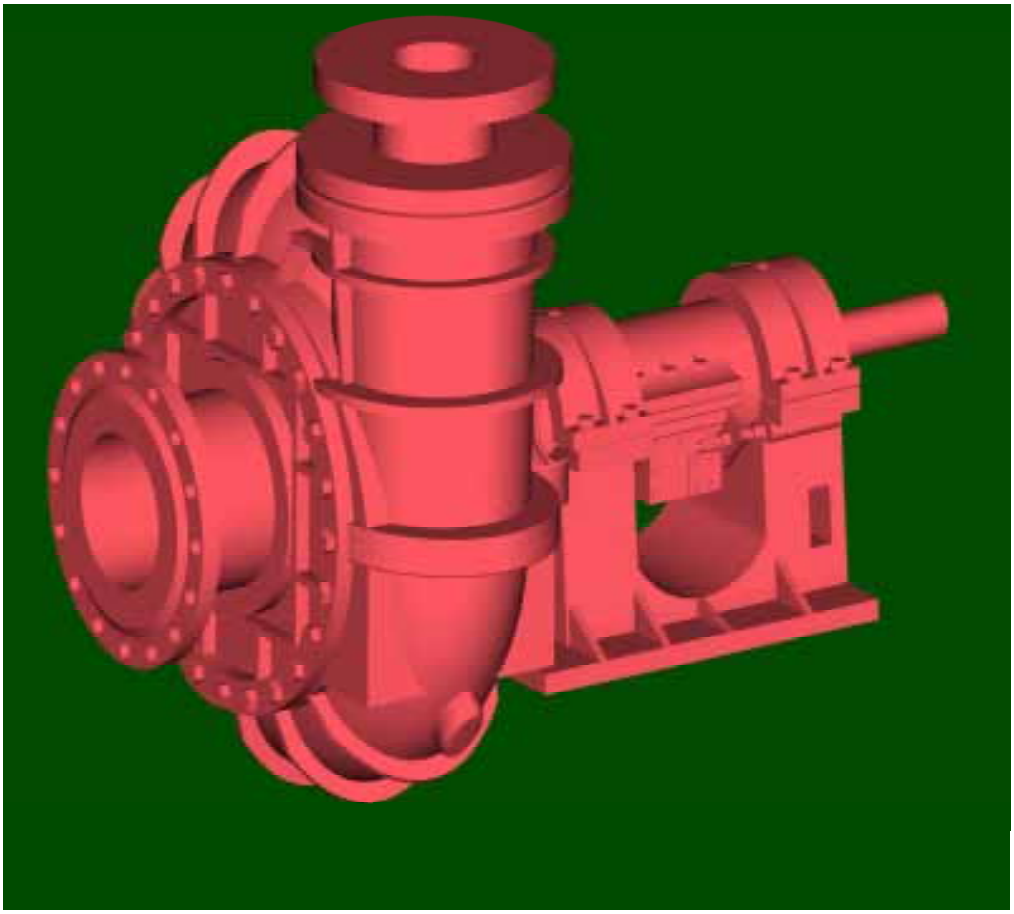
INSTRUCTIONS ON INSTALLATION, OPERATION AND MAINTENANACE FOR SAM TURBO PUMP TYPE "AR"



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SAM TURBO INDUSTRY LIMITED

NEELAMBUR, COIMBATORE-641 014. 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.

We warrant the materials for the chemical composition and mechanical properties of the relevant standard only and not for corrosion and erosion.

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

SAM TURBO INDUSTRY LIMITED

AR / ARS SERIES : TWIN CASING SLURRY PUMPS

"Solution for handling abrasive, coarse grained and fine solids, Slurry Mixtures"

HEAVY DUTY
SLURRY PUMPS

TYPE **AR**

TECHNICAL DATA

CAPACITY	: UPTO 2000 M³/HR
TOTAL HEAD	: UPTO 60 M/STAGE DEPENDING ON CONSISTENCY OF SLURRY
SPEED	: UPTO 1500 RPM IN 'AR' RANGE AND UPTO 3000 RPM IN 'ARS' RANGE.
MAX.OUTER CASING PRESSURE	: UPTO 25 KG/CM² WITH CAST IRON WORKING PRESSURE IS 210 FG 260 & UPTO 40 KG/CM² WITH CARBON STEEL ASTM A 216 GR.WCB.
MAX. OPERATING TEMP	: 110° C
SIZE	: RANGING FROM 2" - 14" (50 mm - 350 mm)

INTRODUCTION

SAM'S reputation for efficiency backed by over 30 years of experience in the manufacturing of Centrifugal Twin Casing Slurry Pumps for various critical applications has carved way for a formidable presence in the special purpose Pump's Industry.

AREAS OF APPLICATION

SAM range of Slurry Pumps, can handle liquids containing abrasive and coarse grained Solids such as Ash Slurry in Thermal Power Stations, Iron Ore in beneficiation plants, Floatation Tailings, Coal Slurries in Washeries, Mining Coking Ploute, Sand Water Mixtures, Ferro Silicon Pulp, Magnetite Pulp etc.,

DESIGN

Versatile design, Engineered for optimum performance and equipped with inner liners made from high abrasion resistant alloys (Ni-Hard, 27% Chromium).The premium design Centrifugal Pump is designed to suit with various slurry pumping applications. Its unique design twin casing leads to excellent wear resistance and longer life cycles compared to other pumps of the same range.

Most of the operating ranges are covered under our ARS / AR Models.

TWIN CASING ARRANGEMENT

The Pump incorporates the Twin Casing concept where there are Inner & Outer Casings. The Outer casing is made of cast Iron/Carbon Steel, designed to withstand the required working pressure. The Inner casing is of high hardness materials like Ni-hard (or) Hi-Chrome and takes the entire wear. In the Twin Casing design the Inner Casing is subjected to equal pressure on either side and the Outer Casing takes care of the working pressure. This arrangement enhances the life of the wear part and avoids any emergency failure.

In our Slurry Pumps, the casing discharge orientation can be adjusted by every 45° angle in 'ARS' range pump and 22.5° angle in 'AR' range to suit layout requirements. However in fewer model pumps are offered in single casing only.

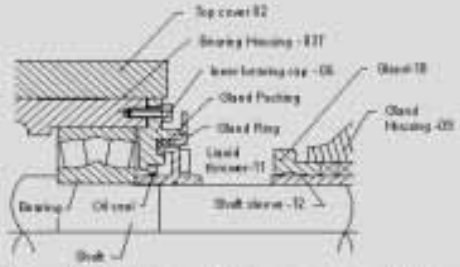
BEARINGS

The Pump shaft is mounted on Spherical Roller Bearings (one no. each at drive end & non drive end). To take care of all radial loads and an additional spherical roller thrust bearing is provided at the drive end to take care of axial thrust on larger pumps. Depending upon size & type of the pump, bearing types also varies.

The Bearings are selected such that to give a minimum of L-10 rating of 25,000 hours in continuous operation in (or) with normal rated condition of the pump.

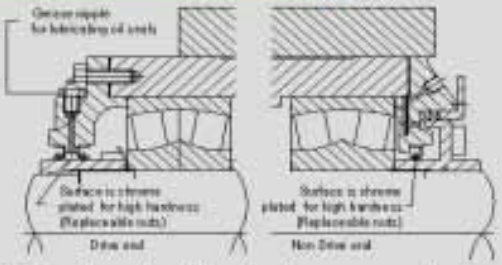
In AR / ARS range all the pumps are oil lubricated except AR 150/510 which is grease lubricated.

A) Bearing protection arrangement



SAM provides unique bearing protection arrangement to avoid entry of external liquid and gland leakage. By imparting revolving liquid thrower along with the gland Packing for additional sealing. This varies from the conventional bearing housing arrangement.

B) Oil seals arrangement



The Oil seals are located and revolves over separate chrome plated sleeve nuts. Thus it prevents the damage of the shaft. The Drive End Oil Seals are arranged back to back which avoids the oil leakage and also prevents the entry of foreign particles.

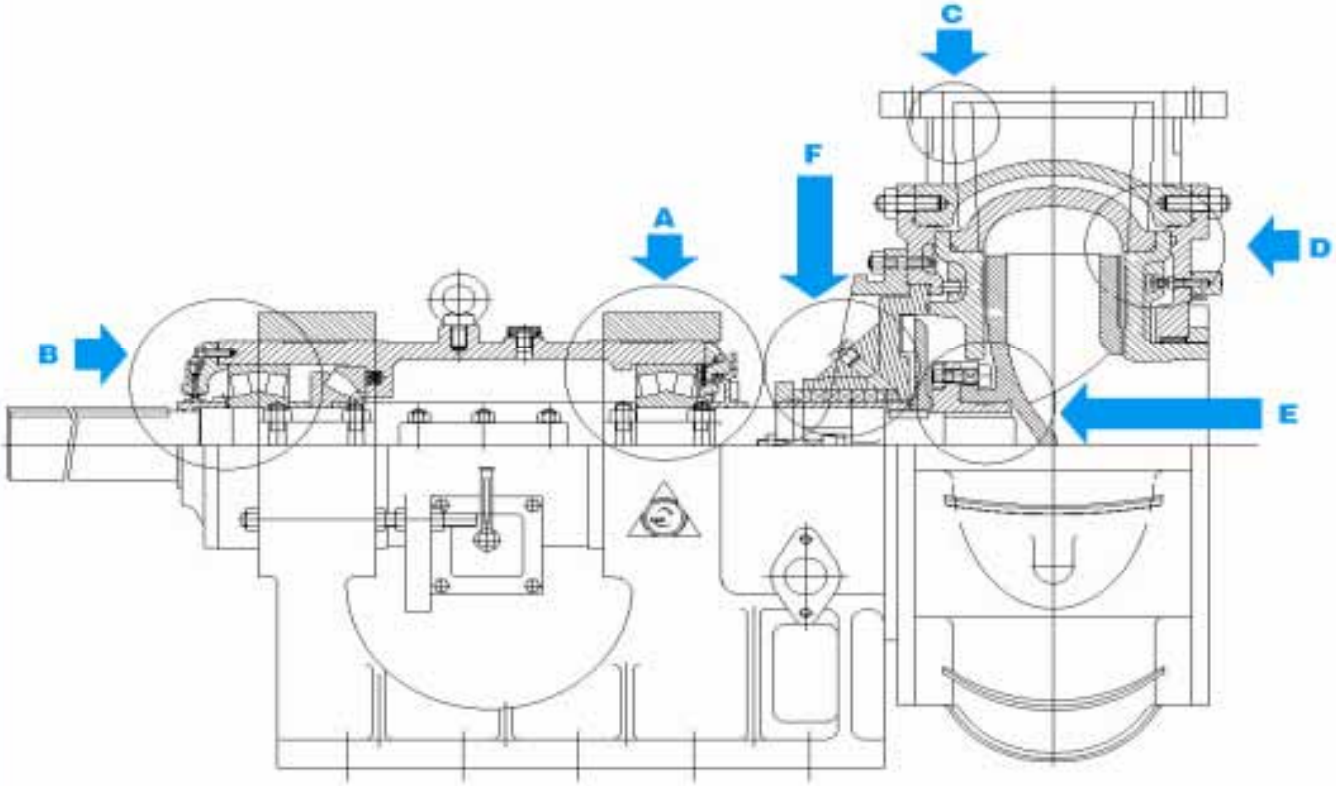
SEALING ARRANGEMENT

SAM Pumps are provided with conventional Gland Packing with Lantern Ring arrangement. In addition to this the pumps are provided with a separate Expeller labyrinth which revolves along with the Impeller and Pumps back the Slurry into the casing which prevents the slurry entry into the Stuffing Box Zone. The Expeller reduces the Sealing Water pressure requirement especially when the pumps are inseries operation.

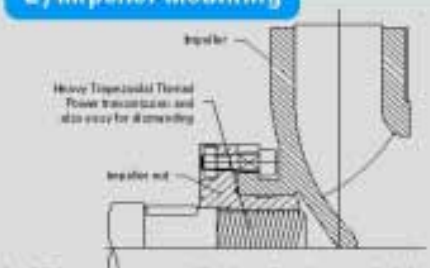
SERVICE

Apart from Design, installation and commissioning SAM's trained Engineers and Country Wide Dealers Net Work are available to give solutions for your Slurry Pumping needs and problems.

SECTIONAL DRAWING

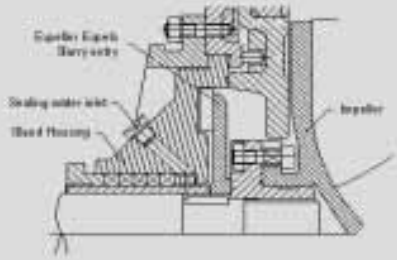


E) Impeller Mounting



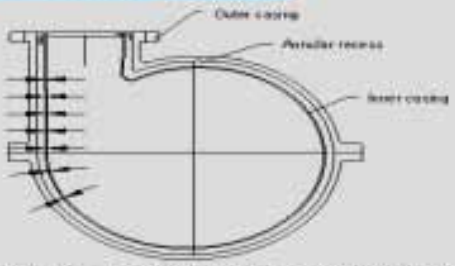
In AR - range pumps the impeller is mounted by a separate impeller nut made of Carbon Steel with a heavy 'T' Bolt for fixing it to the shaft. Adhering to this method machining any bore or threading on the impeller - which is of a very hard material, is totally avoided. In ARS - range pumps different types of impeller locking arrangements are provided which are detailed in sec. drawings of individual pumps only.

F) Stuffing box sealing



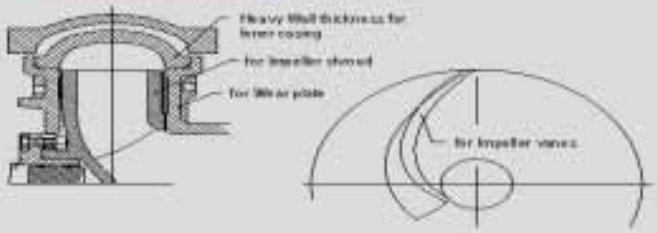
Provision of Expeller labyrinth which rotates in unison with impeller, prevents entry of slurry in to the stuffing box area. Parallely external seal water ensures the entire gland housing is filled with clear water.

C) Twin casing concept



The Inner casing is inculcated in such a way that it experiences equal pressure on either sides and not subjected to any hydraulic stress. The increased wall thickness of the outer casing takes the entire pressure load which results in prolonged life of the inner casing and wear plates. ARS 50/210 and ARS 80/250, AR 200/410 pumps are offered only in single casing.

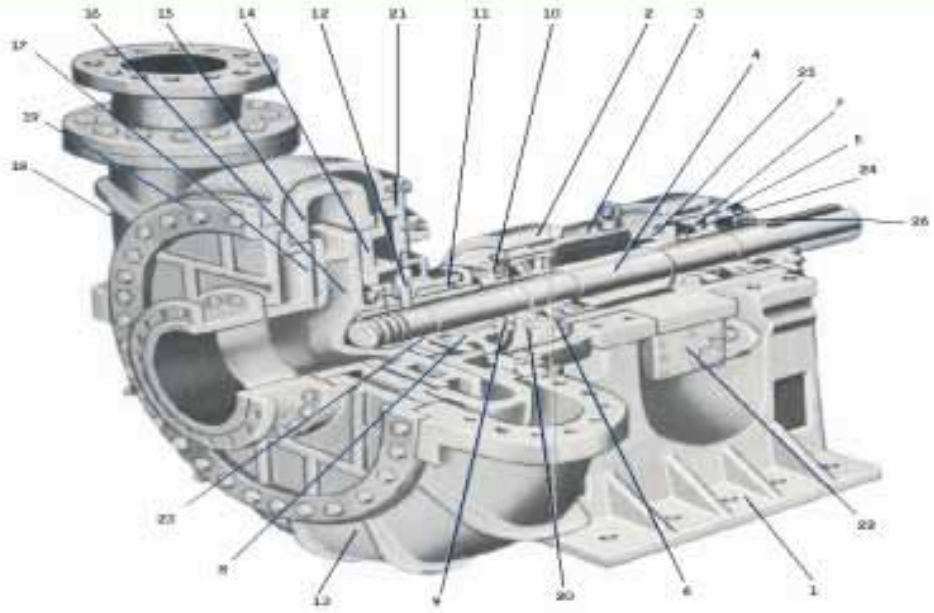
D) Wall thickness



An uniform increased wall thickness of all the wetted parts in our pumps, enhances the durability and increases the life of components.

Part List

S.No.	Part Name
1.	Bearing bed
2.	Top cover
3.	Bearing housing
4.	Shaft
5.	Outer bearing cap
6.	Inner bearing cap
7.	Bearing spacer
8.	Gland housing
9.	Gland
10.	Liquid thrower
11.	Shaft sleeve
12.	Expeller
13.	Outer casing (bottom)
14.	Wear plate (b.side)
15.	Inner casing
16.	Impeller
17.	Wear plate (s.side)
18.	Outer casing (Top)
19.	Suction cover
20.	Gland ring
21.	Bracket side cover
22.	End plate
23.	Impeller nut
24.	Spherical Roller bearing
25.	Spherical Roller thrust bearing
26.	Oil seals



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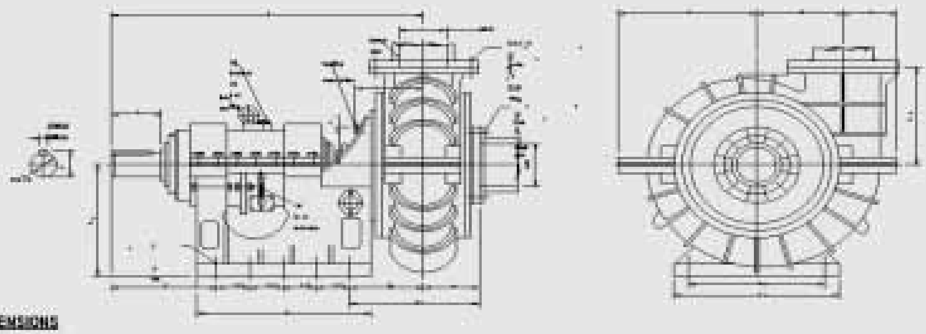
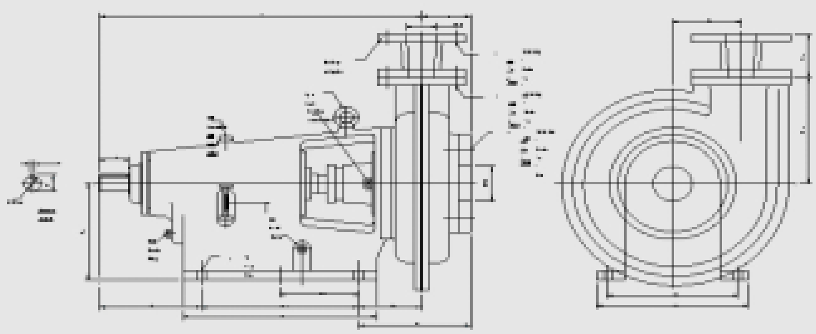


TABLE OF DIMENSIONS

PUMP TYPE	NWS	NWD	l	f	a	h_1	u	c	h_2	h_3	h_4	H	p_1	p_2	x	y	Ød	t	u	r	$Ød_1$	n_1	p_1	d_1	n_2	p_2	s_1	n_3	s_2
AR 150/500	200	150	172	1211	176	470	306	442	448	640	610	602	340	615	210	340	90	95.3	28	165	18	8	292	14 Slot	8	292	28	8	117
AR 150/510	200	150	199	1066	232	480	313	479	450	555	630	608	350	592	241	206	90	95.5	22	297	18	8	292	18 Slot	8	292	28	8	196
AR 150/550	200	150	189	1614	233	480	314	470	500	646	712	898	350	599	279	562	100	106.4	28	311	22	8	299	18 Slot	8	292	28	16	144
AR 200/500V AR 200/600	250	200	220	1680	206	520	360	640	562	740	612	930	354	559	256	541	100	106.4	28	310	22	12	435	22 Slot	8	355	28	16	136
AR 200/550	250	200	252	1575	264	480	380	527	500	640	712	888	364	628	280	502	100	106.4	28	261	22	12	438	22 Slot	8	356	28	16	136
AR 250/650	250	200	260	1686	236	616	430	640	562	740	612	930	341	616	320	597	120	126.4	28	359	28	16	470	28 Slot	12	381	28	16	150
AR 300/650	300	200	260	1686	236	616	430	640	562	740	612	930	341	616	350	597	120	126.4	28	359	22	12	432	22 Slot	12	432	28	16	150
AR 300/650B	300	250	255	1679	228	615	286	526	562	740	612	930	373	611	309	598	120	126.4	28	358	22	12	432	22 Slot	12	432	28	16	158
AR 300/750 AR 300/750A	300	200	266	1694	242	780	476	720	562	740	612	930	380	636	335	593	120	126.4	28	359	28	16	470	22 Slot	16	470	28	16	150
AR 300/750B	350	300	290.5	1570	255	780	497.5	640	562	740	612	930	485	660	350	467	120	126.4	28	220	29	16	540	30 Slot	12	476	28	16	150



SINGLE CASING

PUMP TYPE	NWS	NWD	f	a	h_1	b	h_2	h_3	h_4	h_5	p_1	y	Ød	t	u	l	$Ød_1$	n_1	s_1	$Ød_2$	n_2	s_2	$Ød_3$	n_3	m	p_1	p_2	s	n	m_1	m_2
ARS 80/200	65	50	525	90	200	112	160	80	215	220	105	170	28	21.2	8	60	18	4	114	14	4	127	–		220	–	105	14	4	–	260
*ARJ 80/210	80	50	704	109	213	128	206	–	236	356	141	213	38	41.3	10	80		–		13	8	195	18	8	300	140	240	18	4	–	300
ARS 65/300	80	65	679	100	225	132	206	90	236	356	155	214	38	41.3	10	80	18	4	127	18	4	146	–		300	–	255	18	4	–	300
*ARS 80/350	100	80	858	120	262	150	200	–	408	450	141	302	55	59.3	16	140		–		13	8	195	18	8	635	163	301	13	4	–	435
ARS 80/290	100	80	675	105	245	130	200	120	236	359	159	206	38	41.3	10	80	18	4	146	18	8	179	–		300	–	264	18	4	–	300
ARS 80/340	100	80	867	125	315	200	320	100	400	450	170	302	55	59.3	16	140	18	8	146	13	8	179	–		635	–	295	13	4	–	435
ARS 100/340 ARS 100/340A	100	100	967	126	315	200	320	100	400	450	170	302	55	59.3	16	140	18	8	170	18	8	175	–		635	–	299	18	4	–	436
ARN 100/400	150	100	977	164	355	228	318	110	446	515	172	229	60	64.4	18	140	18	8	228	18	8	260	–		–	–	–	22	4	–	465
ARS 150/340 ARS 150/340A	150	150	943	160	200	220	320	200	406	455	200	299	65	69.4	18	125	22	8	240	22	8	240	–		635	–	273	22	6	210	436
ARS 150/400	150	150	929	145	405	250	320	110	400	450	198	299	65	69.4	18	125	22	8	240	18	8	260	–		635	–	339	22	6	210	436

Sam reserves the right to make changes or alterations due to continuous Technological Improvement from time to time without notice or obligation.

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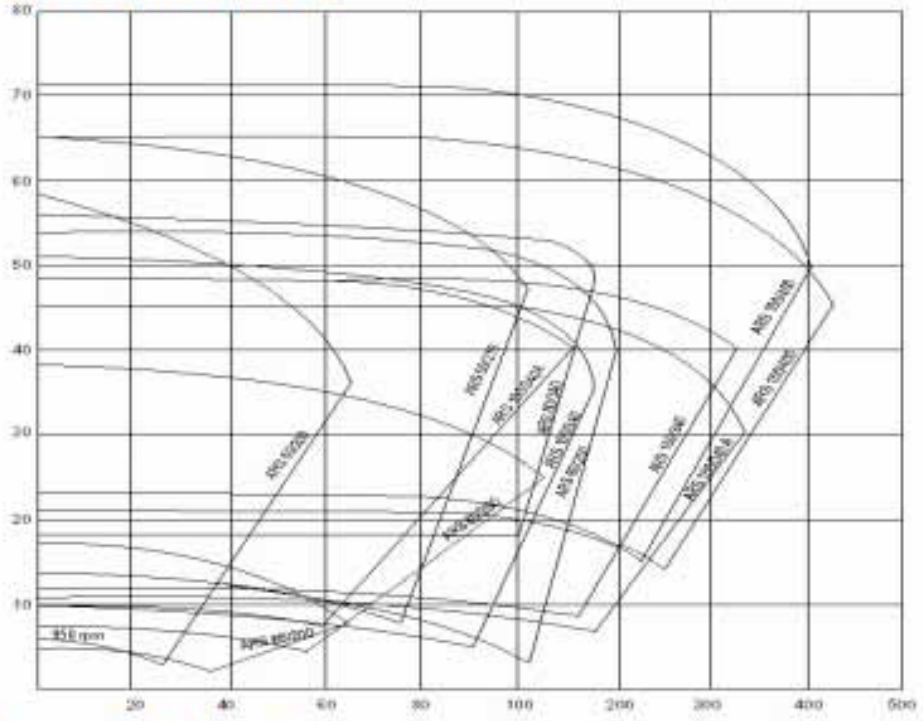
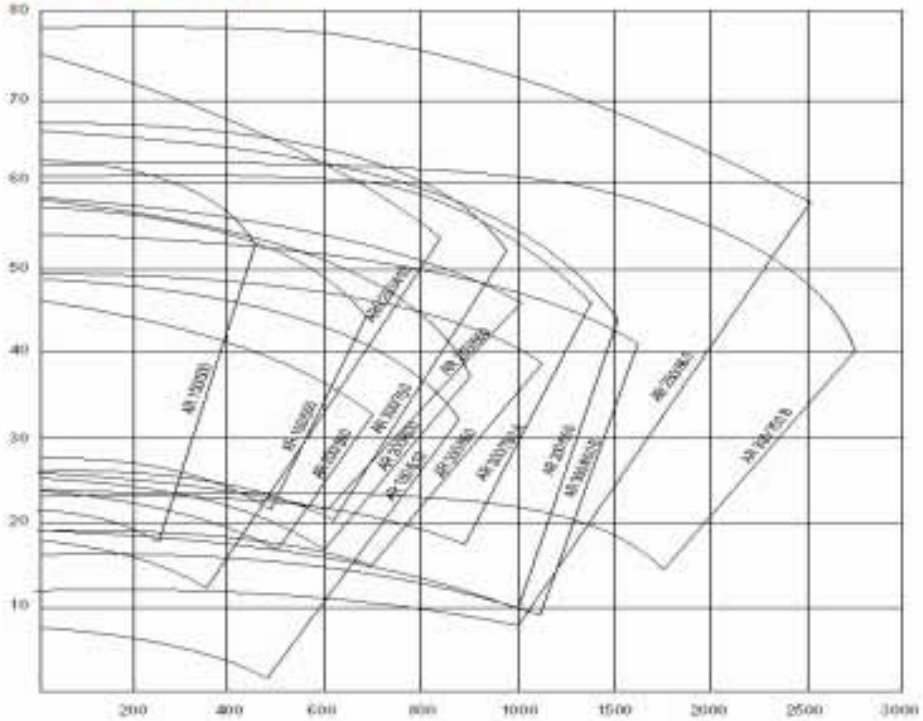
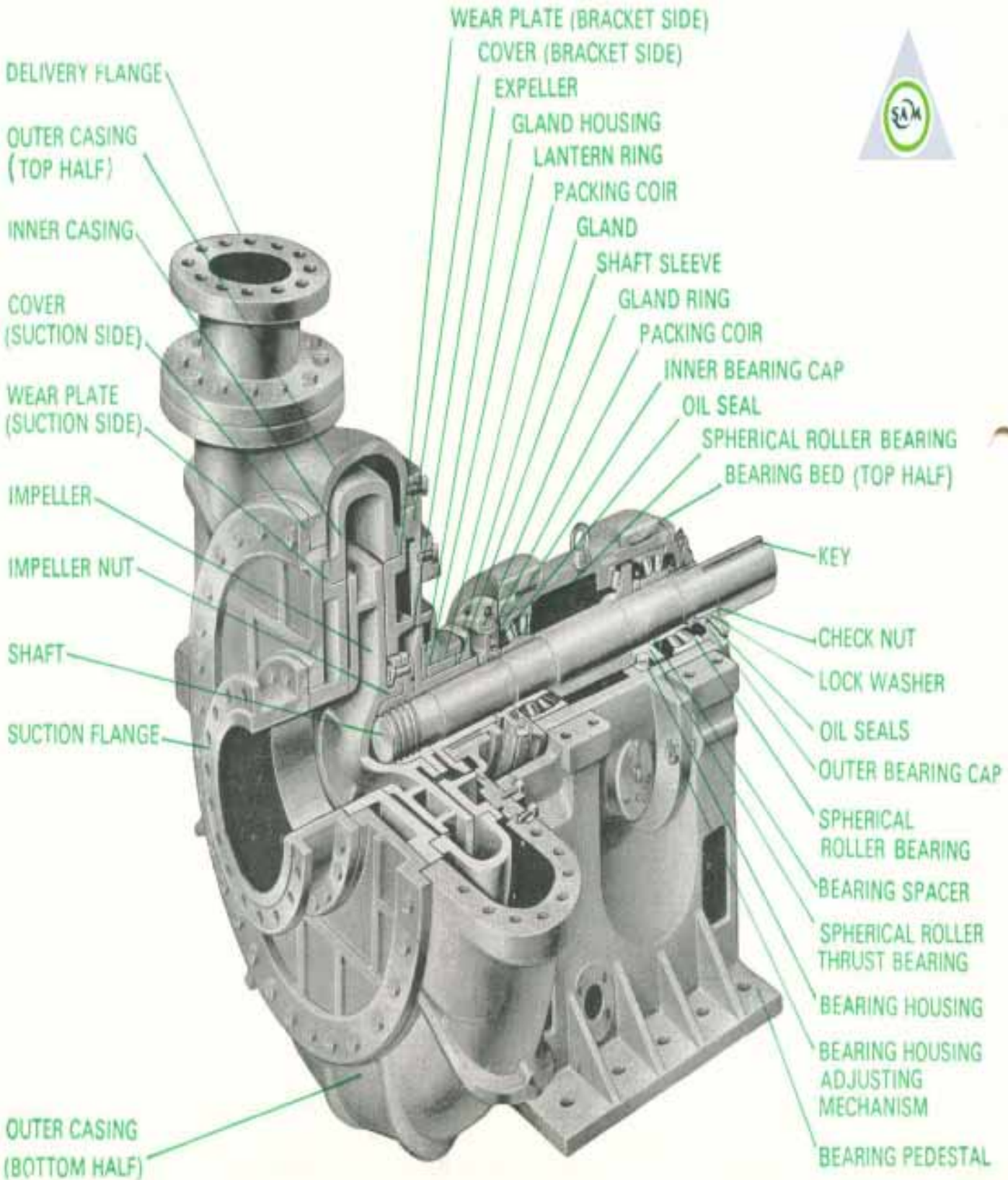
Family Curve - ARS Range



Family Curve - AR Range



Apart from standard range, Hydraulic components are designed / modified for specific requirements


WEAR PLATE (BRACKET SIDE)
COVER (BRACKET SIDE)
EXPELLER
GLAND HOUSING
LANTERN RING
PACKING COIR
GLAND
SHAFT SLEEVE
GLAND RING
PACKING COIR
INNER BEARING CAP
OIL SEAL
SPHERICAL ROLLER BEARING
BEARING BED (TOP HALF)
KEY
CHECK NUT
LOCK WASHER
OIL SEALS
OUTER BEARING CAP
SPHERICAL ROLLER BEARING
BEARING SPACER
SPHERICAL ROLLER THRUST BEARING
BEARING HOUSING
BEARING HOUSING ADJUSTING MECHANISM
BEARING PEDESTAL
DELIVERY FLANGE
OUTER CASING (TOP HALF)
INNER CASING
COVER (SUCTION SIDE)
WEAR PLATE (SUCTION SIDE)
IMPELLER
IMPELLER NUT
SHAFT
SUCTION FLANGE
OUTER CASING (BOTTOM HALF)

VERY VERY IMPORTANT INSTRUCTION

Since many times it is difficult to go through the entire manual. We are giving very very important points to be considered before running the pump. If the points given below are not properly followed (apart from other points) the pump will get damaged resulting failure of the equipment.

Since the pump is provided with screwed on impeller check direction of rotation of Motor before coupling with the pump.

Sealing water connection to be given for both inlets of Stuffing Box. This will improve the gland housing life and shaft sleeve components. If in the event of slurry is seen coming out of stuffing box stop the pump and check the sealing water line.

The .Rubber Gasket provided in the front door is very very important. Whenever pump is dismantled reassembled change this again. This avoids recirculation and hence improves the life of above components. This outer casing should only contain static Liquid

Totally 5 mm clearance is given to the Impeller adjustment. 2.5 clearances are to be maintained on both sides. If during initial trial running rubbing take place increase the clearance with a gasket of 1.5 mm.

Whenever pump is dismantled or reassembled all the '0' rings and Gasket to be changed to new set with same original dimension.

!t is very very important that sleeve type coupling are to be used for connection between suction and delivery pipe line.

For Maintenance purpose provide minimum clearance as specified in the manual.

Never buy Impeller separately from other parties. Impeller is very very important spare parts. it must be procured from us along with Impeller nut for satisfactory performance.

The original spare is very very important and it is must for satisfactory performance. Never use non standard spare parts procured from other parties. Use genuine spare parts from us for all the components.

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ERECTION OF THE PUMP:

Foundation and Alignments:

The foundation 01 the slurry pumps is subject to several 10ads, like Suction and Delivery pipe Loads, Dynamic Load of the revolving parts, Belt Pull and Static load. To withstand these loads the foundation has to be casted. To cast the foundation, just the dimension of GAD and F9undation Drawings, are to be Followed, which will be submitted at the time of execution itself.

In case of direct coupled pumps, pumps and motors are to be mounted on a common Base Plate. Care should be taken, so that the Foundation Bolts are not tightened too much, which will in turn distort the Base Plate and result in mis - alignment. After even-tightening 01 the Foundation Bolts, the coupling alignment has to be checked up. Even if there is small mis - alignment in the Couplings, it will lead to hike in bearing temperature and pre-mature failure 01 the same. After the alignment, the Shaft should be free to rotate. Alter doing the above work, the Suction and Delivery Pipes are to be connected and again alignment 01 the Couplings are to be checked up.

In case 01 Belt Driven pumps, pump pulley end should touch the pump shall step and duly be arrested by the tie rod, by using tappings provided at the centre 01 the Shaft. In the same manner, the Motor Pulley (Vari Pitch Pully has to be filled on the Motor shaft, which should also touch the shaft step and duly be arrested by the tie rods. After putting the Belts, see that the belts are exactly at the centre line with respect to both the pulley. By utilizing tensioning bolts of the Motor Slide Rail, the motor can be moved and proper tightening of the belts is achieved.

PIPINGS:

a) Suction Piping:

The pipe line should be properly supported, so that no, pipe thrust should be exerted on the pump. The suction piping should be as short and direct, as possible with minimum number of bends. Care must be taken, so that the joints of the pipes are absolutely' air tight and also sound piping should only be used. If suction pipe is not proper, there is a possibility of entry of air into the suction piping, causing vibration of the pump, abnormal sound and also less capacity. The suction pipe line should be horizontal or raised continuously all the way to the pump. The sump should be free from wastes, that is, the solids or particles in the sump should not be bigger than the size what was committed at the time of placement of order. In general Strainer is not recommended for slurry application. Around Suction piping, inside the sump, no disturbance should be allowed in the form of vertes or jelling. If at all, any make up water or jelling is called for the system, it should be as much away from the suction intake as possible as per the standard practice.

b) Delivery Pipe:

In any case the Delivery Pipe should not be closed for longer periods while running. At the time of starting only, the Delivery Valve should be closed. Proper venting should be given to release the air also.

c) Suction and Delivery Pipes should be started independently and due to this no load should be exerted on the pump.

OPERATION:

Before starting the pump, for the first time special attention should be paid 10 the following points:-

i) If the pump is of direct coupled arrangement on a common Base Plate, remove the coupling pins and check the direction of rotation of the running motor. Since the Impeller is screwed on type, if the pump is run' in a different direction- than that marked in the pedestal, the Impeller will unwind and create serious damage to the pump. This is a very important precaution. Similarly, in the event of Belt Driven Pump, remove all the bells and check the direction of rotation of the motor.

ii) Do not run the pump in a dry condition, under any circumstance.

v) Connect Flushing water under pressure for the purpose of flushing the gland and lubricating the same.

vi) Check the gland nuts and it should be finger tight only.

vii) Check the freeness of the shaft.

viii) Check the alignment of the Belts, if the pump is Belt Driven, or it is Direct coupled, take extra care in aligning the couplings as specified elsewhere in this manual. Open the Suction Valve and allow the liquid in the case of flooded suction pump.

ix) Keep the Delivery Valve ¾ closed.

x) Open the Suction Valve to allow the liquid to system.

xi) After checking the above points, start and run the same for one or two minutes and again stop the same.

xii) Since the Impeller is screwed on type, there will be a chance for getting tightened, while running in the correct direction. Due to tightening of the Impeller, a clearance between the Impeller and Bracket Side Wear Plate may be reduced or rubbing may take place. So, check up again the freeness of the Shaft. If it is not free and if it is rubbing over the rear wear plates, move the Impeller towards the Suction Side or vice versa, to get free rotation of the shaft (Only once during commissioning)

xiii) After starting, again check up the duty requirements.

xiv) Check up daily during operation of the pump

1. Check the bearing Temperature.
2. Check the Gland leakage. It is in the event slurry leakage is observed, stop the pump immediately.
3. Check seal water line so that the required pressure and flow is maintained.
4. Observe if any abnormal sound from the casing as well as in the Bearing Housing.
5. Keep the record of all the information.

If the pumps are in series keep all the delivery valve in 1/4 open before starting the pump. No moment the first pump is started, within one or two minute open the-delivery valve fully within next one or two minutes start the IInd and lIIrd pump. Now, do not allow ~ore time gap between the pump starting.

STOPPING THE PUMP:

First stop the IIIrd and IInd pump in tl18 series. Now close the final delivery valve at once. Now without any delay within a minute stop the first pump. After this, open the seal flushing line allow the flushing water to flow the IIIrd, IInd and Ist pump so that all the slurry go back to the sump through the Suction valve. This flushing should continue for 15 minutes, Now at the stage close the suction valve and after this stop flushing· and as well as seal water line. This type of operation improves the life of pump components. Further pump is now ready for again starting. Follow the same procedure as above while re-starting the pump.

DISMANTLING PROCEDURE

Procedure for dismantling the Impeller in the event of changing a new Impeller:

i) Remove the Suction pipe connection.
ii) Loosen the Delivery Flange Bolts.
iii) Remove the front suction cover sub-assembly (consisting of part Nos.70.21 and 19). After removing the nuts marked in the drawing, there is no need for removing the Suction Cover (part No.21) from the flange suction cover (part number70). This sub-assembly can be dismantled only in the event of changing the suction side wear plate (part number 19).
iv) After removing the above, you will find 'O' Ring on the Suction Side Cover, which is to be preserved carefully.
v) The Impeller is now visible. Remove the Inner and Outer Casing Assembly (part Nos. 17.15 and 2'0), alter removing the Nuts from the Bracket Side Cover (part No.25). vii) Give a Lever of sufficient diameter and length between the vanes of the Impeller (Inside the Suction Bore of the Impeller), thereby preventing the rotation of the same.
viii) Now rotate the pump pulley (if it is Belt Driven) in the opposite direction, as that of normal running direction, by hand. This process will make the Impeller to unwind from the shaft at the same time to come out towards the operator standing before,
ix) Stop in the middle and provide proper holding, before further unwinding, so that the Impeller will come out and hang on the holding. The above procedure is to be adopted in the reverse fashion for assembling.
x) To remove the Inner Casing (part No.17), the Fasteners provided for tightening 01 the Outer Casing (part Nos.20 and 15) are to be loosened and the same can be separated. A gasket is provided between two halves, to withstand the pressure. While assembly also, care must be taken to see that the gaskets of the same thickness is used.
xi) By loosening the Nuts, which is fixed on the Base (part No 1), the Bracket Cover (part No.25) along with the Bracket .Side Wear Plate (part No.16) can be removed outside.
xii) Now, after removing the Impeller, Expeller (part No.14) can be taken out and 'O' Rings whatever visible are to be preserved carefully. After removing the Expeller, Gland Housing (part No.9) can be taken outside. Now the Shaft Sleeve also can be removed very easily. To remove the Assembly a special type equipment is required

FLUSHING OF OUTER CASING:

During the pump operation with slurry, the gap between Inner Casing and Outer Casing will lead to sedemented slurry particles. In the event of pump being not operated, the slurry particles will be collected at the bottom of the Outer Casing and hence flushing is to be carried out. At the delivery side of the pump, before the Delivery Valve, a by-pass is to be provided with 2" Gate Valve. Provision is to be given for supplying pure water under pressure of 5 Kg/cm2. At intervals, the Suction and Delivery Gate Valves are to be closed and the water under pressure is to be injected through this flushing system after opening the drain plate, provided at the front door of the pump.

While flushing, the following procedures are to be adopted:

i) Close the Delivery valve.
ii) Close the Suction Valve.
iii) Remove Drain Plate at the bottom of the front door, and start flushing the pump.
iv) Open 2" by-pass valve.
v) Now the liquid pass through the Outer Casing and flush away all slurry particles through the drain.
vi) In the event of stopping of pump for maintenance, flushing is to be c3rried out.

IMPELLER:

Impellers are supplied along with Impeller Nut (Part No.38), as one unit and inseparable combination. This Impeller nut aids the removal of material, while carrying out dynamic balancing. Please do not separate this Impeller Nut from the main Impeller on any case. While ordering, always indicate the part numbers of the components and the serial number of the pump.

WORKING PRINCIPLE OF VARI PITCH PULLEY

Most of the Process Industries use pumps, driven by directly coupled motors. Pump head requirements are met by changing the standard Impeller diameter. When abrasive handling slurry pumps are to be used, this practice is no longer possible and the method of varying speed is called for. If a pump is directly coupled to motor, the pump head is determined by the motor speed. If the motor speed is fixed, the only way to alter the developed head is to change the impeller diameter. Due to abrasive action, the wear on the Impeller takes place and this results in alter, i.e., reduction in head for a particular capacity.

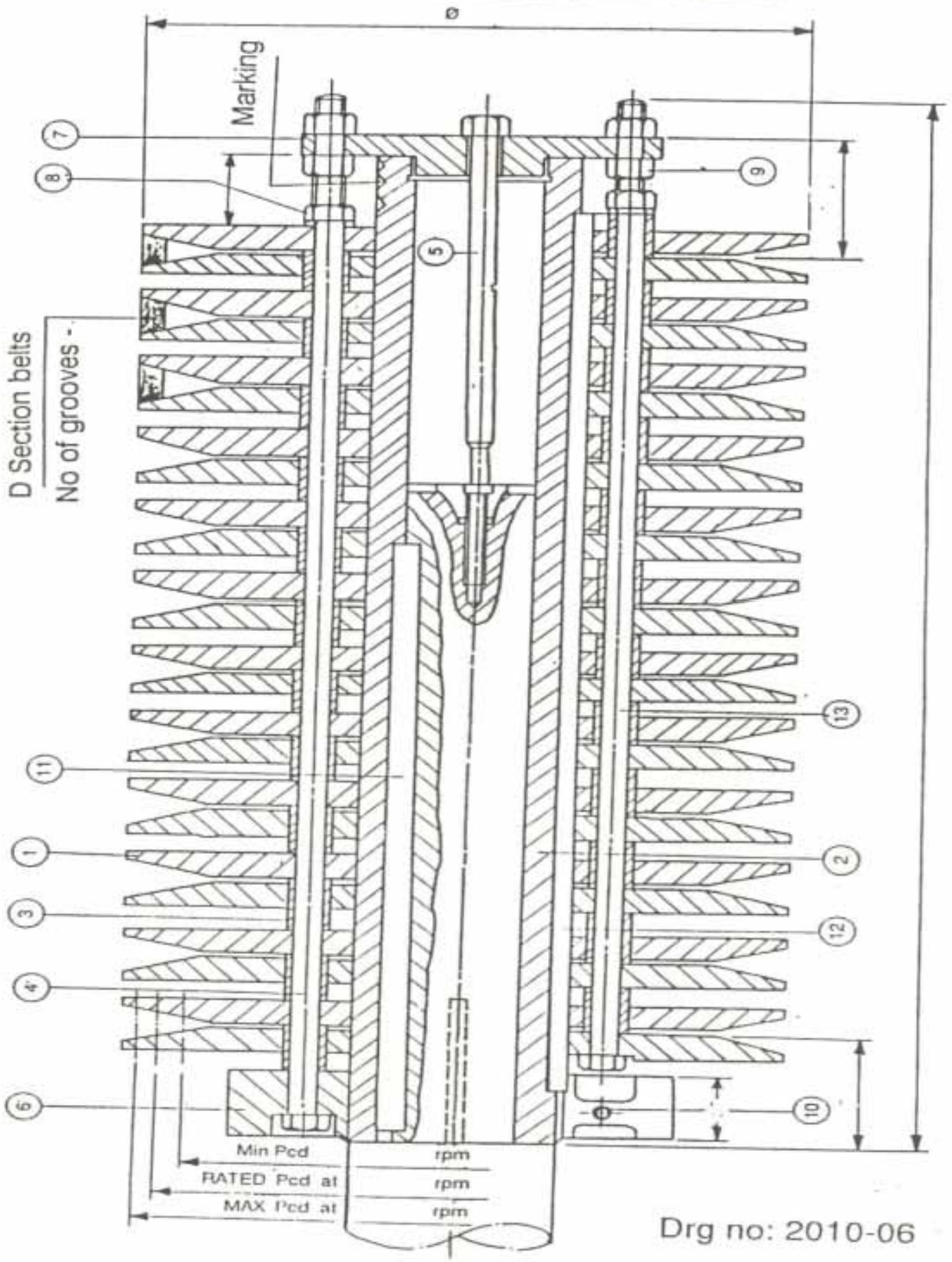
To avoid this, in fixed speed installation, the pump is usually at a higher speed than the duty requirement, to allow drop in performance, as parts wear. This means that pumps are running faster that at the optimum speed. Again wear takes place, performance drops below the duty requirement and replacement of impeller becomes necessary event though it may not be fully worn out.

In the vari pitch pulley driven pump installation, pumps run at optimum designed speed. As wear takes place, performance drops as before. However, instead of replacing the Impeller all that is needed is a simple change to alter the vari pitch pulley, to increase the speed and restore the design duty. This means that the Impeller can be used until it is severely worn before final replacement becomes necessary. This will reduce maintenance/ inventory cost during operation of the pump.

Operation of Vari Pitch Pulley:

(Refer Drawing NO.201 0-06 and its Part list). In the Vari Pitch Pulley, Belts run over the tappered Pulley Plates (part No.1). Tappered angle of the plates suits 5mly 'D' Suction Belts. To get different speeds, the PCD of the vari pitch pulley should be altered. To get this alteration, the pulley plates are to be moved axially, so that the gap between the tappered portion is altered, thus either Belt is run at the edge of the tapper or inner side of the tapper which gives the alter in PCD. At the same time, the plate should be held properly and tightened to withstand the Belt Pressure. To achieve this, all the plates are keyed on to the longitudinal M.S.Sleeve which is going to be mounted (part No.6) and this can be properly fixed on the sleeve by tightening the

Vari Pitch Pulley Sectional drawing



Drg no: 2010-06

PART LIST

V.P.PULLEY

S. NO.	PART NAME	MAT.	QTY/ PULLEY
1.	Pulley Plate	CI	nx2
2.	Sleeve	Steel	1
3.	Bush	En-8	nx8
4.	Long Stud	En-8	4
5.	Retaining Bolt	En-8	1
6.	Ring	M.S.	1
7.	Retaining Plate	En-8	1
8.	Hex. Nuts	M.S.	24
9.	Lock Nuts	M.S.	8
10.	Clamping Bolt	M.S.	1
11.	Key for Motor Shaft	En-8	1
12.	Key for Sleeve	En-8	2
13.	Short Stud	En-8	4
	NOTE: n = number of V-Grooves.		

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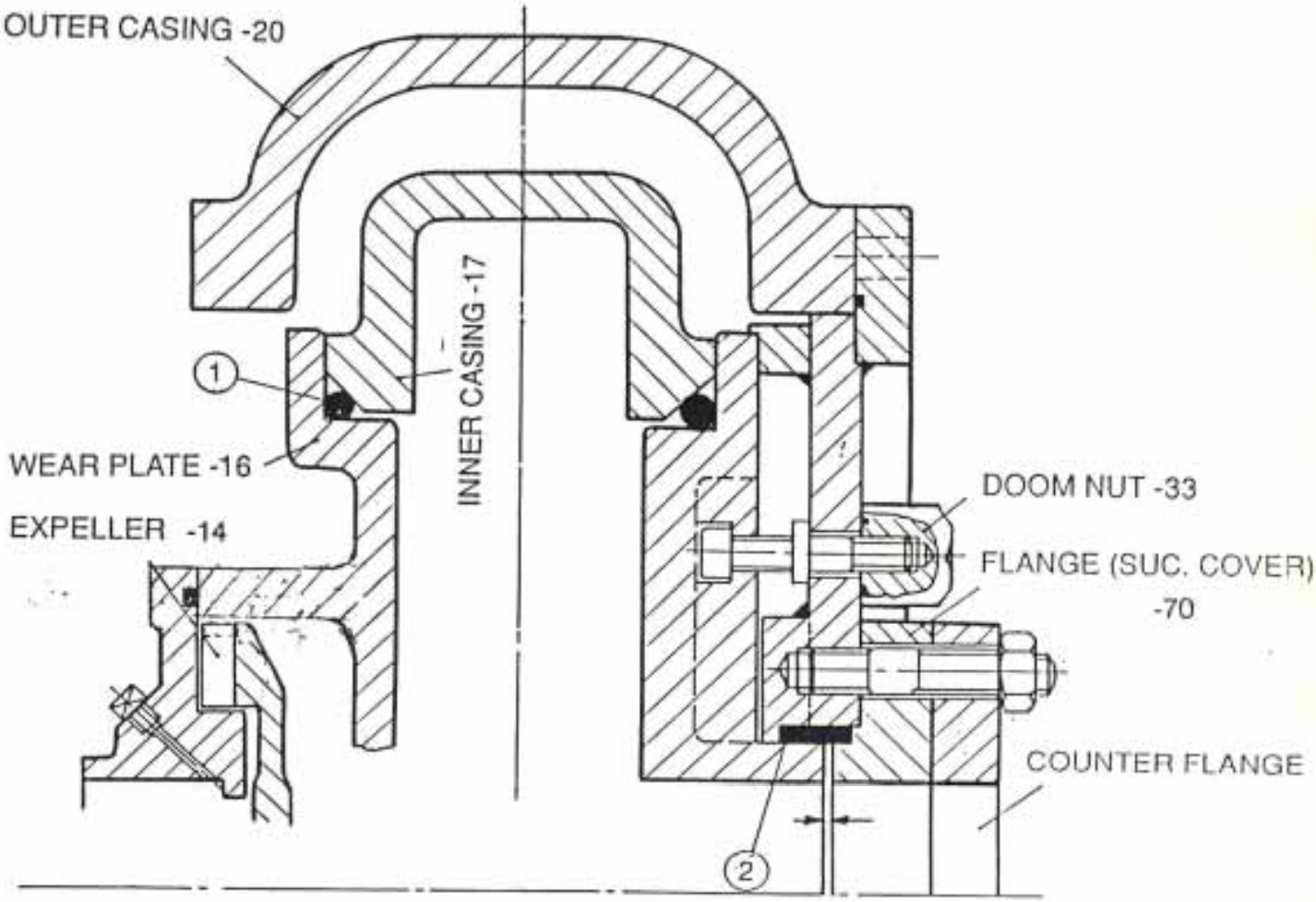
'0' RINGS CHART (NEOPRINE RUBBER CARD):

PART NO.	LOCATION	APPLICA TION
03	In between suction side wear plate and Suction cover	This '0' ring prevents the entry of atmospheric air inside the pump and also by-passing of slurry from the outer casing to the suction.
01	Between suction and Bracket side cover with Outer casing.	This '0' Ring prevents the leakage of Slurry From the Outer Casing, which is under pressure to the atmosphere.
02	Between Inner Casing and Wear Plates,	This '0' Ring prevents the internal circulation between Inner Casing and outer casing. If this '0' Ring does not perform properly, pre-matured failure of Inner Casing and wear plates will result.
05	Between Gland Housing and Bracket side Wear Plate.	This 'O' Ring prevents the flow of slurry from the Outer Casing to the Expeller zone or vice versa.
06	Between Gland Housing and Bracket Side cover.	This prevents leakage of the slurry tram the Outer Casing to the atmosphere.
07	Between Impeller and Impeller Nut.	This '0' Ring prevents the entry of slurry into the Impeller and hence the slurry does not touch the shaft at all.
010	Between Impeller nut and Expeller	This '0' Ring prevents the shaft away from the slurry. This '0' Ring also prevents the shaft away from the slurry.
011	Between Sleeve and Expeller Between Sleeve and shaft.	This '0' Ring prevents the entry of slurry into the Bearing Housing.

CAUTION

WHENEVER PUMPS ARE DISMANTLED CHECK THE RUBBER GASKET PROVIDED BETWEEN WEAR PLATE & FLANGE (SUCTION COVER). THE SAME SHOULD BE TIGHTENED PROPERLY. IF THE GASKET IS NOT GIVEN CIRCULATION WILL TAKE PLACE SPOILING THE DOOR, SUCTION FLANGE AND EVEN OUTER CASING.



1) 'O' ring provision - Between Inner Casing & Wear plate.

2) Rubber Gasket provision - Between wearplate & Flange (Suction cover)

WETTED PARTS ASSEMBLY

CAUTION

IN THE CASE OF IMPELLER RUBBING AGAINST THE FRONT WEAR PLATE

(A) THERE IS A POSSIBILITY SHEARING OF IMPELLER 'T' BOLT.

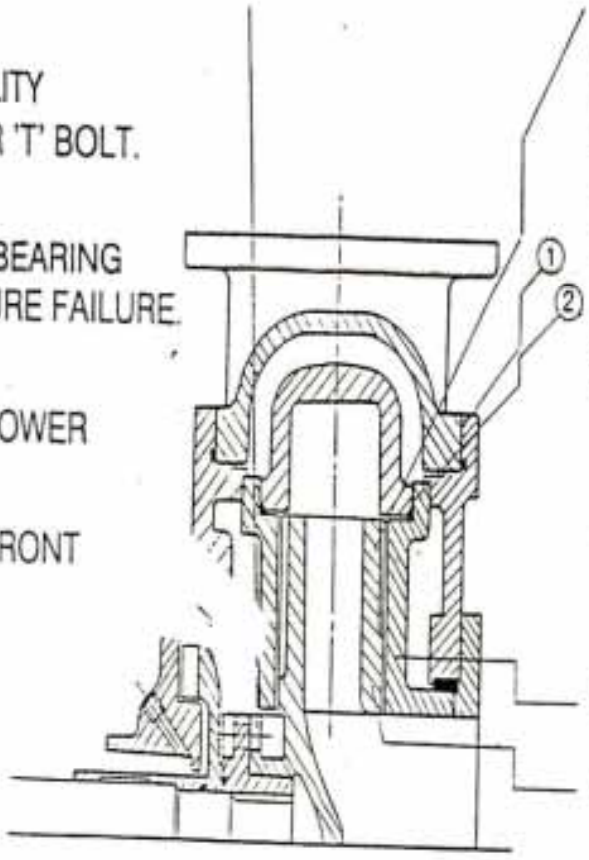
(B) MORE LOADING ON BEARING RESULTING IN PREMATURE FAILURE.

(C) ABSORBING MORE POWER

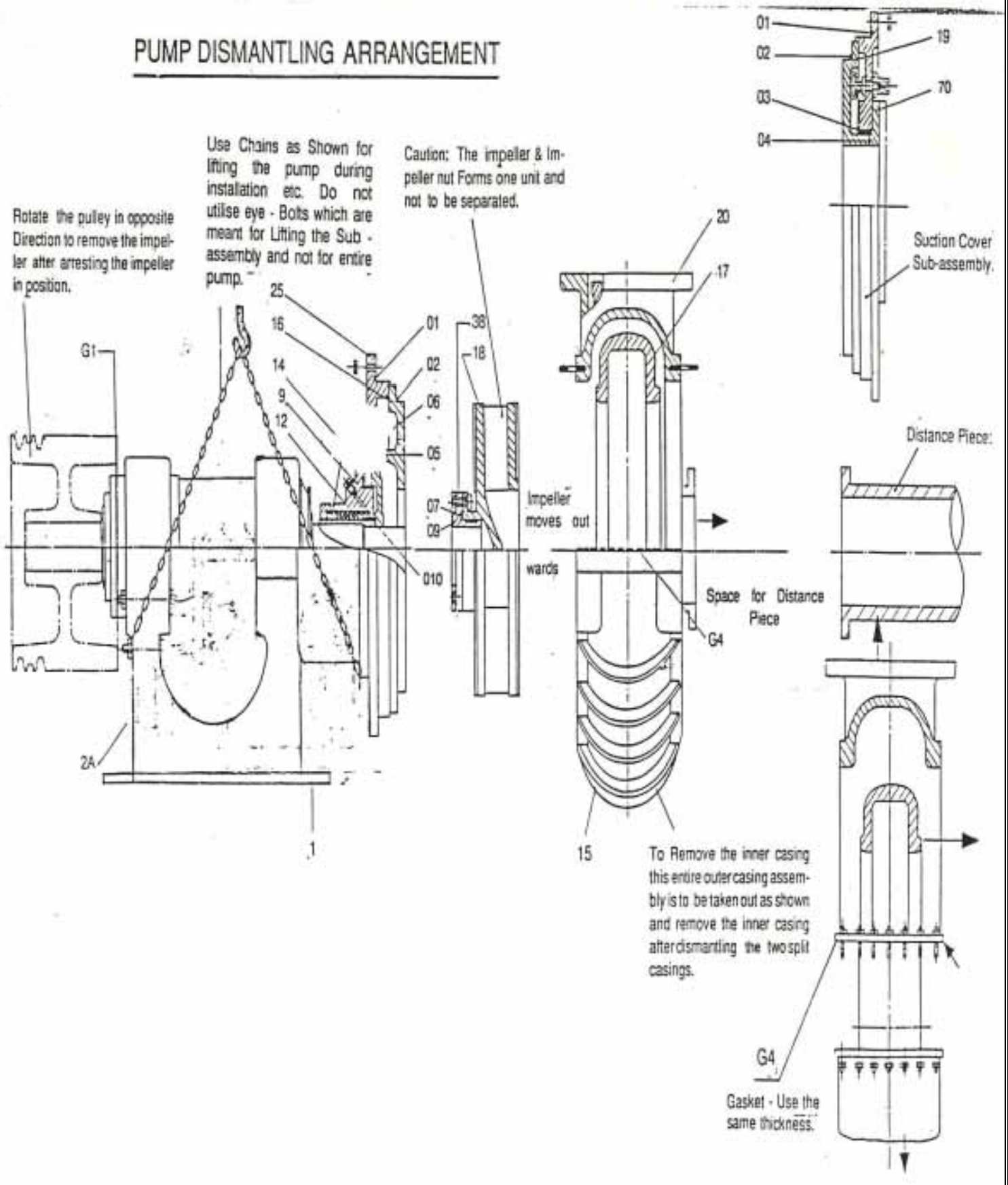
(D) REDUCING LIFE OF FRONT WEAR PLATE

ADJUST THE IMPELLER IN SUCH A WAY TO OBTAIN A CLEARANCE OF 2.5 MM ON BOTH THE SIDES.

IF REQUIRES DUE TO ERECTION PROBLEM THE CLEARANCE HAS TO BE INCREASED BETWEEN THE IMPELLER AND FRONT WEAR PLATE BY PROVIDING 1.5 mm CAF-9 GASKETS ON BOTH THE FACES SHOWN AS (1) & (2)

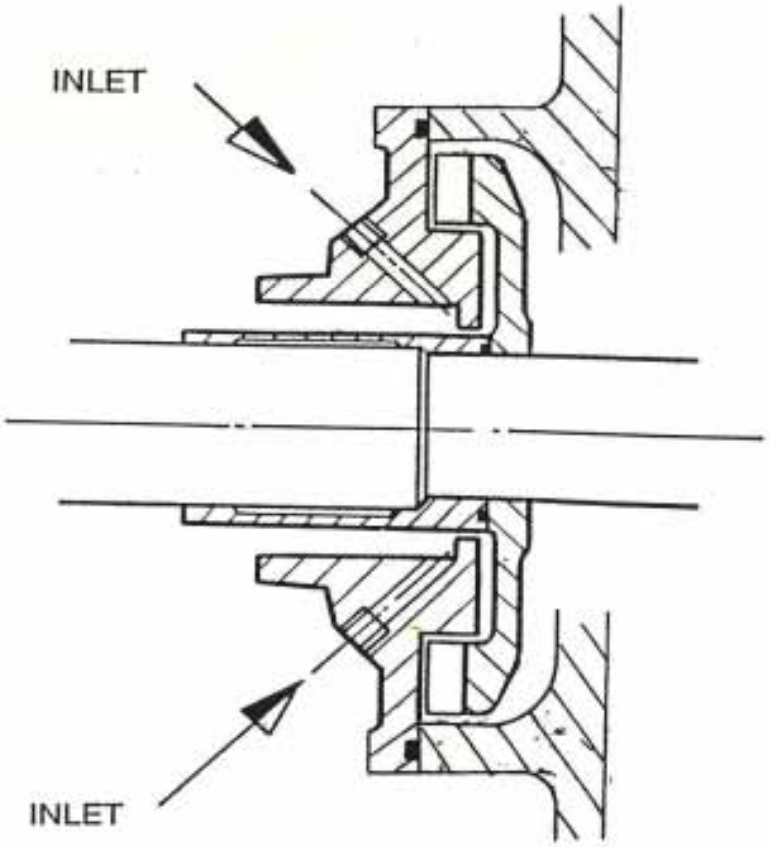


PUMP DISMANTLING ARRANGEMENT



SEALING WATER CONNECTION

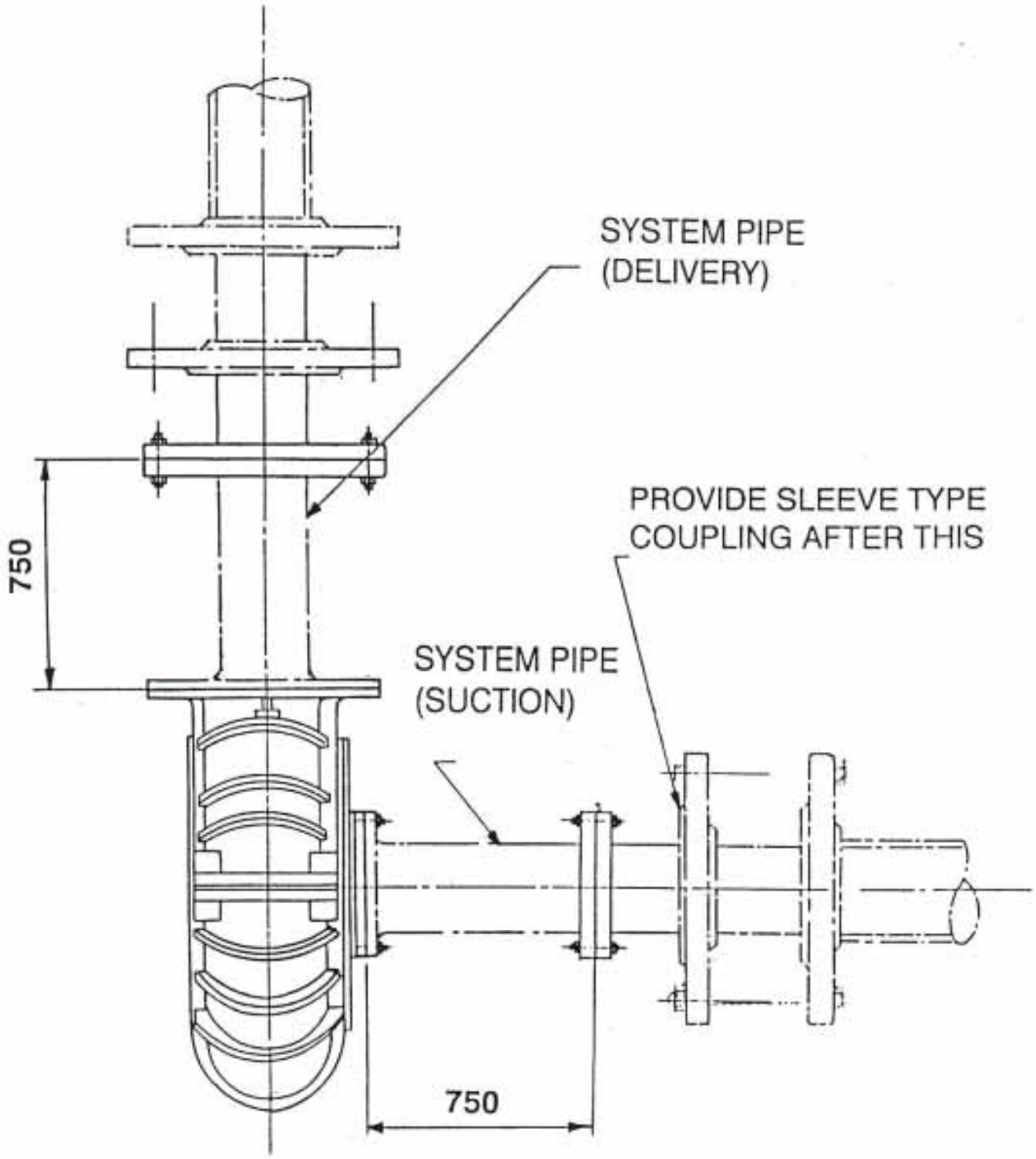
GIVE SUFFICIENT QTY OF WATER UNDER PRESSURE, AS SPECIFIED IN BOTH THE INLETS SHOWN.



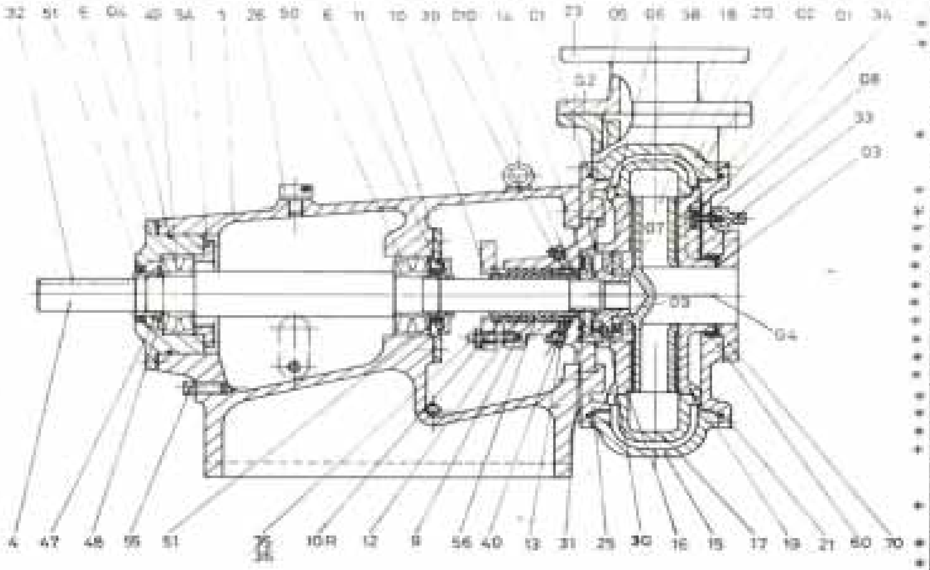
PROVIDE WATER SEALING IN BOTH THE INLETS

CAUTION

IN THE EVENT OF SLURRY IS SEEN COMING OUT OF STUFFING BOX, THE PUMP SHALL BE STOPPED AND CHECK THE SEALING WATER LINE. ENSURE PROPER QTY OF SEALING WATER IS ALWAYS PASSED INTO THE GLAND HOUSING PORTION TO GET BETTER LIFE.



FOR MAINTENANCE PURPOSE, PROVIDE A MINIMUM CLEARANCE OF 750 mm. BETWEEN THE SLEEVE COUPLING, PUMP SUCTION AND DELIVERY FLANGE.



	CODE NO	DESCRIPTION	MATERIAL	QTY
*	4	PUMP SHAFT	BS 970 EN 8	1
*	57	OIL SEALS	SYNTHETIC RUBBER	1
	5	ADOPTER (COUPLING SIDE)	IS 210 FG 200	1
	47 & 52	BEARING	STEEL (22317)	1+1
	54	INNER BRG CAP (FOR ADOPTER)	IS 210 FG 200	1
	1	BEARING BED	IS 210 FG 200	1
*	25	BRACKET SIDE COVER	IS 210 FG 200	1
	8	BEARING CAP (INNER)	IS 210 FG 200	1
	11	LIQUID THROWER	BS 970 EN 8	1
*	10	GLAND	IS 210 FG 200	1
*	10R	PRESSURE RING	BS 970 EN 8	1
*	12	SLEEVE	AISI 410	1
*	56	GLAND PACKING (12.5 SQ.)	TIGA	6
*	13	LANTERN RING	BS 970 EN 8	1
*	9	GLAND HOUSING	IS 210 FG 200	1
*	38	IMPELLER NUT integral part of [illegible]	BS 970 EN 8	1
*	14	LAY BRINTH	ASTM A 296 CA 15	1
*	19	WEAR PLATE (B. SIDE)	MINARD TYPE IV	1
*	18	IMPELLER		1
*	17	INNER CASING		1
*	20	WEAR PLATE (S. SIDE)		1
*	26	OUTER CASING (TOP) INTEGRAL UNIT	IS 210 FG 200	1
*	15	OUTER CASING (BOTTOM)		1
*	70	FLANGE (S. COVER)	IS 210 FG 200	1
	35	STUD (GLAND)	AISI 304	2
	36	HEX NUT (GLAND STUD)	AISI 304	2
*	21	SUCTION COVER	IS 210 FG 200	1
	47 & 48	LOCK NUT & LOCK WASHER	BS 970 EN 8 & STEEL	1+1
*	33	DELIVERY ADOPTER	IS 210 FG 200	1
*	32	KEY (COUPLING)	BS 970 EN 8	1
*	31	KEY (SLEEVE)	AISI 304	1
	26	BREATHER PLUG	STEEL	1
	39	COOLING INLET PLUG	STEEL	1
	40	COOLING OUTLET PLUG	STEEL	1
*	30	IMPELLER BOLT	AISI 410	4
	34 & 60	T BOLT & DOME NUT	BS 970 EN 8	7+7
	55	OIL DRAIN PLUG	STEEL	1
*	48	PACKING (BRKT COVER/SUC FLANGE)	TIGA (1 MM)	4

* MARKED ITEMS REQUIRE SPARES FOR TWO YEARS NORMAL OPERATION

		POS NO	DESCRIPTION	SIZE		QTY
GASKET MATL CAF	*	G4	OUTER CASING	THICKNESS 1 MM		1
	*	G3	OUTER CASING WITH DELIVERY ADOPTER			1
O RINGS MATL NEOPRENE RUBBER	*	D8 & D6	DOME NUT & ADOPTER COUPLING SIDE	CORD DIA	1.5 & 7	7+1
	*	01	SUC & BRKT SIDE COVER WITH O. CASING		5	2
	*	07	IMPELLER WITH IMPELLER NUT		3	1
	*	06	GLAND HOUSING WITH BRKT SIDE COVER		3	1
	*	D10	SLEEVE WITH LAYBRINTH		3	1
	*	05	GLAND HOUSING WITH WEAR PLATE		4	1
	*	09	IMPELLER NUT WITH LAYBRINTH		3	1
	*	02	INNER CASING WITH WEAR PLATE		6	2
	*	03	FLANGE (S.COVER) WITH S-COVER		4	1

PUMP DESIGNATION :

PUMP TYPE : AR 150/340 & AR 150/340A

SIZE : 150 x 100

QTY :

DIRECTION OF ROTATION : CLOCKWISE FROM DRIVE END

SAM TURBO INDUSTRY LIMITED

TITLE SECTIONAL DRAWING WITH BILL OF MATERIAL

SUPPLIED THROUGH

CUSTOMER

PROJECT

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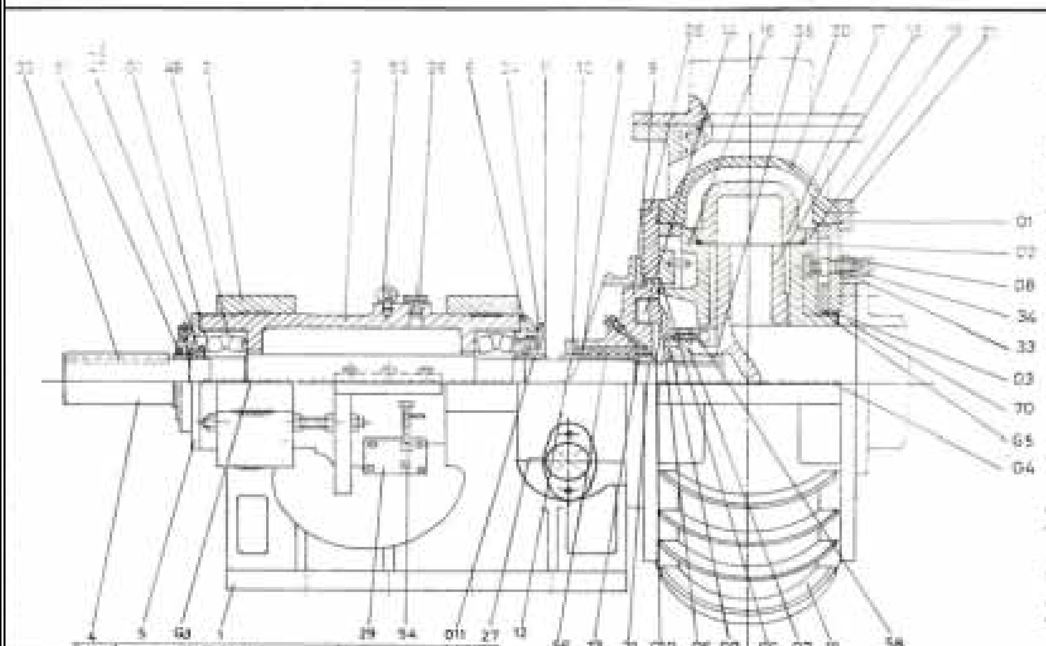
REV NO. 0 1 2 3 4 DRAWING NO.

DATE



	CODE NO	DESCRIPTION	MATERIAL	QTY
	1	BEARING BED INTEGRAL UNIT	IS 210 FG 260	1
	2	BEARING HOUSING (TOP & BOTTOM)	IS 210 FG 260	1
*	4	PUMP SHAFT	BS 970 EN 8	1
	5	BEARING CAP (OUTER)	IS 210 FG 260	1
	6	BEARING CAP (INNER)	IS 210 FG 260	1
*	10R	PRESSURE RING	BS 970 EN 8	1
*	9	GLAND HOUSING	AISI [illegible]	1
*	10	GLAND	ASTM A 216 Gr WCB	1
*	11	LIQUID THROWER	[illegible]	1
*	12	SHAFT SLEEVE	ASTM A 743 CA-15	1
*	15	OUTER CASING (BOTTOM) INTEGRAL UNIT	IS 210 FG 200	1
*	16	OUTER CASING (TOP)		1
*	14	EXPELLER	MINARD TYPE IV	1
*	11	WEAR PLATE (B. SIDE)		1
*	17	INNER CASING		1
*	18	IMPELLER		1
*	19	WEAR PLATE (S. SIDE)		1
*	13	LANTERN RING	ASTM A 743 CF8M	1
*	21	SUCTION SIDE COVER	ASTM A 216 Gr WCB	1
*	24	GLAND RING	[illegible]	1
*	25	BRACKET SIDE COVER	ASTM A 216 Gr WCB	1
	26	OIL BREATHER	M.S.	1
	27	COUNTER FLANGE	[illegible]	1
	28	END PLATE	IS 210 FG 200	2
*	31	KEY (EXPELLER)	AISI 304	1
*	32	KEY (COUPLING)	BS 970 EN 8	1
	33	DOME NUT	BS 970 EN 8	2
	34	T-BOLT	M.S. [illegible]	2
*	23	PACKING (10 MM SQ)	TIGA	5
*	38	IMPELLER NUT [illegible]	ASTM A 216 Gr WCB	1
	47	LOCK NUT	M.S.	1
*	70	FLANGE (S. COVER)	MINARD TYPE IV	1
	49	BEARING (SPHERICAL ROLLER)	22320	2
*	60	IMPELLER BOLT & HEX NUT	AISI 410	4+4
*	57	OIL SEALS	SYNTHETIC RUBBER	2
	52	EYE BOLT	STEEL	1
	54	OIL LEVEL INDICATOR	GLASS WITH BRASS TUBE	1
*	51	PACKING (GLAND HOUSING)	TIGA (10 MM SQ)	5
	48	LOCK WASHER	M.S.	1

		POS NO	DESCRIPTION			QTY
GASKET MATL	*	G5	FLANGE (S COVER) / WEAR PLATE	THICKNESS 1 MM		1
	*	G1	BEARING CAP			1
	*	G4	OUTER CASING			1
		G3	ANABOND SUPER GASKET OR [illegible] BEARING HOUSING SPLIT JOINT			
O RINGS MATL NEOPRENE RUBBER	*	01	SUC & BRKT SIDE COVER WITH O-CASING	CORD DIA	6	2
	*	02	INNER CASING WITH WEAR PLATE		10	2
					4	1
	*	05	GLAND HOUSING WITH WEAR PLATE		4	1
	*	06	GLAND HOUSING WITH COVER		6	1
	*	07	IMPELLER WITH IMPELLER NUT		3	1
	*	08	DOOM NUT		4	2
	*	09	IMPELLER NUT WITH EXPELLER		3	1
	*	010	SLEEVE WITH EXPELLER		5	1
	*	011	LIQUID THROWER WITH SHAFT		3	1

PUMP DESIGNATION :

PUMP TYPE : AR 150/500

SIZE : 200 x 150

DIRECTION OF ROTATION : CLOCKWISE/ANTICLOCKWISE FROM DRIVE END

* MARKED ITEMS REQUIRE SPARES FOR TWO YEARS NORMAL OPERATION

SAM TURBO INDUSTRY LIMITED

TITLE SECTIONAL DRAWING WITH BILL OF MATERIAL

SUPPLIED THROUGH

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PROJECT

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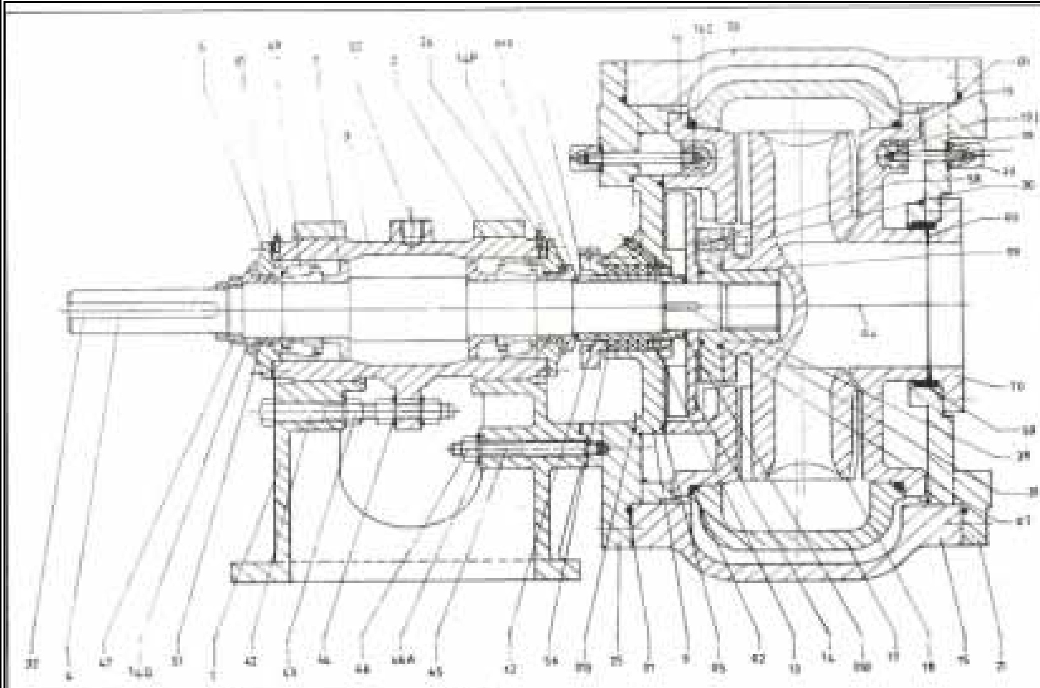
REV NO. 0 1 2 3 4 DRAWING NO.

DATE



CODE NO	DESCRIPTION	MATERIAL	QTY
5	BEARING HOUSING	IS 210 FG 200	1
3	END COVER	IS 210 FG 200	2
1	BASE	IS 210 FG 200	1
2	TOP COVER	IS 210 FG 200	2
14P	LABYRINTH (PUMP END)	ASTM A 743 CF8	1
14D	LABYRINTH (DRIVE END)	BS 970 EN 8	1
12	SHAFT SLEEVE	ASTM A743 CA15	1
10	SPLIT GLAND	ASTM A 216 Gr WCB	1 SET
161	INSERT (WEAR PLATE GUIDE)	IS 226 C15	4
9	EXPELLER HOUSING	ALLOY CI	1
14	EXPELLER	NIHARD TYPE IV	1
15	BRACKET SIDE COVER	ASTM A 216 Gr WCB	1
16	WEAR PLATE (B SIDE)	NIHARD TYPE IV	1
19	WEAR PLATE (S SIDE)	NIHARD TYPE IV	1
18	IMPELLER	NIHARD TYPE IV	1
17	VOLUTE	NIHARD TYPE IV	1
70	FLANGE (S.C. COVER)	NIHARD TYPE IV	1
88	IMPELLER NUT	ASTM 216 Gr WCB	1
20	OUTER CASING (TOP) INTEGRAL		1
15	OUTER CASING (BOTTOM) UNIT		1
13	LANTERN RESTRICTOR	ASTM A 743 CF8M	1
7	GREASE RETAINER	IS 210 FG 200	2
21	SUCTION COVER	ASTM A 216 Gr WCB	1
4	SHAFT		1
45	STUD (BASE/BRT. SIDE COVER)	BS 970 EN 8	2
46	HEX NUT (FOR 45)	IS 1363 MS	4
46A	WASHER (FOR 45)	IS 226 C15	4
32	EYE BOLT	STEEL	1
51	PISTON RING	IS 210 FG 200	4
36	T-BOLT (IMPELLER)	AISI-410	8
58	HEX NUT (IMPELLER BOLT)	AISI-410	8
57	KEY (SHAFT/SLEEVE/EXPELLER)	AISI-304	1
52	KEY (COUPLING)	BS 970 EN 8	1
61	SHIMS (END COVER)	BRASS	1 SET
49	TAPER ROLLER BEARING	STEEL [illegible]	2
47	LOCK NUT	IS 226 C15	1
26	GREASE NIPPLE	STEEL	2
101	INSERT (WEAR PLATE S.SIDE)	IS 226 C15	4
56	GLAND PACKING	TIGA	4
42	BOLT (BEARING HOUSING ADJ.)	BS 970 EN 8	1
43	HEX NUT (BEARING HOUSING ADJ.)	IS 1363 MS	1
44	WASHER (BEARING HOUSING ADJ.)	IS 226 C15	1
31	DOME NUT	BS 970 EN 8	4+4
G4	GASKET (OUTER CASING)	CAF 9 THICKNESS 1mm	1
59	RUBBER GASKET (S.C. COVER)	NEOPRENE RUBBER	1

MATERIAL	POS. NO	DESCRIPTION		QTY
	011	SLEEVE / SHAFT	2	1
O RING NITRILE RUBBER	01	SUC. & BRT. SIDE COVER / OUTER CASING	2	1
	013	BRACKET SIDE COVER / EXPELLER HSG.	4	1
	07	IMPELLER / IMPELLER NUT	3	1
	03	IMPELLER NUT / EXPELLER	3	1
	02	INNER CASING / WEAR PLATE	10	2
	05	EXPELLER HSG. / WEAR PLATE GUIDE	8	1
	010	SLEEVE / EXPELLER	3	1
	08	DOME NUT / SUCTION COVER	4	4
	012	SLEEVE / SHAFT	2	1
CAF9	G5	GASKET (FLANGE S. COVER)	THICKNESS 1mm	1

PUMP DESIGNATION

PUMP TYPE : AR150/510

SIZE : 200 x 150

QTY :

DIRECTION OF ROTATION : CLOCKWISE FROM DRIVE END

ORDER REF :

SAM TURBO INDUSTRY LIMITED

TITLE SECTIONAL DRAWING WITH BILL OF MATERIAL

SUPPLIED THROUGH

CUSTOMER

PROJECT

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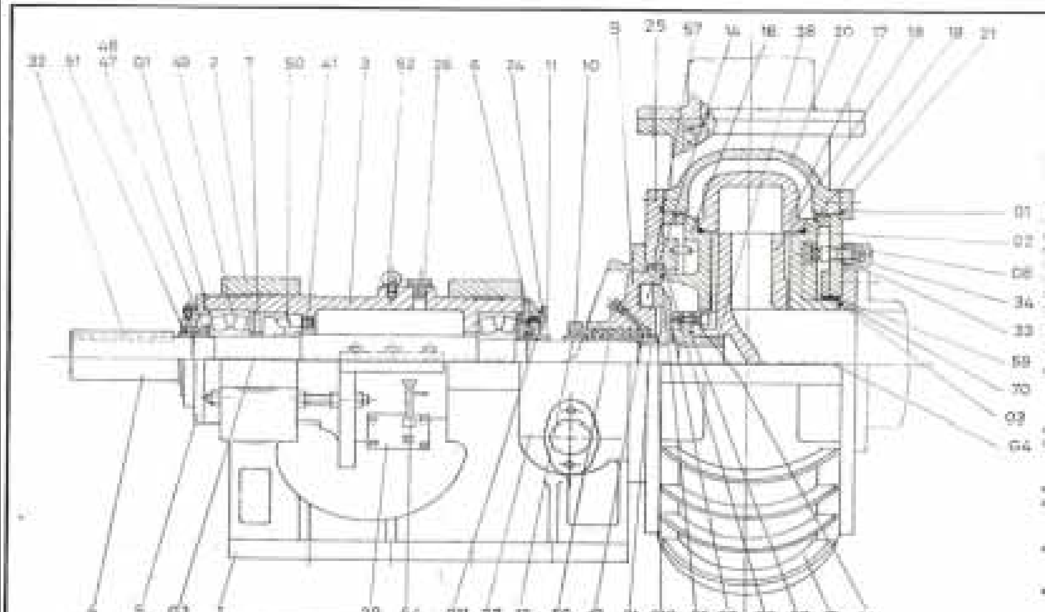
REV. No. 0 1 2 3 4 DRAWING No.

DATE



CODE NO	DESCRIPTION	MATERIAL	QTY
1	BEARING BKT. INTEGRAL	IS 210 FG 200	
2	TOP COVER UNIT		
3	BEARING HSG. (TOP & BOTTOM)	IS 210 FG 200	1
4	PUMP SHAFT	BS 970 EN 8	1
5	BEARING CAP (OUTER)	IS 210 FG 200	1
6	BEARING CAP (INNER)	IS 210 FG 200	1
7	SPACER (BEARING)	IS 210 FG 200	1
48	LOCK WASHER	M.S.	1
9	GLAND HOUSING	ALLOY CI	1
10	GLAND (SPLIT)	ASTM A 216 Gr WCB	1
11	LIQUID THROWER	IS 226 C15	1
12	SHAFT SLEEVE	ASTM A 743 CF8M	1
15	OUTER CASING (BOTTOM) INTEGRAL	IS 210 FG 200	1
20	OUTER CASING (TOP) UNIT		1
14	EXPELLER	NIHARD	1
16	WEAR PLATE (B. SIDE)		1
17	INNER CASING		1
18	IMPELLER		1
19	WEAR PLATE (S. SIDE)		1
13	LANTERN RING	ASTM A 743 CF8M	1
21	SUCTION SIDE COVER	ASTM A 216 Gr WCB	1
22	GLAND RING	IS 226 C15	1
25	BRACKET SIDE COVER	ASTM A 216 Gr WCB	1
26	OIL BREAKER	M.S.	1
27	FLANGE	IS 210 FG 200	1
28	END PLATE	IS 210 FG 200	2
31	KEY (EXPELLER)	AISI 304	1
32	KEY (COUPLING)	BS 970 EN 8	1
33	DOME NUT	BS 970 EN 8	4
34	T-BOLT	BS 970 EN 8	4
59	GASKET (SUCTION SIDE COVER)	NEOPRENE RUBBER	1
38	IMPELLER NUT	ASTM A 216 Gr WCB	1
37	SPRING	STEEL	1
47	LOCK NUT	BS 970 EN 8	1
70	FLANGE (S. COVER)	NIHARD TYPE IV	1
49	BEARING (SPHERICAL ROLLER)	22322	1
50	BEARING (SPHERICAL ROLLER THRUST)	29422	1
51	OIL SEALS	SYNTHETIC RUBBER	2
52	EYE BOLT	STEEL	1
54	OIL LEVEL INDICATOR	GLASS WITH BRASS TUBE	1
56	PACKING (GLAND HOUSING)	TIGA	4
57	GLAND HOUSING PIN	BS 970 EN 8	2
88	IMPELLER BOLT & HEX NUT	AISI 410	4+4

MATERIAL		POS. NO	DESCRIPTION		QTY
GASKET PAPER 120.3	*	01	BEARING CAP	THICKNESS 1mm	2
	*	G4	OUTER CASING		1
	*	G3	FLANGE (S.COVER)		1
GASKET (BRG. HSG. SPLIT JOINT) : ANABOND SUPER GASKET SHIELD					
O RING NITRILE RUBBER	*	02	INNER CASING / WEAR PLATE		2
	*	03	SUC. & BRT. COVER/OUTER CASING		1
	*	05	GLAND HOUSING / WEAR PLATE		1
	*	06	GLAND HOUSING / BRT. S.COVER		1
	*	07	IMPELLER / IMPELLER NUT		1
	*	08	DOME NUT		1
	*	09	IMPELLER NUT / EXPELLER		1
	*	010	SLEEVE / EXPELLER		1
	*	011	LIQUID THROWER / SHAFT		1

PUMP DESIGNATION

PUMP TYPE : AR 250/500 & 300/500

SIZE : 250 x 200

DIRECTION OF ROTATION : CLOCKWISE / ANTI-CLOCKWISE FROM DRIVE END

■ MARKED ITEMS REQUIRE SPARES FOR TWO YEARS NORMAL OPERATION

SAM TURBO INDUSTRY LIMITED

TITLE SECTIONAL DRAWING WITH BILL OF MATERIAL

SUPPLIED THROUGH

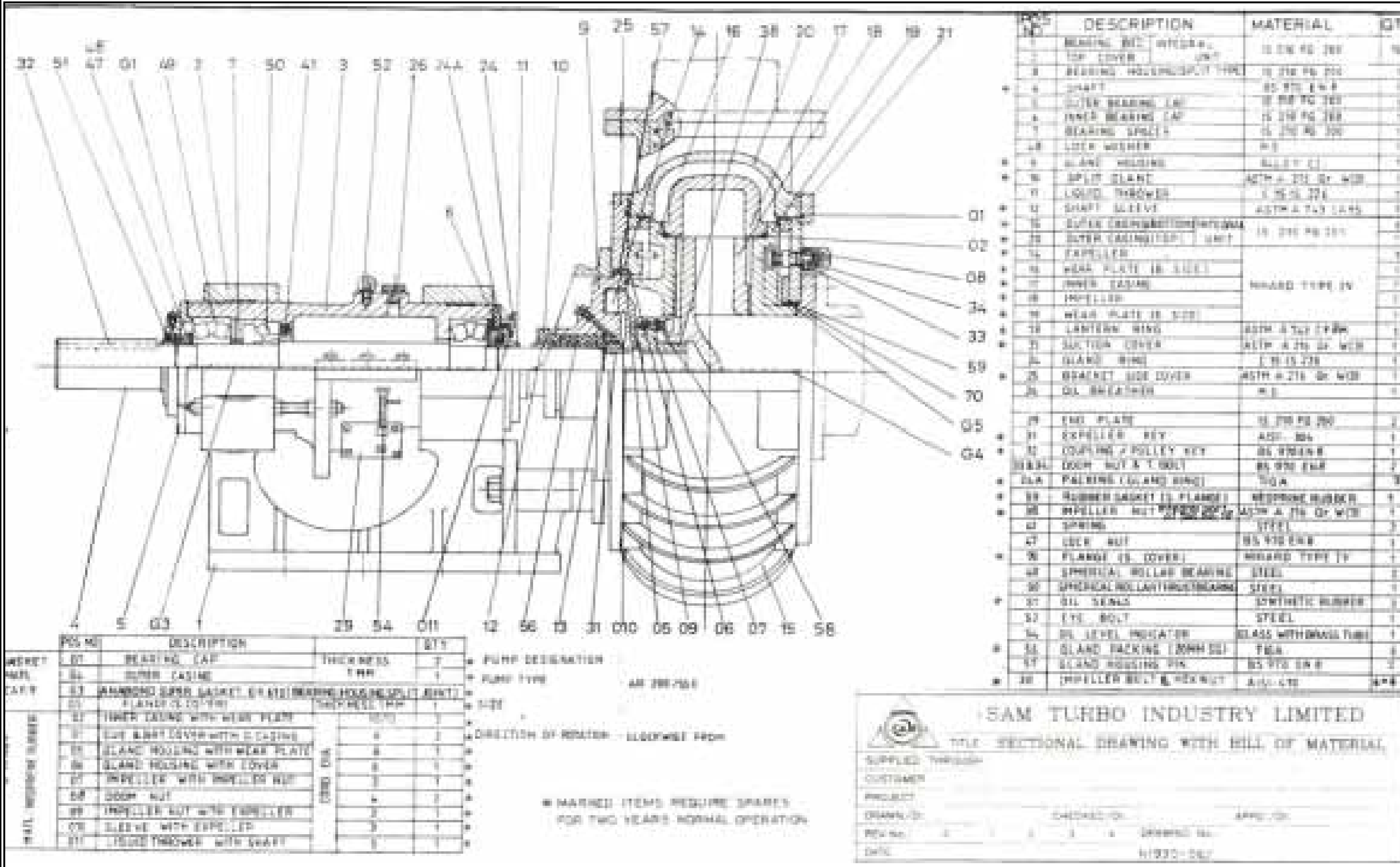
CUSTOMER

PROJECT

DRAWN / DT. CHECKED / DT. APPD. / DT.

REV. No. 0 1 2 3 4 DRAWING No.

DATE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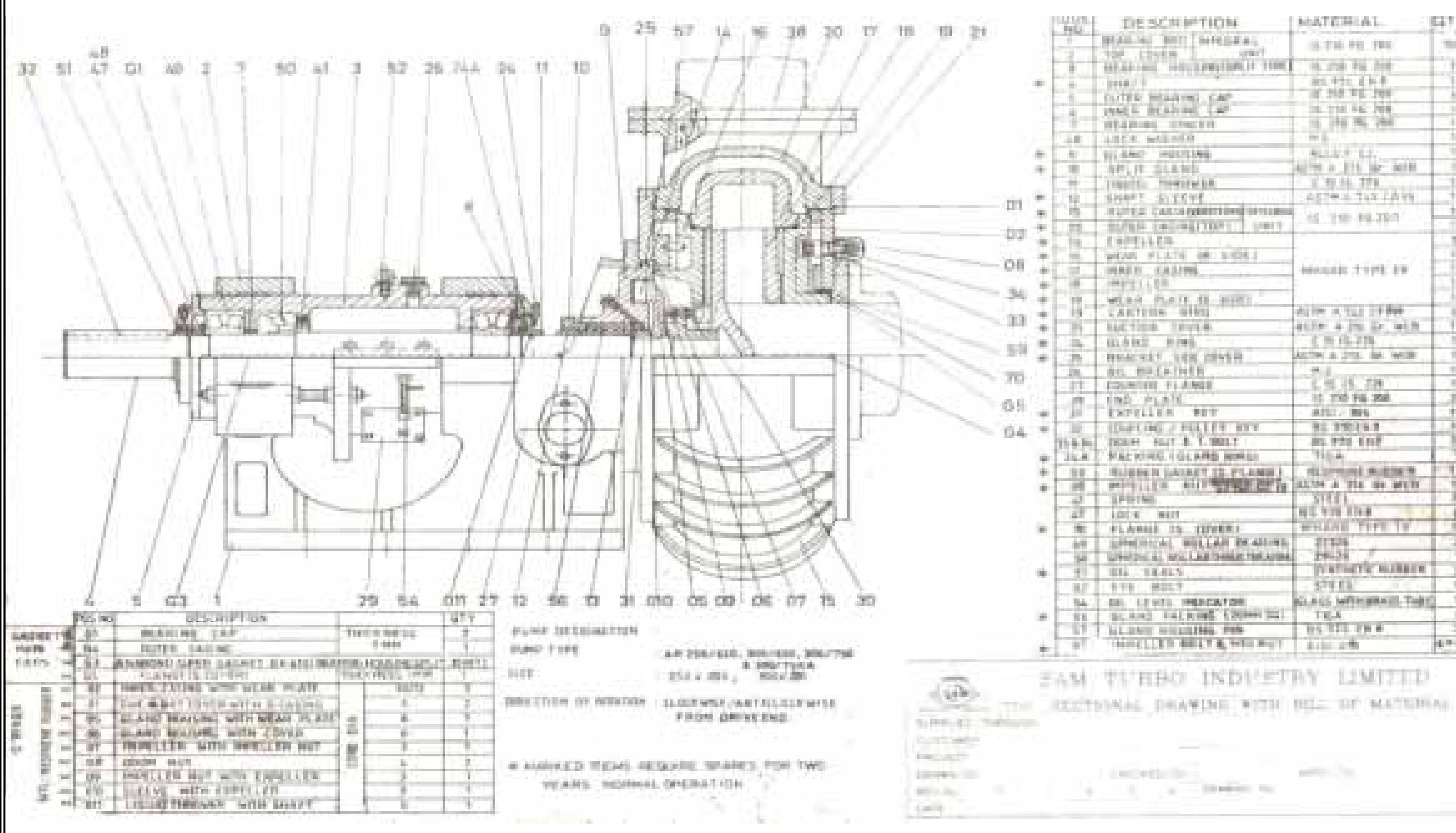
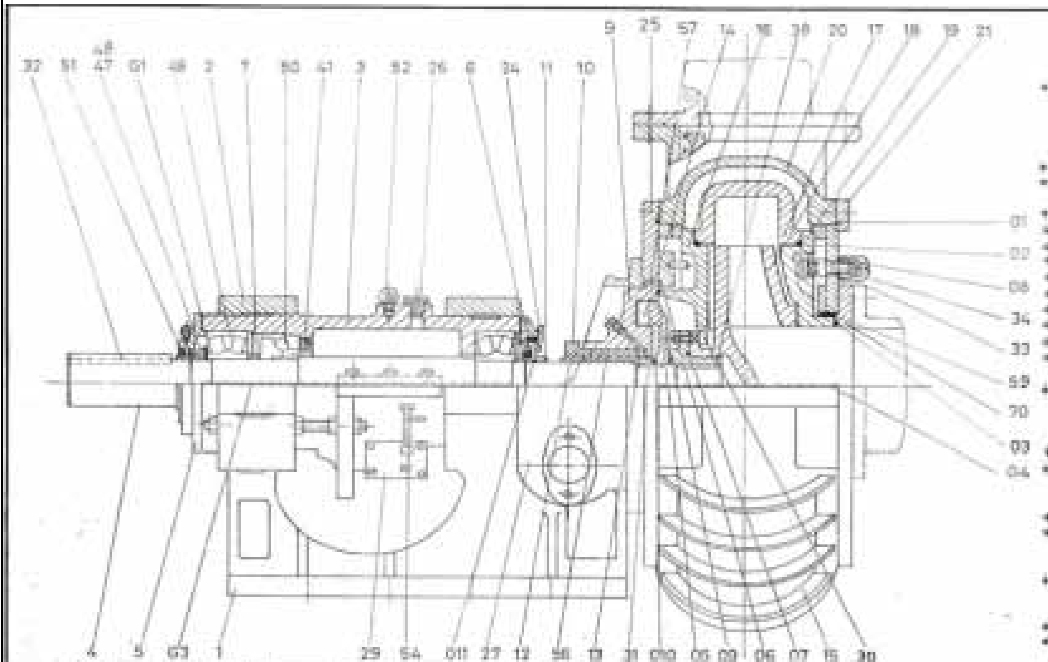
PUMP TYPE
DIRECTION OF ROTATION
* MARKED ITEMS REQUIRE SPARES
FOR TWO YEARS NORMAL OPERATION
SAM TURBO INDUSTRY LIMITED
TITLE SECTIONAL DRAWING WITH BILL OF MATERIAL


DESCRIPTION
MATERIAL
QTY
PUMP DESIGNATION
PUMP TYPE
SIZE
DIRECTION OF ROTATION
* MARKED ITEMS REQUIRE SPARES FOR TWO
YEARS NORMAL OPERATION
SAM TURBO INDUSTRY LIMITED
SECTIONAL DRAWING WITH BILL OF MATERIAL



	NO.	DESCRIPTION	MATERIAL	QTY
	1	BEARING SET (ASSEMBLY UNIT)	IS 210 FG 260	1SET
	2	TOP COVER		
	3	BEARING HOUSING(SPLIT TYPE)	IS 210 FG 260	1SET
★	4	SHAFT	BS 970 EN 8	1
	5	OUTER BEARING CAP	IS 210 FG 260	1
	6	INNER BEARING CAP	IS 210 FG 260	1
	7	BEARING SPACER	IS 210 FG 260	1
	48	LOCK WASHER	M.S.	1
★	9	GLAND HOUSING	ALLOY C.I.	1
★	10	SPLIT GLAND	ASTM A 216 Gr. WCB	1
	11	LIQUID THROWER	IS 1875 [illegible]	1
★	12	SHAFT SLEEVE	ASTM A 743 CA15	1
★	13	OUTER CASING(BOTTOM)(SPLIT/ONE UNIT)	IS 210 FG 260	1
★	70	OUTER CASING(TOP)		1
★	14	EXPELLER	NIHARD	1
★	15	WEAR PLATE (D. SIDE)		1
★	16	INNER CASING		1
★	17	IMPELLER		1
★	18	WEAR PLATE (S. SIDE)		1
★	19	LANTERN RING	ASTM A 743 CF8M	1
★	20	SUCTION COVER	ASTM A 216 Gr. WCB	1
	21	GLAND RING	IS 1875 [illegible]	1
★	25	BRACKET SIDE COVER	ASTM A 216 Gr. WCB	1
	26	OIL BREATHER	M.S.	1
	27	COUNTER FLANGE	IS 15 [illegible]	1
	29	END PLATE	IS 210 FG 260	2
★	31	EXPELLER KEY	AISI 304	1
★	32	COUPLING / PULLEY KEY	BS 970 EN 8	1
	33	DOOM NUT	BS 970 EN 8	2
	34	T-BOLT	BS 970 EN 8	2
★	58	RUBBER GASKET (S. FLANGE)	NEOPRENE RUBBER	1
★	59	IMPELLER NUT [illegible]	ASTM A 216 Gr. WCB	1
	57	SPRING	STEEL	1
	47	LOCK NUT	BS 970 EN 8	1
★	70	FLANGE (S. COVER)	NIHARD TYPE IV	1
	49	SPHERICAL ROLLER BEARING	22316	1
	50	SPHERICAL ROLLER THRUST BEARING	29416	1
★	37	OIL SEALS	SYNTHETIC RUBBER	2
★	52	EYE BOLT	STEEL	1
	54	OIL LEVEL INDICATOR	GLASS WITH BRASS TUBE	1
★	51	GLAND PACKING (20mm SQ)	TG4	5
	57	GLAND HOUSING PIN	BS 970 EN 8	2
★	30	IMPELLER BOLT & HEX NUT	AISI 410	8+8

	POS NO	DESCRIPTION			QTY
GASKET MATL: CAPR	01 ★	BEARING CAP	THICKNESS 1 MM		2
	04 ★	OUTER CASING			1
	013 ★	DIAMOND SHEET GASKET (BETWEEN BEARING HOUSING(SPLIT JOINT))			
O-RINGS MATL: NITRILE RUBBER	011 ★	S.C. [illegible] WITH S.CASING	CORD DIA	6	2
	02 ★	INNER CASING WITH WEAR PLATE		10/12	2
	03 ★	FLANGE(S.COVER)WITH S.COVER		8	1
	05 ★	GLAND HOUSING WITH WEAR PLATE		6	1
	06 ★	GLAND HOUSING WITH COVER		6	1
	07 ★	IMPELLER WITH IMPELLER NUT		3	1
	08 ★	DOOM NUT		4	2
	09 ★	IMPELLER NUT WITH EXPELLER		3	1
	010 ★	SLEEVE WITH EXPELLER		3	1
	011 ★	LIQUID THROWER WITH SHAFT		5	1

PUMP DESIGNATION

PUMP TYPE : AH 300/650 & 300/750

SIZE : 300×250 , 750×NK

DIRECTION OF ROTATION : CLOCKWISE/ANTICLOCKWISE FROM DRIVE END

ORDER REF.

★ MARKED ITEMS REQUIRE SPARES FOR TWO YEARS NORMAL OPERATION

SAM TURBO INDUSTRY LIMITED

TITLE: SECTIONAL DRAWING WITH BILL OF MATERIAL

SUPPLIED THROUGH

CUSTOMER

PROJECT

DRAWN BY | CHECKED BY | APPD. BY

REF. No. | DRAWING No.

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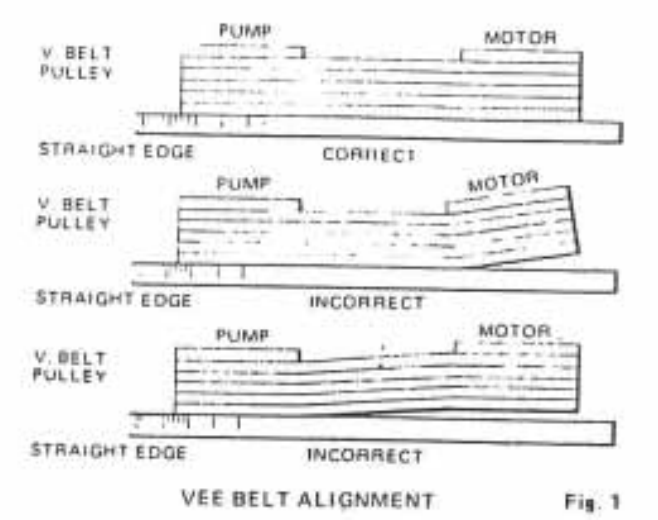
ALIGNMENT AND TENSIONING – VEE BELT DRIVES

General

Whether direct coupled or vee belt driven, the pump and motor shafts should be accurately aligned.

In vee belt drives, non-parallel shafts cause excessive belt wear.



VEE BELT ALIGNMENT Fig. 1

Alignment

Before fitted to the belt drive ensure the following details are adhered to.

Always use a set of new belts.

Clean any oil or grease form pulleys. Remove any rust or burns from the grooves.

Reduce the centre distance by jacking the motor towards the pump using the jacking bolts supplied, until the belts can be put onto the pulley grooves without forcing.

Use a good straight edge across both motor and pump pulley faces. It is important to align the two pulleys to a tolerance whereby daylight is non existent or at a minimum between the pulleys and the straight edge.

Tensioning

Proper tensioning of belts ensures a longer life for both the belts and the roller bearings.

The high performance required form modern belts cannot be achieved without correct tensioning. To check the belt for correct tensioning refer to fig. 2 below and proceed as follows:-

(a) Measure the length of span.
(b) Apply a force at right angles to the belt at the centre of the span sufficient to deflect one belt by 16mm per metre of span
(c) Compare the force required with the value stated in the table.

If the measured force is within the values stated in the table the belt tensioning should be satisfactory. If the force measured is below or above the value stated the belt should be tightened or slackened respectively. Provision should be made for periodic checking of belt wear during the life of a belt and adjusting the belt to correct tension as necessary.

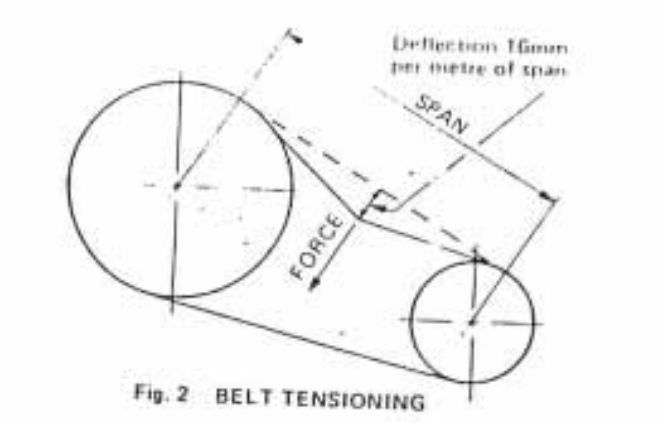


Fig. 2 BELT TENSIONING

Note: New belts should be tensioned at the higher level stated to allow for a drop in tension during the normal running in period. New belts should be checked and adjusted for the correct tension after a period of 2 hours. During the first 24 hours running, it is recommended that a further check is carried our and the belts adjusted as necessary.

TENSIONING FORCES

Belt Section	Force required to deflect belt 16mm per metre of span		
	Small Pulley Diameter (mm)	Newton (N)	Kilogram Force (Kgf)
SPC	224 to 355	60 to 90	6.1 to 9.2
	375 to 560	90 to 120	9.2 to 12.2

Under Tensioning:

Under tensioning of the drive belts can cause vibration resulting in damage to the bearing cartridge, as well as the loss of transmission efficiency. Under tensioning also causes the belts to slip and overheat, resulting in belt fatigue and subsequently a shortening of the belt life.

Over Tensioning:

Over tensioned belts also shorten the drive belt life. Further more bearings will tend to overheat due to excessive radial forces on the rolling elements and this will lead to premature bearing failure.

Adjustment:

After new belts have been fitted or a new installation has been completed, when the drive has been running for approximately 2 hours the tension of the belts should be re-checked and re-adjusted. The drive should be subsequently checked at regular maintenance intervals.

ALIGNMENT - DIRECT COUPLED DRIVE

General

In direct coupled drive misalignment causes unnecessary vibration and wear on the bearings. Rigid couplings should be avoided and used not be used without consultation.

The following procedures outline the recommended practice given in BS 3170 1972 (Appendix) for checking shaft alignment. This method is independent of the truth of the coupling or shaft and is therefore not affected by canted coupling faces or eccentricity of the outside diameter of the coupling.

CAUTION: CHECK THAT NO DAMAGE CAN BE CAUSED WHEN THE SHAFT OF THE DRIVEN UNIT IS TURNED.

Before commencing alignment rotate each shaft independently to check that the shaft and bearings turn without undue friction and that the shaft is true to within 0.04 mm or better as measured on a Dial Test indicator (DTI).

Couplings should be loosely coupled, each half must be free to move relative to the other or the resulting Dial indicator gauge indications can be incorrect. Where tightly fitting pins or springs prevent loose coupling, the pins or springs should be removed, a line scribed across both half couplings and readings taken only when the two are aligned. On couplings with a serrated rim, ensure that as the couplings are rotated, the gauge plungers do not fall in to a groove and become damaged.

Angular Shaft Alignment:

To ensure correct Angular Shaft alignment proceed as follows:-

(a) Isolate the driving **u**nit from the power supply.
(b) Refer to Fig. 3 and clamp two Dial Test Indicators (DTI) at diametrically opposite points (180^0) on one half coupling, with the plungers resting on the back of the other half coupling.
(c) Rotate the couplings until the gauges are in line vertically, and set the gauges to read zero.
(d) Rotate the couplings through half a revolution (180^0) and record the reading on each DTI. The readings should be identical though not necessarily zero because of possible end float. Either positive or negative readings are acceptable provided they are equally positive or equally negative. Refer to the paragraphs headed TOLERANCES for the maximum allowable tolerance and adjust the position of one of the units if necessary.
(e) Rotate the couplings until the gauges are in line horizontally and reset the gauges to read zero.
(f) Repeat operation (d) and adjust the unit position until the correct tolerance is achieved and no further adjustment necessary.

Radial Shaft Alignment

To ensure that the Radial Shaft Alignment is correct proceed as follows

(a) Clamp a DTI to one half coupling or to the shaft, as shown in Fig. 4, with the plunger resting on the rim of the other half coupling.
(b) Set the gauge to read zero.
(c) Rotate the couplings and note the reading at each quarter revolution (90^0). Any variation in the readings indicates a deviation form alignment and the position of one of the units must be adjusted until the readings at each quarter revolution are identical or within the tolerances given. (Refer to paragraphs headed TOLERANCES).

Note: Provisional alignment can be carried out with the unit cold however, where the working temperature of the pump has the effect of raising the centre line of one machine relative to the other allowances must be made. The units should then be realigned when each have attained their correct operating temperature.

Tolerances:

The limits of accuracy within which adjustments must be made cannot be specifically defined because of differences in the size and speed of units, but the following variations which can be tolerated when checking alignment, are suggested.

(1) Angular Alignment:

Couplings up to 300 mm dia….0.05 mm.
Couplings more than 300 mm…..0.07 mm.

(2) Radial Alignment:

Not to exceed 0.1 mm on micrometer dial gauge (i.e. 0.05 mm eccentricity).

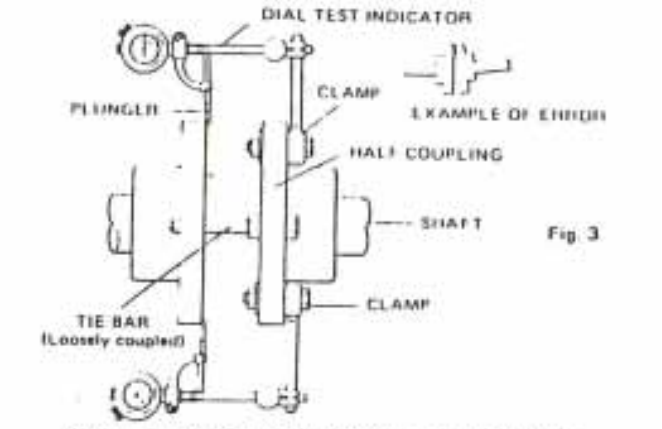


Fig. 3
PARALLELISM OF AXES (ANGULAR ALIGNMENT)

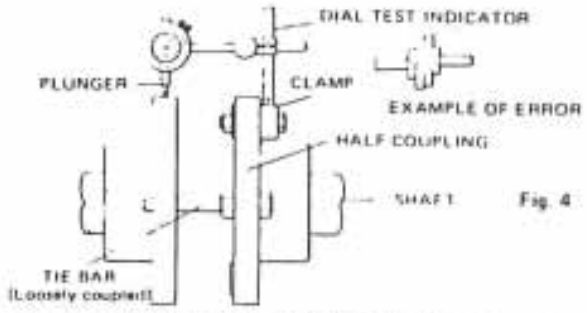


Fig. 4
INTERSECTION OF AXES (RADIAL SHAFT ALIGNMENT)

When both the bedplate level and the shaft alignment are satisfactory the final grout can be run.

OPERATIONAL CHECKS

Running:

When the pump has attained its full operating speed the following checks must be made:-

That the pump is rotating in the correct direction as indicated by the directional arrow.

That the pump is generating not less than its rated delivery pressure.

If the pump fails to generate at least its rated delivery pressure it must be stopped immediately, the cause ascertained, the fault rectified and the pump re-primed before re-starting. If the foregoing checks are proved to be satisfactory, open the delivery valve slowly and bring the pump gradually up to load. Ensure that the bearings are not overheating. The ideal running temperature of a bearing is between 40^0C and 60^0C. However, this figure may be slightly increased as long as

the reading is constant. A constant reading of 68^0C is satisfactory however a reading of 68^0C and still rising should be investigated.

Overheating of roller bearings is frequently caused by over packing them with grease. An increase in running temperature after adding grease is normal, but if one or two shots of grease form a grease gun are applied, the temperature should return to its previous level as the grease is distributed.

Gland leakage check (Oil and Sealed)

If leakage is excessive tighten gland nuts until flow is reduced to required level. If leakage is insufficient and gland shows signs of heating, then loosen the gland nuts. If this is ineffective and the gland continues to heat up, the pump should be stopped and the gland allowed to cool. Gland nuts should be loosened to such an extent that the gland follower is allowed to disengage form the stuffing box.

At low pressure (single stage operation) very little leakage is required and it is possible to operate with only a small amount of water issuing form the gland.

Note: It is normal for gland leakage water to be hotter than the supply because it is conducting away the heat generated by friction in the gland.

It is not essential to stop a pup because of gland heating unless steam or smoke is produced. This difficulty is normally only experienced on initial start up on gland sealed pumps. When initial heat up of the gland is encountered it is usually only necessary to start up – stop – cool and start the pump two or three times before the packing beds in correctly.

It is preferable at start up to have too much leakage than not enough.

After the pump has run for some 8-10 hours, gland bolts should be adjusted to give optimum leakage. If heating of the gland persists, the packing should be removed and the gland repacked.

Gland leakage check (Centrifugal Seal):

During operation no gland leakage should occur to a centrifugally sealed pump. A sight drip will occur from the gland during normal shutdown. Should the leakage be excessive during the shutdown period, first lubricate the gland by rotation of the grease cup, if the gland still leaks adjust the gland nuts to the required tightness. If the gland leakage still persists repack the complete stuffing box.

OPERATIONAL FAULTS

Abnormal Start Up:

If the pump fails to prime, one or more of the following faults may be the cause.

Blocked Suction Pipe:

When the pump has been inoperative for some time it is possible for slurry to settle in or around the suction pipe. This prevents the water rising to the pump impeller.

Air Entering Gland:

Air may be induced into the pump through the gland for one or more of the reasons listed below. This may prevent the pump “picking up” its prime or cause it to lose its prime during operation.

(a) Sealing water pressure too low.
(b) Packing is excessively worn.
(c) Shaft sleeve is excessively worn.
(d) Gland sealing water connection into stuffing box is blocked.

Inspection of gland will readily reveal if above faults are occurring and remedial action is self evident. Overloading may occur when the pump is discharging into an empty system when the delivery head will be temporarily lower and the throughput in excess of that for which the pump is deigned. Careful regulation of the delivery valve until the system is fully charged will prevent this.

WARNING: PUMPS THAT ARE NOT FITTED WITH A LEAK OFF DEVICE SHOULD NOT BE RUN FOR A LONG PERIOD AGAINST A CLOSED DISCHAREGE VALVE. CHECK THAT THE DRIVING UNIT IS NOT BEING VERLOADED – REFER TO DRINVING UNIT AND PUMP DELIVERY PRESSURE GAUGE.

OPERATING – FAULTS

Blocked Suction Pipe:

It is possible during pumping operations for foreign matter to be drawn across the bottom of the suction pipe thereby causing a partial obstruction. Such an obstruction may not be sufficient to stop operation completely by will result in a reduced output form the pump. It will also cause a drop in discharge pressure and will increase the vacuum reading on the pump suction. Rough running and vibration of the pump may also occur due to the high induced suction causing cavitation within the pump.

Blocked Impeller:

Impellers are capable of passing a certain size particles. If a particle larger in size enters the suction pipe it may become lodged I in the eye of the impeller thereby restricting the output of the ump. Such an obstruction will usually result in a drop of current and a drop in both discharge pressure and suction vacuum readings pump vibration may also occur due to the out of balance effects.

Blocked Discharge Pipe:

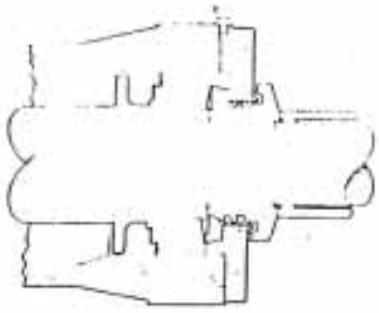
Blocked discharge pipe may be caused by abnormally high concentration of coarse particles in the pump discharge pipe or by the velocity in the discharge pipe being too low to adequately transport the solids. Such a blockage will be shown up by a rise in discharge pressure, and a drop in both current and suction vacuum readings.

Shutting Down Procedure:

On shutting the pump down the pump should be allowed to operate on water only for a short period to ensure the system is clear before shut down. Then proceed as follows:-

(a) Close the delivery valve to reduce the load on the driving unit.
(b) Depress the appropriate 'STOP PUMP' push-button on the control panel.
(c) On gland seal pumps sealing water must be left on during all operations. Including shutdown and run back. Only then should all ancillary supplies be isolated.
(d) When all ancillary supplies have been isolated it is advisable to close the suction valve.

PERIODIC LUBRICATION



Labyrinth seal assembly without grease purge

Bearing lubrication:

A correctly assembled and lubricated bearing assembly will have a long trouble-free life, provided it is protected against ingress of water or other foreign matter and that it is adequately maintained.

It must be left to the good judgement of maintenance personnel, to open bearing housings at regular intervals (not longer than twelve months) to inspect bearings, lubricant and to determine each time the course of action and the period for the next inspection.

The figure shows the labyrinth seal assembly without grease purge. If a regular addition of greasing is necessary the nipples on the bearing housing can be used. It is preferable to lubricate often but sparingly than to add large amounts of grease. **Bearings should never be over lubricated.**

Use only recommended clean lubricant, see page WP 3.02 Lubricants and recommended alternatives.

Excess Grease

The immediate effect of an excess of grease within a bearing is overheating due to the churning effect. This should be avoided, if bearings tend to overheat after a change of grease the trouble is normally due to over greasing. Never add more lubricant to overcome over heating.

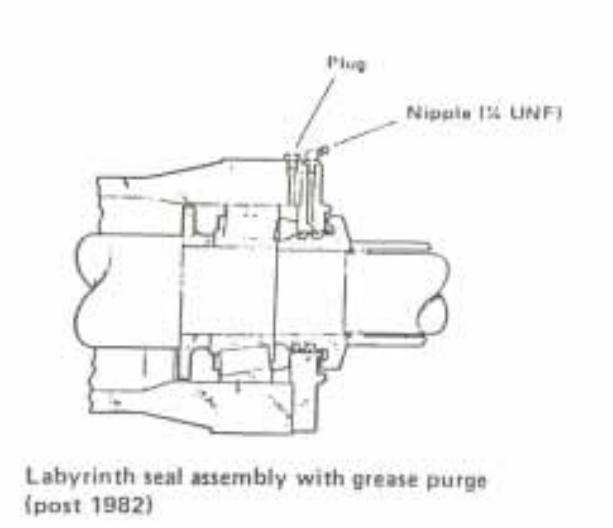
Most pump bearings operate in the lower speed range, however, there is still a risk of damage due to over lubrication, this is especially apparent in the smaller pumps having smaller sized bearings. However, although over lubrication should be avoided this does not imply that bearings can be neglected. Experience should be the final determining factor in establishing routine lubricating procedure. It is advisable to inspect the bearings frequently at the start of operations an dot note any unusual conditions regarding both cleanliness and temperature.

Under normal conditions when the temperature of bearings does not go above normal, the guidelines set out in the text can be used; in humid conditions more frequent greasing may be required.

SUPPLEMENTARY LUBRICATION INSTRUCTIONS

The frequency and amount of lubricant to be added depends upon a number of factors, including speed, size of bearing, extent of on-off operation, and the environmental conditions including, splash and the presence of contaminants.

PERIODIC LUBRICATION



Labyrinth seal assembly with grease purge (post 1982)

Bearing lubrication:

A correctly assembled and lubricated bearing assembly will have a long trouble-free life, provided it is protected against ingress of water or other foreign matter and that it is adequately maintained.

It must be left to the good judgement of maintenance personnel, to open bearing housings at regular intervals (not longer than twelve months) to inspect bearings, lubricant and to determine each time the course of action and the period for the next inspection.

The figure shows the labyrinth seal assembly without grease purge.

To improve the sealing properties of the labyrinth at both the wet end and the drive end of the bearing assembly, a grease nipple and radically drilled hole in the End Cover allows grease to be forced through the labyrinth to the piston rings, thus purging out grit and moisture to the outside of the bearing cartridge. Less contaminants entering the bearing assembly will result in linger bearing life an ultimately considerable cost saving. Therefore careful attention paid to labyrinth purging is an essential maintenance requirement.

The bearings cannot be over greased as approximately 95% if every shot of grease entering the grease purge nipple exits at the labyrinth and only the remaining 5% enters the bearing assembly.

Under normal conditions 2 shots of grease per 24 hours is recommended to be injected into each grease nipple on the end cover to maintain labyrinth sealing.

If site conditions are unfavorable i.e. high humidity, dusty or dirty conditions around the bearing assembly, then the frequency of greasing should be increased to 3 shots per 24 hours.

Use only recommended clean lubricants,

- Lubricants and recommended alternatives

Excess Grease

The immediate effect of an excess of grease within a bearing is overheating due to the churning effect. This should be avoided. if bearings tend to overheat after a change of grease the trouble is normally due to over greasing. Never add more lubricant to overcome over heating.

Most pump bearings operate in the lower speed range. However there is still a risk of damage due to over· lubrication. This is especially apparent in the smaller pumps having smaller sized bearings. However, although over lubrication should be avoided this does not imply that bearings *can* be neglected. Experience should be the final determining factor in establishing routine lubricating procedure. It is advisable to inspect the bearings frequently at the start of operations and to note any unusual conditions regarding both cleanliness and temperature.

Under normal conditions when the temperature of bearings does not go above normal, the guidelines set out in the text can be used; in humid conditions more frequent greasing may be required.

LUBRICATION

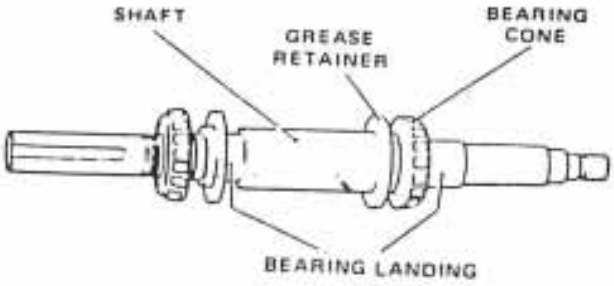
Bearings are grease/lubricated. Following grades of grease available in the market are suitable.

Name of the firm	Grease Specifications	
	Speed 1450 rpm	Speed 2900/3600 rpm
INDIAN OIL	**SERVOGEM 3**	**SERVOGEM 2**
CALTEX	**STARFAK 3**	**STARFAK 2**
HINDUSTAN PETROLEUM	**NATRA 3 or LITHON 3**	**NATRA 2 or LITHON 2**

Fitting Grease Retainers and Bearing Cones

Bearing and shaft should be kept clean at all times.. Mild steel drifts only should be used when tapping bearings into position. Brass or Copper drafts should NOT be used.

1. Check that shaft and shoulders are clean and free from burns.
2. Apply a smear of clean light lubricating oil to the bearing landings on the shaft.
3. Slide on one grease retainer, with flange up to the shaft shoulder.

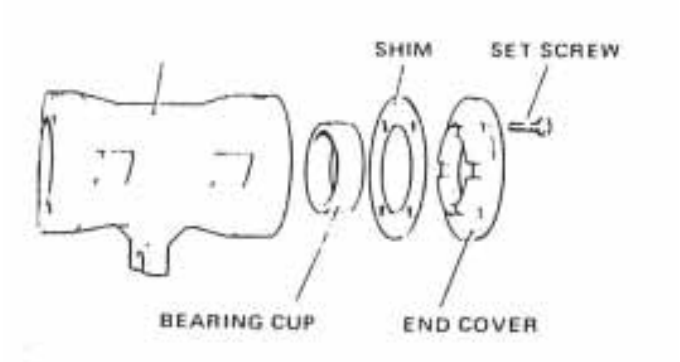


4. Pre-heat bearing cone by placing the cone in a container of clean lubricating oil. Ensure that the cones do not touch the bottom of the container as this will cause local softening. Heat the cones and oil to 100^0C.

5. With the shaft in a vertical position fit the heated bearing cone on the shaft with the large diameter towards the retainer. Allow the bearing cone to cool.
6. Invert the shaft and fit the other grease retainer and bearing cone as above.
7. When the bearings are cool check that they are hard up against the grease retainers by ensuring that the retainers cannot be rotated by hand. If necessary use a mild steel drift to drive the bearings tight against the retainers.

Fitting Impeller End Bearing Cup to Housing

Inspect the bore of the bearing housing for sore marks and clearances. Apply clean lubricating oil or light grease to the bore at each end of the bearing housing.

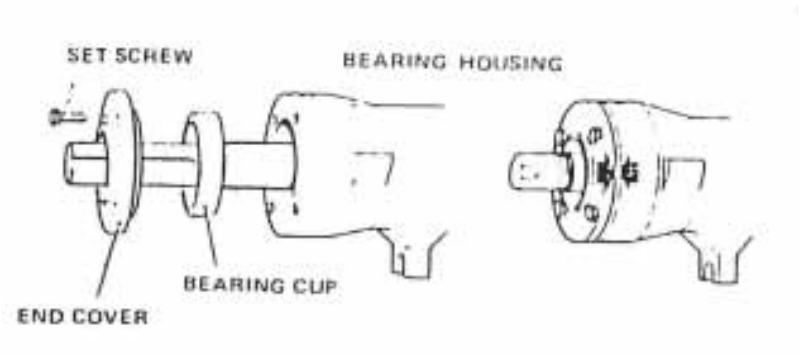


Support the bearing housing impeller end uppermost in a vertical position and carefully press or tap the bearing cup with the larger bore diameter facing inwards, into one end of the housing until the cup is slightly below the end face.

Fit end cover with the thickest shim to the housing and insert end cover set screws
Tighten the set screws evenly; the end cover will now push the bearing cup into the correct position.

Note: In the following instructions, the bearing housing may differ in appearance on different pump types. Assembly instructions remain identical.

Fitting shaft to Bearing Housing



1. Fit the shaft, impeller end first, into bearing housing.
2. Press or tap the second bearing cup into the housing.
3. Fit end cover to the housing without using shims, and insert end cover set screws.

4. Rotate the shaft slowly by hand whitst gradually tightening the set screws. Observe that a gap exists between the end cover and housing face when the screws become tight and the shaft begins to drag
   CAUTION: Do not overtighten set screws or damage may result.

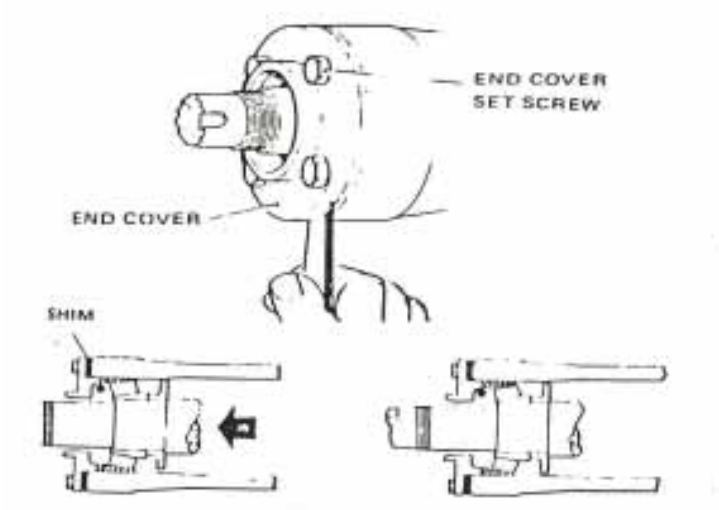
End Play Measurement

Remove end cover and end cover set screw from the keyway end of the shaft. Select shims form shim set having thickness equal to the average gap measured above, plus regular end play, see table below.

Fit shims, replace the end cover and insert end cover set screws leaving approximately 3 mm gap between the end cover and bearing housing.

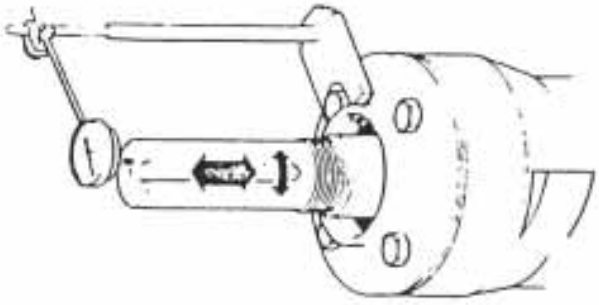
Press or gently tap shaft at impeller end until bearing cup at keyway end has moved back to the loosely fitted end cover. Care must be taken not to damage the thread on the shaft end.

Tighten set screws at keyway end evenly to move bearing cup into correct position, both bearing cups should now be hard against their respective end covers with the correct end play.



Checking End Play

Attach mounting bracket with dial gauge securely to housing by one of the end cover set screws and position dial gauge actuating pin against end of the shaft.



1. Rotate the shaft and push it hard backwards and forwards by hand several times to establish maximum and minimum dial readings, note the difference between the two readings i.e., the total movement.

2. Should the end play be outside the regular limits (see Table of Permissible End Play) shims must be added or removed as required from the keyway end.

    (a) If shims have to be removed, re-position the end cover and tighten end cover set screws after removal of shims.
    (b) If shims have to be added follow the procedure for fitting shims as described under 'End Play Measurement'

3. After re-adjustment of end play with shims, the actual end-play must again be measured with the dial gauge.

Lubrication

Work the recommended lubricant by hand into the bearing, while rotating the shaft. To ease this operation each end cover should be removed, in turn, then be end covers refitted.

Fitting Labyrinths, Piston Rings and Locknut

Smear piston rings with light grease and fit two rings to the grooves of each labyrinth, position the piston ring gaps diametrically opposite.

Smear the shaft adjacent to the end covers with light grease.

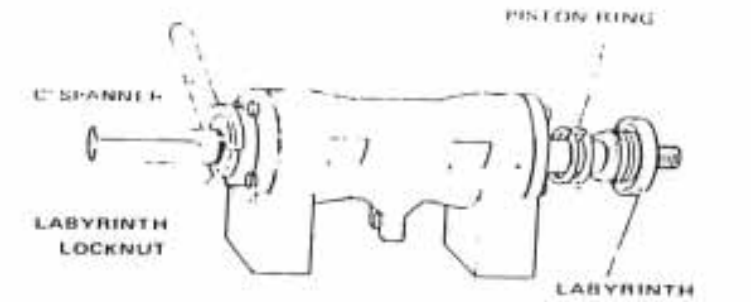
Slide one labyrinth over the shaft at each end and push into the end covers until the piston rings prevent further entry. Compress the piston rings with piston ring compressor, then push labyrinths fully into end covers. Fit labyrinth locknut and tighten with C-spanner.

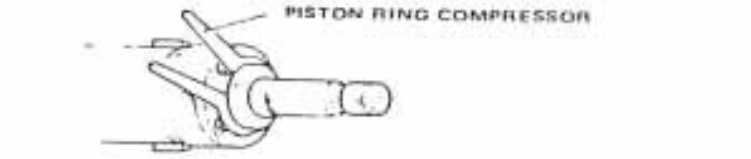
NOTE:

The labyrinth locknut is screwed on anti-clockwise when looking at the drive end.

Fit grease nipples.

The bearing assembly is now called 'Bearing Cartridge Assembly'





Assembly of Stuffing Box Components – Full Flow Gland

1. Place stuffing box flat on the bench, gland side upwards.
2. Drop lantern restrictor into bore to rest on the retaining lip, small diameter first.
3. Stand shaft sleeve on end through the lantern restrictor.
4. Fit packing rings until the chamber is full, stagger the packing ring joints and press each one firmly into place.
5. Assemble the two halves of the gland, insert gland clamp bolts and fully tighten.
6. Place the assembled gland over the shaft sleeve and push down to compress the packing rings.
7. Insert gland bolts and tighten the nuts sufficiently to hold the shaft sleeve.

Assembly of Stuffing Box – Low Flow Gland

1. Place the stuffing box flat on the bench, gland side upwards.
2. Fit the neck ring into the bore of the stuffing box to rest on the retaining lip.
3. Stand the shaft sleeve on end through the neck ring.
4. Insert one packing ring into the bore, follow this with a lantern ring and press firmly into place.
5. Fit packing rings into the bore, stagger the packing ring joints and press each one firmly into place.
6. Assemble the two halves of the gland, insert the gland clamp bolts and fully tighten. Fit the assembled gland loosely to the stuffing box with gland bolts.