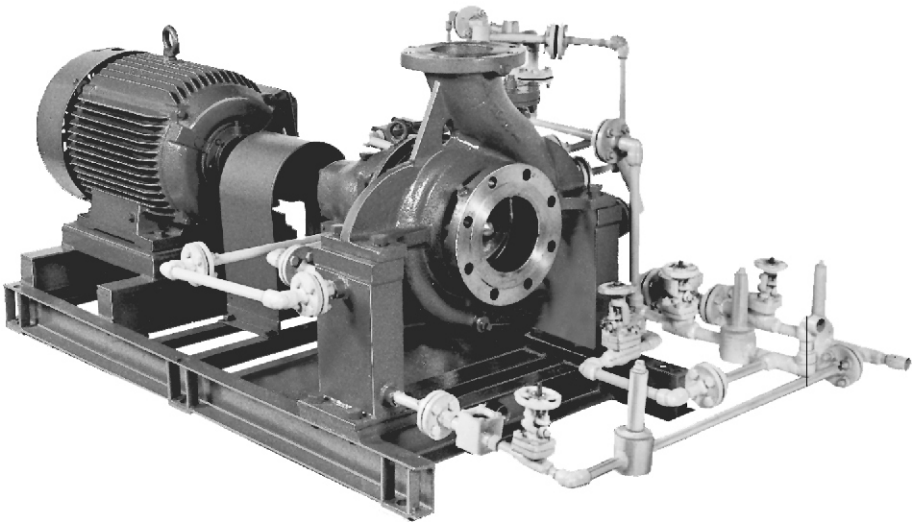
INSTRUCTIONS ON INSTALLATION OPERATION AND MAINTENANCE FOR KIRLOSKAR PUMP TYPE KPD-KPD QF

Enriching Lives



KIRLOSKAR BROTHERS LIMITED
UDYOG BHAVAN, TILAK ROAD, PUNE - 411 002

KIRLOSKAR BROTHERS LIMITED

Udyog Bhavan, Tilak Road, Pune 411 002 (India)

WARRANTY

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

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

KIRLOSKAR BROTHERS LIMITED

CONTENTS

Please furnish complete name of parts, part Nos. and material construction while ordering spare parts for the pump.

1. **GENERAL**

1.1 This booklet covers instruction for following types KPDQF,KPD-J,KPD-T of KPD series

UNIT-4	UNIT-5	UNIT-7	UNIT-9	UNIT-11	UNIT-13
20/13*	25/16*	25/26A#	65/32	125/26	150/50M#
20/16*	32/13	32/26	80/32	at	200/38M#
20/20*	32/16	40/26	80/40	2900	200/46#
Note:	32/16A#	40/32	80/40N	rpm	150/52#
	32/20	50/26	100/26	125/45#	
	32/20A#	50/32	100/32	150/43#	
	40/13	65/16	100/40		
	40/16	65/20	125/26		
	40/20	65/26	125/32		
	40/20A#	65/26N	125/40		
	50/13	80/16	125/40N		
	50/16	80/20	125/32		
	50/16A#	80/26	150/32N		
	50/20	100/20	150/40#		
	65/13		65/43#		

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.

c) Pump models with suffix”N” are modified for improvement in rising nature performance towards shut-off.

d) Pump models with suffix “A” are with improved efficiency than standard model.

1.1 Description KPD pumps.

KPD-	KPD pumps with enclosed impeller
KPD-QF	KPD pumps with semi open impeller.
KPD-J-	KPD pumps with jacketed delivery, casing and casing cover.
KPD HOT	KPD pumps with casing cover for heating/cooling arrangement.
KPD-T	KPD pumps with Traphoil Packing for Thermic Fluid (above 150°C)

1.2 The complete range of ‘KPD’ pump is covered by five driving units thereby reducing, inventory and achieving interchangeability of parts.

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

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

2. INSTALLATION

2.1 For location, preparing foundation, installation, alignment, piping general maintenance, trouble shooting etc. the instructions given in our publication – GENERAL INSTRUCTIONS FOR INSTALLATION, OPERATION AND MAINTENANCE

OF KIRLOSKAR CENTRIFUGAL PUMPS' which is also printed alongwith this booklet must be followed 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.

2.2 Mounting and Alignment

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

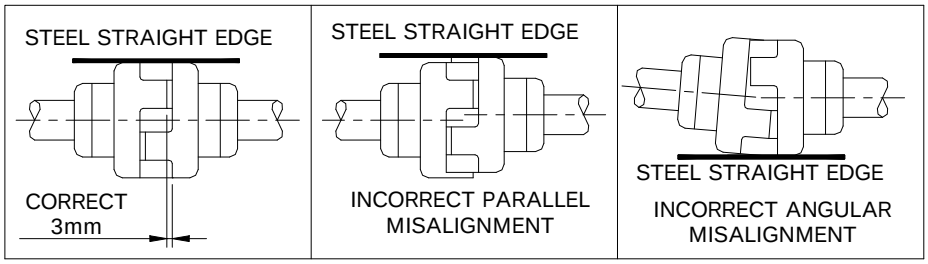
Alignment

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

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

(i) Angular mis-alignment- Shaft with axis concentric but not parallel.
(ii) Parallel mis-alignment- Shaft with axis parallel but not concentric. Mis-alignment is checked by using straight edge as shown in Fig.1 at 90° apart.

SPACER COUPLING



STD COUPLING

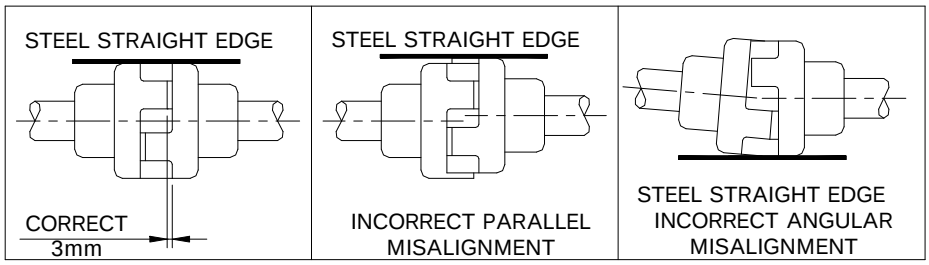


Fig.1

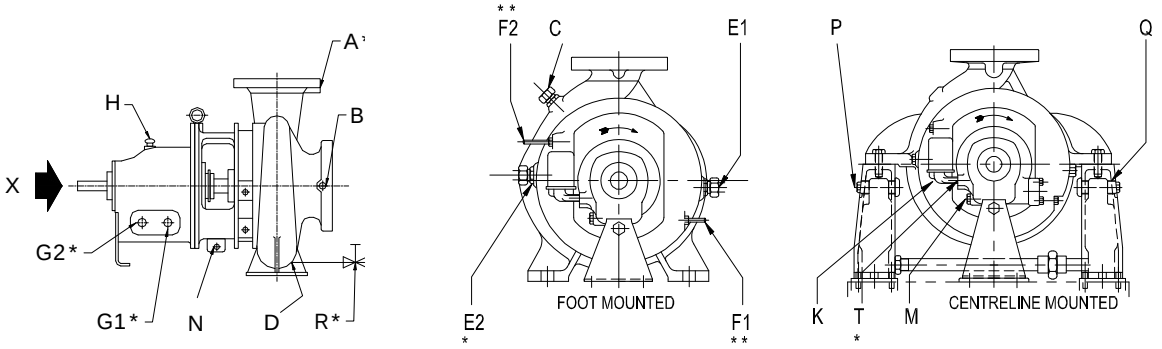
2.3 BEFORE COMMISSIONING THE PUMPSET, PLEASE ENSURE;

2.3.1 The pipe connections are flushed and tightened properly.

2.3.2 Alignment is proper.

2.3.3 Auxiliary piping connections such as sealing connections, cooling connection etc. are made. Details of sealing liquid are given in our supply order.

Please refer to Fig. 2 for Plugs and piping connection in KPD pumps.



KPD PUMPS-TAPPING CONNECTIONS CHART

Code	Description	Location of Connection
A	Gauge connection Discharge side	On pump discharge side
B	Gauge suction side or vacuum equalising connection	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 of 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 centre line mounted pump	On pad for centre line mounted pump casing
Q	Pad cooling water outlet for centre line mounted pump	On pad for centre line mounted pump casing
R*	For drain cock and piping	On pump casing bottom
S	Drain tapping 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

* This special provision on request only - Will be applicable only for Jacketted pump.
** For hot models KPD/KPD-Q/Centre line mounted KPD/KPD-T Pumps

2.3.4 KPD pumps are oil lubricated as standard supply. The pump is provided with constant level oiler.

2.3.4.1 Constant Level Oiler

Fix the constant level oiler and fill the oil. Procedure for fitting the constant level oiler and method of filling oil is given below.
Constant level oiler has plastic container and aluminum body as a standard supply. Connection stem is ¼''BSP tapped and its capacity is 70 ml approx. 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. Fig 3,4 and 5).

2.3.4.2 Method of Fitting:

Screw constant level oiler stem into the tapped hole of the bearing housing reservoir. Before fitting oiler, check the level of tapped hole with the help of a turned bar with ¼'' BSP tapping at one end and a spirit level. (see Fig 3). If the level is incorrect and oiler tilts downward, oil will not flow from oiler into the reservoir (See Fig.4). hence it is necessary to check the level before fitting in the constant level oiler.

2.3.4.3 Method of Filling the Oil

Tilt the container (as shown in fig.5) 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 the above procedure till the level in the reservoir is equal to the level of which the oiler is adjusted.

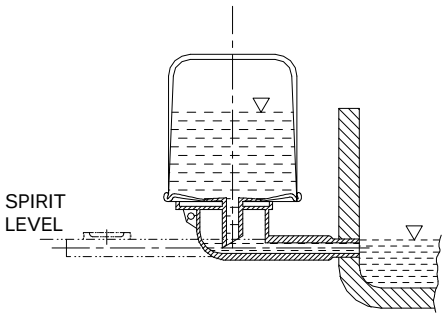


Fig. No.3 CORRECT METHOD

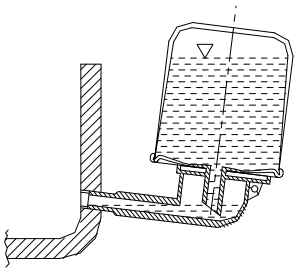


Fig. No.4 INCORRECT METHOD

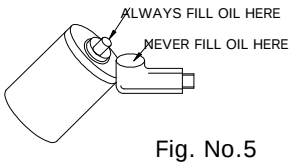


Fig. No.5

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 reservoir is filled upto mark.

CAUTION

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

3. Operation

3.1 Before starting the pump check the following:

3.1.1. The pump rotates freely by hand.
3.1.2. The level of the oil in the constant level oiler is up to the mark.
3.1.3. The sealing liquid and cooling water connections are properly tightened and adjusted.
3.1.4. The direction of rotation of driver. It should correspond to the direction of rotation of the pump.
3.1.5. The pump casing and suction pipe line is fully primed with the liquid.
3.1.6. Valve on delivery side is closed.
3.1.7. The cock for pressure gauge connection is closed.
3.1.8. The gland bolts are properly tightened.
3.1.9. 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 (half) hour to ensure that all solidified liquid is melted.

3.2 Starting the pump

3.2.1 Start the pump. Let the prime mover pick up its full speed.
3.2.2 Open the valve on delivery line gradually.
3.2.3 Regulate the required flow by adjusting the delivery valves.
3.2.4 Open the cock for pressure gauge connection.

3.3 During running the pump check the following things and regulate, if necessary.

3.3.1 The pump is running smooth.
3.3.2 The flow of sealing liquid and cooling/heating water is uninterrupted. If necessary, provide sight glass in the piping.
3.3.3 The bearings are not getting abnormally hot.
3.3.4 The gland is properly tightened to ensure sufficient leakage to dissipate heat generated. Maximum permissible leakage is 60 to 80 drops per minute.
3.3.5 Head and capacity developed by the pump is specified.
3.3.6 Power consumption is within limit.
3.3.7 Ensure that there is not mechanical friction in the pump.
3.3.8 Stop the pump immediately, if any, defects are detected. Do not start the pump unless the defects are rectified. Report immediately to the supplier, if it is not possible to rectify the defects.

3.4 During stopping the pump:

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

4. TECHNICAL DATA

4.1 Direction of Rotation

The direction of rotation is clockwise when viewed driving end.

4.2 Bearings

4.2.1 Specification of bearings, oil seal and quantity of oil.

Part no.	Description	Unit N0				
		No.5	No.7	No.9	No.11	No.13
500.1	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 Litre	0.5 Litre	0.7 Litre	1.0 Litre	1.5 Litre

* Supplied against request.

4.2.2 Bearing Temperature

a) Maximum allowable temperature of bearings 80°C.

b) In case of pumping liquid above 180°C, cooling of lubricating oil shall be necessary. Bearing housing cooling arrangement is provided Quantity of cooling water required is 0.25m^3/hr at 6kg/cm^2 max.

c) 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

Driving Unit No.	Speed in RPM	Bearing Arrangement	Bearing Size	
			Driving End	Non Driving End
5	Upto 3000 rpm	Standard supply	SKF-6305 (1 No.)	SKF-6305 (1 No.)
	Upto 3000 rpm	Reinforced (against requirement)	SKF-7206BG (2 Nos/1 pair)	SKF-NU305 (1 No.)
7	Upto 1500 rpm	Standard supply	SKF-6307 (1 No.)	SKF-6307 (1 No.)
	Upto 1500 rpm	Reinforced (against requirement)	SKF-7307BG (2 Nos/1 pair)	SKF-NU307 (1 No)
	Above 1500 & upto 3000 rpm	Standard supply	SKF-7307BG (2 Nos/1 pair)	SKF-NU307 (1 No.)
9	Upto 3000 rpm	Standard supply	SKF-7309BG (2 Nos/1 pair)	SKF-NU309 (1 No.)
11	Upto 3000 rpm (Only for 125/126) AT 2900 rpm	Standard supply	SKF-3311 (1 No.)	SKF-NU311 (1 No.)
13	Upto1500 rpm	Standard supply	SKF-7313BG (2 Nos/1 pair)	SKF-NU313 (1 No.)

B. Bearing Details for KPD 125/45 and KPD 150/43 Pump.

Driving Unit No.	Speed in RPM	Bearing Arrangement	Bearing Size	
			Driving End	Non Driving End
11A (KPD 125/45	Upto1750 rpm	Standard supply	SKF-7311BECB (2 Nos/1 pair)	SKF-NU311 (1 No.)
11B (KPD 150/43)	Upto1750 rpm	Standard supply	SKF-7311BECB (2 Nos/1 pair)	SKF-NU311 (1 No.)

C Bearing details for KPD pumps with semi-open impeller i.e. KPDQF

Driving Unit No.	Speed in RPM	Bearing Arrangement	Bearing Size	
			Driving End	Non Driving End
4	Upto3000 rpm	Standard supply	SKF-6304 (1 No.) & SKF-7304 (1 No.)	SKF-6304 (1 No.)
5	Upto3000 rpm	Standard supply	SKF-7206BG (2 Nos/1 pair)	SKF-NU305 (1 No.)
7	Upto3000 rpm	Standard supply	SKF-7307BG (2 Nos/1 pair)	SKF-NU307 (1 No.)
9	Upto3000 rpm	Standard supply	SKF-7309BG (2 Nos/1 pair)	SKF-NU309 (1 No.)

a) KPD Pumps in Driving Unit 5 can be supplied in Reinforced bearing arrangement against request
b) KPD Pumps in driving unit 7 having speed less than 1500 rpm can be supplied in reinforced bearing arrangement against request

Notes:

1. Bearings of SKF make or equivalent are used.
2. The bearing arrangement 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, Kirloskarwadi.
3. C3 clearance bearings are used.
4. Axial running clearance shall be less than 0.45 mm for all above bearing arrangements.
5. Maximum allowable temperature of bearing shall be 80° C.
6. Bearings are oil lubricated. Oil level in the bearing housing is maintained upto the desired level with the help of constant level oiler. Constant level oiler is our standard supply.
7. In case of pumping liquids above 180°C, cooling of lubricating oil shall be necessary. However bearing housing cooling arrangement shall be provided at an extra cost and against specific request only.

4.3 Lubrication

The oil used should be a highly refined straight mineral product of high demulsibility, free from running and acid forming tendencies. Detergent oil may cause foaming and emulsion difficulties and should not be used. The oil should be filled in with the help of constant level oiler. For fitting and operating instructions, please refer to 2.3.4. The lubrication oil should be confirmed to following grades of oil available in market.

Manufacturers	Speed 1450 RPM	Speed 2900 RPM
INDIAN OIL	SERVO SYSTEM 81	SERVO SYSTEM 57
HINDUSTAN PETROLEUM	ENKLO- 57	ENKLO- 53

4.4 SPECIFICATIONS OF STUFFING BOX PACKING GASKET AND “O” RING FOR DRIVING UNITS 5,7,9,11,13

PART NO.	DESCRIPTION	UNIT NO. KPD 5	KPD 7	KPD 9	KPD 11	KPD 13
		32/13 40/13 50/13 65/13 32/16 40/16 50/16 25/16 25/20 32/20 40/20 50/20	65/16 80/16 65/20 80/20 100/20 32/26 40/26 50/26 65/26 80/26 40/32 50/32	100/26 125/26 65/32 80/32 100/32 125/32 80/40 100/40 125/40 150/40 150/32 65/43	125/26 150/43 125/45	200/38M 200/46 150/50M 150/52 125/32 (2900)
	GLAND PACKING ARRGT. WITH LANTERN RING	2 + L +3	2 + L +3	2 + L +3	2 + L +3	2 + L +3
4300001	GLAND PACKING SIZE (O.D. x I.D. x THICK.)	51 x 35 x 8 THICK.	65 x 45 x 10 THICK.	75 x 55 x 10 THICK.	75 x 55 x 10 THICK.	80 x 105 x 12 THICK. 125/32 (2900): 55 x 82 x 13 THICK
	STRAIGHT LENGTH OF GLAND PACKING IN mm	140	180	205	205	295 125/32 (2900): 215
5110001	GASKET FOR CASING & CASING COVER	114 ID x 152 OD x 1 TH. 176 ID x 188 OD x 1 TH. 216 ID x 230 OD x 1 TH.	176 IDx 188 OD x 1 TH. 216 ID x 230 OD x 1 TH. 266 ID x 282 OD x 1 TH. 331 ID x 348 OD x 1TH.	266 ID x 282 OD x 1 TH. 331 ID x 348 OD x 1TH. 411 ID x 432 OD x 1 TH. 431 ID x 450 OD x 1 TH.	266 ID x 282 OD x 1 TH. 454 ID x 474 OD x 1 TH. 471 ID x 491 OD x 1 TH.	402 IDx 425 OD x 2 TH 460 IDx 4900 OD x2TH 685 ID x710 OD x1TH 520 ID x540 0D x2 TH 331 ID x3480 OD x1 TH
5140001	GASKET FOR BEARING COVER	78 SQ. x 1TH	112 x 102 x 1TH	124 x 134 x 1TH	146 x 156 x 1TH	140 x 184 x 1 TH
5150001	GASKET FOR IMPELLER AND SHAFT SLEEVE	30 OD x 25 ID x 1TH	40 OD x 35 ID x 1 TH	50 OD x 44 ID x 1TH	50 OD x 44 ID x 1TH	69 OD x 74 ID x 1TH 125/32 (2900): 46 ID x 52 OD x 1TH
5160001	GASKET FOR MECH. SEAL	52 ID x 64 OD x 1T	76 ID x 94 OD x 1T	76 ID x 94 OD x 1T	76 ID x 94 OD x 1T	83 ID x 94 OD x 1 T
5250101	‘O’ RING FOR CASING COVER	104 ID x 3 TH.	123 ID x 3 TH.	145 ID x 3 TH.	145 ID x 3 TH.	175 ID x 3 TH. 125/32 (2900): 145 ID x 3 TH.
5231101	‘O’ RING FOR BEARING HOUSING	125 ID x 3 TH.	150 ID x 3 TH.	150 ID x 3 TH.	150 ID x 3 TH.	207 ID x 3 TH.
5250201	‘O’ RING FOR LANTERN BRACKET	142 ID x 3 TH 175 ID x 3 TH 215 ID x 3 TH.	175 ID x 3 TH. 215 ID x 3 TH. 285 ID x 3 TH.	265 ID x 3 TH.	265 ID x 3 TH.	308 ID x 3 TH. 125/32 (2900): 265 ID x 3 TH
5230301	‘O’ RING FOR BEARING CARTRIDGE	72 ID x 3 TH.	88 ID x 3 TH.	108 ID x 3 TH.	----------------	----------------
6820001	GASKET FOR IMPELLER AND IMPELLER NUT	28 OD x 20 ID x 1 TH.	38 OD x 28 ID x 1 TH.	48 OD x 38 ID x 1 TH.	48 OD x 38 ID x 1 TH.	69 OD x 56 ID x 1 TH. 125/32 (2900): 40 ID x 48 OD x 1 TH.
6850001	GASKET FOR OIL WELL COVER	99 OD x 55 ID x 1 TH.	99 OD x 55 ID x 1 TH.	99 OD x 55 ID x 1 TH.	99 OD x 55 ID x 1 TH.	99 OD x 55 ID x 1 TH.

NOTE: CORRECT LIQUID SPECIFICATIONS SHOULD BE INFORMED TO US TO RECOMMEND SUITABLE GRADE OF ST. BOX PACKING.
ALL DIMENSIONS ARE IN mm.
4.5 MECHANICAL SEAL SPECIFICATIONS:- PL. REFER TO C/S DRAWING SUPPLIED AGAINST ORDER.

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

4.5.1 Cool the gland packed stuffing box when pumping liquid temperature is above 105°C.

4.5.2 Cool the mechanical seal; stuffing box when pumping liquid temperature is above 140°C. This limit is subject to change as per seal manufacturer's recommendation.

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

Full nominal Impeller dia. In cms.	Cooling water quantity at various pumping liquid temperature				
	110°C	150°C	200°C	250°C	300°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

Cooling water quantities mentioned are in m^3/hr.
Maximum temperature of cooling water at outlet = 50°C
Maximum permissible cooling water pressure = 6.0 kg/cm^2(G)

4.5.4 Cooling of Pump Pads:

Center–line mounted pumps are supported on pads through which cooling water should be circulated. Center–line mounted pumps are recommended for pumping liquid temperature above 180°C. Pump with center -line mounted delivery casing is optional.

Quantity of cooling water to pad- 0.2 to 0.3 m3/hr.

Maximum permissible cooling water pressure = 6kg/cm^2(G)

4.6 Clearance between impeller vanes and wear plate on suction side should be 0.3 to 0.5 mm in case of pumps with semi-open impeller.

4.7 Steam or hot water circulation in KPD Jacketted 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.

4.8 Interchangeability:

Parts standardisation is optimised utilising 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. Interchangeability chart is given in 4.8.1

5 MAINTENANCE:

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

5.1 Daily Checks

5.1.1 An hourly record of suction and delivery pressure, discharge quantity input to the pump driver should be maintained.

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

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

5.2 Periodical checks

5.2.1 The temperature of the bearing should be measured by a thermometer. Safe maximum temperature a bearing can attain is 80 ° C.

5.2.2 The lubricants of the bearings 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.

5.2.3 Check the stuffing box leakage, normal leakage should be sufficient to dissipate heat generated. In case the packings are worn out, all the packing rings should be replaced. Replacement of one or two rings of addition rings should never be done.

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

5.2.5 Sufficient quantity of suitable type of lubricant and stuffing box packing should be kept for daily and emergency use.

5.2.6 Calibrate the measuring instrument.

5.3 Annual checks

5.3.1 The pump should be overhauled completely to check the clearance and to replace worn out parts. Clearance between impeller and casing rings, shaft sleeve and throat bush, lantern ring and the shaft sleeve etc. are very important. The bearings should be cleaned thoroughly and lubricated. The stuffing box should be repacked by correctly locating the lantern ring.

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

5.3.4 The measuring instruments, gauge etc. should be recalibrated.

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

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

6 MECHANICAL SEAL IN 'KPD' PUMPS

6.1 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 but in order to obtain the maximum life with trouble-free performance; the equipment should be adequately maintained.

When the mechanical seal is functioning satisfactorily without any leakage etc. the preventive maintenance is not advocated. If leakage occurs, a thorough check-up is needed. While fitting the mechanical seals initially at pump manufacturer's side, due care is taken and the running test is conducted to ensure the performance of seals.

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 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.

Before re-assembly, please check up the following points to ensure the proper fitting and satisfactory operation of the mechanical seal.

1. Shaft sleeve OD should be within + 0.00 mm or –0.05 mm for specified seal size.

2. Leading edge of shaft sleeve is chamfered.

3. Run out of the shaft at the seal face is within 0.05mm.

6.2 Flushing the Mechanical Seal face/ product recirculation of fluid at the seal face.

Flush fluids are those which are different from the fluid being handled or pumped liquid. If they are introduced from an external source, flushing should be done at pressure at least one atmosphere above the vapour pressure of the liquid at the temperature being pumped. Flushing liquid quantity should be approximately 0.3 to 0.5 m^3/hr at the minimum pressure of 0.7 kg/cm^2 above pressure of liquid at stuffing box. For specific application refer cross sectional drawing supplied against order.

Flushing at the seal face is necessary to provide lubrication heating, or cooling of the seal faces and densing action. Pump should not run without flushing at the seal face unless specifically recommended by the seal manufacturer.

CAUTION:

Please refer to the CS drawing supplied against O/A for flushing/ product recirculation recommendation.

6.3 Quenching:

Quench fluids are introduced to the low pressure side of seals for following reasons:

a. Cooling to remove heat from stationary seal faces and mechanical seal cover.

b. Heating to add heat to the fluid in the stuffing box through seal faces. This is often done when handling a thermo-sensitive fluid such as tar, which will get hardened if allowed to cool.

c. Smothering to prevent air from reaching the low pressure side of seal face. In some cases, sealed fluids can react with air to form to sticky residue, which might interfere with seal operation.

d. Clearing to remove any accumulation which may develop at the low pressure side of the seal faces.

Quenching liquid media shall be recommended by seal manufacturer. Quench should be supplied at a low pressure of 0.5 to 0.7 Kg/cm^2 in order to avoid the leakage of the same through throttle bush. Quench quantity should be approximately 0.3 to 0.5 m^3/hr.

CAUTION: Please refer to the cross sectional drawing supplied for Quenching recommendation if any against order.

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

7 OVERHAULING

PROCEDURE FOR DISMANTLING AND RE-ASSEMBLING.

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

Note: 'O' ring Part No. 525.2 is applicable only for KPD Hot pump.

7.1 Dismantling:

Follow the following steps for dismantle the pump.

7.1.1. Isolate power supply to motor.

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

7.1.3. Drain the liquid from the pump by removing the drain plug (601), or open the pump casing drain cock.

7.1.4. Remove all auxiliary tubing and piping.

7.1.5. Drain the lubricating oil from bearing housing (240/242) and remove constant level oiler (443).

7.1.6. We recommend to match the punch mark of coupling halves.

7.1.7. In case of pumps with spacer type flexible couplings, disconnect coupling (pump half and motor half) from the coupling spacer (399) and remove coupling spacer. Coupling spacer shall fall down. In case of ordinary flexible couplings, remove the motor from the base.

7.1.8. Remove the support foot hold down bolts (251).

7.1.9. Adjust string or chain tension to support the weight of the back-pullout assembly for higher size pump.

7.1.10. Remove the hex. nuts from casing studs holding the lantern bracket (248) to pump casing (105/106).

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

7.1.12. Slightly pullout the driving unit till impeller (151/153) clears the pump casing (105/106).

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

7.1.14. Remove casing gasket (511).

7.1.15. Unscrew the impeller nut(330). Remove the gasket between impeller and impeller nut (682). In case of KPD driving Unit-13 pumps unscrew both the impeller nuts and remove the gasket between impeller nuts as well as between impeller and impeller lock nut also.

7.1.16. Take out the impeller (151/153) from pump shaft (180.1/180.2). Remove the gasket between impeller and shaft sleeve (515).

7.1.17. Removal of stuffing box with gland packing: For this following steps should be taken:

a) Remove split gland (229) by loosening after nuts used tightening.

b) Take out casing cover (220) alongwith throat bush (350), Gland packing (430), lantern ring (227), 'O' ring for casing cover (525.1) will also come out along with it.

c) Take out 'O' ring lantern bracket (525.2).(Only for Hot Model).

d) Unscrew the hex socketted screw clamping throat bush (350) to casing cover (220) and remove the throat bush (350).

e) Remove gland packing rings (430) and lantern ring (227).

f) Remove shaft sleeve (311) alongwith liquid deflector (236).

g) Remove impeller key (320).

h) Remove deflector guard (237) by unscrewing hex. screws.

7.1.18. Removal of stuffing box with mechanical seal.
(Applicable for single and double internal Mechanical Seals). Follow the steps given bellow:

a) Unscrew hex socketted screw clamping throat bush (350) to the casing cover (220) and remove throat bush (350).

b) Seal seat will come out alongwith throat bush (350) in case of double mechanical seal.

c) Pull shaft sleeve under mechanical seal (315). Use the groove on the shaft sleeve for pulling it out. Be careful while removing shaft sleeve since sleeve comes out along with 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 (220) studs.

f) Take out the casing cover (220) alongwith mechanical seal cover (231). 'O' ring for casing cover (525.1) 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 cover (231) from casing cover (220).

h) Remove deflector guard (237) by unscrewing hex. screws (In case of externally mounted mechanical seals similar procedure should be followed only with the change that casing cover (220) should be removed before removing the shaft sleeve (315) along with mechanical seal).

7.1.19. Loosen the grub screw holding liquid deflector (236. Take out liquid deflector.

7.1.20. Remove nuts holding lantern bracket (248) and bearing housing (240/242)

7.1.21. Take out lantern bracket (248)

7.1.22. Take out "O" ring for bearing housing (523.1) carefully.

7.1.23. Remove the pump half coupling (397) 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.

7.1.24 Take out the coupling key (321).

7.1.25 Loosen the hex screws for bearing cover (driving end)(270). Remove carefully the bearing cover along with oil seal (500.1).

7.1.26 Take out the packing (514).

7.1.27 Force the shaft (180.1or 108.2) carefully in the direction of the driving end. Shaft will come out alongwith the bearings.

7.1.28 Unlock the Lock washer (415) and remove lock nut (336), in case of reinforced bearing arrangement.

7.1.29 Take out the driving end bearing (263 or 260.1) with the help of puller.

7.1.30 Take out non driving end ball bearing (260.2) or inner race of Roller bearing at non driving end (264) with the help of a suitable sleeve.

CAUTION:
1. Push the sleeve on Arbour Press with uniform pressure.
2. Steps 7.1.28 to 7.1.30 are to be followed only if bearings are damaged and to be replaced.

7.1.31 Take out outer race of roller bearing at no-driving end from bearing housing in case of reinforced bearing arrangement.

7.1.32 Oil seal in the driving end bearing cover (500.1) should be removed if the oil seal lips are wormout or spring has lost tension.

7.1.33 Take out circlips(485) at driving end and no- driving end fitted in the bearing housing if found damaged (In case of reinforced bearing arrangement only).

7.1.34 Casing ring suction side (190), casing ring delivery side (191) are to be removed only if they are worn-out and need replacement.

INTERCHANGEABILITY OF KPD, KPD-T, KPD-Q, KPD-Q-J, KPD-J PUMPS. (DRIVING UNIT NO. KPD-7)

PART NO.	PART DESCRIPTION	TOTAL NO. OF PARTS	65/16	80/16	65/20	80/20	100/20	32/26	40/26	50/26	65/26	80/26	40/32	50/32
	PUMP SIZE		KPD-H, KPD-CL, KPD-QH / KPD, KPD-T, KPD-Q, KPD-Q-J, KPD-J	KPD-H, KPD-CL, KPD-QH / KPD, KPD-T, KPD-Q, KPD-Q-J, KPD-J	KPD-H, KPD-CL, KPD-QH / KPD, KPD-T, KPD-Q, KPD-Q-J, KPD-J	KPD-H, KPD-CL, KPD-QH / KPD, KPD-T, KPD-Q, KPD-Q-J, KPD-J	KPD-H, KPD-CL, KPD-QH / KPD, KPD-T, KPD-Q, KPD-Q-J, KPD-J	KPD-H, KPD-CL, KPD-QH / KPD, KPD-T, KPD-Q, KPD-Q-J, KPD-J	KPD-H, KPD-CL, KPD-QH / KPD, KPD-T, KPD-Q, KPD-Q-J, KPD-J	KPD-H, KPD-CL, KPD-QH / KPD-J, KPD-T, KPD-Q, KPD-Q-J, KPD-J	KPD-H, KPD-CL, KPD-QH / KPD, KPD-T, KPD-Q, KPD-Q-J, KPD-J	KPD-H, KPD-CL, KPD-QH / KPD, KPD-T, KPD-Q, KPD-Q-J, KPD-J	KPD-H, KPD-CL, KPD-QH / KPD, KPD-T, KPD-Q, KPD-Q-J, KPD-J	KPD-H, KPD-CL, KPD-QH / KPD, KPD-T, KPD-Q, KPD-Q-J, KPD-J
105	PUMP CASING FOOT MOUNTED	24	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	23 - 23 24
106	PUMP CASING CENTERLINE MOUNTED	12	- 1 - -	- 2 - -	- 3 - -	- 4 - -	- 5 - -	- 6 - -	- 7 - -	- 8 - -	- 9 - -	- 10 - -	- 11 - -	- 12 -
151	ENCLOSED IMPELLER	12	1 - 1	2 - 2	3 - 3	4 - 4	5 - 5	6 - 6	7 - 7	8 - 8	9 - 9	10 - 10	11 - 11	12 - 12
153	SEMI OPEN IMPELLER	12	- 1	- 2	- 3	- 4	- 5	- 6	- 7	- 8	- 9	- 10	- 11	- 12 -
190	CASING WEAR RING SUC. SIDE	9	1 - 1	2 - 2	3 - 3	4 - 4	5 - 5	6 - 6	7 - 7	8 -	8 - 8	4 - 4	6 - 6	9 - 9
191	CASING WEAR RING DEL. SIDE							----------					6 - 6	9 - 9
192	IMPELLER RING SUC. SIDE	9	1 - 1	2 - 2	3 - 3	4 - 4	5 - 5	6 - 6	7 - 7	8 -	8 - 8	4 - 4	6 - 6	9 - 9
193	IMPELLER RING DEL. SIDE							----------					6 - 6	9 - 9
220	CASING COVER	15	1/2 - - 3	1/2 - - 3	4/5 - - 6	4/5 - - 6	4/5 - - 6	7/8 - - 9	7/8 - - 9	7/8 - - 9	7/8 - - 9	7/8 - - 9	10/11 - - 12	13/14 - - 15
511	GASKET FOR CASING COVER	4	1		2			3					4	
151	SUPPORT FOOT FOR FOOT MOUNTED	6	1	2			3	2			3	4	3	4
151	SUPPORT FOOT FOR CENTERLINE MOUNTED							5				6	5	
248	LANTERN BRACKET	6	1 2	1 2	3 4	3 4	3 4	5 6	5 6	5 6	5 6	5 6	5 6	5 6
525.1	O RING FOR CASING COVER	1	1/- 1 1/- -	1/- 1 1/- -	1/- 1 1/- -	1/- 1 1/- -	1/- 1 1/- -	1/- 1 1/- -	1/- 1 1/- -	1/- 1 1/- -	1/- 1 1/- -	1/- 1 1/- -	1/- 1 1/- -	1/- 1 1/- -
525.2	O RING FOR LANTERN BRACKET	3	1/- 1 1/- -	1/- 1 1/- -	2/- 2 2/- -	2/- 2 2/- -	2/- 2 2/- -	3/- 3 3/- -	3/- 3 3/- -	3/- 3 3/- -	3/- 3 3/- -	3/- 3 3/- -	3/- 3 3/- -	3/- 3 3/- -
350	STUFFING BOX BUSH	2	1 1/2 1	1/2 1	1/2 1	1/2 1	1/2 1	1/2 1	1/2 1	1/2 1	1/2 1	1/2 1	1/2 1	1/2
227	LANTERN RING	1	1 1/- 1	1/- 1	1/- 1	1/- 1	1/- 1	1/- 1	1/- 1	1/- 1	1/- 1	1/- 1	1/- 1	1/-
236	LIQUID DEFLECTOR	1							1					
330	IMPELLER NUT	1							1					
515	GASKET FOR SHAFT SLEEV	1							1					
682	GASKET FOR IMPELLER NUT	1							1					
430	GLAND PACKING	2	1 1/2 1	1/2 1	1/2 1	1/2 1	1/2 1	1/2 1	1/2 1	1/2 1	1/2 1	1/2 1	1/2 1	1/2 1
443	CONSTANT LEVEL OILER	1							1					
226	DRIP PAN	3	1		2						3			
219	DRIP PLATE	1							1					
240	BEARING HOUSING (STANDARD)	1							1					
242	BEARING HOUSING WITH COOLING	1							1					
367	OIL WELL COVER FOR BRG. OIL COOLING	1							1					
270	BEARING COVER D.S.	1							1					
514	GASKET FOR BEARING COVER D.S.	1							1					
181.1	PUMP SHAFT WITH DEEP GROOVE BRG.	1							1					
181.2	PUMP SHAFT WITH REINFORCED BRG. ARRG.	1							1					
311	SHAFT SLEEVE	1							1					
260.1,260.2	DEEP GROOVE BALL BEARING D.S. & P.S.	1							1					
263	ANGULAR CONTACT BALL BEARING	1							1					
264	CYLINDRICAL ROLLER BEAIRNG	1							1					
229	SPLIT GLAND	2	1 1/2 1	1/2 1	1/2 1	1/2 1	1/2 1	1/2 1	1/2 1	1/2 1	1/2 1	1/2 1	1/2 1	1/2 1
460	WEAR PLATE SUC. SIDE													

INTERCHANGABILITY CHART OF KPD PUMPS (UNIT 9 & 11)

PART NO.	PUMP SIZE / PART DESCRIPTION	TOTAL NO. OF PARTS	100/26			125/26			65/32			80/32			100/32			125/32			80/40			80/40N			100/40			125/40			125/40N			150/32			150/32N			150/40			65/43			125/45			150/43		
			KPD-H	KPD-CL		KPD-H	KPD-CL		KPD-H	KPD-CL		KPD-H	KPD-CL		KPD-H	KPD-CL		KPD-H	KPD-CL		KPD-H	KPD-CL		KPD-H	KPD-CL		KPD-H	KPD-CL		KPD-H	KPD-CL		KPD-H	KPD-CL		KPD-H	KPD-CL		KPD-H	KPD-CL		KPD-H	KPD-CL		KPD-H	KPD-CL		KPD-H	KPD-CL		KPD-H	KPD-CL	
			KPD	KPD-T	KPD-J	KPD	KPD-T	KPD-J	KPD	KPD-T	KPD-J	KPD	KPD-T	KPD-J	KPD	KPD-T	KPD-J	KPD	KPD-T	KPD-J	KPD	KPD-T	KPD-J	KPD	KPD-T	KPD-J	KPD	KPD-T	KPD-J	KPD	KPD-T	KPD-J	KPD	KPD-T	KPD-J	KPD	KPD-T	KPD-J	KPD	KPD-T	KPD-J	KPD	KPD-T	KPD-J	KPD	KPD-T	KPD-J	KPD	KPD-T	KPD-J	KPD	KPD-T	KPD-J
105	PUMP CASING FOOT MOUNTED	28	1	-	2	3	-	4	5	-	6	7	-	8	9	-	10	11	-	12	13	-	14	13	-	14	15	-	16	17	-	18	17	-	18	19	-	20	19	-	20	21	-	22	23	-	24	25	-	26	27	-	28
106	PUMP CASING CENTERLINE MOUNTED	28	-	1	2	-	3	4	-	5	6	-	7	8	-	9	10	-	11	12	-	13	14	-	13	14	-	15	16	-	17	18	-	17	18	-	19	20	-	19	20	-	21	22	-	23	24	-	25	26	-	27	28
151	ENCLOSED IMPELLER	17		1			2			3			4			5			6			7			8			9			10			11			12			13			14			15			16			17	
190	CASING WEAR RING SUC. SIDE	14		1			2			3			4			5			6			7			7			8			9			9			10			10			11			12			13			14	
191	CASING WEAR RING DEL. SIDE	12			-					1			2			3			4			5			5			6			7			7			8			8			9			10			11			12	
192	IMPELLER RING SUC. SIDE	14		1			2			3			4			5			6			7			7			8			9			9			10			10			11			12			13			14	
193	IMPELLER RING DEL. SIDE	12			-					1			2			3			4			5			5			6			7			7			8			8			9			10			11			12	
220	CASING COVER	24	1 2	1	3	1 2	1	3	4 5	4	6	4 5	4	6	7 8	7	9	7 8	7	9	10 11	10	12	10 11	10	12	10 11	10	12	10 11	10	12	10 11	10	12	13 14	13	15	13 14	13	15	10 11	10	12	16 17	16	18	19 20	19	21	22 23	22	24
511	GASKET FOR CASING COVER	7			1									2														3										2						4			5			6			7	
251	SUPPORT FOOT FOR FOOT MOUNTED	5		1			2			1				2									3													4										3				5			
251	SUPPORT FOOT FOR CENTERLINE MOUNTED	5		1			2			1						2															3												4			3				5			
248	LANTERN BRACKET	4	1		2	1		2	1		2	1		2	1		2	1		2	1		2	1		2	1		2	1		2	1		2	1		2	1		2	1		2	1		2	3		4	3		4
525.1	O RING FOR CASING COVER	2	1 -	1	-	1 -	1	-	1 -	1	-	1 -	1	-	1 -	1	-	1 -	1	-	1 -	1	-	1 -	1	-	1 -	1	-	1 -	1	-	1 -	1	-	1 -	1	-	1 -	1	-	1 -	1	-	1 -	1	-	2 -	2	-	2 -	2	-
525.2	O RING FOR LANTERN BRACKET	2																										1																										
350	STUFFING BOX BUSH	4	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	3	3 4	3
227	LANTERN RING	1	1	1 -	1	1	1 -	1	1	1 -	1	1	1 -	1	1	1 -	1	1	1 -	1	1	1 -	1	1	1 -	1	1	1 -	1	1	1 -	1	1	1 -	1	1	1 -	1	1	1 -	1	1	1 -	1	1	1 -	1	1	1 -	1	1	1 -	1
236	LIQUID DEFLECTOR	3																					1																							2				3			
330	IMPELLER NUT	1																										1																										
515	GASKET FOR SHAFT SLEEVE	1																										1																										
682	GASKET FOR IMPELLER NUT	1																										1																										
430	GLAND PACKING	2	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	3	3 4	3	3	3 4	3
443	CONSTANT LEVEL OILER	1																							1																												
226	DRIP PAN	3											1																						2															3			
240	BEARING HOUSING (STANDARD)	2																							1																									2			
242	BEARING HOUSING WITH COOLING	2																							1																									2			
270	BEARING COVER D.S.	2																							1																									2			
514	GASKET FOR BEARING COVER D.S.	2																							1																									2			
181.2	PUMP SHAFT	3																							1																							2			3	
311	SHAFT SLEEVE	4																					1																							2			3			4	
263	ANGULAR CONTACT BALL BEARING	2																							1																									2			
264	CYLINDRICAL ROLLER BEARING	2																							1																									2			
229	SPLIT GLAND	2	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	1	1 2	1	3	3 4	3	3	3 4	3
469	WEAR PLATE	13		1			2			3			4			5						7			8			9			10			11			12			13			-----			----			----			----	
241	BEARING CARTRIDGE	1																				1																									-----------						

INTERCHANGABILITY CHART OF KPD PUMPS (UNIT 13)

PART NO.	PUMP SIZE / PART DESCRIPTION	TOTAL NO. OF PARTS	200/38			200/46			150/50M			150/52			125/32M (2900RPM)		
			KPD-H	KPD-CL		KPD-H	KPD-CL		KPD-H	KPD-CL		KPD-H	KPD-CL		KPD-H	KPD-CL	
			KPD	KPD-T	KPD-J	KPD	KPD-T	KPD-J	KPD	KPD-T	KPD-J	KPD	KPD-T	KPD-J	KPD	KPD-T	KPD-J
105	PUMP CASING FOOT MOUNTED	10	1	-	2	3	-	4	5	-	6	7	-	8	9	-	10
106	PUMP CASING CENTERLINE MOUNTED	10	-	1	2	-	3	4	-	5	6	-	7	8	-	9	10
151	ENCLOSED IMPELLER	5		1			2			3			4			5	
190	CASING WEAR RING (SUCTION)	4		1			1			2			3			4	
191	CASING WEAR RING (DEL)	4		1			1			2			3			4	
192	IMPELLER WEAR RING (SUCTION)	4		1			1			2			3			4	
193	IMPELLER RING (DEL)	4		1			1			2			3			4	
220	CASING COVER	15	1 / 2	1	3	4 / 5	4	6	7 / 8	7	9	10 / 11	10	12	13 / 14	13	15
511	GASKET FOR CASING COVER	5		1			2			3			4			5	
251	SUPPORT FOOT FOR FOOT MOUNTED	4		1			2			1			3			4	
251	SUPPORT FOOT FOR CENTERLINE MOUNTED	4		1			2			1			3			4	
248	LANTERN BRACKET	4	1		2	1		2	1		2	1		2	3		4
525.1	O RING FOR CASING COVER	2	1 / -	1	-	1 / -	1	-	1 / -	1	-	1 / -	1	-	2 / -	2	-
525.2	O RING FOR LANTERN BRACKET	2	1 / -	1	-	1 / -	1	-	1 / -	1	-	1 / -	1	-	2 / -	2	-
350	STUFFING BOX BUSH	4	1	1 / 2	1	1	1 / 2	1	1	1 / 2	1	1	1 / 2	1	3	3 / 4	3
227	LANTERN RING	2	1	1 / -	1	1	1 / -	1	1	1 / -	1	1	1 / -	1	2	2 / -	2
236	LIQUID DEFLECTOR	3					1						2			3	
330	IMPELLER NUT	1								1							
515	GASKET FOR SHAFT SLEEVE	1								1							
682	GASKET FOR IMPELLER NUT	1								1							
430	GLAND PACKING	2	1	1 / 2	1	1	1 / 2	1	1	1 / 2	1	1	1 / 2	1	1	1 / 2	1
443	CONSTANT LEVEL OILER	1								1							
226	DRIP PAN	3								1							
240	BEARING HOUSING (STANDARD)	2								1							
242	BEARING HOUSING (WITH COOLING)	2								1							
270	BEARING COVER D.S.	2								1							
514	GASKET FOR BEARING COVER D.S.	2								1							
180.2	PUMP SHAFT	3								1							
311	SHAFT SLEEVE	4								1							
263	ANGULAR CONTACT BALL BEARING	2								1							
264	CYLINDRICAL ROLLER BEARING	2								1							
229	SPLIT GLAND	2	1	1 / 2	1	1	1 / 2	1	1	1 / 2	1	1	1 / 2	1	1	1 / 2	1

KPD-H	KPD-CL		KPD-H	KPD-CL		KPD-H	KPD-CL		KPD-H	KPD-CL		KPD-H	KPD-CL		KPD-H	KPD-CL		KPD-H	KPD-CL		KPD-H	KPD-CL		KPD-H	KPD-CL		KPD-H	KPD-CL		KPD-H	KPD-CL		KPD-H	KPD-CL	
KPD	KPD-T	KPD-J	KPD	KPD-T	KPD-J	KPD	KPD-T	KPD-J	KPD	KPD-T	KPD-J	KPD	KPD-T	KPD-J	KPD	KPD-T	KPD-J	KPD	KPD-T	KPD-J	KPD	KPD-T	KPD-J	KPD	KPD-T	KPD-J	KPD	KPD-T	KPD-J	KPD	KPD-T	KPD-J	KPD	KPD-T	KPD-J

INTERCHANGEABILITY OF KPD, KPD-T, KPD-Q, KPD-Q-J, KPD-J PUMPS. (DRIVING UNIT NO. KPD-5)

PART NO.	PART DESCRIPTION	TOTAL NO. OF PARTS	PUMP SIZE	32/13					40/13					50/13					65/13				
			KPD-H	KPD-CL	KPD-QH			KPD-H	KPD-CL	KPD-QH			KPD-H	KPD-CL	KPD-QH			KPD-H	KPD-CL	KPD-QH		
			KPD-J	KPD-T	KPD-Q	KPD-Q-J	KPD-J	KPD-J	KPD-T	KPD-Q	KPD-Q-J	KPD-J	KPD-J	KPD-T	KPD-Q	KPD-Q-J	KPD-J	KPD-J	KPD-T	KPD-Q	KPD-Q-J	KPD-J
105	PUMP CASING FOOT MOUNTED	22	1	-	1	2		3	-	3	4		5	-	5	6		7	-	7	8	
106	PUMP CASING CENTERLINE MOUNTED	11	-	1	-	-		-	2	-	-		-	3	-	-		-	4	-	-	
151	ENCLOSED IMPELLER	10	1		-	1		2		-	2		3		-	3		4		-	4	
153	SEMI OPEN IMPELLER	11	-		1	-		-		2	-		-		3	-		-		4	-	
190	CASING WEAR RING SUC. SIDE	4	1		-	1		2		-	2		3		-	3		4		-	4	
191	CASING WEAR RING DEL. SIDE	-	-					-					-					-				
192	IMPELLER RING SUC. SIDE	4	1		-	1		2		-	2		3		-	3		4		-	4	
193	IMPELLER RING DEL. SIDE	-	-					-					-					-				
220	CASING COVER	15	1 2	1	1 2	3		1 2	1	1 2	3		1 2	1	1 2	3		1 2	1	1 2	3	
511	GASKET FOR CASING COVER	3	1															2				
151	SUPPORT FOOT FOR FOOT MOUNTED	3	1										2					3				
151	SUPPORT FOOT FOR CENTERLINE MOUNTED	1	1																			
248	LANTERN BRACKET	3	1															2				
525.1	O RING FOR CASING COVER	1	1 -		-			1 -		-			1 -		-			1 -		-		
525.2	O RING FOR LANTERN BRACKET	3	1 -		-			1 -		-			1 -		-			2 -		-		
350	STUFFING BOX BUSH	3	1	1 2	1			1 2	1				1 2	1				1 2	1			
227	LANTERN RING	1	1	-	1			-	1				-	1				-	1			
236	LIQUID DEFLECTOR	1	1																			
330	IMPELLER NUT	1	1																			
515	GASKET FOR SHAFT SLEEV	1	1																			
682	GASKET FOR IMPELLER NUT	1	1																			
430	GLAND PACKING	2	1	1 2	1			1 2	1				1 2	1				1 2	1			
443	CONSTANT LEVEL OILER	1	1																			
226	DRIP PAN	2	1																			
219	DRIP PLATE	1	1																			
240	BEARING HOUSING (STANDARD)	1	1																			
242	BEARING HOUSING WITH COOLING	1	1																			
367	OIL WELL COVER FOR BRG. OIL COOLING	1	1																			
270	BEARING COVER D.S.	1	1																			
514	GASKET FOR BEARING COVER D.S.	1	1																			
181.1	PUMP SHAFT WITH DEEP GROOVE BRG.	1	1																			
181.2	PUMP SHAFT WITH REINFORCED BRG. ARRG.	1	1																			
311	SHAFT SLEEVE	1	1																			
260.1,260.2	DEEP GROOVE BALL BEARING D.S. & P.S.	1	1																			
263	ANGULAR CONTACT BALL BEARING	1	1																			
264	CYLINDRICAL ROLLER BEAIRNG	1	1																			
229	SPLIT GLAND	2	1	1 2	1			1 2	1				1 2	1				1 2	1			
460	WEAR PLATE SUC. SIDE	11	-	1	-	2		-	3	-	4		-	5	-	6		-	7	-	8	

PART NO.	PART DESCRIPTION	TOTAL NO. OF PARTS	25/16					32/16					40/16					50/16					32/20					40/20					50/20				
			KPD-H	KPD-CL	KPD-QH			KPD-H	KPD-CL	KPD-QH			KPD-H	KPD-CL	KPD-QH			KPD-H	KPD-CL	KPD-QH			KPD-H	KPD-CL	KPD-QH			KPD-H	KPD-CL	KPD-QH			KPD-H	KPD-CL	KPD-QH		
			KPD-J	KPD-T	KPD-Q	KPD-Q-J	KPD-J	KPD-J	KPD-T	KPD-Q	KPD-Q-J	KPD-J	KPD-J	KPD-T	KPD-Q	KPD-Q-J	KPD-J	KPD-J	KPD-T	KPD-Q	KPD-Q-J	KPD-J	KPD-J	KPD-T	KPD-Q	KPD-Q-J	KPD-J	KPD-J	KPD-T	KPD-Q	KPD-Q-J	KPD-J	KPD-J	KPD-T	KPD-Q	KPD-Q-J	KPD-J
105	PUMP CASING FOOT MOUNTED	22	9	-	9	10		11	-	11	12		13	-	13	14		15	-	15	16		17	-	17	18		19	-	19	20		21	-	21	22	
106	PUMP CASING CENTERLINE MOUNTED	11	-	5	-	-		-	6	-	-		-	7	-	-		-	8	-	-		-	9	-	-		-	10	-	-		-	11	-	-	
151	ENCLOSED IMPELLER	10	----------					5		-	5		6		-	6		7		-	7		8		-	8		9		-	9		10		-	10	
153	SEMI OPEN IMPELLER	11	-		5	-		-		6	-		-		7	-		-		8	-		-		9	-		-		10	-		11	-	
190	CASING WEAR RING SUC. SIDE	4	-----					1		-	1		2		-	2		3		-	3		2		-	2		2		-	2		3		-	3	
191	CASING WEAR RING DEL. SIDE	-	-					-					-					-					-					-					-			
192	IMPELLER RING SUC. SIDE	4	-----					1		-	1		2		-	2		3		-	3		2		-	2		2		-	2		3		-	3	
193	IMPELLER RING DEL. SIDE	-	-					-					-					-					-					-					-			
220	CASING COVER	15	4 5	4	6 7	8	9	4 5	4	6 7	8	9	4 5	4	6 7	8	9	4 5	4	6 7	8	9	10 11	1 0	12 13	1 4	1 5	10 11	10	12 13	1 4	1 5	10 11	10	12 13	1 4	15
511	GASKET FOR CASING COVER	3	2																				3													
151	SUPPORT FOOT FOR FOOT MOUNTED	3	2					2					2					3					3					3					3			
151	SUPPORT FOOT FOR CENTERLINE MOUNTED	1	1																																	
248	LANTERN BRACKET	3	2																				3													
525.1	O RING FOR CASING COVER	1	1 -		-			1 -		-			1 -		-			1 -		-			1 -		-			1 -		-			1 -		-	
525.2	O RING FOR LANTERN BRACKET	3	2 -		-			2 -		-			2 -		-			2 -		-			3 -		-			3 -		-			3 -		-	
350	STUFFING BOX BUSH	3	1 2	3	1 2			1 2	3	1 2			1 2	3	1 2			1 2	3	1 2			1 2	3	1 2			1 2	3	1 2			1 2	3	1 2		
227	LANTERN RING	1	-	1				-	1				-	1				-	1				-	1				-	1				-	1			
236	LIQUID DEFLECTOR	1	1																																	
330	IMPELLER NUT	1	1																																	
515	GASKET FOR SHAFT SLEEV	1	1																																	
682	GASKET FOR IMPELLER NUT	1	1																																	
430	GLAND PACKING	2	1 2	1	1 2			1 2	1	1 2			1 2	1	1 2			1 2	1	1 2			1 2	1	1 2			1 2	1	1 2			1 2	1	1 2		
443	CONSTANT LEVEL OILER	1	1																																	
226	DRIP PAN	2	1																				2													
219	DRIP PLATE	1	1																																	
240	BEARING HOUSING (STANDARD)	1	1																																	
242	BEARING HOUSING WITH COOLING	1	1																																	
367	OIL WELL COVER FOR BRG. OIL COOLING	1	1																																	
270	BEARING COVER D.S.	1	1																																	
514	GASKET FOR BEARING COVER D.S.	1	1																																	
181.1	PUMP SHAFT WITH DEEP GROOVE BRG.	1	1																																	
181.2	PUMP SHAFT WITH REINFORCED BRG. ARRG.	1	1																																	
311	SHAFT SLEEVE	1	1																																	
260.1,260.2	DEEP GROOVE BALL BEARING D.S. & P.S.	1	1																																	
263	ANGULAR CONTACT BALL BEARING	1	1																																	
264	CYLINDRICAL ROLLER BEAIRNG	1	1																																	
229	SPLIT GLAND	2	1 2	1	1 2			1 2	1	1 2			1 2	1	1 2			1 2	1	1 2			1 2	1	1 2			1 2	1	1 2			1 2	1	1 2		
460	WEAR PLATE SUC. SIDE	11	-	5	-	6		-	7	-	8		-	9	-	10		-	11	-																

In case of pump with semi-open impeller :

7.1.35 Remove wear plate (460) 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 centre lathe to take out. (Not applicable for KPD 150/32QF).

7.1.36 Change wear- plate (460) if worn out.

7.1.37 Loosen adjustable hex. screw(925) alongwith locknut (698.2). Take out the Permanite Washer and metallic washer.(For KPD-150-32'QF' only).

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

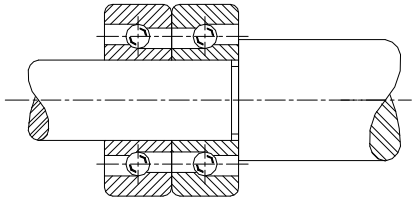
7.1.38 Take out cover for bearing housing arrangement (367) along with copper tube coil (370) by loosening the screws.

7.1.39 Take out packing(518).

7.2. 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 with Kerosene, Petrol ,or Benzene to remove the dust rust etc. After cleaning the necessary parts should be replaced.

7.2.1. Mount the double row angular contact ball bearing back to back (263) at driving end in case of reinforced bearing arrangement. Please refer to any standard bearing catalogue for back to back arrangement of angular contact ball bearing. (The arrangement is also shown in the figure). Mount the deep groove ball bearing (260.1) at driving end in case of bearing arrangement with deep groove ball bearings.



Pair of angular contact ball bearing in back to back arrangement.

Caution :

a) Use Arbor Press while fitting the bearings. However, it is recommended that bearing should be heated in oil bath at temperature 70 to 80°C and then fitted. (If hot oil is not available use ARBOR PRESS).

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

c) Do not use hammer to fit the bearings. Do not damage the shaft surface especially where it contacts the oil seal.

7.2.2. Mount non driving end deep groove ball bearings (260.2) or inner race of roller bearing (264) in case of reinforced bearings arrangement. Follow the procedure and observe the cautions given in 7.2.1.

7.2.3. Tighten bearing lock nut (336) after inserting the washer for bearing locking (625) in proper position. Fold one lip of lock washer in slot of bearing lock nut to lock it.(applicable for reinforced bearing arrangement only).

7.2.4. Insert the circlip at driving end and non driving end (485) in the groove provided of the bearing housing (240or242) in case of reinforced bearing arrangement only. Check returning duct holes in bearing housing and bearing cover at DE are clean.

7.2.5. Insert the shaft (180.1/180.2) alongwith the bearings (viz. Angular contact ball bearing at driving end and inner race of roller bearing at non-driving end in case of reinforced bearing arrangement. Deep groove ball bearing at DE and NDE in case of arrangement with deep groove ball bearings) in to the bearing housing from driving end.

7.2.6. Replace oil seals in bearing cover (270) if they are removed.

7.2.7. Put packing (514) of bearing cover at driving end (270) and tighten the bearing cover (270) with the help of hexgonal headed screws.

7.2.8. Push outer race of roller bearing (264) at non driving end into bearing housing (240/252) in case of reinforced bearing arrangement of bearings.

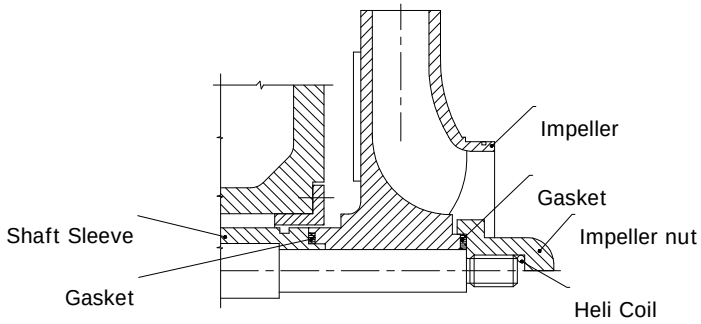
7.2.9. Place 'O' ring (523) on bearing housing. Lubricant 'O' with grease or with an 'O' ring lubricant before placing it on the bearing housing.

7.2.10. Mount lantern bracket (248) on bearing housing and tighten the nuts.

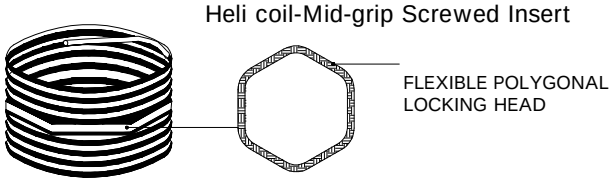
7.2.11. Put the drip pan (226) if it was removed from Lantern bracket.

7.2.12. If the casing ring delivery side is replaced, take dimensions of the bore of the ring to check the clearance between impeller and casing wear ring. If the impeller ring is (192/193) replaced, its dimensions should be taken to check the clearance between casing ring and impeller ring.

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



Heli coil-Mid-grip Screwed Insert



HELI-COIL-MID-GRIP SCREWED INSERT

Fig. 7 & 8

a) Apply some oil or grease on the shaft under sleeve position. Mount the impeller key (320) on the shaft and insert the shaft sleeve (311) along with deflector (654) mounted on it.

b) Place 'O' Ring (525.1) on casing cover (220) after lubricating it properly.

c) Place 'O' Ring (525.2) on lantern bracket (248) after lubricating it properly. (Applicable for Hot model only).

d) Insert Casing Cover (220) with 'O' ring (525.2) and drip plate (219) in proper position. Tighten nuts on studs of the casing cover.

e) Fit throat bush (350) into casing cover and tighten the hex. socketed screws.

f) Put gasket (515) on impeller hub in proper position.

g) Push impeller (151/153) on shaft till it touches the shaft sleeve.

h) Fix impeller nut (330) alongwith helicoil mid grip insert after gasket (682) in between impeller fixing arrangement and helicoil mid grip insert.

i) Tighten the grub screw on the labyrinth type deflector.

j) Fix the deflector guard (237).

Caution:

1. If helicoil insert is damaged replace impeller nut with newone.
2. Spare impeller nut if ordered always supplied with heli coil insert.

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

a. Mount deflector (236) on shaft.
b. Replace bush for mechanical seal cover (360) (throttle bush) if it is wear.
c. Place the mechanical seal cover alongwith stationary seal seat/insert/mating ring and gasket (516) and tighten in the nuts on studs for mechanical seal cover evenly.

CAUTION:

1) Tightening of nuts should be done evenly and across corner so that seal face shall be square to the shaft.
2) Lapped end of seal seat/insert/mating ring should be face to the rotating part of the Mechanical Seal.

d. Place O' ring (525.1) on casing cover (220) after lubricating it properly.

e. Place 'O' ring (525.2) on lantern bracket (248) after lubricating it properly.(Applicable for Hot model only).

f. Insert casing cover (220) with 'O' rings (525.1and 525.2) in proper positions. Tighten the nuts on the studs of casing cover.

g. Mount rotating part of mechanical seal on shaft sleeve (315) after applying oil on it. Tighten grub screws provided n rotating element of mechanical seal after resting seal against step on sleeve.

h. Mount impeller key (320) into casing cover. In case of double mechanical seal fit mechanical seal with care till face of rotating part of touches the stationary seal seat/insert/mating ring.

i. Fit throat bush (350) into casing cover. In case of double mechanical seal fit mechanical seal seat/insert mating ring of seal towards impeller end in throat bush (350) and then fit it in casing cover. Tighten the hex. socketted grub screws.

j. Put gasket (515) on impeller hub in proper position.

k. Push impeller (151/153) on shaft till it touches shaft sleeve.

l. Fix impeller nut (330) with gasket (682) in between impeller hub and impeller nut and gradually tighten it.

m. Tighten grub on the labyrinth type deflector (236) after resting its shoulder against shaft sleeve shoulder.

n. Fix deflector guard (237).

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

1) Insert shaft sleeve (315) into shaft before fitting casing cover (220) on to lantern bracket (248).
2) Rotating part of the mechanical seal should be mounted on to the shaft sleeve 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.

1) Fit the cover for bearing housing arrangement (367) along with cooling tube coil (370) with packing (685) in between and tighten screws.

Caution:

The cooling tube coil should be pressure-tested at 9 kg/cm^2 (G) recommended pressure and insured to be leak-proof.

7.2.15 Assembly of wear plate of KPD-150-32-QF pump only.

Follow the procedure given below for gland packing as well as for KPD-150-32-QF mechanical seal pumps. (For semi open impeller only.)

1) Place the gasket (511) on the casing cover.

2) Engage lock nut (698.2) in the adjustable hex. screw (925).

3) Engage adjustable hex. screw (925) alongwith lock nut (698.2) in pump casing (105) with gasket (684) and metallic washer (626) in between.

Caution:

Engage adjustable hex screw up to the end of the pump casing wall. Do not allow adjustable hex screw to come out of pump casing wall.

Place 'O' ring (522.1 and 522.2) on wear plate (460) after lubricating them properly.

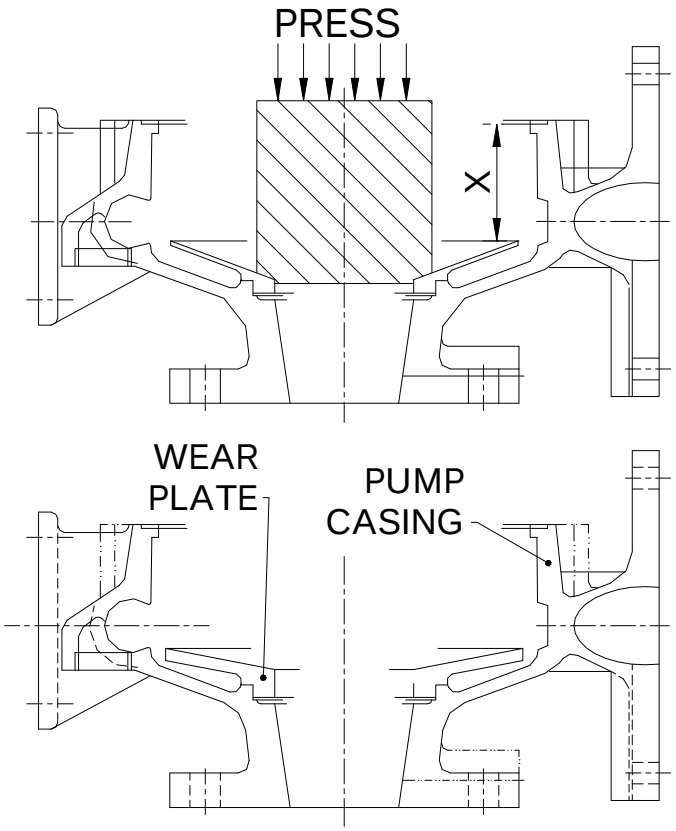
4) Insert wear plate (460) with studs facing suction side pump casing wall, till it rests against the wall of pump casing. See that the studs on wear plate pass through the hollow portion of the adjustable hex screw (925).

5) Tighten nuts (698.1) on wear plate studs.

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

a) If wear plate is removed is to be replaced, this should be done carefully. Apply pressure a portion shown otherwise he 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 and wear plate. It is recommended that wear plate together with casing be drilled and tapped to fit minimum two nos. of counter sunk head screws to prevent rotation of wear plate during actual pump operation. Instead of counter sunk head screws, two tag welds may be sufficient if casing and wear plate is of weldable material.



7.2.17 General Assembly procedure rotating unit for all pumps.

a) Slide complete, back-pull out assembly into pump casing (105/106).

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

Caution :

1) In case of KPD-QF pumps, clearance between impeller and wear plate 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 it is recommended to reassemble the pump with minimum number of gaskets. The thickness of gasket can be decided using the method below.

2) In case of KPD 150/32-QF pumps with semi open impeller with adjustable wear plate, adjust the clearance between impeller and wear plate with the help of adjustable wear plate arrangement. For this follow the procedure below:-

i) Loosen hex nut (698.1).

ii) Loosen lock nut (698.2).

iii) Tighten adjustable hex screws (925) till the wear plate just touches impeller. Rotate shaft and ensure that it rotates freely.

iv) Tighten lock nut (698.2).

v) Tighten hex nut (698.1)

7.2.18 In case of pumps with gland packing, insert gland packing (430) and lantern ring (227) in order of 2 rings first then lantern ring and finally 3 rings Joints should be staggered.

7.2.19 Put gland in two halves (229), clamp them with gland bolts (574). Tighten gland stud nuts.

7.2.20 Fit constant level oiler (443), Breathercap (444).

7.2.21 Fit pump half coupling (397).

7.2.22 Rotate shaft by hand and ensure free rotation.

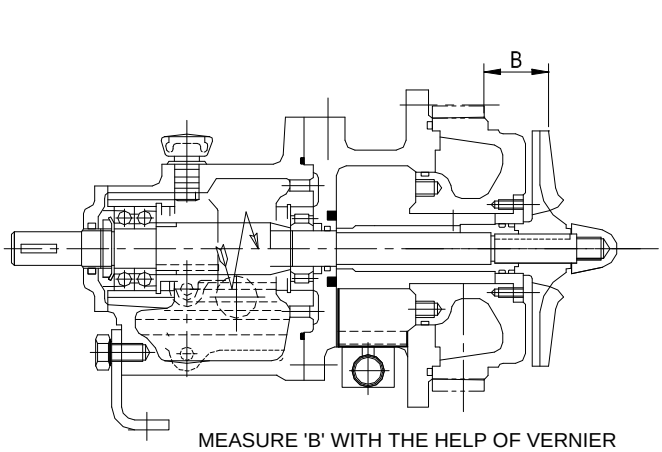
7.2.23 Fit all accessories such as sealing water, flushing water, cooling water connection, hot water/ steam circulation etc.

7.2.24 Fit support foot (251) to bearing housing.

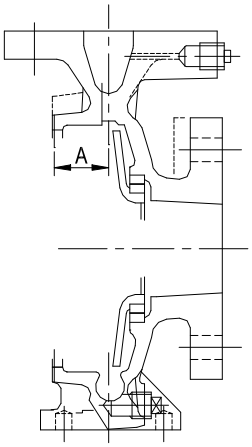
7.2.25 Fit coupling spacer between pump half and motor half coupling in case of spacer type flexible couplings.

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

7.2.27 Fit coupling guard.



MEASURE 'B' WITH THE HELP OF VERNIER



MEASURE 'A' WITH THE HELP OF VERNIER

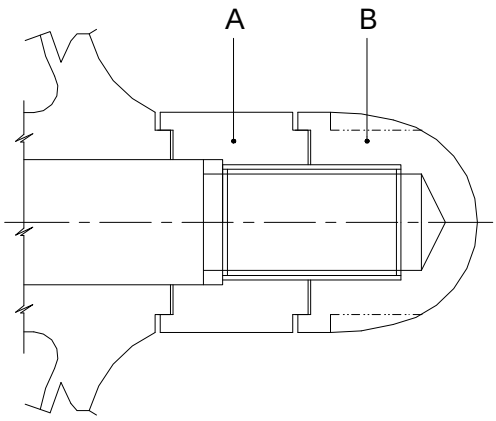
SPECIAL IMPORTANT INSTRUCTIONS

1) The instructions given in this booklet are of general nature. This manual is to be read in contest with C.S. Drawing supplied against O/A.

2) In case of mechanical seal arrangement, KBL invariably supply C.S. drawing indicating mech. 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-QFJ 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 liquid in casing and suction line is in pumpable form. Check free rotation of shaft prior to start of pump.

4) Pumps in all **CN 7MS** material of construction and with K-monel shaft are supplied with impeller nut in two parts as shown in the figure. While fitting impeller nut in this case ensure the following. This arrgt. is std. for KPD driving unit-13 pumps.



a. Tighten nut ‘A’ fully.

b. Tighten nut ‘B’ fully.

c. Hold nut ‘B’ firmly in position and slightly loosen nut ‘A’. This will ensure positive locking of impeller nuts.

5) In case of KPD-QF pumps, the clearance between impeller and wear plate depends upon thickness of gasket (511). If thickness is more than required, pump performance may be lowered. If thickness is less than required, pump rotation shall not be free. Ensure to assemble pump with required thickness of gasket.

6) Impeller nut (330) 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 –midgrip-insert duly fitted in.

PART NUMBER AND DESCRIPTION

Part no.	Description
105	Pump casing foot mounted
106	Pump casing centerline mounted
128	Diffuser with guide vanes
151*	Impeller (enclosed)
153*	Impeller (semi-open)
180.1*	Pump shaft (for deep groove ball bearing arrangement)
180.2*	Pump shaft (for reinforced ball bearing arrangement)
190*	Casing wear ring (suction side)
191*	Casing wear ring (delivery side)
192*	Impeller ring(suction side)
193*	Impeller ring(delivery side)
219	Drip plate
220	Casing cover
226	Drip pan
227	Lantern ring
229	Split gland (1980)
230*	Mechanical seal
231	Mechanical seal cover
236	Liquid deflector for mechanical seal arrangement
236.1	Liquid deflector for gland packing arrangement
240	Bearing housing
248	Lantern bracket
251	Support foot
252	Bearing housing with cooling arrangement
260.1*	Ball bearing D.S.
260.2*	Ball bearing P.S.
263*	Angular contact bearing D.S.
264*	Cylindrical roller bearing P.S.
270	Bearing cover D.E.
311*	Shaft sleeve P.S.
315*	Shaft sleeve P.S.
320	Key for impeller
321	Key for coupling
330*	Impeller nut
336*	Lock nut
338	Pipe nut
350*	Throat bush
360.1*	Throttling bush for quenching
360.2*	Throttling bush for double mechanical seal
367	Oil well cover
370	Cooling coil
384	Pump foot pad for centerline mounted pump casing

Part no.	Description
390	flexible coupling-pump half
391	flexible coupling-driver half
397	Spacer type coupling-pump half
398	Spacer type coupling-pump half
399	Spacer for spacer coupling
402	Coupling block
403*	Coupling star
415*	Lock washer for bearing nut
430*	Gland packing
443	Constant level oiler
444	Breather cap
460*	Wear plate
468	Orifice
479*	Helicoil screw lock insert
485*	Internal circlip
490.1*	Companion flange- suction side
490.2*	Companion flange- delivery side
490.3*	Slip-on flange- suction side
490.4	Slip-on flange- delivery side
500.1	Oil seal D.S.
511*	Gasket for casing cover
513.1*	Gasket for Companion /Slip-on flange- suction side
513.2*	Gasket for Companion /Slip-on flange- delivery side
514*	Gasket for bearing cover D.S.
515*	Gasket for shaft sleeve and impeller
516*	Gasket for mechanical seal cover
517.5*	Gasket for pad cooling plug
517.7*	Gasket for constant level oiler
518*	Gasket for adaptor for sealing connection
590.3	Stud for suction flange (steam jacket pump)
590.4	Stud for delivery flange (steam jacket pump)
591.1	Studs on casing cover to receive lantern bracket
591.2	Studs on casing cover to receive gland
591.3	Studs on casing cover to receive mechanical seal cover
591.4	Studs on casing cover to receive mechanical seal cover and holding plate
591.5	Studs on mechanical seal cover to receive aux. gland.
593	Studs on lantern bracket to receive bearing housing
594	Studs for wear plate
600.1	Plug for pressure gauge connection
600.2	Plug for suction gauge connection
600.3	Plug for steam jacket
601	Plug for pump casing drain
602.1	Plug for sealing connection on pump casing
602.2	Plug for sealing inlet connection on casing cover

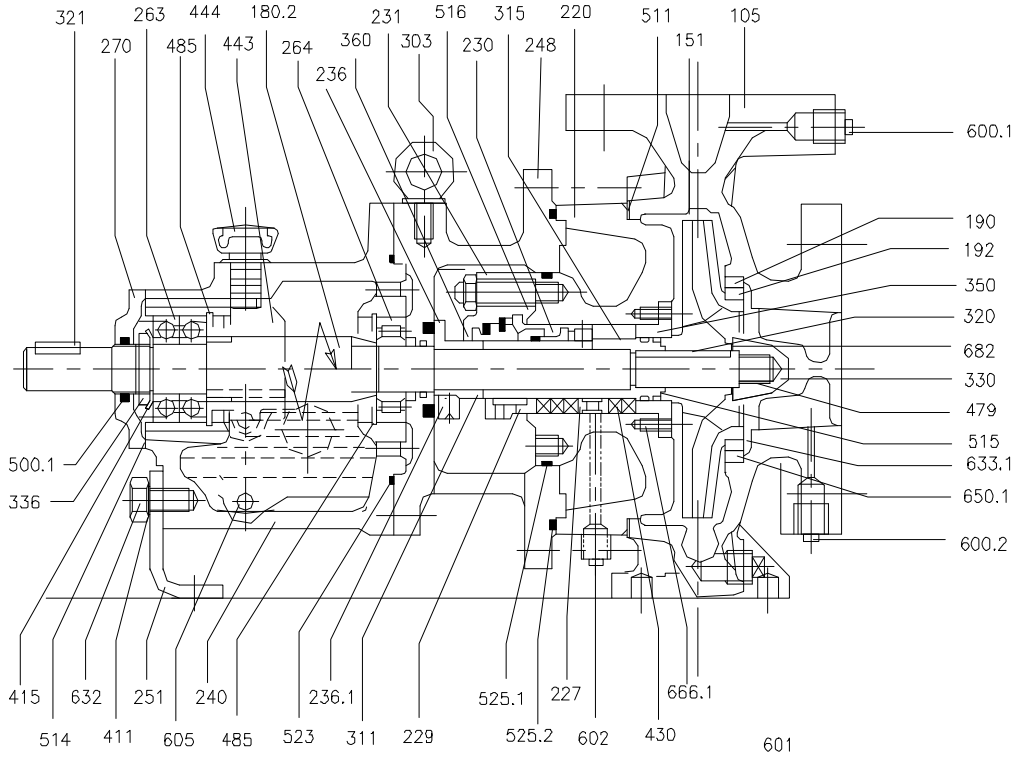
Part no.	Description
602.3	Plug for sealing outlet connection on casing cover
602.5	Plug for jacketed gland
603.1	Plug for casing cover cooling inlet connection
603.2	Plug for casing cover cooling outlet connection
603.3	Slotted collared plug
605	Plug for bearing housing drain
605.3	Plug for cooling inlet and outlet of bearing housing
609.1	Plug for flushing inlet on mechanical seal cover
609.2	Plug for quenching inlet & outlet
611.1	Pin for mechanical seal cover
611.2	Taper pin for pad
626	Washer for lock nut or wear plate (metalic)
630	Hex. release screw for casing cover
631.1	Hex. screw for bearing cover D.S.
631.2	Hex. screw for cover of bearing housing cooling arrangement
632	Hex. screw for support foot
640	Rivets for name plates
650.1	Grub screw for casing wear ring- suction side
650.2	Grub screw for casing wear ring- delivery side
653.1	Hex. socketed grub screw for pump coupling
653.2	Hex. socketed grub screw for motor coupling
654	Grub screw for deflector
522.1*	O ring for wear plate –suction side
522.2*	O ring for wear plate –suction side
523*	O ring for bearing housing and lantern bracket
525.1*	O ring for casing cover and lantern bracket
525.2*	O ring for lantern bracket and casing cover (only for Hot Model)
531.1	Pipe nipple for pad cooling
531.2	Pipe nipple for pad cooling
532.2	Pipe nipple for quenching
533.1	Pipe nipple for casing drain
533.2	Pipe nipple for casing drain
540	(Pipe coupling) socket
542.1	Elbow for casing drain
545	Union joint
550	Wheel cock
558.1	Hex. nut for sealing pipe adapter
559.1	Adapter (male) on pump casing for sealing connection
559.2	Pipe adapter on casing cover for sealing piping
559.3	Adapter (male) for cooling piping
569.4	Adapter (male) for flushing piping (inbuilt orifice)
560.1	Flushing inlet pipe
560.2	Flushing outlet pipe
570.1	Hex. bolt for companion/ slip- on flange- suction side

Part no.	Description
570.2	Hex. bolts for companion/slip-on flange – delivery side
574	Hex. bolts for gland
580.1	Hex. bolts for companion/slip-on flange bolts – suction side
580.2	Hex. bolts for companion/slip-on flange bolts – delivery side
581	Hex. nuts for casing studs
582.1	Hex. nuts for gland studs
582.2	Hex. nuts for mechanical seal cover/holding plate studs
582.3	Hex. nuts for studs receiving lantern bracket & casing cover
582.4	Hex. nuts for studs receiving casing cover
582.5	Hex. nuts for hex. bolts receiving gland
582.6	Hex. nuts for studs of aux. gland
586	Hex. nuts for receiving brg. housing & lantern bracket
590.2	Studs on pump casing to receive casing cover and lantern bracket
663.1	Grub screw for impeller ring –suction side
663.2	Grub screw for impeller ring –delivery side
666.1	Hex. socketed cap screw for stuffing box bush
666.2	Socketed grub screw for casing cover
670	Name plate for duties
671.1	Cooling water inlet name plate
671.2	Cooling water outlet name plate
672	Direction of arrow name plate
673	Lubrication instructions name plate
676.1	Sealing water inlet name plate
676.2	Sealing water outlet name plate
679.1	Quenching inlet name plate
679.2	Quenching outlet name plate
682*	Gasket for impeller nut & impeller
684*	Gasket for lock nut
685*	Gasket for oil well cover
698.1*	Hex. nuts for wear plate studs
698.2	Hex. lock nuts for wear plate bolt (BSP)
701	Spring washer for bearing nut
713	Screw for drip plate
717	Hex. screw for centreline mounted pad
781.1	Flushing inlet name plate
781.2	Flushing outlet name plate
785.1	Steam inlet name plate
785.2	Steam outlet name plate
802*	Gasket for center line mounted pad
604	Plug for drip pan
791	Screw for wear plate for KPD-J pumps
872	Gasket for wear plate and adapter plate
925*	Adjustable screw for wear plate

* Recommended spares for two year normal working

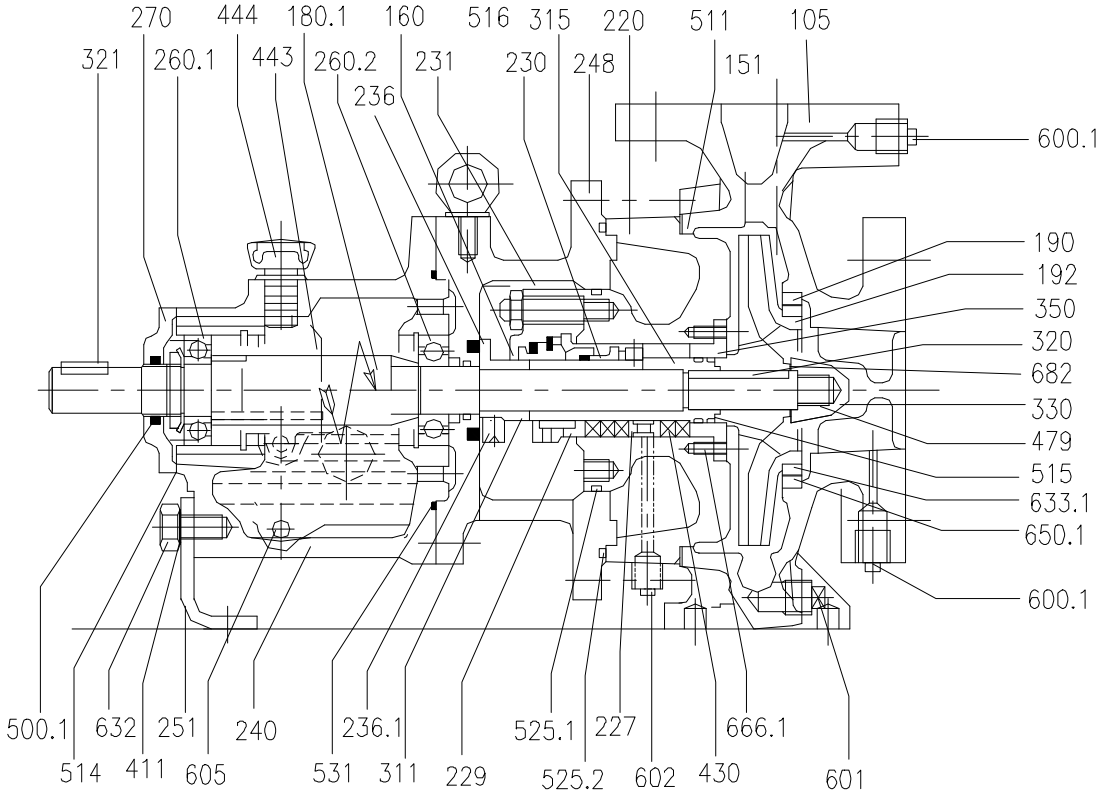
* While ordering spare parts please quote name plate details of pump for correct supply.

Drg. No.
CT-137-070-1

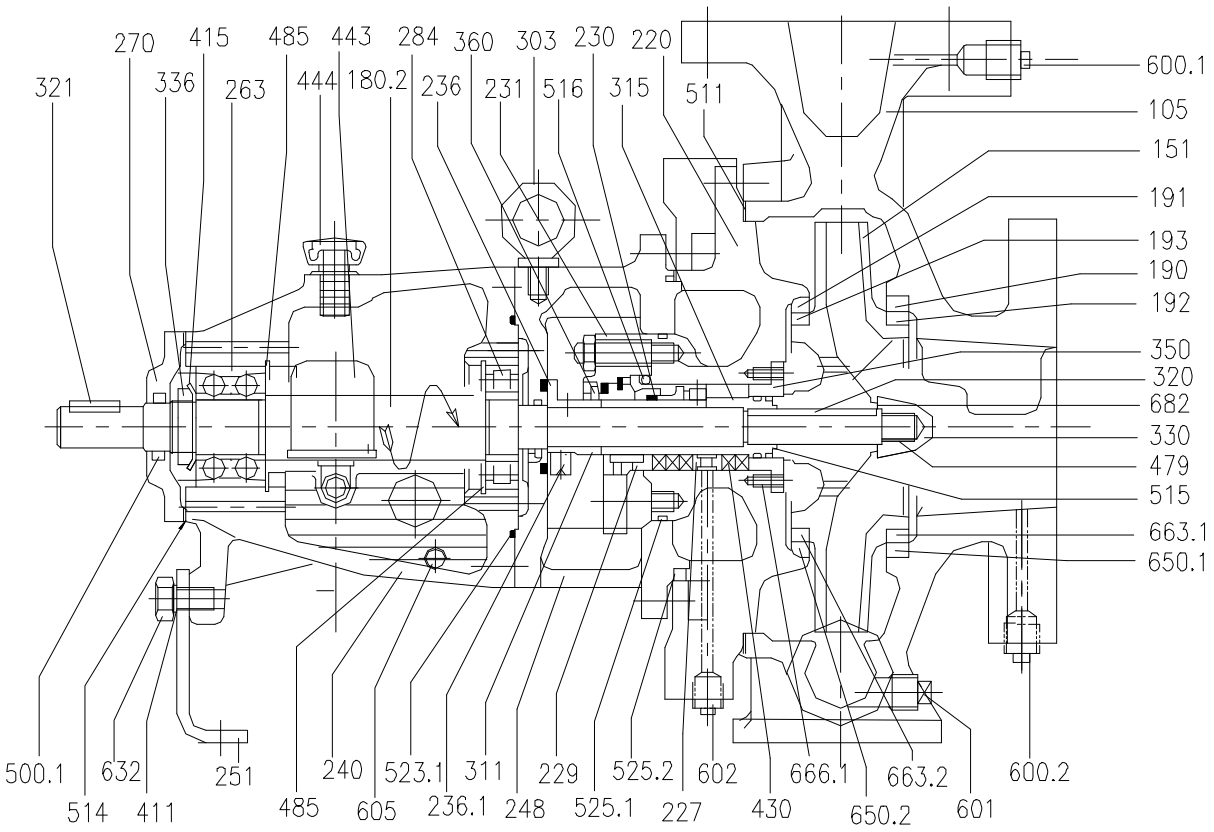


Cross sect. assembly of kpd pump (kpd32 to 80/16,32to100/20,32to125/26)
enclosed impeller with reinforced bearing arrangement.
(lifting eye bolt supplied only for KPD 32 TO 125/26 PUMPS)

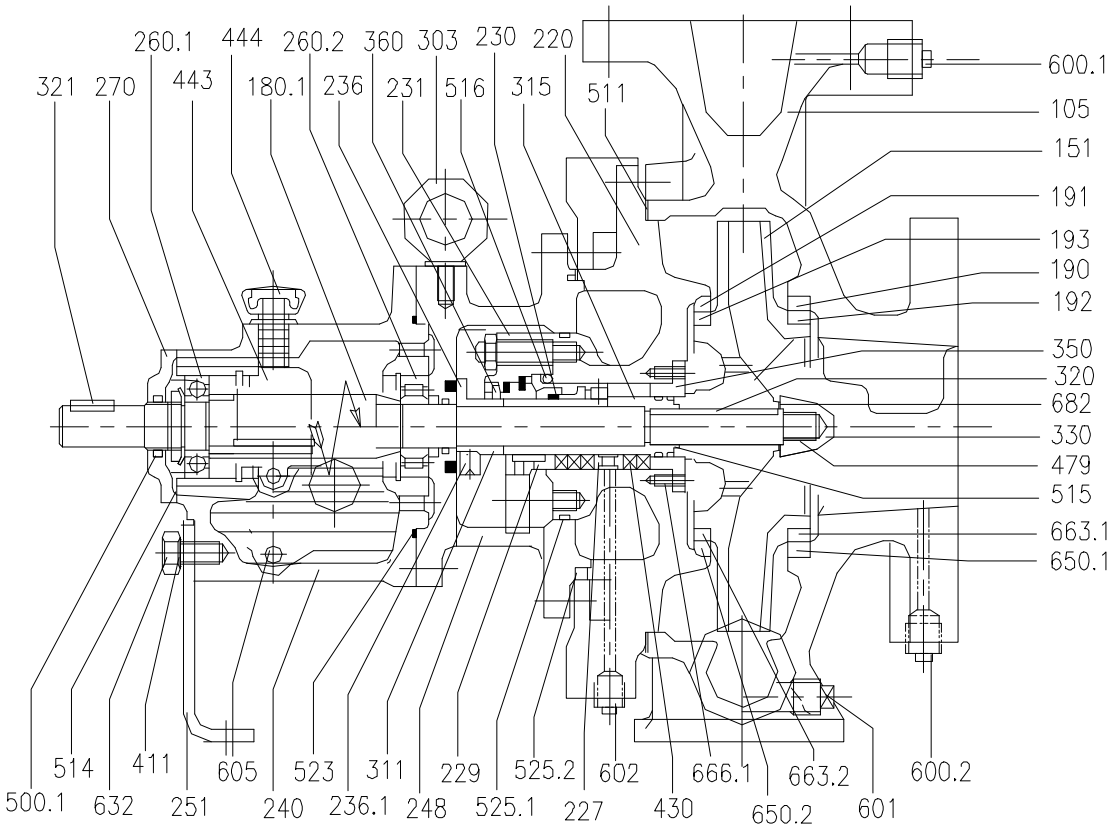
Drg. No.
CT-137-067-1



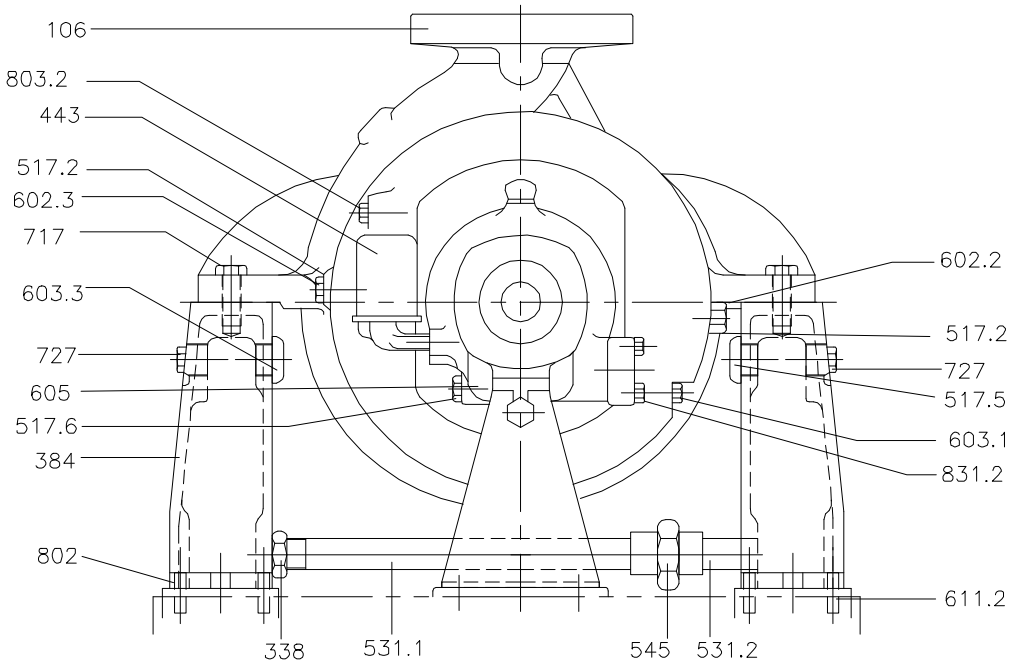
Cross sectional assembly of KPD Pump (KPD 32,40,50 & 65/13)
Enclosed impeller with deep groove ball bearing arrangement.



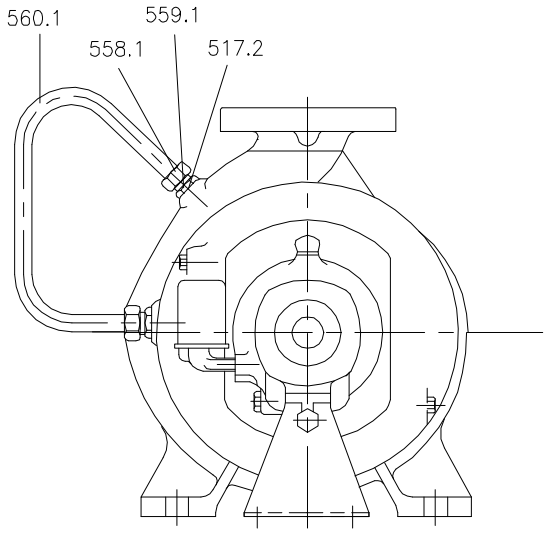
CROSS SECT. ASSEMBLY OF (KPD 11 UNIT) ENCLOSED IMPELLER (KPD 150/32)



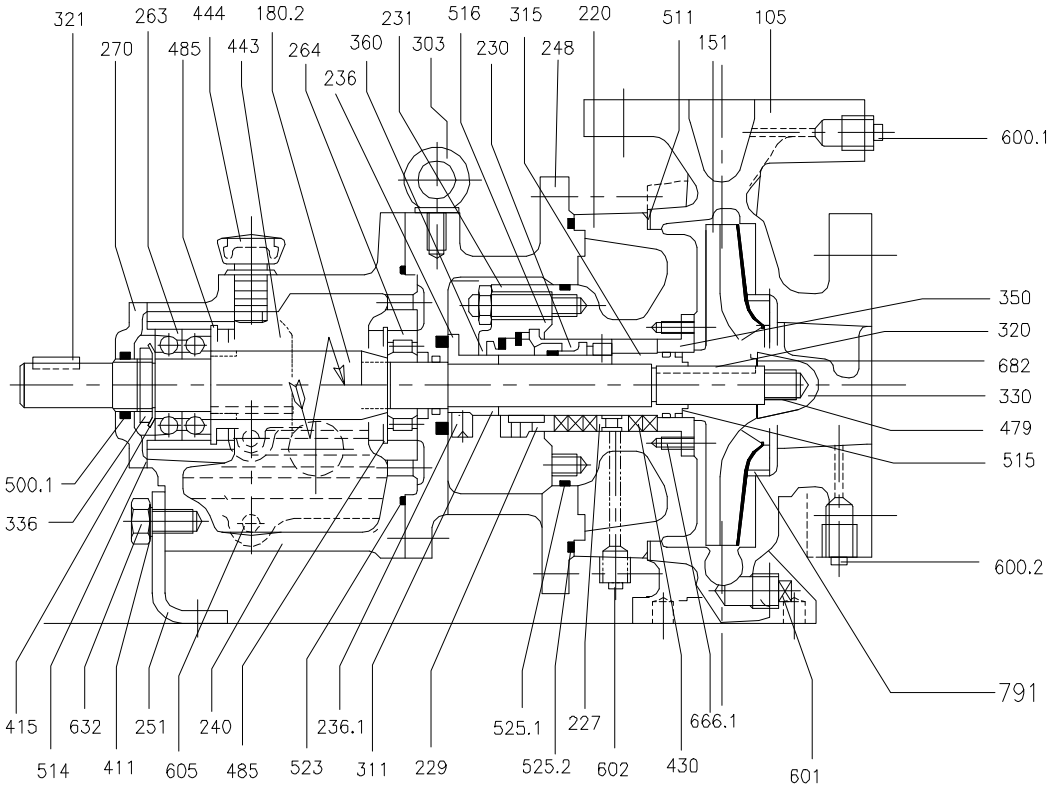
CROSS SECT. ASSEMBLY OF KPD PUMP (KPD 40,50/32) ENCLOSED IMPELLER WITH DEEP GROOVE BALL BEARING ARRANGEMENT.



END VIEW OF CENTRE LINE MOUNTED PUMP

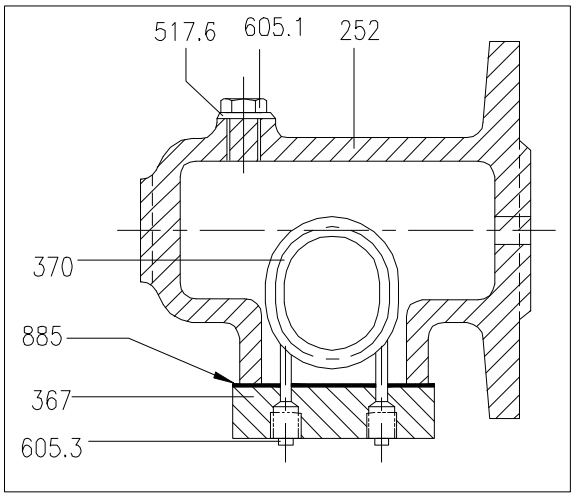


(END VIEW OF FOOT MOUNTED PUMP)

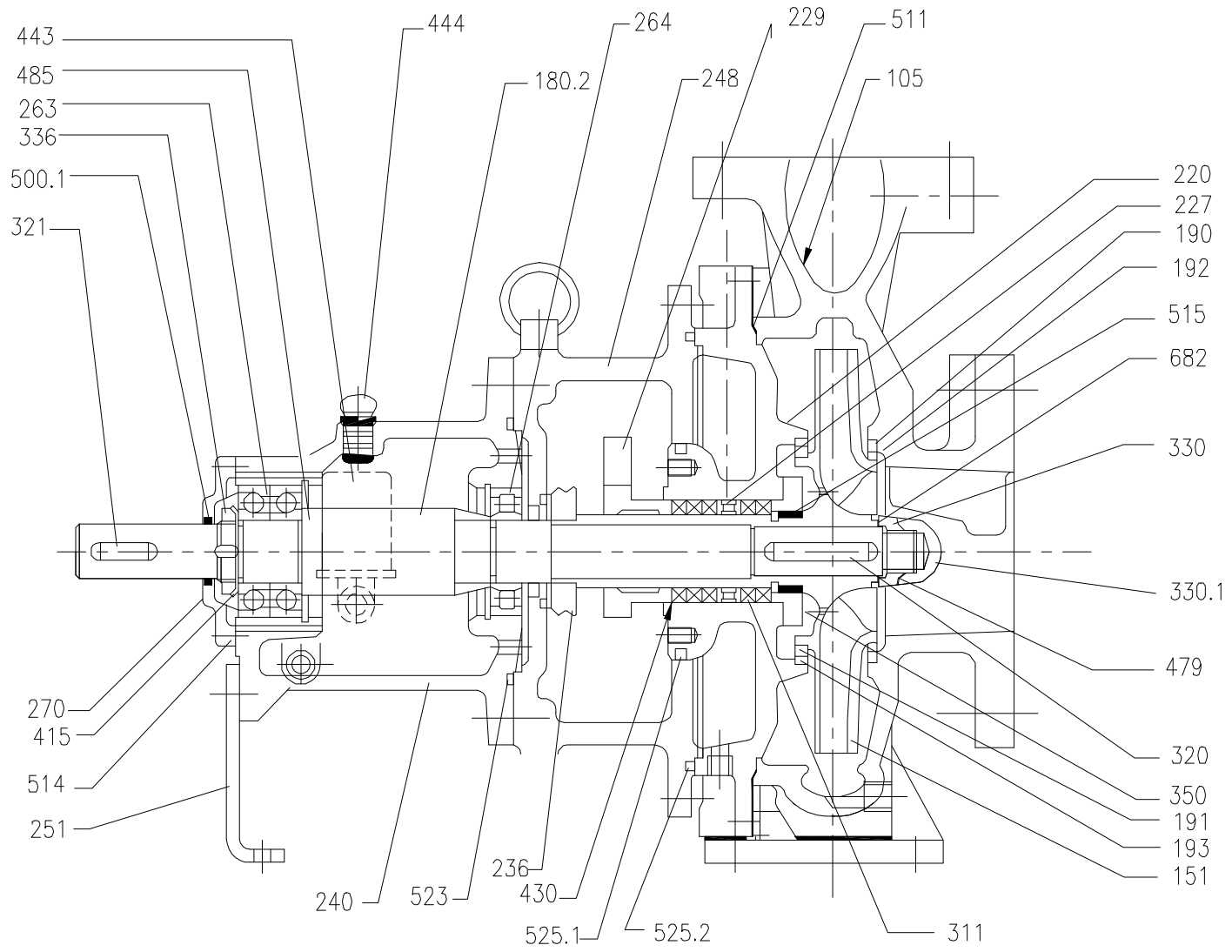


Drg. No.
137-88-008-0

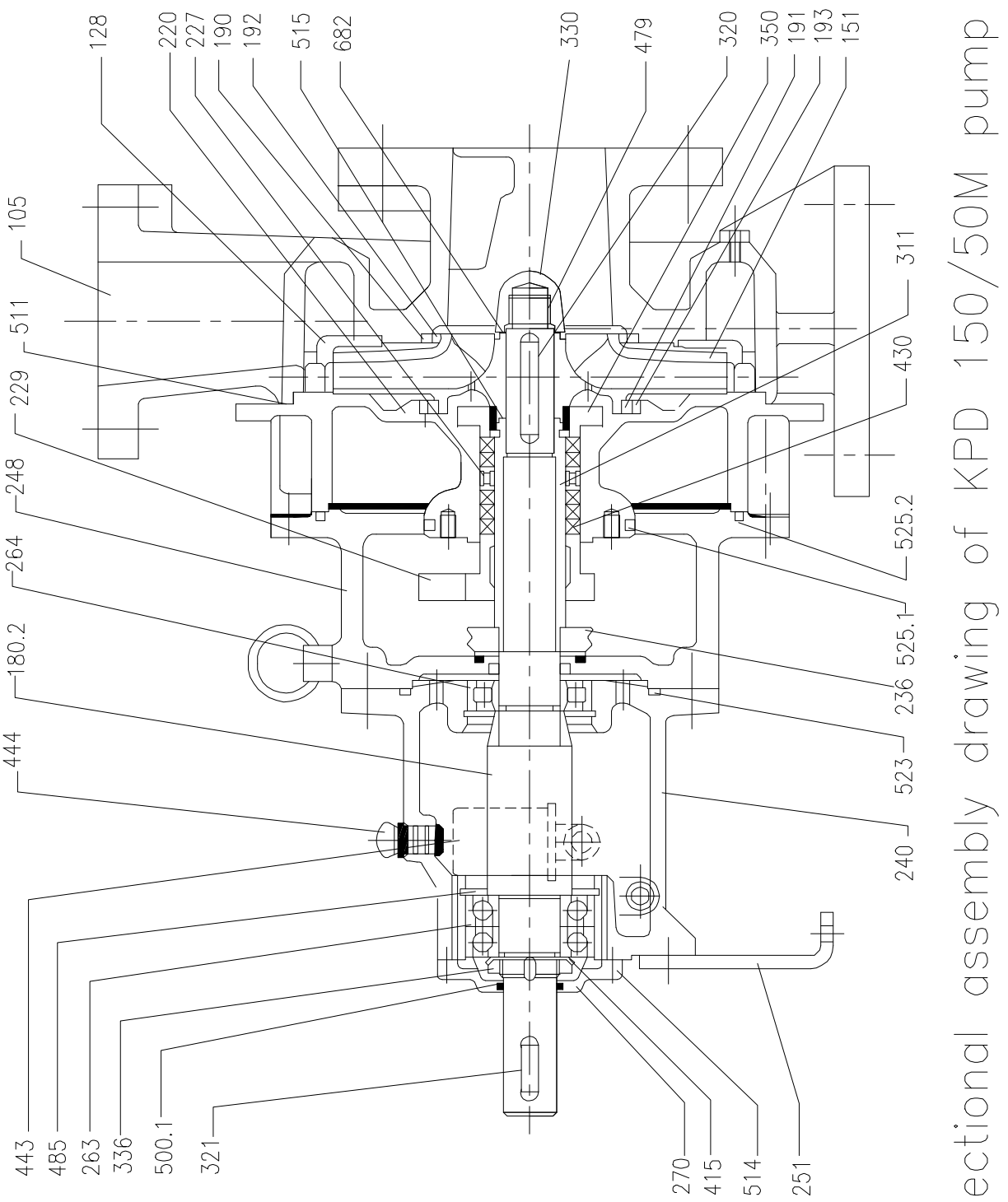
CROSS SECTION ASSEMBLY OF (KPD Q 25/16 PUMP) SEMI OPEN IMPELLER & FIXED WEAR PLATE.



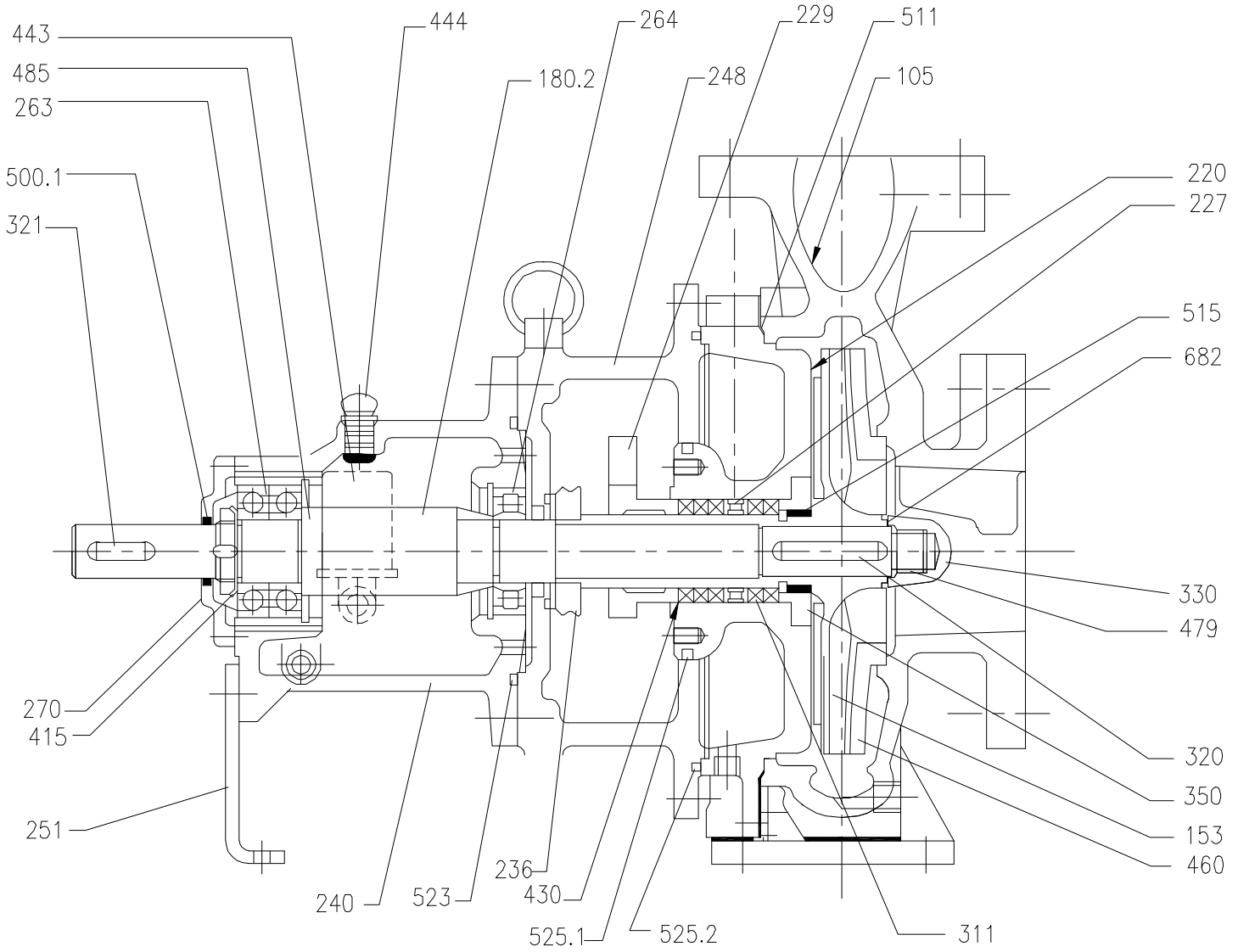
BEARING OIL COOLING ARRANGEMENT.



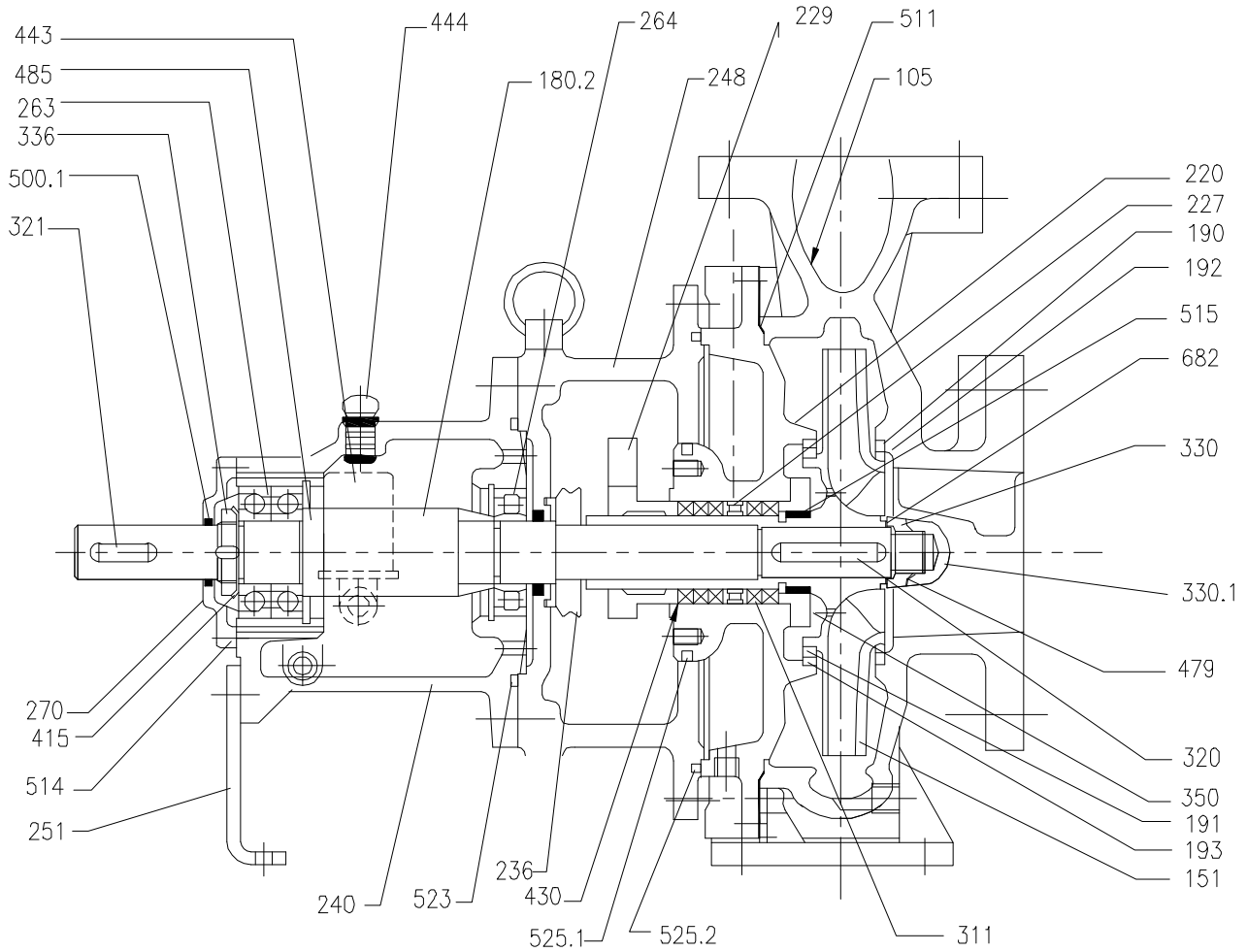
Cross sectional assembly drawing of KPD 200/38M 7 KPD 200/46 Pump



Cross sectional assembly drawing of KPD 150/50M pump



Cross sectional assembly drawing of general KPD–QF pumps.



CROSS SECTION ASSEMBLY OF KPD 65/43,KPD 150/43
KPD 150/52 PUMP.

DRG. NO. : CT137-99-001-0

GENERAL INFORMATION & SAFETY INSTRUCTIONS

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

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

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

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

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

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

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

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

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

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

1.9 Clear and easy access to all controls, gauges and dials etc must be maintained at all times. Hazardous or flammable materials must not be stored in pump rooms unless safe areas or racking and suitable container have been provided.

1.10 Use suitable earthing and tripping devices for electrical equipments.

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

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

3. SAFETY INSTRUCTIONS WHILE HANDLING AND STORAGE

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

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

4. SAFETY INSTRUCTIONS WHILE ASSEMBLY & INSTALLATION

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

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

5. SAFETY INSTRUCTIONS WHILE COMMISSIONING & OPERATION

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

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

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

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

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

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

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

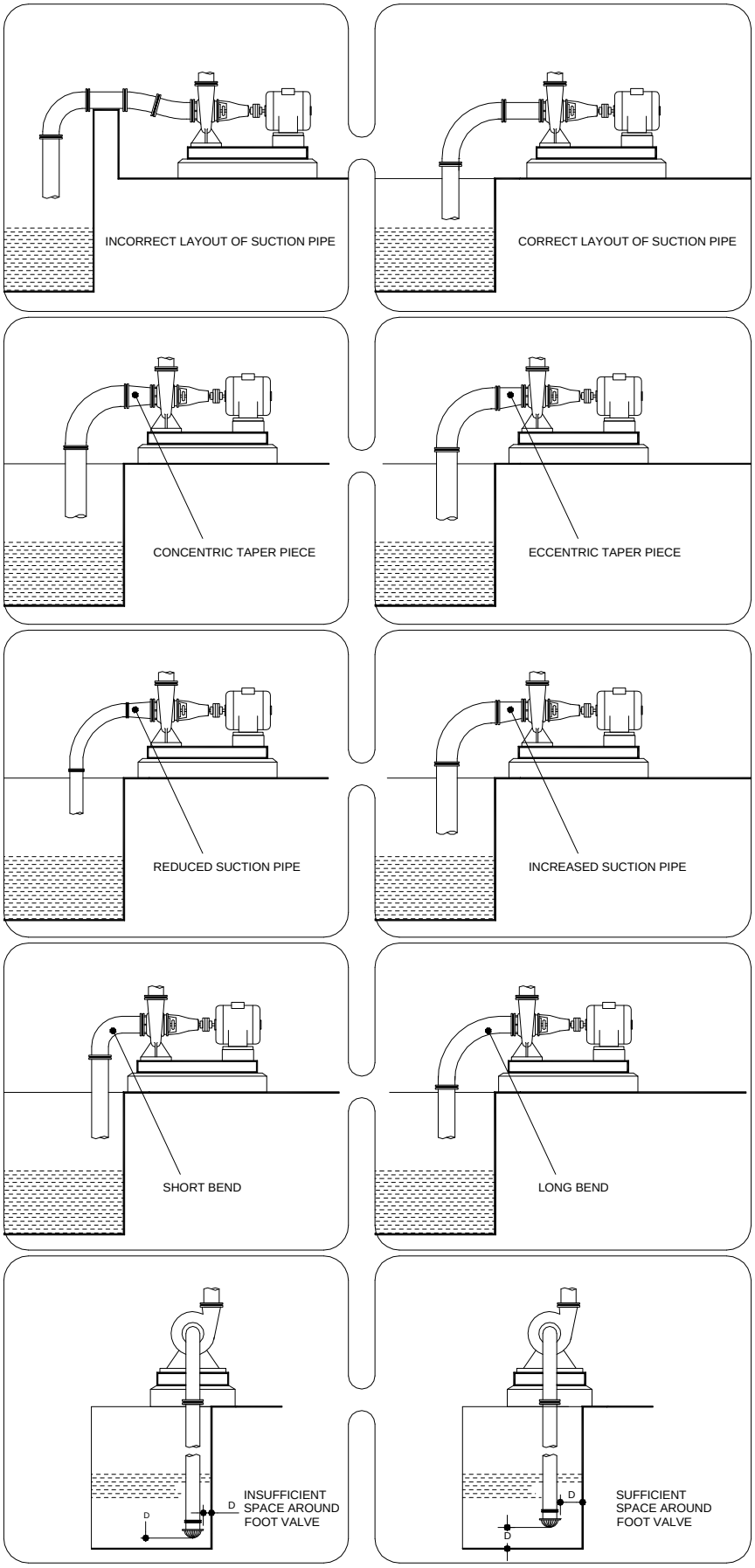
Store all oily rags or other flammable material in a protective container in a safe place. Do not weld or flame cut on pipes/tubes that contents flammable fluids. Clean them thoroughly with nonflammable solvent before welding or flame cutting on them. Use solvent/chemical resistant gloves for hand protection.

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



FOR RECOMMENDATIONS OF SUITABLE SUCTION AND DELIVERY PIPE SIZE PLEASE CONTACT OUR AUTHORISED DEALER OR NEAREST REGIONAL OFFICE

GENERAL INSTRUCTIONS FOR INSTALLATION OPERATION & MAINTENANCE OF KIRLOSKAR CENTRIFUGAL PUMPS

GENERAL INSTRUCTIONS FOR INSTALLATION, OPERATION & MAINTENANCE OF KIRLOSKAR CENTRIFUGAL PUMPS

WARNING

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

LOCATION

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

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

FOUNDATION

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

ALIGNMENT

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

FLEXIBLE COUPLING

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

TYPE OF MISALIGNMENT (SEE FIGURE 1)

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

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

(b) Parallel misalignment : Shafts with axis Parallel but not concentric.

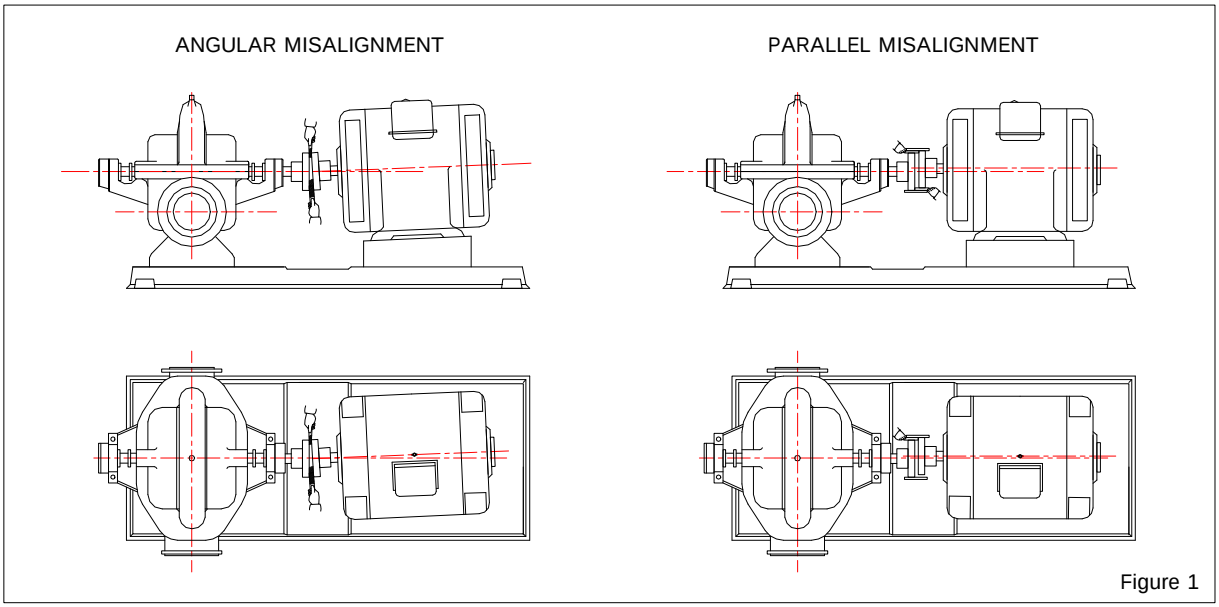


Figure 1

LEVELLING THE UNIT

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

FLEXIBLE COUPLING ALIGNMENT (SEE FIGURE2)

The two halves of the coupling should be at least 4 mm apart so that they cannot touch each other when the driver shaft is rotated. Necessary tools for approximately checking are straight-edge and on an outside caliper.

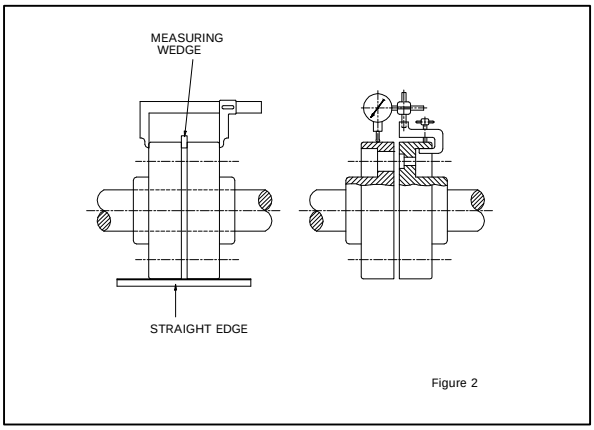
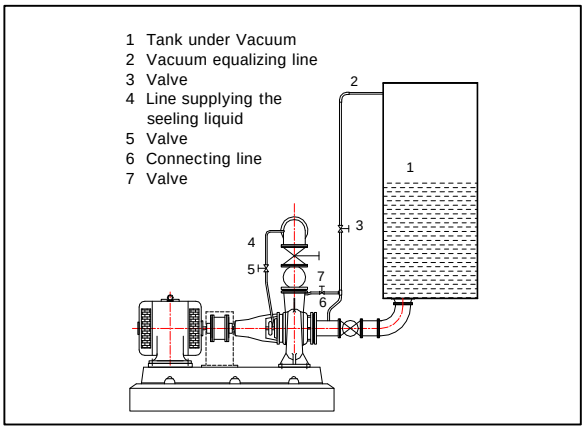


Figure 2



A check for parallel alignment is made by placing a straight-edge across both coupling periphery at the top, bottom and both the sides. The unit will be in parallel alignment when the straight-edge rests evenly on the coupling periphery at all positions. Care must be taken to have the straight-edge parallel to the axis of the shafts.

A check for angular alignment is made by using an outside caliper across the width of the coupling faces at various points.

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

GROUTING

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

FACTORS THAT MAY DISTURB ALIGNMENT

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

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

PIPING

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

SUCTION PIPE

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

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

DELIVERY PIPE

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

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

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

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

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

FOOT VALVE

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

STUFFING BOXES AND PACKING

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

BALL BEARINGS

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

Three monthly when on continuous duty.

Six monthly when on eight-hour per duty.

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

PRIMING

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

(1) Liquid level above pump level

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

(2) Priming with foot valve

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

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

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

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

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

STARTING

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

RUNNING

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

STOPPING

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

STUFFING BOXES

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

CASING RINGS

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

SPARE PARTS

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

PUMP TROUBLE

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

BREAK DOWN-CAUSE-CHECK POINTS

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

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

CHECK POINTS

1. Suction pipe, foot valve choked.
2. Nominal diameter of suction line too small.
3. Suction pipe not sufficiently submerged.
4. Too many bends in the suction line.
5. Clearance around suction inlet not sufficient.
6. Shut off valve in the suction line in unfavourable position.
7. Incorrect layout of suction line (formation of air pockets).
8. Valve in the suction line not fully open.
9. Joints in the suction line not leak-proof.
10. Air leaking through the suction line and stuffing box etc.
11. Suction lift too high.
12. Suction head too low (difference between pressure at suction connection and vapour pressure too low).
13. Delivery liquid contains too much gas and/or air.
14. Delivery liquid too viscous.
15. Insufficient venting.
16. Number of revolutions too high.
17. Number of revolutions too low.
18. Incorrect direction of rotation (electric motor incorrectly connected, leads of phases on the terminal block interchanged).
19. Impeller clogged.
20. Impeller damaged.
21. Casing rings worn out.
22. Separation of crystals from the flow of pumping liquid (falling below the temperature limit/equilibrium temp).
23. Sealing liquid line obstructed.
24. Sealing liquid contaminated.
25. Lantern ring in the stuffing box is not positioned below the sealing liquid inlet.
26. Sealing liquid omitted.
27. Packing incorrectly fitted.
28. Gland tightened too much/slanted.
29. Packing not suitable for operating conditions.
30. Shaft sleeve worn in the region of the packing.
31. Bearing worn out.
32. Specified oil level not maintained.
33. Insufficient lubrication of bearings.
34. Ball bearings over-lubricated.
35. Oil/Grease quality unsuitable.
36. Ball bearing incorrectly fitted.
37. Axial stress on ball bearings (no axial clearance for rotor).
38. Bearings dirty.
39. Bearings rusty (corroded).
40. Axial thrust too great because of worn casing rings, relief holes obstructed.
41. Insufficient cooling water supply to stuffing box cooling.
42. Sediment in the cooling water chamber of the stuffing box cooling.
43. Alignment of coupling faulty or coupling loose.
44. Elastic element of coupling worn.
45. Pump casing under stress.
46. Pipeline under stress.
47. Shaft runs untrue.
48. Shaft bent.
49. Rotor parts insufficiently balanced.
50. Rotor parts touching the casing.
51. Vibration of pipe work.
52. Non-return valve gets caught.
53. Contaminated delivery liquid.
54. Obstruction in delivery line.
55. Delivery flow too great.
56. Pump unsuitable for parallel operation.
57. Type of pump unsuitable.
58. Incorrect choice of pump for existing operating conditions.
59. Voltage too low/power supply overloaded.
60. Short circuit in the motor.
61. Setting of starter of motor too high.
62. Temperature delivery liquid too high.

KIRLOSKAR PUMP
TYPE-KPD-QF
(Driving Unit-4)

KIRLOSKAR BROTHERS LIMITED

Udyog Bhavan, Tilak Road, Pune 411 002 (India)

WARRANTY

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

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

KIRLOSKAR BROTHERS LIMITED

1. KPD – 4 PUMPS – Tapping Connections Chart
(See separate chart)

2. TECHNICAL DATA

2.1 Direction of Rotation:

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

2.2 Bearings:

2.2.1 Specifications of bearings, oil seal and quantity of oil

Part No.	Description	Size	remark
500.1	Oil seal D.S.	Unit No. 4 18 x 35 x 7 Thick	
	Quantity of oil in bearing housing (Approx.)	0.1 Litre	

2.2..2 Bearing temperature

a) Maximum allowable temperature of bearings is 80°C.

b) In case of pumping liquid above 180°C, cooling of lubrication oil shall be necessary. Bearing housing cooling arrangement is provided. Quantity of cooling water required is 0.25 m^3/hr at 6 kg/cm^2 max.

c) 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.

Bearing Details:

Driving Unit	Speed in rpm	Bearing Arrangement	Bearing at DE	Bearing at NDE	Remarks
4	n 3000	Standard	SKF 6304 C3 or equi. 1No. & SKF 7304 B or equi. 1 No.	SKF 6304 C3 1 No.	Standard supply

note:

1. Above bearing arrangement is suitable for pumps operating on suction pressure is less than – 5 kg/cm^2.
2. Applications involving suction pressure more than- 5kg/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. Maximum allowable temperature of bearing shall be 80°C.
5. Bearing should be lubricated with lubricating oil as indicated below.

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

2.3 Specification for Stuffing Box Packing, Gaskets and '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
430	Gland Packing Size (ODxIDxT) Straight length of One Packing	44 x 28 x 8	44 x 28 x 8	44 x 28 x 8
511	Gasket for Casing & Casing Cover ODxIDxT	115 mm 152 OD x141 IDx 1 Thick	115 mm 188 OD x176 IDx 1 Thick	115 mm 230 OD x216 IDx 1 Thick
514	Gasket for Bearing Cover (ODxIDxT)	85 OD x 52 ID x 1 Thick	85 OD x 52 ID x 1 Thick	85 OD x 52 ID x 1 Thick
516	Gasket for Mech. Seal cover (ODxIDxT)	60 OD x 50 ID x 2 Thick	60 OD x 50 ID x 2 Thick	60 OD x 50 ID x 2 Thick
875	Gasket for oil well cover (ODxIDxT)	128x85x1.5 T	128x85x1.5 T	128x85x1.5 T
575	Gasket for impeller and Shaft Sleeve	230 OD x 17 ID x 1 Thick	230 OD x17 ID x 1 Thick	230 OD x 17 ID x 1 Thick
525.1	'O' ring for Casing cover	96 ID x 3 T	96 ID x 3 T	96 ID x 3 T
523.1	'O' ring for Bearing Housing	142 ID x 3 T	142 ID x 3 T	142 ID x 3 T
523	'O' ring for Bearing Cartridge	60 ID x 3 T	60 ID x 3 T	60 ID x 3 T

NOTE:

1. Correct liquid specification should be informed to us to recommend a suitable grade of gland packing.

2. All dimensions are in millimeters.

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

2.4.1 Cool the packed stuffing box when pumping liquid temperature is above 105 °C.

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

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

Full nominal impeller dia in.	Cooling water quantity at various pumping liquid temperature				
Cms.	110°C	115°C	200°C	250°C	300°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/hr.
Maximum temperature of cooling water at outlet - 50°C.
Maximum permissible cooling water pressure - 6.0 kg/cm^2

2.4.4 Cooling of Pump Pads:

Centreline mounted pumps are supported on pads through which cooling water should be circulated. Centreline mounted pumps are recommended for pumping liquid temperature above 180°C. Pump with centreline mounted delivery casing is optional.

Quantity of cooling water to pad - 0.2 to 0.3 m^3/hr.

Maximum permissible cooling water pressure - 6kg/cm^2

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

2.6 Interchangeability

Parts standardization is optimised 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 2.6.1

2.6.1 Interchangeability Chart

Part No.	Name of the Part	Total No. of parts for 3 pumps	Pump type KPD-4		
			20/13 QF	20/16 QF	20/20 QF
105	Pump Casing Foot Mounted	3	1	2	3
106	Pump Casing Centerline Mounted	3	1	2	3
153	Semi-open impeller	3	1	2	3
220	Casing Cover	3	1	2	3
511	Gasket for casing cover	3	1	2	3
251	Support foot for Foot mounted pump	3	1	2	3
251	Support foot for centreline mounted pump	1	1	1	1
525.1	'O' Brg. for casing cover	1	1	1	1
240	Bearing Housing	1	1	1	1
241	Bearing Cartridge	1	1	1	1
350	Stuffing box bush	1	1	1	1
227	Lantern ring	1	1	1	1
236.1	Liquid deflector for gland packed arrangement	1	1	1	1
236	Liquid deflector for mech. seal arrangement	1	1	1	1
515	Gasket for Shaft sleeve	1	1	1	1
430	St. box packing 5 rings	1	1	1	1
443	Constant level oiler	1	1	1	1
397	Spacer type	Suitable coupling to suit motor KW & frame size			
398	Coupling				
226	Drip pan	1	1	1	1
226	Drip pan	1	1	1	1

Part No.	Name of the Part	Total No. of parts for 3 pumps	Pump type KPD-4		
			20/13 QF	20/16 QF	20/20 QF
219	Drip Plate	1	1	1	1
367	Oil well cover for bearing housing cooling arrangement	1	1	1	1
271	Bearing cover NDs	1	1	1	1
180.2	Pump Shaft	1	1	1	1
311	Shaft sleeve for gland packed arrangement	1	1	1	1
315	Shaft sleeve for mech. seal arrangement	1	1	1	1
260	Deep groove ball bearing DS & PS	1	1	1	1
263	Angular contact ball bearing D.S.	1	1	1	1
229	Split gland	1	1	1	1
231	Mech. Seal cover	1	1	1	1
209	Spacer ring	1	1	1	1
199	Shoulder ring	1	1	1	1
523	'O' ring for bearing cartridge	1	1	1	1
525.2	'O' ring for bearing housing	1	1	1	1

3 Maintenance

Preventive maintenance schedule is the periodical check and precautions by which possibilities of failure and break-downs are minimised.

3.1 Daily checks

3.1.1 An hourly record of suction and delivery pressure, discharge quantity input to the pump driver should be maintained.

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

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

3.2 Periodical checks

3.2.1 The temperature of the bearing should be measured by a thermometer. Safe maximum temperature a bearing can attain is 80 ° C.

3.2.2 The lubricants of the bearings 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.

3.2.3 Check the stuffing box leakage, normal leakage should be sufficient to dissipate heat generated. In case the packings are worn out, all the packing rings should be replaced. Replacement of one or two rings of addition rings should never be done.

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

3.2.5 Sufficient quantity of suitable type of lubricant and stuffing box packing should be kept for daily and emergency use.

3.2.6 Calibrate the measuring instrument.

3.3 Annual checks

3.3.1 The pump should be overhauled completely to check the clearance and to replace worn-out parts. Clearance between impeller vanes and pump casing wear face, shaft sleeve and throat bush, lantern ring and shaft sleeve etc. are very important. The bearing should be cleaned throughly and lubricated. The stuffing box should be repacked by correctly locating the lantern ring.

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.

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

3.3.4 The measuring instruments, gauge etc. should be recalibrated.

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

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

4. MECHANICAL SEAL IN KPD-4 PUMPS

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 but in order to obtain the maximum life with trouble-free performance; the equipment should be adequately maintained.

When the mechanical seal is functioning satisfactorily without any leakage etc. the preventive maintenance is not advocated. If leakage occurs, a thorough check-up is needed. While fitting the mechanical seals initially at pump manufacturer's side, due care is taken and the running test is conducted to ensure the performance of seals.

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 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.

Before re-assembly, please check up the following points to ensure the proper fitting and satisfactory operation of the mechanical seal.

1. Shaft sleeve OD should be within + 0.00 mm or –0.05 mm for specified seal size.

2. Leading edge of shaft sleeve is chamfered.

3. Run out of the shaft at the seal face is within 0.05mm.

4.1 Flushing the Mechanical Seal face/ product recirculation of fluid at the seal face.

Flush fluids are those which are different from the fluid being handled or pumped liquid. If they are introduced from an external source, flushing should be done at pressure at least one atmosphere above the vapour pressure of the liquid at the temperature being pumped. Flushing liquid quantity should be approximately 0.3 to 0.5 m^3/hr at the minimum pressure of 0.7 kg/cm^2 above pressure of liquid at stuffing box. For specific application refer cross sectional drawing supplied against order.

Flushing at the seal face is necessary to provide lubrication heating, or cooling of the seal faces and densing action. Pump should not run without flushing at the seal face unless specifically recommended by the seal manufacturer.

CAUTION:

Please refer to the CS drawing supplied against O/A for flushing/ product recirculation recommendation.

4.2 Quenching:

Quench fluids are introduced to the low pressure side of seals for following reasons:

a. Cooling to remove heat from stationary seal faces and mechanical seal cover.

b. Heating to add heat to the fluid in the stuffing box through seal faces. This is often done when handling a thermo-sensitive fluid such as tar, which will get hardened if allowed to cool.

c. Smothering to prevent air from reaching the low pressure side of seal face. In some cases, sealed fluids can react with air to form to sticky residue, which might interfere with seal operation.

d. Clearing to remove any accumulation which may develop at the low pressure side of the seal faces.

Quenching liquid media shall be recommended by seal manufacturer. Quench should be supplied at a low pressure of 0.5 to 0.7 Kg/cm^2 in order to avoid the leakage of the same through throttle bush. Quench quantity should be approximately 0.3 to 0.5 m^3/hr.

CAUTION: Please refer to the cross sectional drawing supplied for Quenching recommendation if any against order.

4.3 Throttle bush for Mechanical Seals:

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

5. OVERHAULING

PROCEDURE FOR DISMANTLING AND RE-ASSEMBLING

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

NOTE: 'O' ring parts (No. 523.1 and 525.1) are applicable only for KPD-4 Hot Pump.

5.1 Dismantling:

Follow the following steps for dismantle the pump.

5.1.1 Isolate power supply to motor.

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

5.1.3 Drain the liquid from the pump by removing the drain plug (601), or open the pump casing drain cock.

5.1.4 Remove all auxiliary tubing and piping.

5.1.5 Drain the lubricating oil from bearing housing (240/242) and remove constant level oiler (443).

5.1.6 We recommend to match the punch mark of coupling halves.

5.1.7 In case of pumps with spacer type flexible couplings, disconnect coupling (pump half and motor half) from the coupling spacer (399) and remove coupling spacer. Coupling spacer shall fall down. In case of ordinary flexible couplings, remove the motor from the base.

5.1.8 Remove the support foot hold down bolts (251).

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

5.1.10 Remove the hex. nuts from casing studs holding the bearing housing (240) in case of KPD 20/13 QF pump.

Remove the hex. nuts from casing studs holding the casing cover (220) 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 (153) clears the pump casing (105/106).

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

5.1.14 Remove casing gasket (511).

5.1.15 Unscrew the impeller (153). Remove the gasket between impeller and shaft sleeve (515) after taking out the impeller from the pump shaft (180).

5.1.16 Removal of stuffing box with gland packing:

For this, following steps should be taken:

a. Remove the split gland (229) by taking out the bolts for clamping of the split positions.
b. Take out the casing cover (220) alongwith throat bush (350), gland packing (430), and lantern ring (227), 'O' ring for casing cover in Hot Models only (525.1) will also come out alongwith it.
c. Take out 'O' ring (525.2) for bearing housing.(Only for Hot Model).
d. Unscrew the hex socketted cap screws clamping throat bush (350) to the casing cover (220) and remove the throat bush (350).
e. Remove the gland packing rings (430) and lantern ring (227).
f. Remove the shaft sleeve (311).
g. Remove shaft sleeve key (320).
h. Remove liquid deflector.

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 throat bush (350) to the casing cover (220) and remove the throat bush.

b) Seal seat will come out along with the throat bush (350) in case of double mechanical seal.

c) Pull shaft sleeve under mechanical seal (315). 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 (220) 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 (220) along with the mechanical seal cover taking care of mating ring face. 'O' ring for casing cover (525.1) for Hot Models 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 (231) from casing cover (220).

h) In case of externally mounted mechanical seals, similar procedure should be followed only with the change that casing cover (220) should be removed before removing shaft sleeve(315) alongwith mechanical seal.

5.1.18 Loosen the grub screw holding the liquid deflector (236.1). Take out the liquid deflector.

5.1.19 Take out "O" ring for bearing housing (525.2) carefully in case of Hot Models only.

5.1.20 Remove the pump half coupling (397) 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 (321).

5.1.22 Loosen the hex screws for bearing cover (NDE)(271). Remove carefully the bearing cover (271) and packing (514).

5.1.23 Loosen the nuts (586) from bearing housing studs (593) receiving bearing cartridge (241).

5.1.24 Force the shaft (180.2) out carefully in the direction of the driving end. Shaft will come out with bearings and bearing cartridge (241).

5.1.25 Remove circlip (485), remove the bearing cartridge (241) with the help of a suitable puller.

5.1.26 Unlock the washer (415) and remove lock nut (336).

5.1.27 Take out the driving end groove ball bearing (260) with the help of puller.

5.1.28 Take out spacer ring (209) between the DE bearing.

5.1.29 Take out driving end angular contact ball bearing (263) with the help of puller.

5.1.30 Take out shoulder ring (199) for driving end bearings.

5.1.31 Take out the non driving end ball bearing (260) with the help of a suitable puller.

5.1.32 Take out the non-driving end shoulder ring (199).

CAUTION:

Steps 5.1.26 to 5.1.32 are to be followed only if bearings are damaged and to be replaced.

5.1.33 Oil seal in the bearing cartridge (500.1) 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 (523.1) 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 (367).

5.1.36 Take out the packing (875).

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 with 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 (199), angular contact ball bearing (263), spacer ring (209) and deep groove ball bearing (260) 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 (260).

CAUTION:

a) Use Arbor Press while fitting the bearings. However, it is recommended that bearing should be heated in oil bath at temperature 70 to 80°C and then fitted. (If hot oil is not available use ARBOR PRESS).

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

c) Do not use hammer to fit the bearings. Do not damage the shaft surface especially where it contacts the oil seal.

5.2.3 Tighten bearing lock nut (336) after inserting the washer for bearing locking (625) in proper position. Fold one lip of lock washer in slot of bearing lock nut to lock it.

5.2.4 Fit the oil seal (500.1) in the bearing cartridge (241) and 'O' (523) on the cartridge.

5.2.5 Insert the circlip (485) in the groove provided for it.

5.2.6 Insert shaft (180) alongwith 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 (540) at non - driving end and tighten the bearing cover (271) with the help of hex. screws.

5.2.8 Place 'O' ring (525.1) on bearing housing in case of Hot Models only. 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 (226) 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 (320) on shaft and insert shaft sleeve (311) alongwith deflector (236) mounted on it.

b) Place 'O' ring (525.1) on casing cover after lubricating it properly for Hot Models only.

c) Insert casing cover (220) with 'O' ring (515.1) (for Hop Models only) and drip plate (219) in proper positions.

Tighten the nuts on studs of casing cover in case of pump types KPD 20/16 QF and KPD 20/20 QF.

For KPD 20/13 QF pump, casing cover (220) is guided on bearing housing (240) steps.

d) Fit throat bush (350) into the casing cover and tighten the hex. socketed screws.

e) Put the gasket for shaft sleeve and impeller (515) on shaft sleeve (311) step.

f) 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.

g) Tighten the grub screws on the labyrinth type reflector.

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

a) Mount the deflector (236.1)on shaft.

b) Replace the bush for mechanical seal cover(360) (Throttle bush) if it is worn out.

c) Place the mechanical seal cover (231) alongwith stationary seal seat/insert/mating ring and gasket (516) and tighten the nuts on studs for mechanical seal cover on casing cover evenly.
CAUTION:

1) Tightening of nuts should be done evenly and across corner so that seal face shall be square to the shaft.
2) Lapped end of seal seat/insert/mating ring should be face to the rotating part of the Mechanical Seal.

d) Place 'O' ring (525.1) on casing cover (220) after lubricating it properly in case Hot Models only.

e) Insert the casing cover (220) with 'O' rings (525.1 and 525.2) 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.

f) Mount rotating part of mechanical seal on shaft sleeve (315) after applying oil on it. Tighten grub screws provided n rotating element of mechanical seal after resting seal against step on sleeve.

g) Mount shaft sleeve key (320) on shaft and push the sleeve (315) along with mechanical seal with care till the face of rotating part touches the stationary seal/seat/insert/mating ring.

h) Fit throat bush (350) into casing cover. In case of double mechanical seal fit mechanical seal seat/insert mating ring of seal towards impeller end in throat bush (350) and then fit it in casing cover. Tighten the hex. socketted grub screws.

i) Put gasket(515) on shaft sleeve step in proper position.

j) Fix the impeller on the shaft along with the heli coil mid-grip insert avg. gradually tighten it.

k) Tighten the grub screw on the labyrinth deflector (236.1) after resting its shoulder against shaft sleeve shoulder.

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

1) Insert shaft sleeve into shaft before fitting casing cover (220) on to the bearing housing (240).

2) Same as that for KPD pump mentioned in clause (2) for external mech. seals.

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

1) Fit the cover for bearing housing cooling arrangement (367) with packing (875) and tighten the screws.

5.2.12 General Assembly procedure rotating unit for all pumps.

a) Slide complete, back-pull out assembly into pump casing (105/106).

b) Tighten all 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 (241) and bearing housing (240) face at driving end, is 3 mm in normal condition. So while reassembling the back-pull out assembly, keep the hex screws (635) in loose condition and tighten the casing cover to the screws (635) 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 (635) for bearing housing in loose condition.

b) Tighten the axial gap bearing cartridge (586) so that the impeller just touches pump casing wear face.

c) Measure the hex nuts for bearing cartridge (241) and bearing housing (240) 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 (586) and tighten the hex screws for bearing cartridge (635) 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 (586) 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-

i) Loosen the back-pull-out assembly from pump casing. Remove it.

ii) Remove the impeller (153) from the shaft(180.2)

iii) Remove stuffing box bush (350) from casing cover (220).

iv) Remove the shaft sleeve with rotary unit of the mechanical seal.

v) 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.

vi) Fit the shaft sleeve along with the mechanical seal rotary unit.

vii) Fit the stuffing box bush (350).

viii) Fit the impeller (153) on the shaft.

ix) Tighten the back-pull-out assembly to the pump casing by tightening casing nuts (581).

CAUTION:

1. No need of mechanical seal adjustment is there in case of as shaft adjustment upto 1.0 mm for 500 class mechanical seals.
2. Also for 1500 class seals, no adjustment of mechanical seal is necessary even after adjusting the shaft for clearance, at any time.

5.2.13 In case of pump with gland packing, insert gland packing (430) and lantern ring (227) in order of 2 rings first than lantern ring and finally 3 rings. Joints should be staggered.

5.2.14 Put gland in two halves (229), clamp them with gland bolts (574). Tighten gland stud nuts.

5.2.15 Fit constant level oiler (443), Breathercap (444).

5.2.16 Fit pump half coupling (397).

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 (251) 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.

Part No.	Description
105	Pump Casing -Foot mounted
106	Pump casing -Centreline mounted
153*	Semi-open Impeller
180.2*	Pump shaft
199	Shoulder ring
209	Spacer ring
219	Drip plate
220	Casing cover
226	Drip pan
227*	Lantern ring
229	Split gland
230*	Mechanical seal
231	Mechanical seal cover
236	Liquid deflector - Gland packed pump
236.1*	Liquid deflector- Mech. sealed pump
240	Bearing housing
241	Bearing cartridge
251	Support foot
260*	Ball bearing D.S.
260*	Ball bearing N.D.S.
263*	Angular contact bearing D.S.
271	Bearing cover N.D.S.
311*	Shaft sleeve for gland packing
315*	Shaft sleeve for mechanical seal
320*	Key for shaft sleeve
321	Key for coupling
336*	Bearing lock nut
338	Pipe nut for centreline mounted pump
350*	Stuffing box bush or Throat bush
360*	Throttle bush
367	Oil well cover
384	Pump foot pad for centreline mounted pump
390	Flexible coupling-Pump half
391	Flexible coupling-Driver half
397	Spacer type coupling-Pump half
398	Spacer type coupling-Driver half
399	Spacer for spacer type coupling
403*	Coupling star
701	Spring washer for support foot
415*	Lock washer for bearing nut
430*	Gland packing
443	Constant level oiler
444	Air breather
468	Orifice (Mechanical seal)
479*	Helicoil spring insert

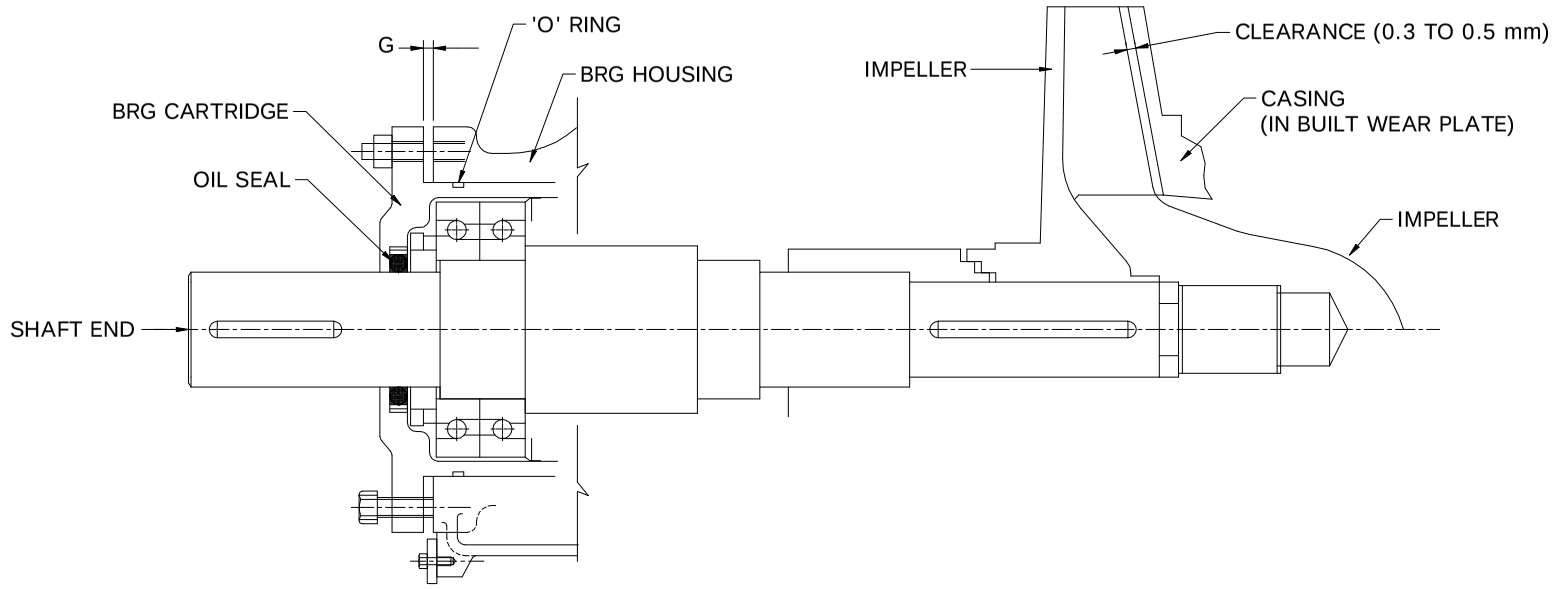
Part No.	Description
485*	Internal circlip
490.1	Companion flange: Suction side
490.2	Companion flange: Delivery side
490.3	Slip-on flange- Suction side
490.4	Slip-on flange- Delivery side
500.1*	Oil seal (D.S.)
511*	Gasket for casing cover
513.1*	Gasket for companion /slip-on flange- Delivery side
514*	Gasket for bearing cover N.D.S.
515*	Gasket for shaft sleeve and impeller
516*	Gasket for mechanical seal cover
517.7*	Gasket for constant level oiler
518*	Gasket for adapter for sealing connection
523*	'O' ring for bearing cartridge
531.1*	'O' ring for bearing housing and casing cover
531.2*	'O' ring for bearing housing
525.1	Pipe nipple for pad cooling
525.2	Pipe nipple for pad cooling
532	Pipe nipple for flushing
533.1	Pipe nipple for casing drain
533.2	Pipe nipple for casing drain
542.1	Elbow for casing drain
545	Union joint
550	Wheel cock
558.1	Hex nut for sealing pipe adapter
582.1	Hex nut for gland studs
582.2	Hex nut for mechanical seal cover
582.3	Hex nut for studs receiving bearing housing
582.4	Hex nut for studs receiving casing cover
582.5	Hex nut for gland screws
586	Hex nut for studs receiving bearing cartridge
590.2	Studs on pump casing to receive casing cover or bearing housing to receive mechanical seal cover
591.2	Studs on casing cover to receive gland
591.3	Studs on casing cover to receive mechanical seal cover
593	Studs on bearing housing to receive bearing cartridge
600.1	Plug for pressure gauge connection
600.2	Plug for suction gauge connection
601	Plug for pump casing drain
602.1	Plug for sealing connection on pump casing
602.2	Plug for sealing inlet connection on casing cover
602.3	Plug for sealing outlet connection on casing cover
603.1	Plug for casing cover cooling inlet connection
603.2	Plug for casing cover outlet connection
603.3	Slotted collared plug

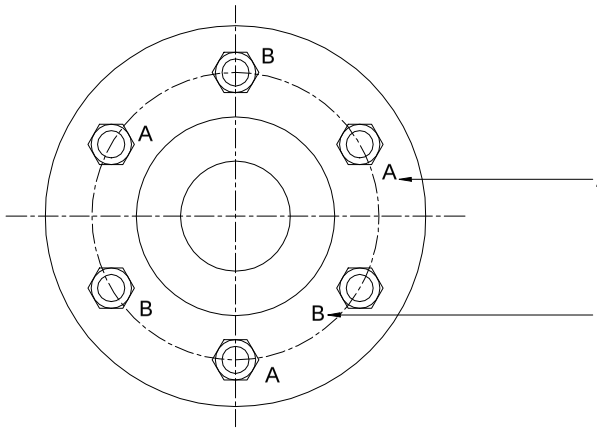
Part No.	Description
605.1	Plug for bearing housing drain
609.1	Plug for mechanical seal inlet and outlet of quenching
611.2	Taper pin for pad
630	Hex release screw for casing cover
631.1	Hex screw for bearing cover NDE
631.2	Hex screw for cover of bearing housing cooling arrangement
632	Hex screw for support foot
635	Hex screw for bearing cartridge
640	Rivets for name plates
653.1	Hex socketed grub screw for coupling (pump)
653.2	Hex socketed grub screw for motor coupling
654	Grub screw for deflector
666.1	Hex sockted cap screw for St. box bush
666.2	Socketed grub screw for casing cover
670	Name plate for duties
671.1	Cooling water inlet name plate
671.2	Cooling water outlet name plate
672	Direction of rotation arrow name plate
673	Lubrication instructions name plate
676.1	Sealing water inlet name plate
676.2	Sealing water inlet name plate
679.1	Quenching inlet name plate
679.2	Quenching out name plate
605.3	Locking plug
605.4	Locking plug
600.3	Plug for pad
603	Locking plug
604	Plug for drip pan
605.2	Plug for bearing housing
574	Hex screw for gland
713	Screw for drip plate
717	Hex screw for centreline mounted pad
727	Locking plug
781.1	Flushing inlet name plate
781.2	Flushing outlet name plate
724	Plug for bearing housing against
802*	Gasket for pad
875*	Gasket for oil well cover

* Recommended spares for two year normal working.

PARTIAL ASSEMBLY OF TELESCOPIC ARRANGEMENT

(FOR CPHM-4 UNIT PUMPS ONLY)

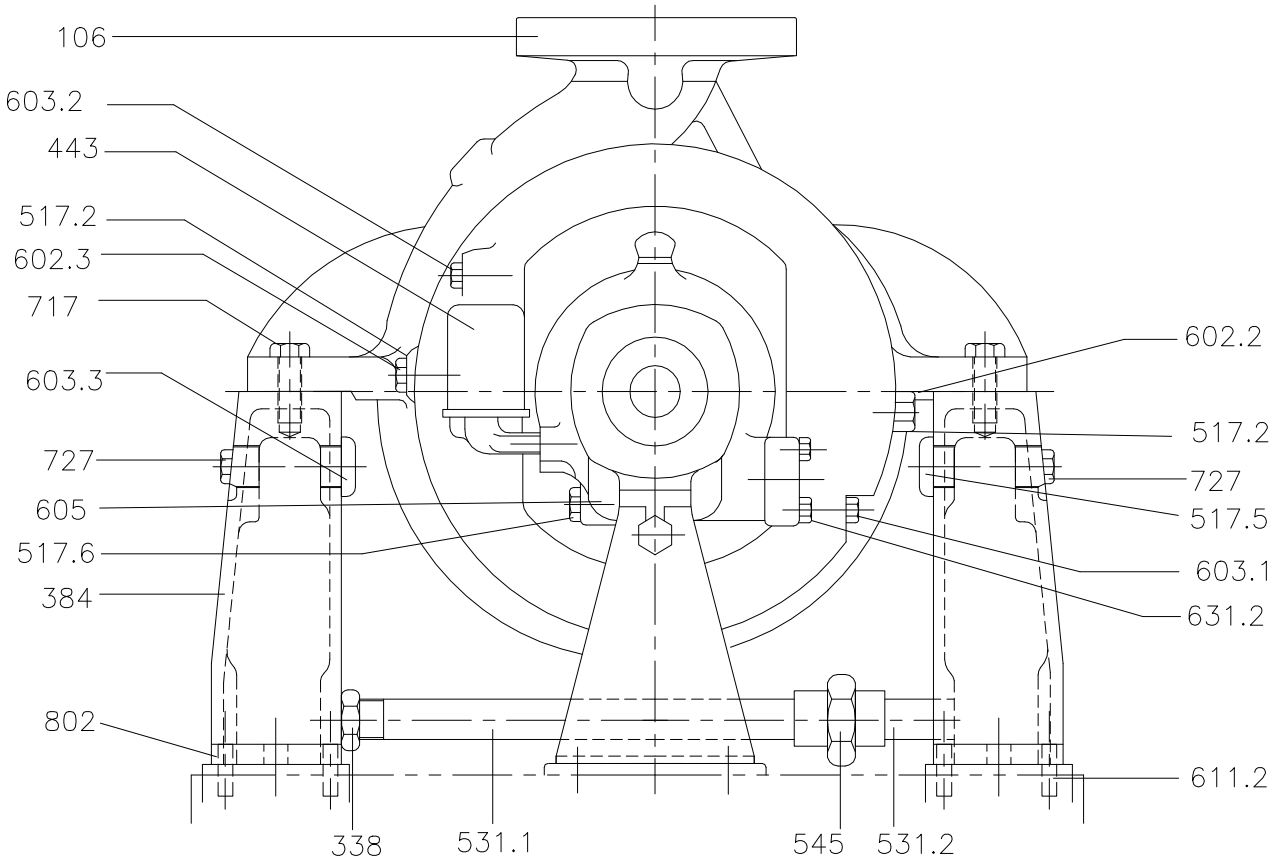




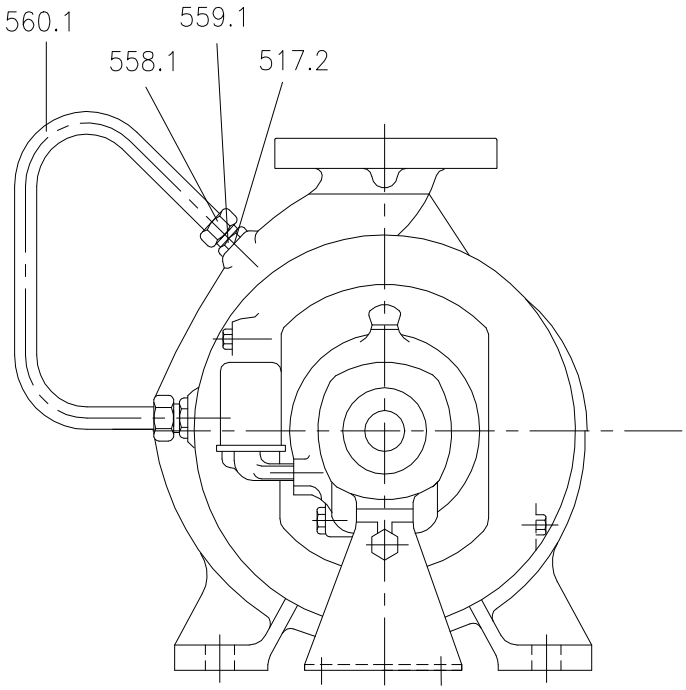
VIEW FROM SHAFT END
OF BRG. CARTRIDGE

A] 3 HEX. SCREWS FOR CLEARANCE ADJUSTMENT OF IMPELLER & WEAR PLATE BY GAP G OF BRG HOUSING & BRG. CARTRIDGE.

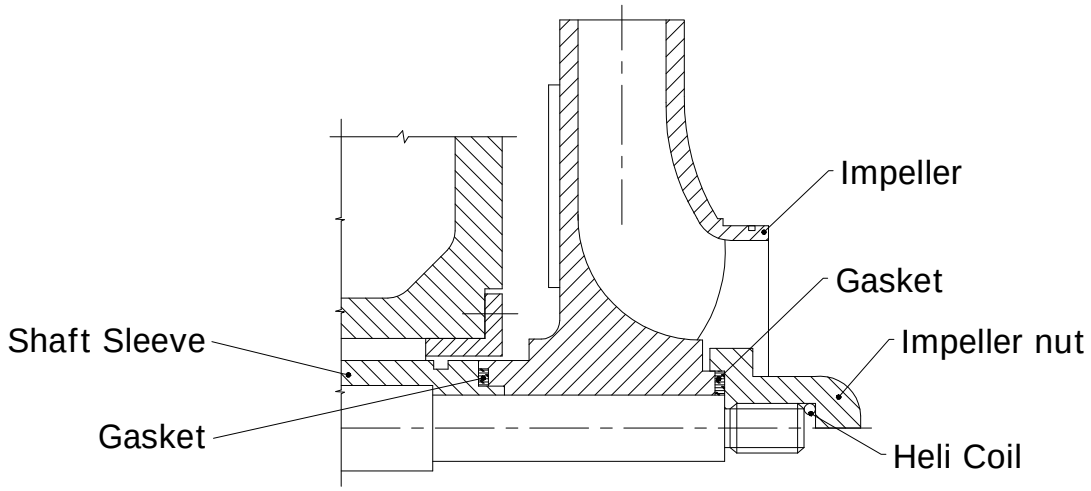
B] 3 STUDS & NUTS FOR HOLDING OF BRG. CARTRIDGE.

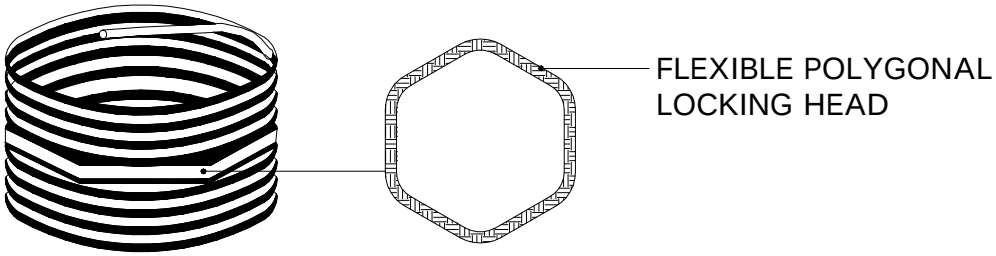


END VIEW OF CENTRE LINE MOUNTED PUMP

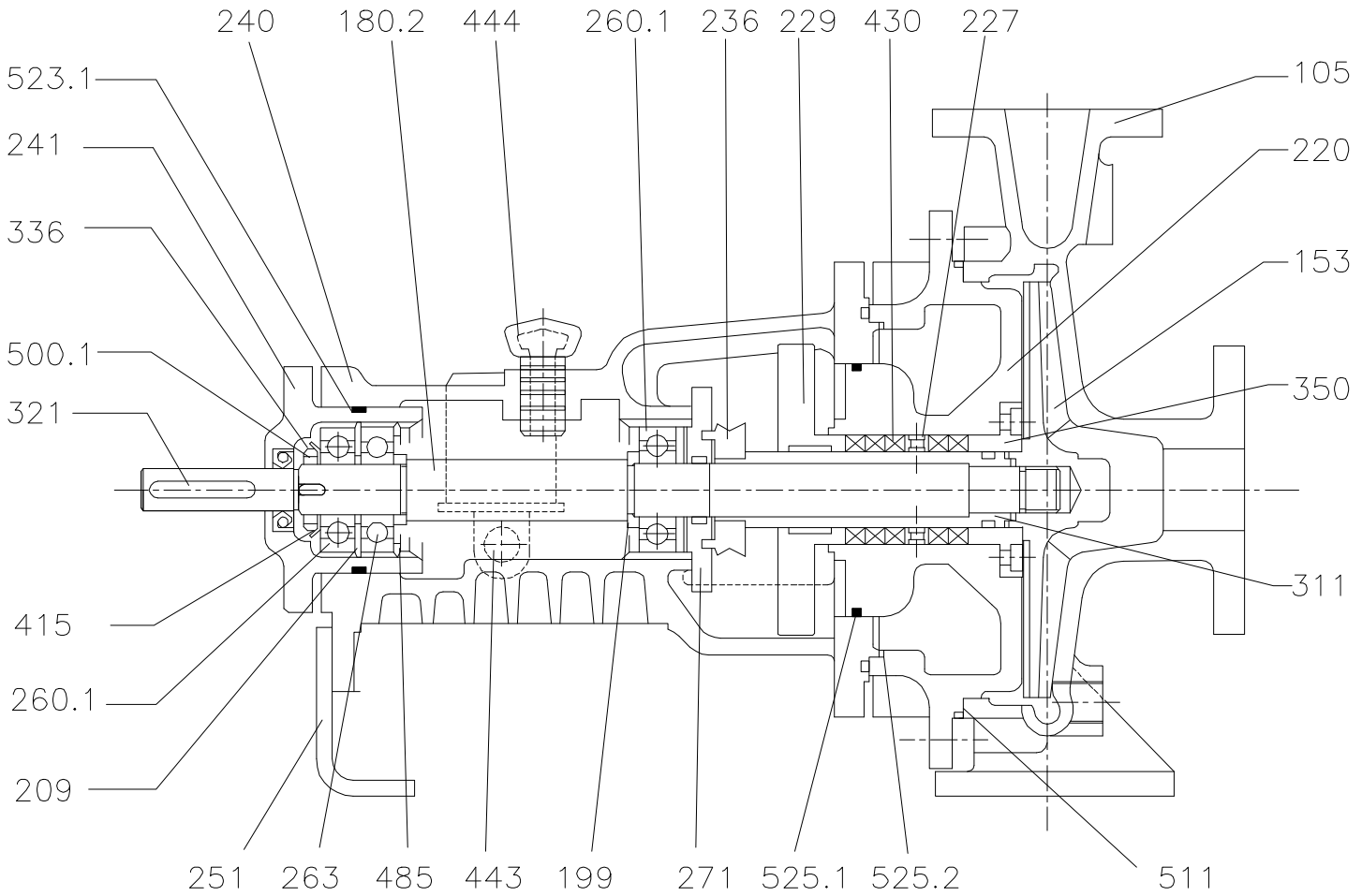


(END VIEW OF FOOT MOUNTED PUMP)

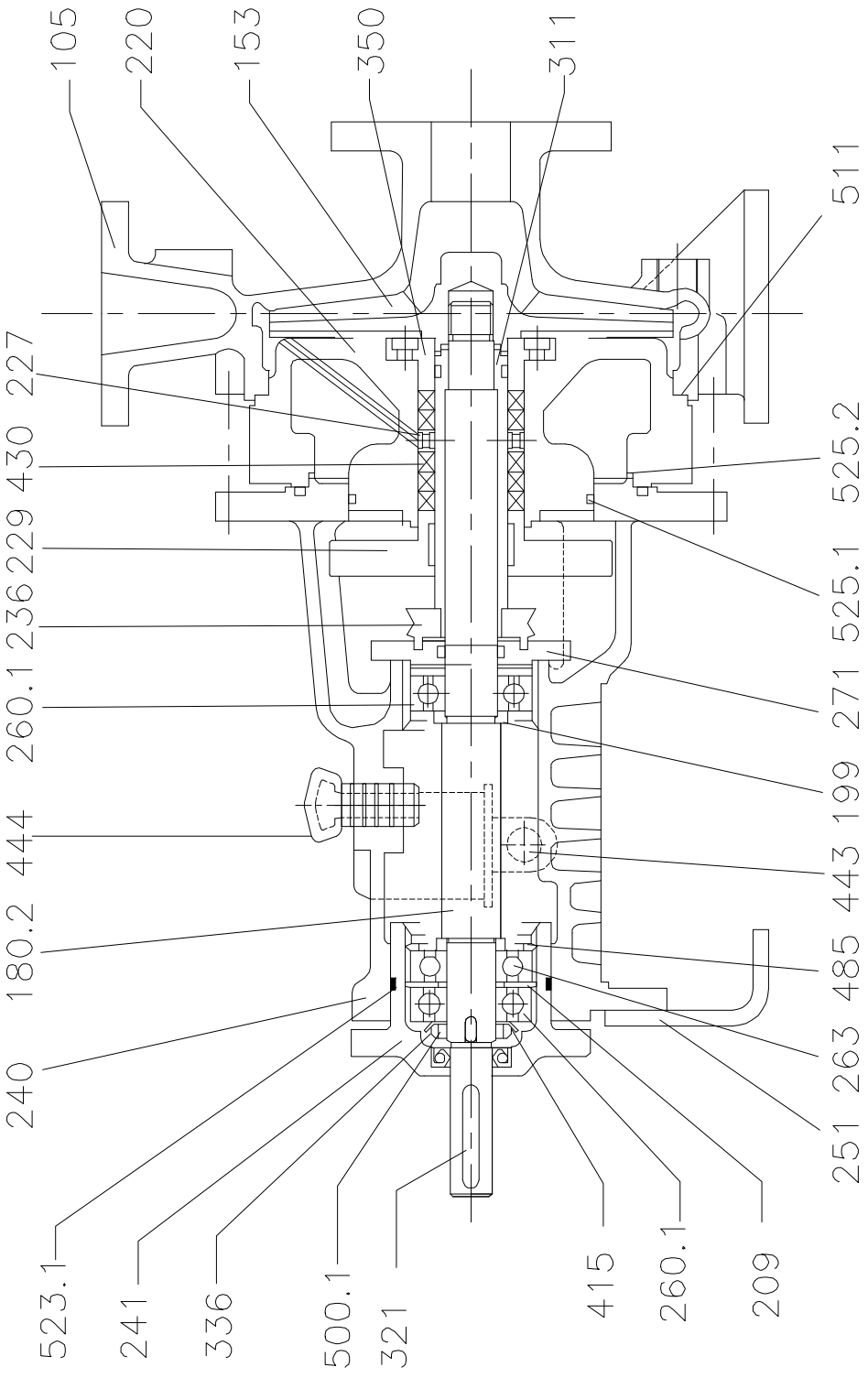




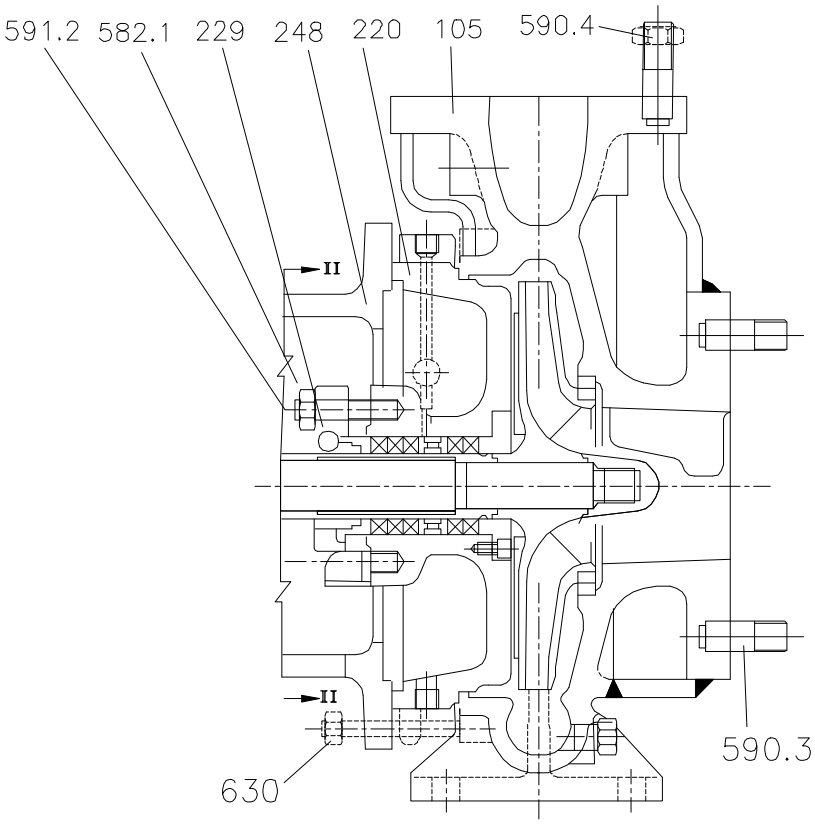
HELI-COIL-MID-GRIP SCREWED INSERT



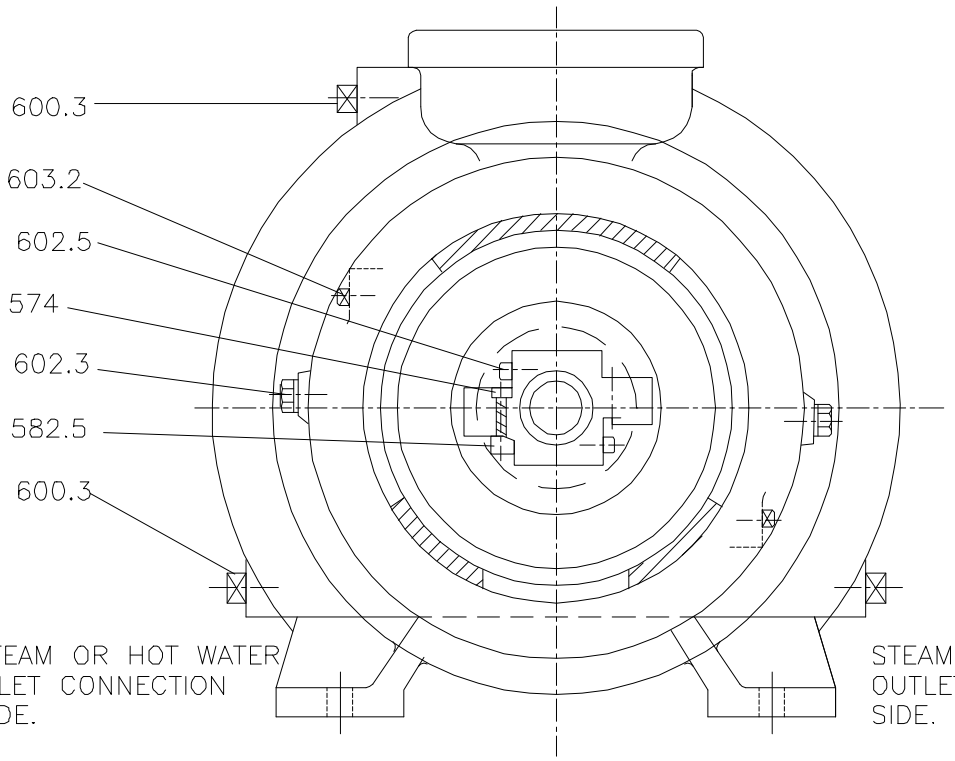
CROSS SECTIONAL ASSEMBLY DRAWING OF KPD 20/16QF & KPD 20/20QF PUMP

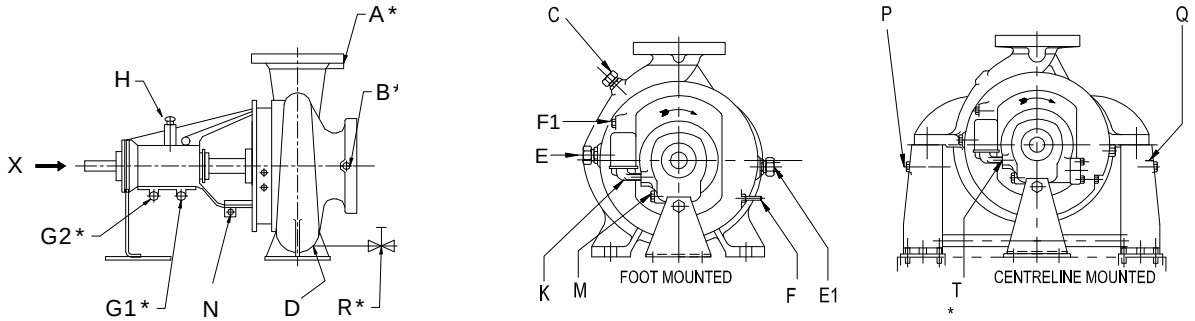


CROSS SECTIONAL ASSEMBLY DRAWING OF KPD 20/13QF PUMP



GENERAL CROSS SECTIONAL DRAWING OF KPD STEAM JACKETED PUMP





S. NO.	CODE OF PIPE CONN.		LOCATION OF CONNECTION
1.	A	Gauge connection discharge side.	On pump discharge suction side.
2.	B	Suc. Gauge /Vacuum equalising conn.	On suction side boss top.
3.	C	Flushing/Sealing conn. From pump casing.	On pump volute left side.
4.	D	Pump casing drain.	On pump casing bottom side towards suction.
5.	E1	Stuffing box flushing inlet.	On casing cover top left.
6.	E2	Stuffing box flushing outlet.	On casing cover bottom right.
7.	F1	Stuffing box cooling water inlet.	On casing cover bottom right.
8.	F2	Stuffing box cooling water outlet	On casing cover top left.
9.	G1*	Bearing housing cooling water inlet	On bearing housing right
10.	G2*	Bearing housing cooling water outlet	On bearing housing right
11.	H	Oil breather plug	On bearing housing top
12.	K	Constant level oiler	On bearing housing left
13.	M	Bearing housing oil drain	On bearing housing left
14.	N*	Drip pan drain	On lantern bracket bottom right.
15.	P Q	Pad cooling for centerline mounted pump outlet & inlet.	On pad for centerline mounted pump casing.
16.	R*	Drain cock & piping.	On pump casing bottom.
17.	S	Drain tapping for drain rim type base.	On base (not shown here).
18.	T*	Thermo well (Temperature gauge.)	On bearing housing right, near constant level oiler.

NOTE- LOCATION OF CONNECTION ARE SPECIFIED FROM ARROW 'X'.
* THIS SPECIAL PROVISION ON REQUEST ONLY AND AT EXTRA COST.

GENERAL INFORMATION & SAFETY INSTRUCTIONS

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

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

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

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

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

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

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

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

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

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

1.9 Clear and easy access to all controls, gauges and dials etc must be maintained at all times. Hazardous or flammable materials must not be stored in pump rooms unless safe areas or racking and suitable container have been provided.

1.10 Use suitable earthing and tripping devices for electrical equipments.

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

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

3. SAFETY INSTRUCTIONS WHILE HANDLING AND STORAGE

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

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

4. SAFETY INSTRUCTIONS WHILE ASSEMBLY & INSTALLATION

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

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

5. SAFETY INSTRUCTIONS WHILE COMMISSIONING & OPERATION

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

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

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

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

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

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

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

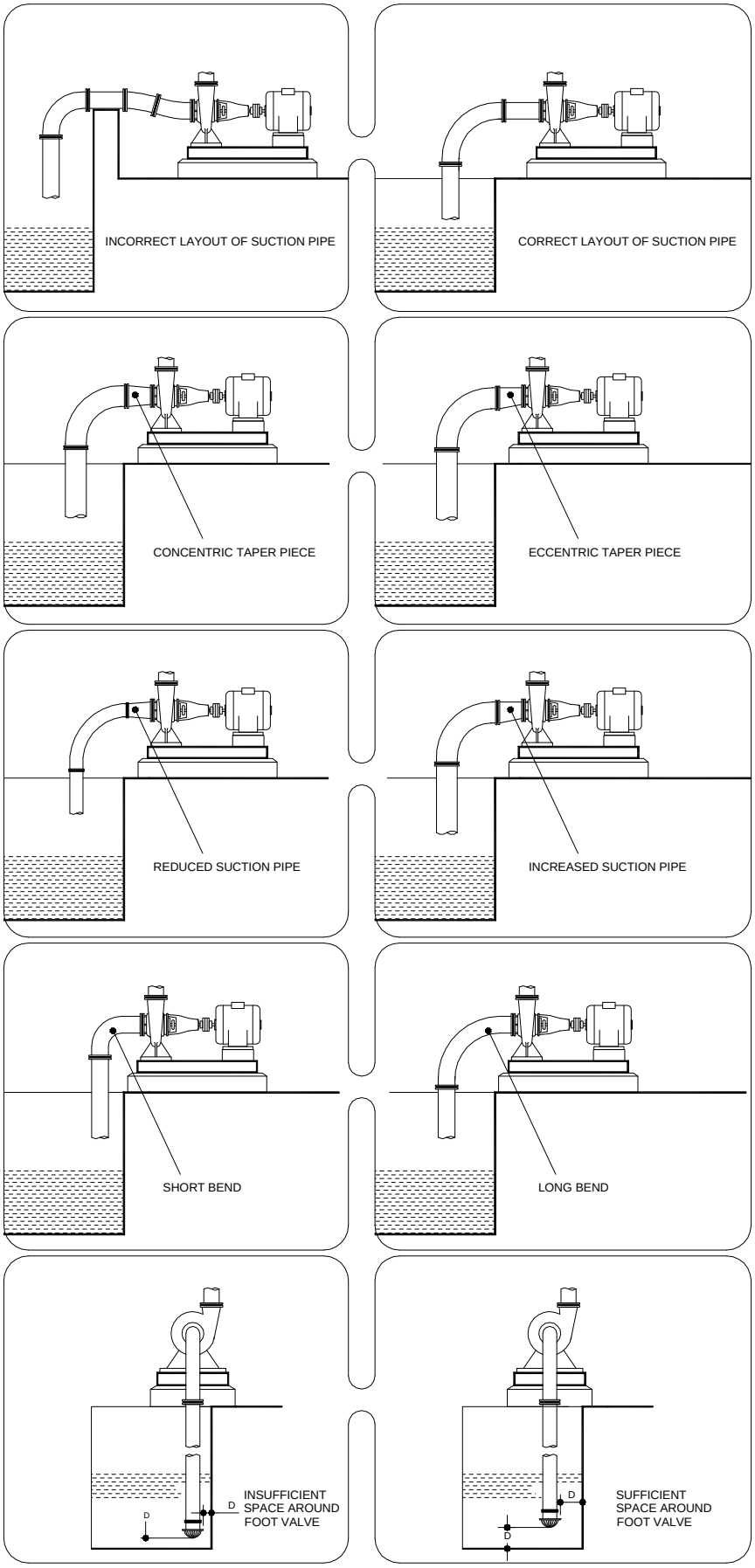
Store all oily rags or other flammable material in a protective container in a safe place. Do not weld or flame cut on pipes/tubes that contents flammable fluids. Clean them thoroughly with nonflammable solvent before welding or flame cutting on them. Use solvent/chemical resistant gloves for hand protection.

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



FOR RECOMMENDATIONS OF SUITABLE SUCTION AND DELIVERY PIPE SIZE PLEASE CONTACT OUR AUTHORISED DEALER OR NEAREST REGIONAL OFFICE

GENERAL INSTRUCTIONS FOR INSTALLATION OPERATION & MAINTENANCE OF KIRLOSKAR CENTRIFUGAL PUMPS

GENERAL INSTRUCTIONS FOR INSTALLATION, OPERATION & MAINTENANCE OF KIRLOSKAR CENTRIFUGAL PUMPS

WARNING

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

LOCATION

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

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

FOUNDATION

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

ALIGNMENT

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

FLEXIBLE COUPLING

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

TYPE OF MISALIGNMENT (SEE FIGURE 1)

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

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

(b) Parallel misalignment : Shafts with axis Parallel but not concentric.

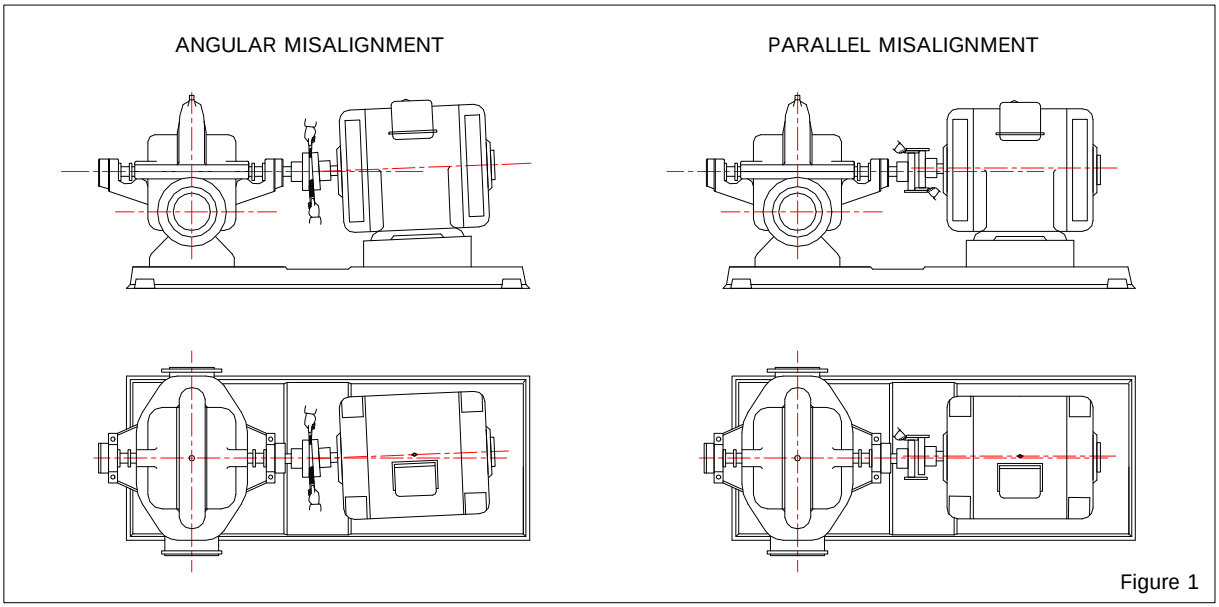


Figure 1

LEVELLING THE UNIT

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

FLEXIBLE COUPLING ALIGNMENT (SEE FIGURE2)

The two halves of the coupling should be at least 4 mm apart so that they cannot touch each other when the driver shaft is rotated. Necessary tools for approximately checking are straight-edge and on an outside caliper.

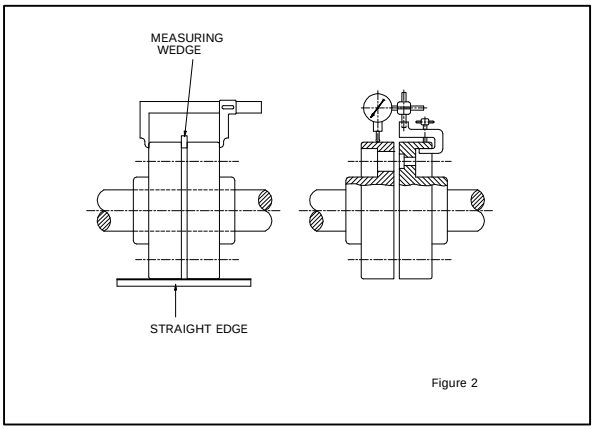
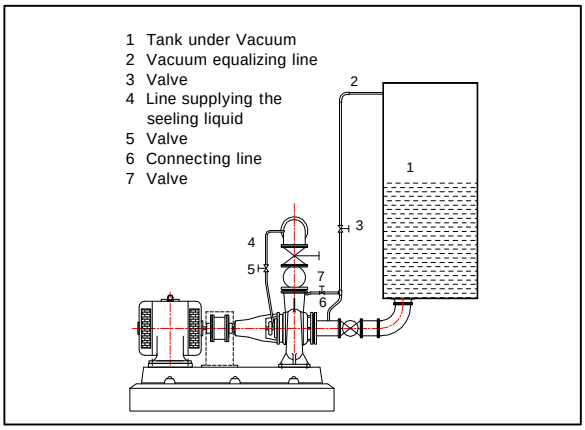


Figure 2



A check for parallel alignment is made by placing a straight-edge across both coupling periphery at the top, bottom and both the sides. The unit will be in parallel alignment when the straight-edge rests evenly on the coupling periphery at all positions. Care must be taken to have the straight-edge parallel to the axis of the shafts.

A check for angular alignment is made by using an outside caliper across the width of the coupling faces at various points.

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

GROUTING

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

FACTORS THAT MAY DISTURB ALIGNMENT

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

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

PIPING

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

SUCTION PIPE

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

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

DELIVERY PIPE

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

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

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

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

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

FOOT VALVE

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

STUFFING BOXES AND PACKING

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

BALL BEARINGS

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

Three monthly when on continuous duty.

Six monthly when on eight-hour per duty.

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

PRIMING

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

(1) Liquid level above pump level

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

(2) Priming with foot valve

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

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

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

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

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

STARTING

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

RUNNING

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

STOPPING

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

STUFFING BOXES

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

CASING RINGS

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

SPARE PARTS

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

PUMP TROUBLE

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

BREAK DOWN-CAUSE-CHECK POINTS

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

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

CHECK POINTS

1. Suction pipe, foot valve choked.
2. Nominal diameter of suction line too small.
3. Suction pipe not sufficiently submerged.
4. Too many bends in the suction line.
5. Clearance around suction inlet not sufficient.
6. Shut off valve in the suction line in unfavourable position.
7. Incorrect layout of suction line (formation of air pockets).
8. Valve in the suction line not fully open.
9. Joints in the suction line not leak-proof.
10. Air leaking through the suction line and stuffing box etc.
11. Suction lift too high.
12. Suction head too low (difference between pressure at suction connection and vapour pressure too low).
13. Delivery liquid contains too much gas and/or air.
14. Delivery liquid too viscous.
15. Insufficient venting.
16. Number of revolutions too high.
17. Number of revolutions too low.
18. Incorrect direction of rotation (electric motor incorrectly connected, leads of phases on the terminal block interchanged).
19. Impeller clogged.
20. Impeller damaged.
21. Casing rings worn out.
22. Separation of crystals from the flow of pumping liquid (falling below the temperature limit/equilibrium temp).
23. Sealing liquid line obstructed.
24. Sealing liquid contaminated.
25. Lantern ring in the stuffing box is not positioned below the sealing liquid inlet.
26. Sealing liquid omitted.
27. Packing incorrectly fitted.
28. Gland tightened too much/slanted.
29. Packing not suitable for operating conditions.
30. Shaft sleeve worn in the region of the packing.
31. Bearing worn out.
32. Specified oil level not maintained.
33. Insufficient lubrication of bearings.
34. Ball bearings over-lubricated.
35. Oil/Grease quality unsuitable.
36. Ball bearing incorrectly fitted.
37. Axial stress on ball bearings (no axial clearance for rotor).
38. Bearings dirty.
39. Bearings rusty (corroded).
40. Axial thrust too great because of worn casing rings, relief holes obstructed.
41. Insufficient cooling water supply to stuffing box cooling.
42. Sediment in the cooling water chamber of the stuffing box cooling.
43. Alignment of coupling faulty or coupling loose.
44. Elastic element of coupling worn.
45. Pump casing under stress.
46. Pipeline under stress.
47. Shaft runs untrue.
48. Shaft bent.
49. Rotor parts insufficiently balanced.
50. Rotor parts touching the casing.
51. Vibration of pipe work.
52. Non-return valve gets caught.
53. Contaminated delivery liquid.
54. Obstruction in delivery line.
55. Delivery flow too great.
56. Pump unsuitable for parallel operation.
57. Type of pump unsuitable.
58. Incorrect choice of pump for existing operating conditions.
59. Voltage too low/power supply overloaded.
60. Short circuit in the motor.
61. Setting of starter of motor too high.
62. Temperature delivery liquid too high.