valve.
   a. When pump is installed on suction lift with foot valve at the end of suction line, fill pump with water from some outside source till all air is expelled and water flows through the air vent.
   b. When there is liquid under some pressure in the discharge pipe, priming can be effected by bypassing the pressured liquid around the check and gate valve. Of course, the initial priming must be affected from some outside source.

   Note: In this case, the foot-valve must be capable of withstanding pump pressure and possible surge.
3) Priming by ejector
   An ejector operated by steam, compressed air or water under pressure and connected to air vent at the top of casing can be used to remove air from pump and prime the pump on suction lift installations.
4) Priming by dry vacuum pump
   A hand or power pump sucks in all the air from the casing and the suction pipe, and thus primes the system.

STARTING

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

RUNNING

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

STOPPING

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

STUFFING BOXES (only for gland packed pump)

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

CASING RINGS

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

SPARE PARTS

A set of ball bearings, a set of casing rings and a set of gland packing rings / mechanical seal must always be kept at hand to ensure uninterrupted service from the pump. While ordering for spare parts, always give type, size and serial number of the pump as stamped on the number 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 22 56 57 58

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

CHECK POINTS

1. Suction pipe, foot valve choked.
2. Nominal diameter of suction line too small.
3. Suction pipe not sufficiently submerged.
4. Too many bends in the suction line.
5. Clearance around suction inlet not sufficient.
6. Shut off valve in the suction line in unfavorable position.
7. Incorrect layout of suction line (formation of air pockets).
8. Valve in the suction line not fully open.
9. Joints in the suction line not leak-proof.
10. Air leaking through the suction line and stuffing box etc.
11. Suction lift too high.
12. Suction head too low (difference between pressure at suction connection and vapor pressure too low).
13. Delivery liquid contains too much gas and/or air.
14. Delivery liquid too viscous.

15. Insufficient venting.
16. Number of revolutions too high.
17. Number of revolutions too low.
18. Incorrect direction of rotation (electric motor incorrectly connected, leads of phases on the terminal block interchanged).
19. Impeller clogged.
20. Impeller damaged.
21. Casing rings worn out.
22. Separation of crystals from the flow of pumping liquid (falling below the temperature limit/equilibrium temp).
23. Sealing liquid line obstructed.
24. Sealing liquid contaminated.
25. Lantern ring in the stuffing box is not positioned below the sealing liquid Inlet.
26. Sealing liquid omitted.
27. Packing incorrectly fitted.
28. Gland tightened too much/slanted.
29. Packing not suitable for operating conditions.
30. Shaft sleeve worn 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 of delivery liquid too high.