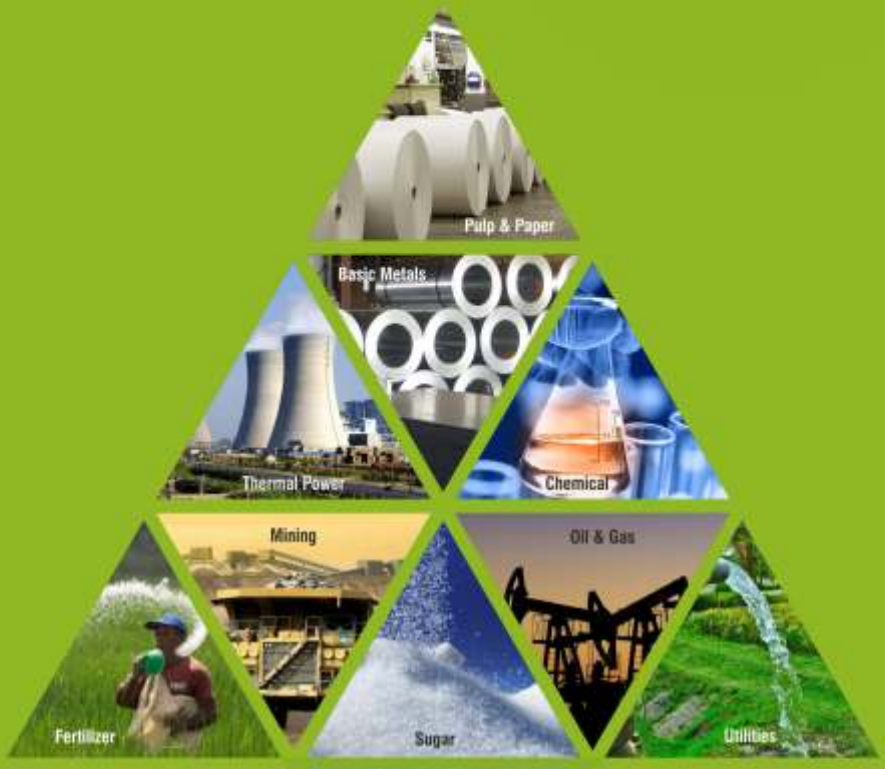


www.sampumps.com

TPS, TPS+C, SPS+T, SPS+T+C& TCC
OPERATION & MAINTENANCE MANUAL

SAM

Excellence Through Innovation

Upholding excellence in the pump industry...

IMPORTANT NOTES

TYPE : _____

ORDER REF : _____

PUMP TYPE : _____

SL NO : _____

CUSTOMER : _____

PROJECT : _____

SAM TURBO INDUSTRY PVT LTD

NEELAMBUR, COIMBATORE-641 062

WARRANTY

We warrant that the pump supplied by us is free 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 dispatch from our factory, whichever is earlier.

Our liability in respect of any complaint is limited to replacing part/parts free of charge ex-works or repairs of the defective part/parts only to the extent that such replacement/repairs are attributable 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 PVT LTD

CONTENTS

1. GENERAL

"TPS, TCC and SPS+T" pumps are Back Pull out Design which enables to remove the rotating unit of the pump for inspection and repairs, without disturbing the pipe connections.

(i) The complete range of "TPS, TCC and SPS+T" pumps are covered by 6 Power Series, thereby, reducing inventory and achieving maximum interchangeability of parts.

(ii) Pumps when properly installed and given proper care-in operation and maintenance should operate satisfactorily for a long period.

FORWARD AND GUARANTEE

Inspect the pump and accessories upon arrival for any damage or loss which may *have* been incurred during shipment. Report on damage or shortage immediately to the Sales Department of our Factory.

We are not liable for damage incurred through failure to observe the instructions for erection and operation. In this connection we refer to our General Terms of delivery for centrifugal pumps.

During the period of guarantee, repair work, and modification shall be carried out by our fitters only, or following our approval in writing, it may be done by you. If contrary to our Acknowledgment of Order, you wish to use the pump for a different service please ask for our acceptance. Otherwise, the guarantee given for this pump will not be valid.

2. STORAGE & PRESERVATION OF PUMPS

Protect the equipment upto 6 months in an indoor environment. The pump must be protected against damage, dust or any aggressive environment. Pumps stored for period exceeding one year should be serviced every 12 months. They should be disassembled, cleaned and the whole preservation process described below should be repeated.

- All inlet connections in the pump should be closed.
- Suction and discharge flanges should be covered to prevent the entry any kind of foreign material.
- The surfaces to be preserved should be covered with the preservatives suitable for the storing environment.
- Mechanical seals should be cleaned by compressed air. No other liquid of material should be applied to the min order to prevent damage to the secondary sealings and too-ring/gaskets.
- Oil in the bearing bed should be drained.
- Pumps waiting for the installation or startup should be turned manually every 15 days. If it is difficult to move the shaft by hand, use a suitable spanner, by protecting the surface of the shaft at the point of operation.

3. DESCRIPTION OF PUMP

Pump Name plate / Ordering Spare Parts / Spare Parts List

Every 'SAM' pump has a name plate giving following details:
Pump type
Serial Number / Year
Duty conditions (Head, Capacity)
Motor details etc., (KW & RPM)

While you correspond with us for your requirements of spare parts or for any technical information, please always quote the above details in your letter.

Constructional Features

SAM's TPS, SPS+T & TCC are single volute casing pumps with end suction and top centre line discharge. Especially TPS & SPS+T pumps are suited for handling paper stocks, pulps, upto 7% consistency. The wide passages in the Suction Zone of the impeller with less number of vanes and non-clogging design helps to handle stocks easily. Overall dimensions are as per DIN 24256.

The Back-Pull-Out design permits dismantling of the complete bearing unit without disturbing the piping connections and drive. The pumps are available for capacity range up to 550 M^3/Hr, for differential head up to 100 Meters and temperature up to 160°C.

Bearings are grease and oil lubricated.

Direction of Rotation : Clockwise, pump viewed from driven end.

4. ERECTING THE PUMP

Assembling the set on the Base plate:

If the assembly of the pump with the driver on a common base plate is done in our works, the whole set will be carefully mounted and aligned. It is necessary to check once more the alignment of the coupling before putting the pump into operation.

The eye bolts which may be fitted to the driver must never be used to lift the complete set as they are meant to carry the weight of the driver only.

If you furnish the driver yourselves, the clearance between the motor and pump coupling halves as shown on the arrangement drawing must be strictly observed.

Difference in level between the shaft centre lines of pump and driver must be equalized by suitable packing (plane parallel Shims). When the pump and motor holding-down bolts are finally secured, care must be taken to avoid distortion.

Leveling the Base plate, aligning the Coupling:

To check whether pump and motor shafts are in perfect alignment, proceed as follows:

Level accurately the base plate which carries the complete set with the aid of a spirit level. Place metallic packing between the base plate and foundation close to the foundation bolt holes. To prevent sagging of the base plate, place metallic packing if required - also between the foundation bolt holes. After leveling' the base plate fill up the foundation bolt holes-with the bolts

inserted with a quick setting cement compound. After the grout has set, tighten the nuts crosswise and check once again the alignment with a spirit level.

After leveling the pump set, measure the axial clearance between the two coupling halves. Axial clearance between two corresponding points should remain same when both couplings are turned through an angle. Maximum permissible tolerance is 0.05 mm.

The radial alignment is achieved by dial gauge the permissible tolerance being 0.05mm provided that the type of coupling is such as to allow this check figure 1 (a). Otherwise a coupling aligner must be used, permissible tolerance 0.05 mm figure 1 (b).

At every check take care that the axial float of the rotor is taken into account, i.e when measuring the rotor and the driver shaft must always be brought to bear in the same direction.

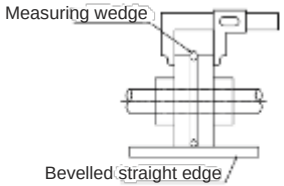


FIG 1(a)

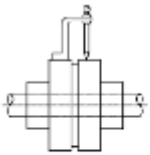


FIG 1(b)

Grouting the Base plate :

Grout base plate fully with concrete through the grouting holes provided for this purpose, leaving no cavities. After the grout has set, recheck the alignment of the coupling.

5. LAYING & CONNECTING PIPES

GENERAL

After grouting the base plate, the pipe may be connected. The diameters of the piping are not determined by those of the pump discharge and suction branches.

On short delivery runs the diameter should be such that the pipe resistance constitutes but a small portion of 'the delivery head for long pipe runs the most economic pipe diameter must be assessed in each particular case.

The flow velocity in the suction piping should be 1.5 to 2.5 metres/sec., for normal cases, but should not exceed 3 metres/sec.

Unfavourably installed pipe runs, especially on the suction side (i.e. bends in various planes immediately before the suction branch) can affect performance of the pump.

As the pump branches should not absorb pipe forces and moments, the pump must not be used as a locating point of the pipework.

Once the flange bolts have been loosened, the flanges must not yield more than the amount corresponding to the gasket thickness, nor must they be out of the parallel nor near against each other under stress. See that the flange gaskets do not extend into the bore of the piping. Clean carefully all pipe parts, valves and fittings, and pump branches prior to assembly.

ATTENTION : After connecting up the piping, the coupling alignment must be rechecked. It must be possible to turn the rotor easily by hand. In case of inadequate alignment, bearings, coupling, shaft seal, and impeller wear ring may get damaged prematurely. In accordance with safety prescriptions the coupling must be protected with a guard against contact.

Suction and Feed Line:

To prevent collection of gas the suction line must be horizontal or rise continuously all the way to the pump.

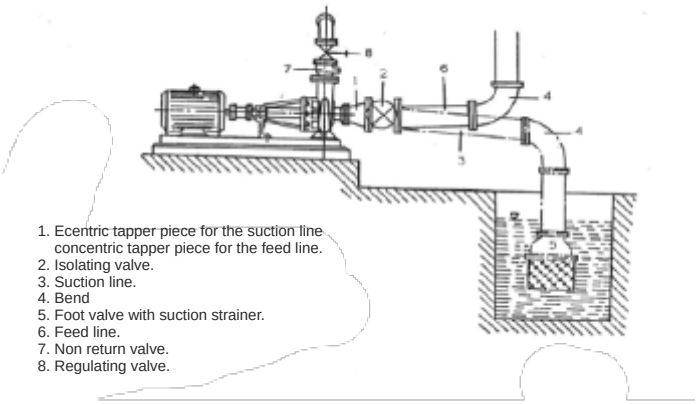
The feed Line, however, must be horizontal or shown a gradual slope towards the pump.

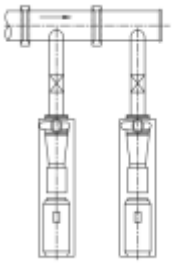
The suction line must be completely airtight and laid so that it can be properly vented. If tapers are required, eccentric ones must be used.

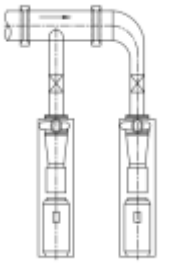
The inlet bore of the suction pipe should be set as deeply as possible below liquid level and be provided with a foot valve fitted with a suction strainer. The foot valve must, however, be far enough away from the bottom to avoid inlet losses becoming too great and thereby lowering the performance.

The isolating valves in the suction or feed line must remain fully open during the operation and must never be used for regulating.

Valve should be mounted with the spindle in the horizontal or in the vertical downward position to avoid air pockets forming in the spindle cap. To avoid ingress of air, it is advisable to use isolating valves with sealing water connection or with a water seal.


1. Ecentric tapper piece for the suction line
concentric tapper piece for the feed line.
2. Isolating valve.
3. Suction line.
4. Bend
5. Foot valve with suction strainer.
6. Feed line.
7. Non return valve.
8. Regulating valve.


NOT GOOD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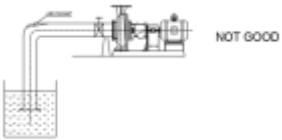
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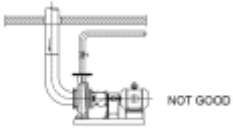
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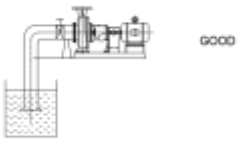
GOOD

FIG.2

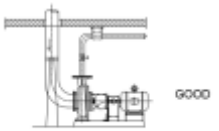
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FIG.4

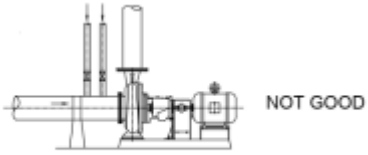


FIG.3

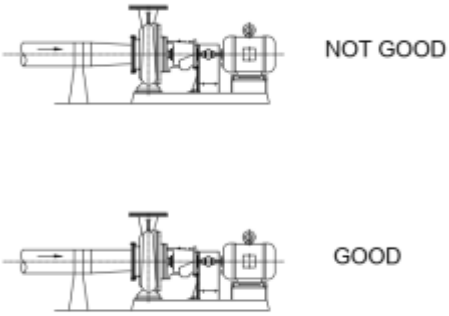


FIG.5

Cleaning the piping and Suction Pit

After the piping has been installed, it should be cleaned and emptied of welding waste, welding rod ends and other foreign material. Likewise, the suction pit should be thoroughly cleaned of all loose rubbish.

Delivery Line :

Install gate valve or an output control valve in the delivery line as close to the pump branch as possible. it is recommended to install a non return valve between pump branch and regulating valve (figure 2), thus protecting the pump against reverse rotation and further more the pump and the foot valve against water-hammer which may occur in case of sudden shut-down. Pressure Gauge to be fitted in between volute casing delivery flange and NRV / valve.

Sealing Liquid Lines :

For the sealing liquid line connection(s) please refer to the arrangement drawing. The service data (like pressure, flow rates etc) for external sealing are stated in our General Arrangement Drawing / Mechanical Seal Drawing.

If only a sealing liquid inlet is provided for, a regulating valve should be installed in the inlet line. If an inlet and outlet line (discharges into the open air) is provided for, the regulating valve is to be fitted in the outlet line.

Cooling Water Lines :

For the cooling water line connection please see the arrangement drawing. Connect the cooling water lines so that the inlet is at the lower connection. Thus ensuring that the cooling chamber is vented and completely filled.

Stuffing box cooling :

If a liquid being pumped evaporates at the pumping temperature, then the stuffing box should be cooled. This prevents the packing from running dry due to the evaporation of the liquid handled. The regulation valve, which should be placed in the outlet line, is to be set in such a manner that the heating up of the cooling water does not exceed 15°C.

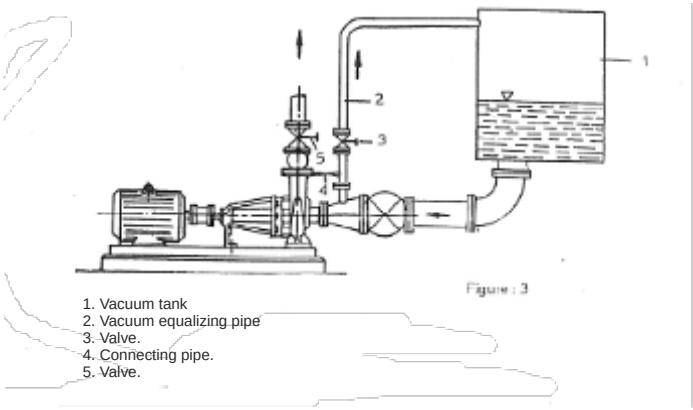


Figure : 3

1. Vacuum tank
2. Vacuum equalizing pipe
3. Valve.
4. Connecting pipe.
5. Valve.

Vacuum Equalizing Pipe (and Sealing Liquid Pipe):

If the pump draws from a system under vacuum, an equalizing pipe must be connected from the highest point of the suction line, however, as close to the suction branch as possible, to the top of the feed tank to keep gas bubbles that might have been entrained in the flow from entering the pump (figure 3).

The line should be fitted with an isolating valve which should be closed only for maintenance work on the pump set.

Apply sealing liquid (external sealing) to the shaft seal to prevent entry of air.

6. LUBRICATION

Grease specifications

The grease-lubricated bearings have been lubricated before shipment. For these bearings following roller bearing greases are recommended which are available in the market.

Name of the firm	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

Bearing Unit	Bearings 2 x (pcs)	Speed (rpm)	Lubr.interval (oper.hrs)	Qty of grease for re-lubr. of each bearing	
				(g)	(oz)
15	30308	1500/1800 3000/3600	1500 700	10	0.35
18	30310	1500/1800 3000	1200 500	15	0.55
22	30312	1500/1800 3000	1100 400	20	0.70
30	32214	1000/1200 1500/1800	1500 900	20	0.70
45	32216	1000/1200 1500/1800	1400 800	25	0.90
60	32220	1000/1200 1500/1800	1100 600	40	1.4

Table - 1

- The lubrication intervals in Table 1 apply if the temperature is below 70°C (158°F).

- Each temperature rise of 15°C (59°F) will reduce the lubrication interval to a half

Oil lubrication

The bearing housing has been emptied of oil prior to shipment and must be refilled before starting.

Pour oil in the bearing housing half way up the sight glass. Also fill the plastic domed cap of the constant level oiler and put it in place.

During operation, the oil level may slightly fall. Refilling during operation should always be done through the cap hole of the constant level oiler. In the plastic cap there must always be oil.

When the pump is put into operation after prolonged shut-down, flush bearings and bearing housing with petrol or benzol in order to remove impurities, during the flushing procedure rotate the shaft slowly.

FIRM	Lubricating oil for temperature up to 80°C	
	Speed up to 1500 rpm	Speed over 1500 rpm
Indian Oil	Servo system 150	Servo system 68
Hindustan Petroleum	ESSTIC 55, TERRESSO 56	ESSTIC 50, TERRESSO 52
Mobil	MOBIL VACTRA Oil Heavy MOBIL D.T.E Oil Heavy Vac HLP 49	MOBIL VICTRA Oil Heavy Medium MOBIL D.T.E Oil Heavy Medium Vac HLP 36
Shell	Shell Vitrea Oil 33, Shell Oil 33	Shell Vitrea Oil 31, Shell Tellus Oil 29

Oil Change

It is recommended that for a new pump the oil should be changed after 100 hours of operation for the first time and thereafter at intervals of 6-12 months. Add oil when necessary.

Oil volume of the Bearing Housing:

Bearing Unit	Amount of oil in litres
15	0.5
18	0.9
22	1.0

Bearing Unit	Amount of oil in litres
30	1.7
45	2.5
60	3.3

Table - 2

TO INSTALL A CONSTANT LEVEL OILER AS BELOW:

1. Unscrew upper screw sub assembly from lower sub assembly. (Refer Fig.1)

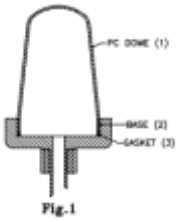


Fig.1

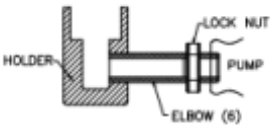


Fig.2

2. Fix lower sub assembly (elbow type) on pump. Please note Pump has two tappings. One tapping is for CLO and other is a drain, which is at a lower height.

Fig.3

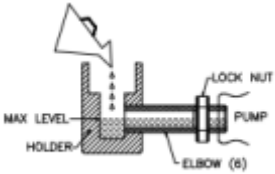


Fig.4

3. Once lower sub assembly is fixed, tighten locknut to ensure that CLO is 90° with respect to ground.

5. Once initial oil level is maintained in pump, take upper sub assembly, reverse, it and put it oil in dome through the hole by using a suitable funnel (3/4th full) DO NOT UNSCREW DOME from the sub assembly to fill oil. (Ref.Fig.5)

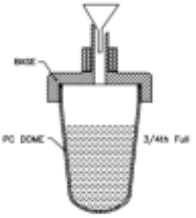
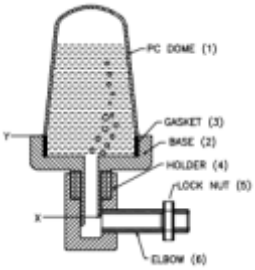
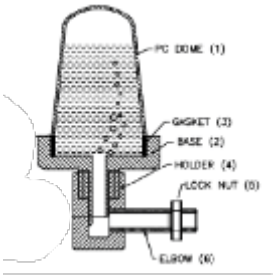


Fig.5



6. Once oil is filled dome, reverse and screw it on the lower sub assembly. DO NOT OVERTIGHTEN. Some bubbling will take place, This is O.K., bubbling will stop once oil has reached its level. I=i.e.X (Ref.Fig.6)

7. Once bubbling has stopped the pump should be started. CLO will automatically maintain oil level in pump. Refill oil whenever oil level in the dome goes below level Y ref.Step-1,5,6.



Note: 1-In case of pump is already full of oil before installing CLO, it is recommended to check oil level in sump as per step 4.
In case there is excess oil, drain it out and bring it to half the elbow overfilling oil will cause oil to overflow from above the holder resulting in oil leakage.

Note-2: keep vent hole of breather in pump clean, if it is chocked it will cause leakage from oil cup.

7. STARTING AND STOPPING

General

When pumping from a tank, the liquid level must always be well above the inlet opening.

The parameter as indicated on the pump nameplate must not be exceeded while operating.

The stuffing box must always drip slightly to remove friction heat from the sealing faces. If the leakage intensifies and does not decrease when the gland is tightened evenly, the packing must be renewed (see sub section 6.3.1). Also take care that the surface of the shaft sleeve is still perfectly smooth. Otherwise change shaft sleeve.

If a pump shaft is equipped with a mechanical seal, practically no attention is required. During the running-in period occasional slight leakage may occur (See sub-section 6.4).

When handling hot liquids (pump design 'With stuffing box cooling') pay attention to the flow of the cooling water for the shaft seal and the oil bath cooling, if any. The cooling water flow should be adjusted so that the heating of the cooling water does not exceed 15°C.

Sudden changes in temperature of the liquid handled from cold to hot or vice versa should be avoided.

All pumps are equipped with a constant level oiler (see sub-section 6.2), merely check that there is oil in its container and bearing housing.

The shaft must run freely, it must be possible to turn it by hand.The bearing temperature must not exceed 80°C.

Starting - up:

The isolating valve in the feed line (and, if there is any, the valve in the vacuum Equalizing pipe) should be fully open. The regulating valve in the delivery line, however, should be closed, or in the case of automatic operation, the full back pressure should be on the non-return valve.

Make sure that there is a flow in the pipes supplying the external sealing liquid, the cooling water for the shaft seal and, if required, the cooling water for the oil bath. Do not switch on motor until then.

If the delivery pressure does not rise continuously as speed increases, stop the set and prime once more carefully.

Once the pump has run up to working speed, open the regulating valve in the delivery line slowly until the required service data are reached.

Prolonged operating against closed regulating valve in the delivery line may lead to destruction of the internal pump parts and must therefore be avoided.

An alteration of the service data which might become necessary may be effected only with the aid of regulating valve in the delivery line.

When starting up automatically operated plants, all isolating *valves,* hence the delivery gate valve too, must be kept open.

Stopping:

If there is no back flow preventer (non-return flap, non-return valve, etc) close the regulating valve in the delivery line. Do not switch off motor until then.

Close isolating valve in the feed line only if necessary.

Once the pump has completely cooled down, shut off the external sealing and cooling Water supply. If pump draws from a vacuum tank, close vacuum equalizing pipe. However, do not shut off the sealing liquid supply.

If a vacuum gauge without relief valve. is attached to the suction branch of the pump, then it must be isolated before stopping the pump set.

If as a result of prolonged shut-down a change in the concentration of the liquid, crystallization, or solidification etc., can be anticipated, drain pump and, if necessary, flush with a suitable liquid.

If there is danger freezing up during prolonged shut-down periods (e.g. where the pump set is located in the open) the pump including the cooling chamber, heating chamber, etc., must be drained.

Re-Starting:

Before-starting the set, take care that the pump shaft is at rest and does not rotate backwards. Starting with the shaft rotating in opposite direction may lead to shaft damage.

8. SUPERVISION AND MAINTENANCE

Re-packing

When a new pump is being put into service or the stuffing box has just been re-packed, watch the packing performance more closely than normal. For the checking, shut off the cooling water to the gland (if applicable).

During the first hours, the stuffing box is allowed to leak quite a good deal, about 100 drops a minute. If the leakage decreases, slacken the packing gland. If you want to reduce the leakage, tighten the packing stepwise at intervals of about 10 minutes and continue until the packing performance is satisfactory. A small leakage of single drops should be allowed from the stuffing box for ascertainment of lubrication and of the correct packing tightness. A suitable leakage is 60-90 drops a minute. If the packing cannot be made to seal without intense tightening, it is best to re-pack. When re-packing removes all the old packing rings and clean the stuffing box thoroughly. At the same time check to see that the water channels are clear and the shaft is free of warpage and score marks.

When selecting the packing type, observe the quality and temperature of the liquid being pumped and the shaft sleeve material.

Carefully form the packing into the right ring shape over the shaft sleeve. First insert the cut ends into the stuffing box and then push the whole ring to the bottom of the stuffing box. Put the rings one by one in the stuffing box, with the cut ends spaced 90 degrees apart.

Sealing :

The required sealing liquid pressure in the case of external sealing depends on the pump type and the service conditions since no general stipulations can be made please ask us about the required pressure, unless it is stated in our acknowledgment of order, please quote also the service data, such as capacity, head, nature of liquid etc.,

Sealing of the stuffing box with the liquid handled (self sealing) or with a liquid from an outside source (external sealing) which suits the particular service conditions, and thus the use of a lantern ring is necessary in the following cases.

a) For suction lift duties and suction heads of up to 0.5 Kg/cm^2 or for liquids drawn from vacuum tanks (with self-sealing or external sealing, depending on the service conditions).

b) For liquids with temperatures near boiling point (with external sealing or self sealing, depending on the service conditions).

c) For handling explosive, poisonous or evil smelling liquids (external sealing imperative).

d) For handling abrasive liquids or liquids which tend to crystallize (external sealing imperative).

In all other cases the lantern ring is unnecessary. It is then replaced by two packing rings. When packing, see that the lantern ring (46.10) is located underneath the sealing liquid hole (figure 3) When square section packing rings are used, it is essential to install first two packing rings and only then the lantern ring (2-L-2).

By drilling an additional hole into the casing cover, an inside self-sealing system of the stuffing box is achieved. As a rule, this design is used on suction lift duties (the liquid handled must be clean).

FRAME	15/18	22	30	45	60
Capacity M^3/Hr	0.4	0.4	0.4	0.5	0.6
Pressure Kg/Cm^2	0.35	Stuffing Box Pressure (30% of the pump delivery pressure) + 1 Kg/Cm^2			

Stuffing box cooling :

If a liquid being pumped evaporates at the pumping temperature, then the stuffing box should be cooled. This prevents the packing from running dry due to the evaporation of the liquid handled.

For location of the cooling water connections, see arrangement drg.

The regulation valve, which should be placed in the outlet line, is to beset in such a manner that the heating up of the cooling water does not exceed 15°C.

TEMP	FRAME - CAPACITY IN M^3/Hr				
	15/18	22	30	45	60
110°	0.3	0.34	0.5	0.7	1.0
150°	0.3	0.36	0.5	0.7	1.0
200°	0.35	0.4	0.55	0.75	1.1
250°	0.4	0.42	0.6	0.8	1.2

Mechanical Seal :

Concerning the pumps fitted with a mechanical seal, we refer the special instructions for installation, provided by seal manufacturers.

The life of a mechanical seal depends on various factors such as cleanliness of the liquid handled, its lubricating properties etc., Due to diversity of operating conditions it is, however, not possible to give definite indications as to its life. As dry running of a mechanical seal, even for a few seconds, must be avoided, never operate the pump without liquid.

When renewing or changing the mechanical seal, check pump shaft for true running and take care that the shaft sleeve surface is in perfect condition in the area of the mechanical seal.

For more particulars please see the instructions for installation and maintenance of mechanical seals given by the concerned seal manufacturers.

If the shaft seal is to be converted from packing to mechanical seal at a later date, this is feasible for a fair number of standard mechanical seals without re-machining the stuffing box chamber.

Shaft sleeve and the gland (suitable to the seal to be installed by you) along are to replaced. These can ordered with us as extra components, giving complete details about the mechanical seal you propose to install.

Flushing of the Mechanical Seal :

Evaporation of the liquid between the rotary seal faces, hence the risk of dry-running must in all cases be avoided. Therefore we recommend flushing of the seal; this is

indispensable when the temperature of the liquid handled is in the vicinity of the boiling point.

If abrasive particles can get to the seal faces, flushing must also be provided. The smaller the particles the easier it is for them to get lodged between the contact faces. This will destroy the faces and lead to breakdown of the seal.

The flushing is achieved by means of circulating line (Self-flushing) or through an external flushing system (external flushing). To regulate the flushing liquid a throttling element (e.g. a flow controller) can be installed in the circulating line.

The required pressure of the external flushing liquid depends on the type of pump and service conditions.

Size of O-Rings				Packing ring and length (mm)
Bearing unit	O-ring (42.3) for bearing cover	O-ring (42.5) for deflector	O-ring for (42.6) for dismantling sleeve	
15	ID125 x ⌀3	ID30 x ⌀3	ID38 x ⌀4	ID45xOD65x10 sq
18	ID145 x ⌀3	ID39 x ⌀3	ID49 x ⌀3	ID50xOD70x10 sq
22	ID170 x ⌀6	ID50 x⌀5	ID60 x ⌀3	ID63xOD88x12.5 sq
30	ID162 x ⌀5	ID58 x ⌀6	ID70 x ⌀3	ID70xOD95x12.5 sq
45	ID180 x⌀6	ID70 x ⌀6	ID80 x ⌀3	ID85 x OD117 x 16 sq
60	ID221 x⌀6	ID85 x ⌀6	ID99 x ⌀3	ID100 x OD132 x 16 sq

O-ring (42.4) for wear plate : Material: Neoprene Rubber

Diameter of suction opening	Size of O-ring
150	ID160 x 6
200	ID 210 x 6
250	ID 262 x 5
300	ID 260 x 6
350	ID 339.3 x 6
400	ID 360 x 6

Table 6

BEARING FRAME	BEARING	OIL SEAL SIZE		CIRCLIP SIZE	LOCK NUT	LOCK WASHER
	DE & NDE	DE	NDE			
15	30308 – 2 Nos	ID35 X OD50 X 7 – 1 No	ID40 X OD52 X 7 – 1 No	LIGHT A 40	KM 8	MB 8
18	30310 – 2 Nos	ID45 X OD62 X 8 – 1 No	ID50 X OD65 X 8 – 1 No	LIGHT A 50	KM 10	MB 10
22	30312 – 2 Nos	ID55 X OD72 X 8 – 1 No	ID60 X OD80 X 8 – 1 NO	LIGHT A 60	KM 12	MB 12
30	32214 – 2 Nos	ID65 X OD90 X 10 – 1 NO	ID70 X OD90 X 10 – 1 No	LIGHT A 70	KM 14	MB 14
45	32216 – 2 Nos	ID75 X OD100 X 10 – 1 NO	ID80 X OD100 X 10 – 1 NO	LIGHT A 80	KM 16	MB 16
60	32220 – 2 Nos	ID90 X OD120 X 12 – 1 NO	ID100 XOD120 X 12 – 1 NO	LIGHT A 100	KM 20	MB 20

BEARING FRAME	TPS	TCC	SPS+T
15	-	40/200	32/200, 50/200
18	-	50/260, 65/260	40/260, 65/260, 80/260
22	100/260, 80/320, 100/320, 100/400, 125/400	100/320, 100/400, 125/260, 125/320, 125/400	100/260, 125/260, 40/330, 65/330, 80/330, 100/330, 125/330, 150/300, 100/400, 125/400
30	150/320, 200/320, 250/320, 300/320, 150/400, 200/400, 100/500, 150/500	150/320, 150/400	-
45	250/400, 200/500	-	-
60	300/400, 250/500, 350/500, 350/600	-	200/530+C

9. DISMANTLING AND ASSEMBLING

Preparations

Make sure that the motor cannot be started.

Close the suction and discharge valves, open the bottom tap of the casing.

Disconnect the seal water and cooling water pipes.

Detach the coupling guard.

Remove the spacer of the coupling (spacer coupling).

Detaching the Exchange Unit

Loosen the screws fixing the stuffing box cover to the casing.

Support the exchange unit underneath the bearing housing or with hoist.

Remove the screws fixing the support foot from the base plate

Pull the exchange unit out by means of the detaching screws of the stuffing box cover.

Installing the exchange Unit into Casing

Clean the casing (11.4) and inspect the seal surfaces and gasket (41.2).

Inspect the casing wear ring (51.4) or wear plate (14.7) replace if necessary.

Install the new exchange unit into the casing.

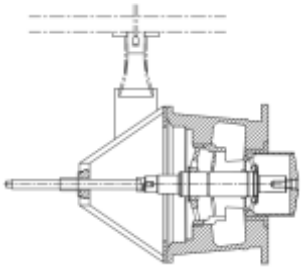
Take the support foot (19.5) and coupling flange (if needed) from the old exchange unit into the new one.

Adjust for correct distance (0.5mm=0.020 in) between impeller and wear plate by moving the rotor assembly.

To adjust the gap between the impeller and wear plate move the impeller until it contacts the wear plate and then move the rotor assembly back as long as required (0.5mm=0.020 in). Make the adjustment by loosening the fixing screws of

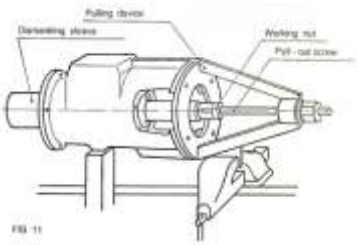
the bearing housing covers by tightening the screws of the opposite cover.

If your pump has a mechanical seal, do not move the rotor assembly, but the manufacturer should be consulted for advise to adjust the gap.



Dismantling the bearing Housing

Stage 1



-vise
-puller
-dismantling sleeve
-working nut
-wrenches
-hex screw M12x70 (4 pcs) (fully threaded)
-hex nut M12

Remove the screws fixing the bearing covers and detach the coupling end cover (37.3) by levering at the heads of the pull - out screws.

Place the puller, at its fixing point, in the vise as shown in Fig: 11; tighten firmly.

Fix the bearing cover with 4 Nos of M12 x 70 hex screws and nuts to the puller and screw the working nut and pull-out screw in place. If necessary, support the bearing housing to the floor.

Fix the dismantling sleeve, with the screw provided, to the drive end of the shaft. Center the sleeve with the outer ring of the bearing and tighten reasonably.

Pull the shaft (22.3), with the bearings, out of the housing by means of the pull-out nut. The bearing cover (37.2) will come along.

Unscrew the working nut from the shaft and detach the bearing housing from the puller while supporting the shaft.

Pull the shaft out of the bearing housing and remove the dismantling sleeve.

Stage 2

Fix the shaft assembly in the vise. Remove the locknut 93.5,lockwasher 94.3 and Oil flinger 56.3.

Place the two-pronged extractor on the shaft as shown in fig.12 pull the bearing (33.2) out. Remove the loosened parts from the shaft.

Tools:

-vise
-two-pronged extractor
-hooked wrench
-working ring
-hammer
-punch (2 pcs)
-external snap ring pliers

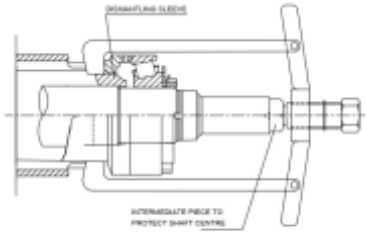


FIG.12

Give the Grease Retainer (56.3) a couple of smart strokes with punch. (fig:13) Detach the circlip (94.4) with suitable pliers and remove the Grease Retainer (56.3) from the shaft. Use a punch, or preferably a pipe punch, to hammer the roller ring out from the shaft with the aid of the working ring (fig: 13). Clean and inspect all parts; replace if necessary.

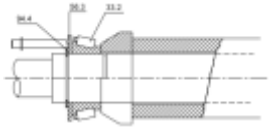


FIG.13

Assembling the Bearing Housing

Tools:
- vise
- working ring
- external snap
- ring pliers
- hammer
- punch

Stage 1

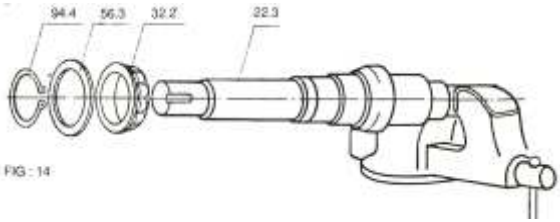


FIG : 14

1. Place the shaft (22.3) in the vise as shown in fig: 14
2. Place the working ring around the greatest diameter of the shaft.
3. Pre-heat the roller ring of the bearing (33.2) in oil bath to 100-11 O°C (212-230°F)
4. Push the bearing inner race on the shaft against the shoulder.
5. Place the Grease Retainer (56.3) and circlip (94.4) on the shaft. Use circlip pliers.
6. Hammer the parts against the circlip with the aid of the working ring and punch.
7. Place the shaft, partly carried into bearings during Stage 1, in the vise as shown in fig : 16

DO THE STEPS 4-6 AT A GOOD SPEED BECAUSE THE ROLLER RING, WHEN COOLING DOWN, WILL RAPIDLY SHRINK ON THE SHAFT.

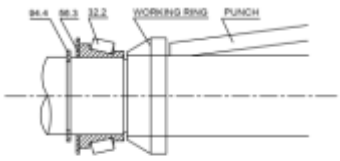
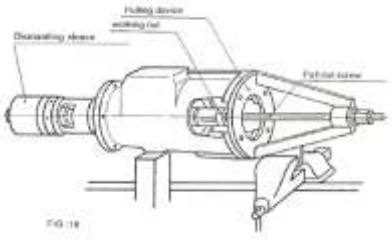


FIG.15

Stage 3



Tools

-vise
-puller
-dismantling sleeve
-working nut
-wrenches
-grease squirt
-hex screw M12x70 (4 pcs)
-hex nut M12 (4 pcs)

8. Place the puller, at its tightening point, in the vise as shown in fig : 18 Tighten firmly.
9. Fix the bearing housing (34.2) with 4 hex. screws (M12x70) and nuts to the puller. Support the bearing housing to the floor.
10. Screw the nut of the pull-out bolt almost up to the screw end so that the screw comes through the puller opening.
11. Fix the dismantling sleeve, with the screw provided, to the drive end of the shaft (22.3) Center the sleeve with the outer ring of the bearing tighten reasonably.
12. Push the shaft unit into the bearing housing (34.2) and screw the working nut into the shaft end thread.
13. Tighten the pull-out nut and check to be sure that the shaft is straight when the pulling starts.
14. Pull the shaft unit into the bearing housing. When the first bearing has passed through, tighten the nut again and check for alignment. Pull the shaft unit until the outer ring of the front bearing and that of the hindermost bearing are at the same distance form the bearing housing.

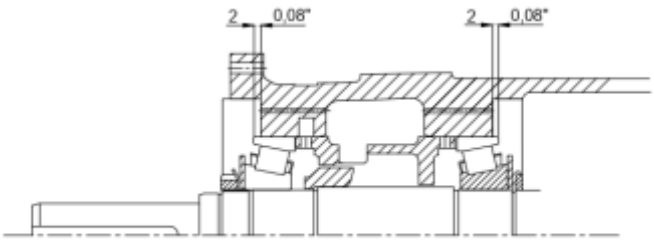
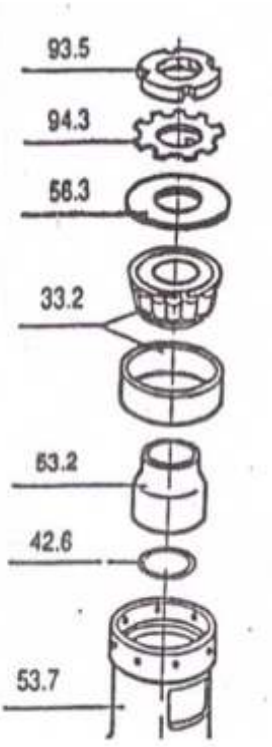


FIG.19

15. Detach the working nut form the shaft and the bearing housing form the puller; remove the dismantling sleeve.
16. Lubricate the bearings with grease squirt (if grease lubricated bearings are concerned); fill about 2/3 of the space around the bearings.
17. Install the bearing covers (37.2, 37.3) being careful not to damage o-rings and oil seals (43.3, 43.13). In case of oil lubrication, the bearing covers have labyrinth rings; place their oil filling holes downwards.

TPS PUMPS – BEARING ASSEMBLY & CLEARANCE DETAILS



1. Put the outer ring of the bearing (33.2) in place on the roller ring and the support sleeve (53.7) on the outer ring with the larger opening upwards.
2. Lightly grease the o-ring (42.6) with Vaseline and put it in the groove on the shaft.
   Press the dismantling sleeve (53.2) in place on the o-ring - against the shoulder on the shaft.
3. Put the outer race of the bearing on the support sleeve (53.7)
4. Pre-heat the inner race in oil bath to 100-110°C (212-230°F)
5. Push the roller ring on the shaft against the shoulder.
6. Place the Grease Retainer (56.3) and lockwasher (94.3) on the shaft and screw the locknut (93.5) into the thread on the shaft
7. Place 0.2 mm to 0.3mm thickness Shims in between outer race face of the bearing and support sleeve (53.7).
8. Tighten the bearings with the bearing locknut (93.5) until no clearance is present, couple of strokes with punch on the lock nut (93.5) face will make tightening easier.
9. While tightened the bearing unit should be rolled for several times.
10. Once clearance cannot be felt anymore (rolls stiffyly), remove the shims and bend the claw of the lock washer (94.3) into the nut (93.5) slot.

ASSEMBLING THE EXCHANGE UNIT

Put the deflector (51.9) and shaft sleeve (53.6) on the shaft. Note O-ring (42.5) between the shaft sleeve and deflector.

Put the gland (46.4) and lantern ring (46.10) on the shaft and check to see that the neck bush is in place at the casing cover. Be careful not to damage the surfaces of the shaft and shaft sleeve. If your pump has a mechanical seal, follow the special instructions by the seal manufacturer for seal assembly.

Impeller fixing and locking on TPS, SPS+T & TCC Pumps

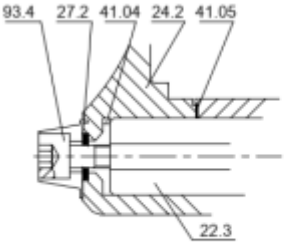


FIG.20(a)

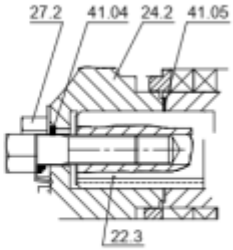
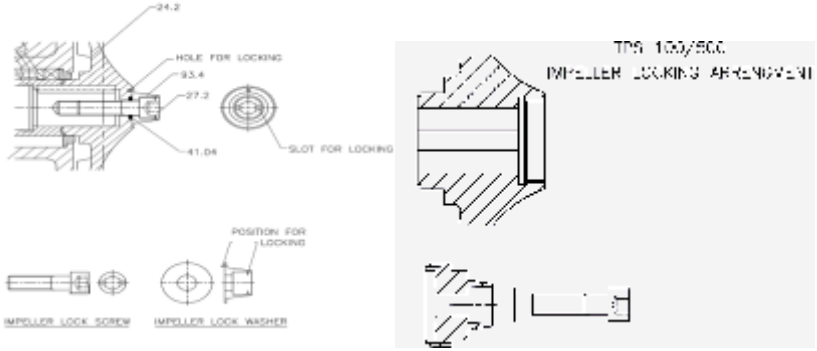


FIG.20(b)

Before Locking

After Locking



Step-I

Fix the impeller (24.2) on the shaft. put the gasket (3.5mm) (41.04) on the step provided. put the impeller lock screw (27.2) & impeller lock washer in place with the fixing claw in the slot provided.

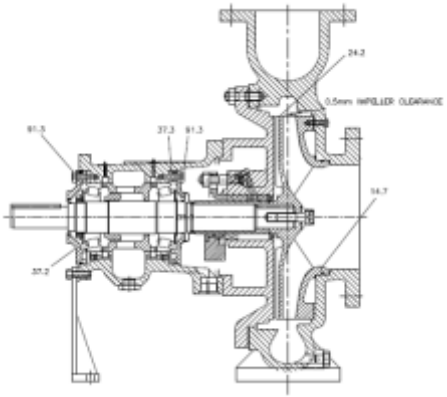
Step-II

Secure the screw (27.2) by hammering the edge of the lock washer (93.4) at two points into the slot provided in the lock screw head (27.2) the edge should cut in the slot.

Step-III

The lock screw (27.2) secured by hammering the lock washer shoulder into the hole provided in the impeller (24.2)

TELESCOPIC ARRANGEMENT



Impeller Clearance

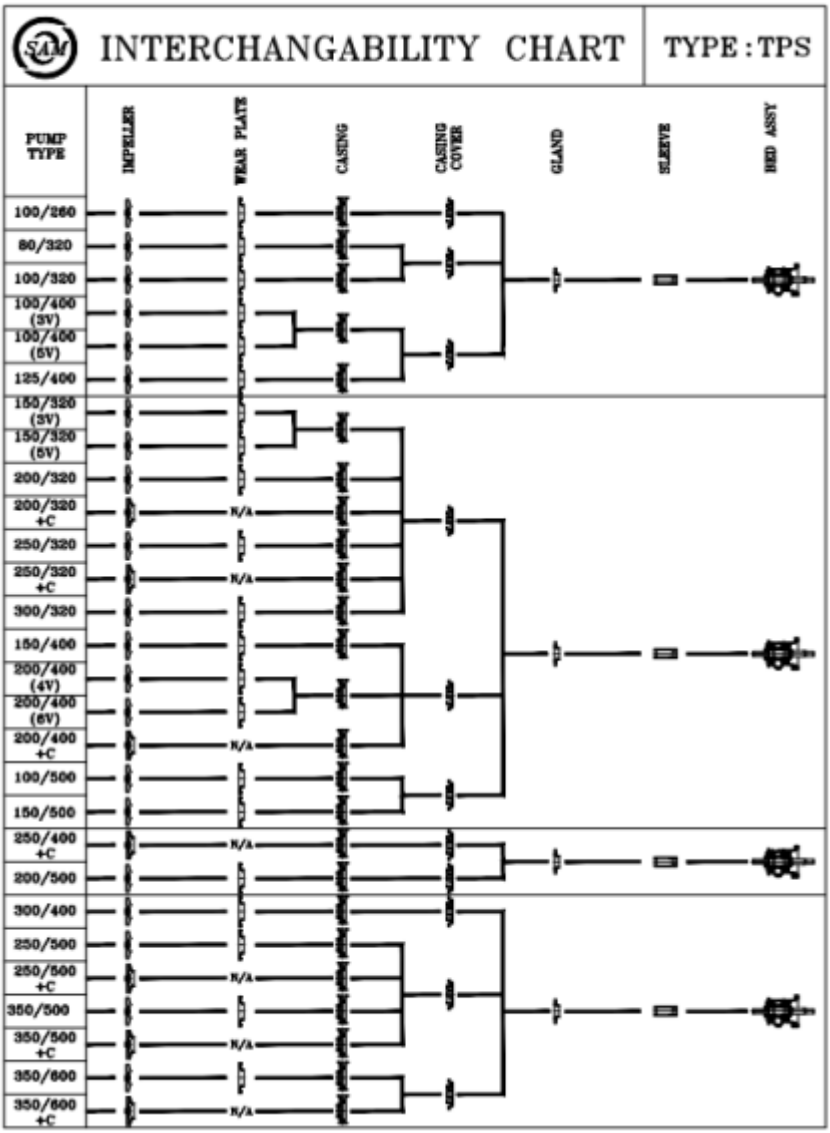
The impeller clearance is an important factor in maintaining optimum pump. performance, nominal clearance is 0.5 mm, the actual clearance is dependent on the specific operating conditions, taking into account temperature, solids etc. for maximum service flexibility pumps are shipped from the factory 0.5mm.

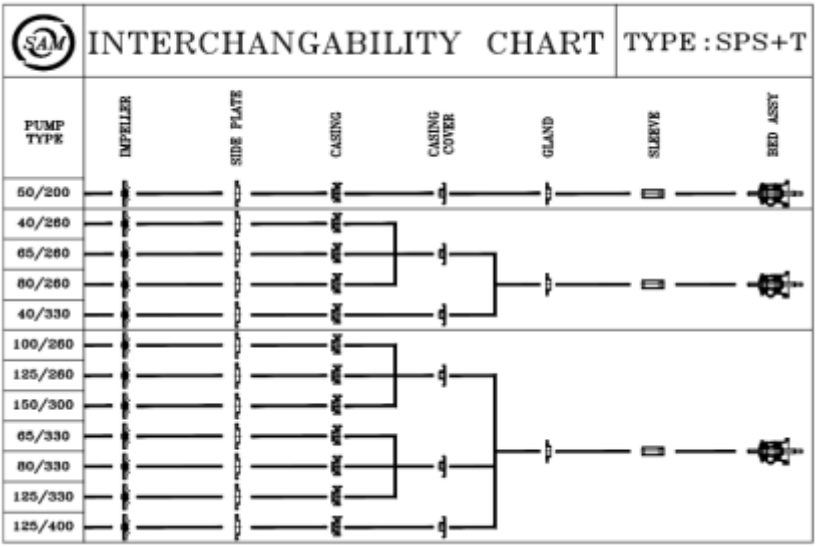
The desired clearance is obtained in the following manner:-

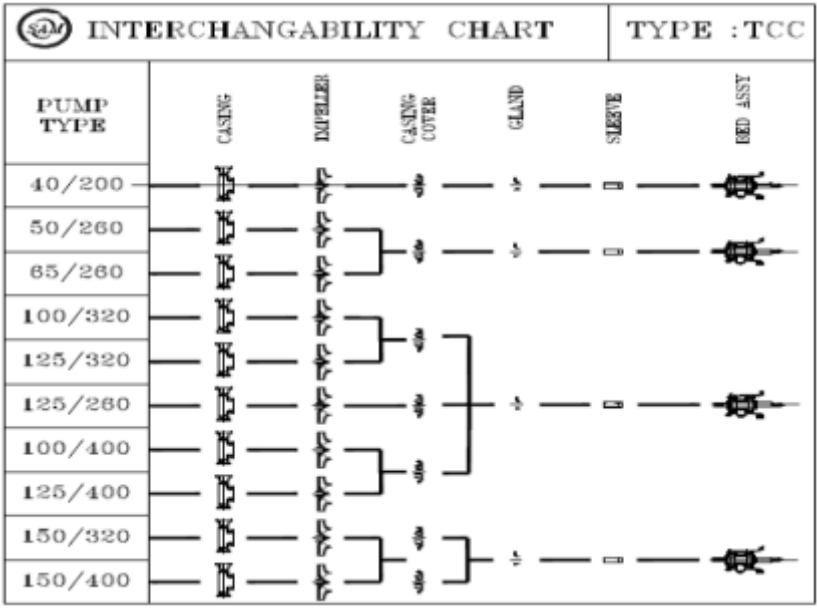
a. To move the impeller towards wear plate (14.7) loosen the screws (91.3) provided in the pump end brg cover (37.3) & tighten the screws (91.3) provided d.e brg cover (37.2) continue this exercise. by the by rotate the rotating assembly by hand till the impeller touches the wear plate.
   In order to maintain the desired gap of 0.5 mm between the impeller and wear plate loosen the d.e cover screw (91.3) and tighten the p.e cover screw (91.3).

B. If desired, a dial indicator, can be used to check that the bearing assembly has been moved the correct distance.

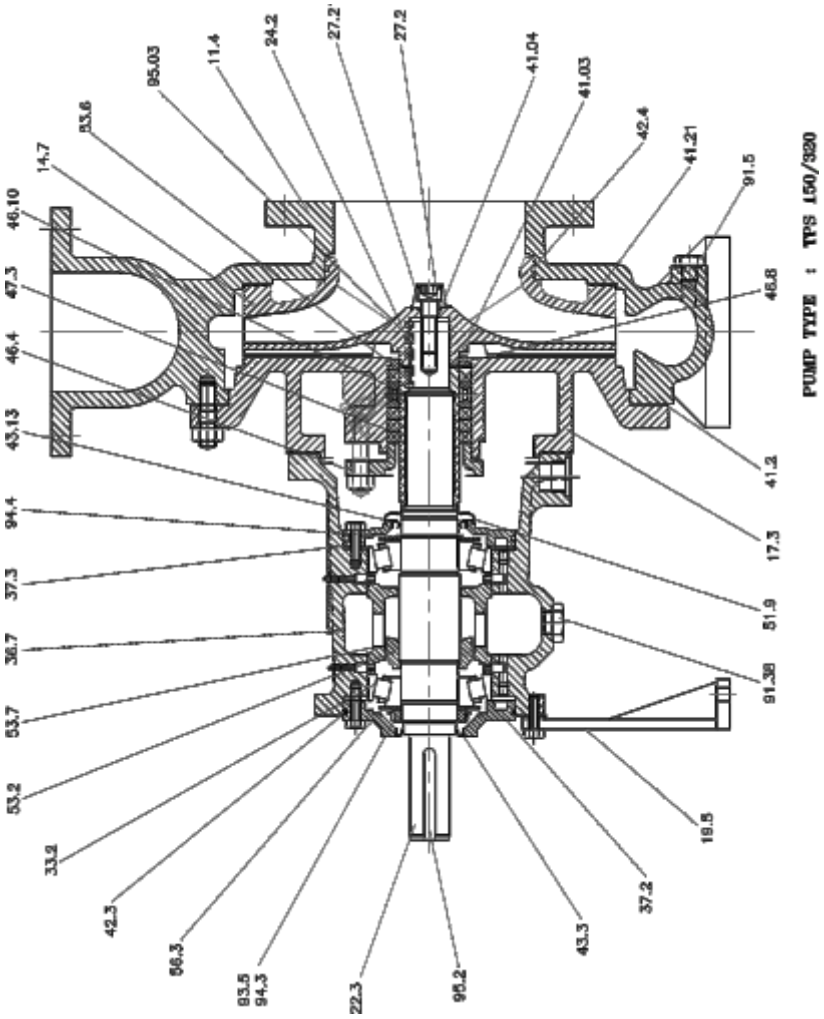
10. INTERCHANGEABILITY CHART

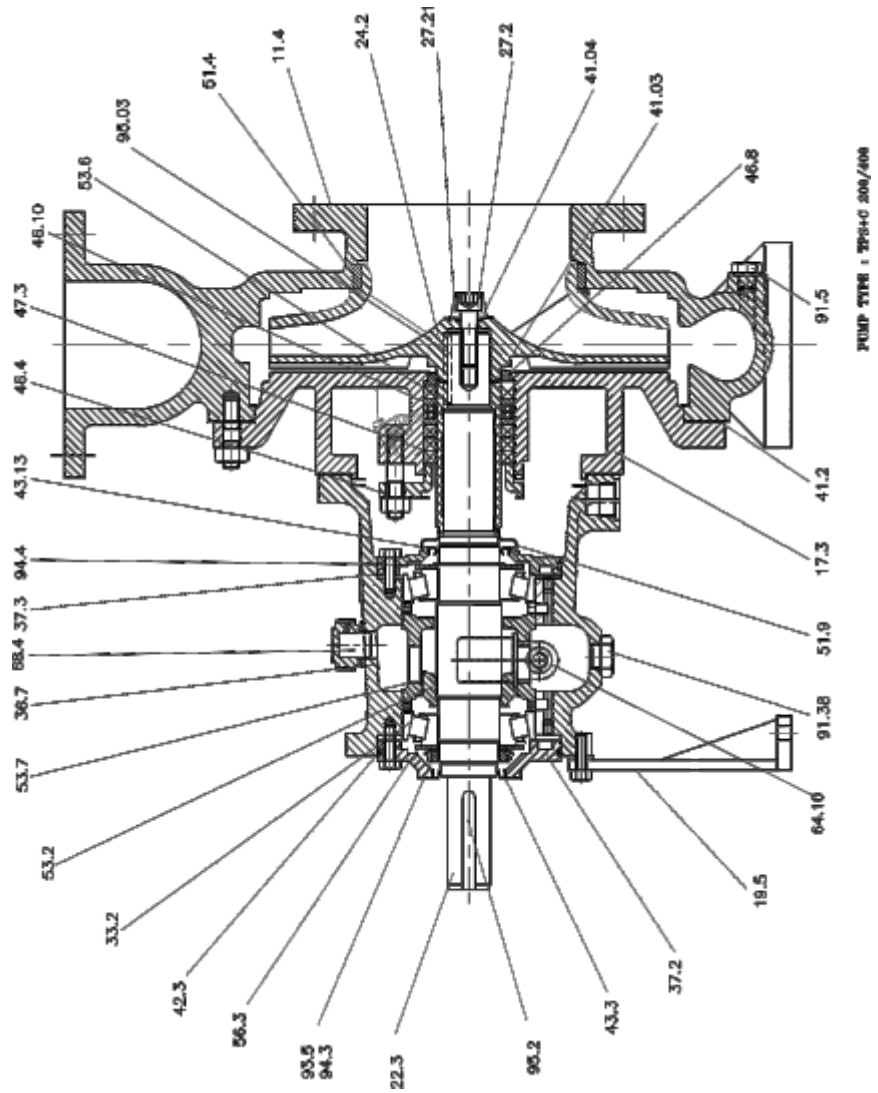


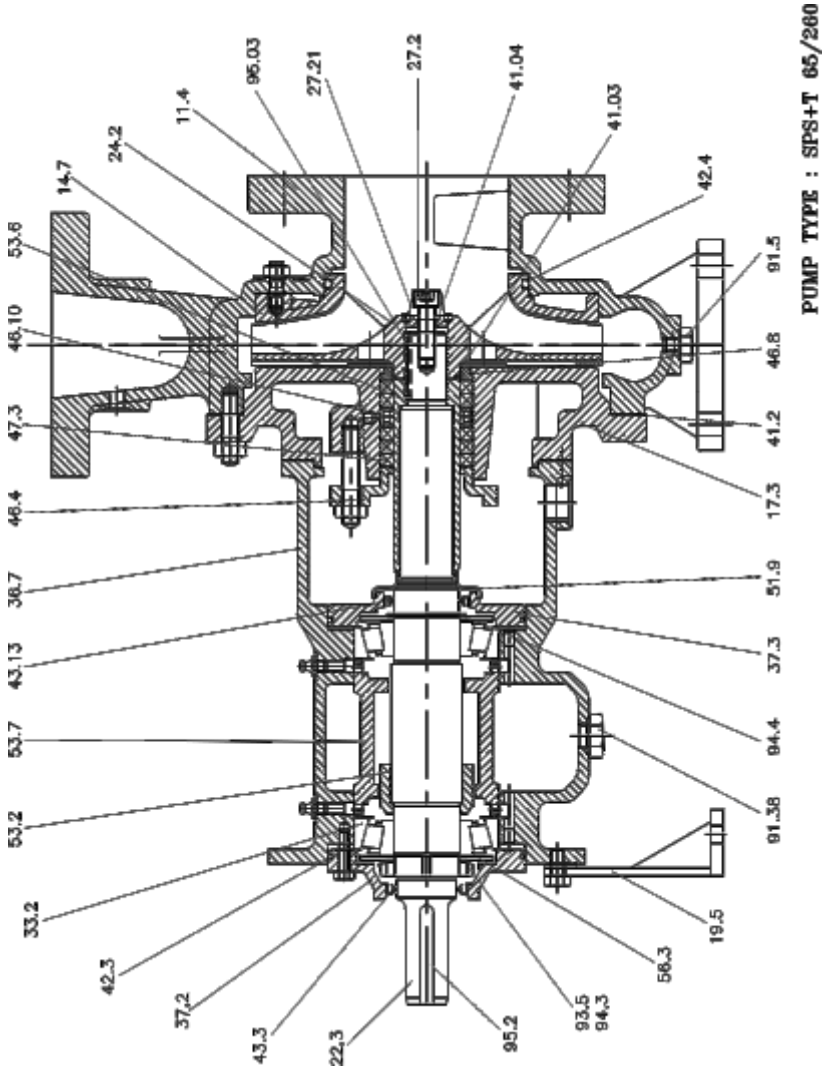

INTERCHANGABILITY CHART
TYPE : SPS+T
PUMP TYPE
IMPELLER
SIDE PLATE
CASING
CASING COVER
GLAND
SLEEVE
BED ASSY
50/200
40/260
65/260
80/260
40/330
100/260
125/260
150/300
65/330
80/330
125/330
125/400

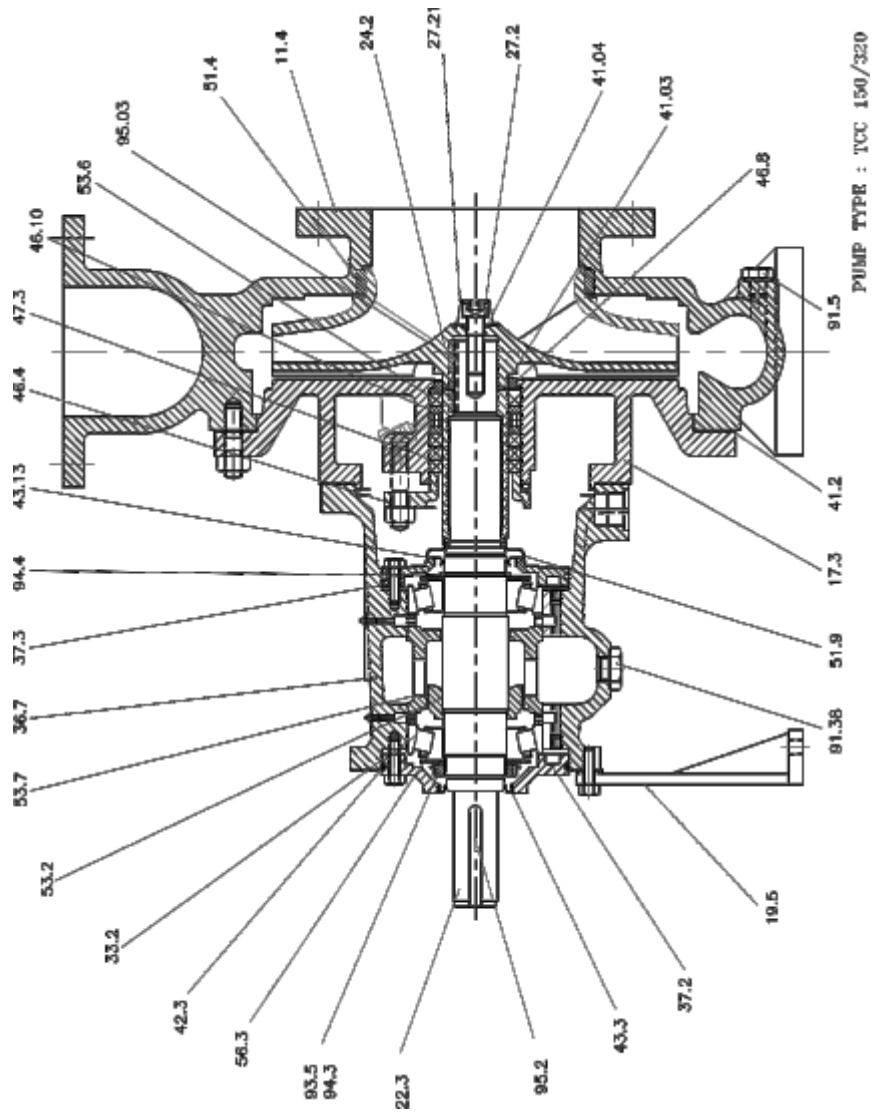

INTERCHANGABILITY CHART
TYPE : TCC
PUMP TYPE
CASING
IMPELLER
CASING COVER
GLAND
SLEEVE
BED ASSY
40/200
50/260
65/260
100/320
125/320
125/260
100/400
125/400
150/320
150/400

11. SECTIONAL DRAWING




51.4
11.4
24.2
27.21
27.2
41.04
41.03
95.03
53.6
46.10
46.8
47.3
46.4
43.13
94.4
37.3
88.4
36.7
53.7
53.2
33.2
42.3
56.3
93.5
94.3
22.3
95.2
43.3
37.2
19.5
64.10
91.38
51.9
17.3
41.2
91.5
PUMP TYPE : TPS+C 200/400


PUMP TYPE : SPS+T 65/260
96.03
27.21
27.2
41.04
41.03
11.4
24.2
14.7
53.6
46.10
47.3
46.4
36.7
43.13
53.7
53.2
33.2
42.3
37.2
43.3
22.3
95.2
93.5
94.3
56.3
19.5
42.4
91.5
46.8
41.2
17.3
51.9
37.3
94.4
91.38


PUMP TYPE : TCC 150/320
46.10
53.6
95.03
51.4
11.4
24.2
27.21
27.2
41.04
41.03
46.8
91.5
47.3
46.4
43.13
94.4
37.3
36.7
53.7
53.2
33.2
42.3
56.3
93.5
94.3
22.3
95.2
43.3
37.2
19.5
91.38
51.9
17.3
41.2

12. BILL OF MATERIALS

	CODE NO	PART NAME	
	11.4	Casing	
*	17.3	* Stuffing Box Cover	
*	14.7	* Wear Plate	
	17.7	Cover	
	19.5	Support foot	
*	22.3	* Pump shaft	
*	24.2	* Impeller	
*	27.2	* Impeller Screw	
*	33.2	* Bearings	
	34.2	Bearing Bed	
	37.2	Bearing Cover (Drive)	
	37.3	Bearing Cover (Pump)	
*	41.04	* Gasket (Impeller Screw)	
*	41.2	* Gasket (Casing)	
*	42.3	* 'O' ring (Bearing Cover)	
*	42.4	* 'O' ring (Wear Plate)	*
	43.3	* Oil Seal (Drive)	
*	43.13	* Oil Seal (Pump)	
	46.4	Gland	
	46.10	Lantern ring	
*	46.8	* Throttle bush	
*	47.3	* Gland packing	
	51.9	Deflector	
	53.2	Dismantling sleeve	
*	53.6	* Shaft Sleeve	
	53.7	Support Sleeve	
	56.3	Grease Retainer	
	91.3	Adjusting Screw (Impeller)	
	91.38	Plug (Oil Drain)	
	91.5	Plug (Casing Drain)	
	93.5	Lock Nut	
	94.3	Lock Washer	
	94.4	Circlip	
*	95.2	* Key (Coupling)	
*	95.03	* Key (Impeller)	
*	51.4	* Wear ring	
*	41.05	* Gasket (Sleeve/Impeller)	
*	93.4	* Locking Cap	
	51.91	'O' ring (Deflector)	

* Recommended spares for 2 years normal operation.

13. TROUBLE – CAUSE - REMEDY

In the event of troubles we recommend to locate the cause using the following chart:

TROUBLE	CAUSE – REMEDY NO.
1. Pump does not deliver	1 7 8 9 10 11 12 15 16 17 18 19 20 24 26 27 31 68 69 70
2. Pumps delivers at reduced Capacity	1 2 3 4 5 6 7 8 9 10 11 12 14 15 16 18 19 20 21 23 68 69 70 74
3. Delivery performance reduced	1 3 7 9 10 11 12 14 15 20 21 23 24 59 65 69 74
4. Pump delivers too much	17 68 69 70
5. Delivery is interrupted	1 3 6 7 8 9 10 11 12 13 14 15 16 17 20 23 24 26 31 68 69 70 74
6. Pumps runs in reverse direction	64
7. Very noisy	1 2 5 6 7 8 11 12 14 16 20 21 23 26 67 68 69 70 74
8. Unsteady running of the pump	20 21 23 33 34 36 38 39 40 41 42 43 47 48 49 52 54 55 56 57 58 63 66 67 70
9. Pumping casing not leak proof	52 54 59 60

10. Excessive leakage from stuffing box	21 25 28 29 30 32 33 55 56 57 65
11. Fumes from stuffing box	23 24 25 26 27 28 29 32 45 46 65
12. Mechanical Seal leaking	21 23 24 31 45 46 55 57 65 75
13. Pump rotor blocked in standstill position	23 49 50 52 54 58
14. Pump is heating up and seizing	23 24 25 26 27 28 30 32 43 45 46 49 50 54 55 56 57 58
15. Bearing temperature increase	20 21 23 33 34 36 39 40 41 42 43 44 45 47 48 49 50 52 54 55 57 63 66 67 70
16. Motor will not start	15 23 72
17. Motor is difficult to start	15 17 23 28 29 49 50 54 58 70 71 72
18. Motor is running hot burning out	15 17 23 28 29 43 58 68 69 70 71 72 73

CAUSE - REMEDY :

1. Suction filter, foot valve clogged.
2. Nominal diameter of suction line too small.
3. Suction does not reach down far enough into the delivery liquid.
4. Ground clearance of suction too narrow
5. Too many bends in the suction line.
6. Shut-off valve in the feed line in un-favorable position
7. Incorrect layout of suction line (Formation of air pockets)
8. Valve (s) in the suction and/or feed line not fully open.
9. Screwed joints or flanges in the suction line not leak – proof
10. Ingress of air via leaking valves and fittings in the suction line (Stuffing box etc).
11. Suction lift too great.
12. Available NPSH too low (difference between pressure at suction branch and vapour pressure too low).
13. Cut-out level for starter too low (In automatic plants.
14. Delivery liquid containing too much gas and/or air.
15. Delivery liquid too viscous
16. Insufficient venting
17. Speed too high (number of revolutions of driver higher than nominal number of revolutions of pump)
18. Speed too low (number or revolutions of driver lower than nominal number of revolutions of pump).
19. Incorrect direction of rotation (electric motor, incorrectly connected, leads on the terminal board interchanged).
20. Impeller Clogged.
21. Impeller damaged.

23. Separation of crystals from the delivery liquid (falling below the temperature limit/equilibrium temperature).
24. Sealing liquid line/circulation line clogged.
25. Sealing liquid line contaminated.
26. Lantern Ring in the stuffing box is not positioned below the sealing liquid inlet.
27. Sealing liquid omitted.
28. Packing incorrectly fitted.
29. Gland tightened too much/slanted.
30. Packing material not suitable for operating conditions.
31. Mechanical Seal blocked; O-ring-rotating seal ring or stationary seal ring damaged.
32. Shaft sleeve/shaft worn in the region of the packing.
33. Bearing worn out.
34. Insufficient lubrication of bearings (also in case of automatic lubrication).
36. Specified oil level not maintained.
38. Oil quality unsuitable.
39. Rolling contact bearings incorrectly fitted.
40. Axial stress on rolling contact bearings (no axial clearance for rotor)
41. Bearings dirty.
42. Bearings rusty (corroded).
43. Axial thrust too great because of worn wear rings, obstructed relief holes.
44. Radial shaft seal ring has not much tension (local heating-up of shaft)
45. Insufficient cooling water chambers.
46. Sediment in the cooling water chambers

47. Alignment of coupling faulty or coupling loose.
48. Elastic element of coupling worn.
49. Foundation in correctly performed.
50. Base plate not rigid enough in the event of erection without foundation.
52. Pump casing under stress.
54. Pipe line under stress.
55. Shaft runs untrue.
56. Shaft bent.
57. Rotor insufficiently balanced.
58. Rotor parts touching the casing.
59. Unsuitable casing seal.
60. Casing screw not light enough
63. Vibration of pipe work.
64. Non return valve gets stuck.
65. Contaminated delivery liquid.
66. Delivery flow too small.
67. Delivery flow too great.
68. Pump unsuitable for parallel operation.
69. Type of pump unsuitable.
70. Incorrect designing of pump for existing operating conditions.
71. Voltage too low/power supply overloaded.
72. Short circuit-in the motor.
73. Setting of circuit-breaker for motor handled too high.
74. Temperature of the liquid too high.
75. Spring of the mechanical seal damaged.

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