INSTALLATION, OPERATION AND MAINTENANCE MANUAL

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IMBIL®
Pumping Solutions

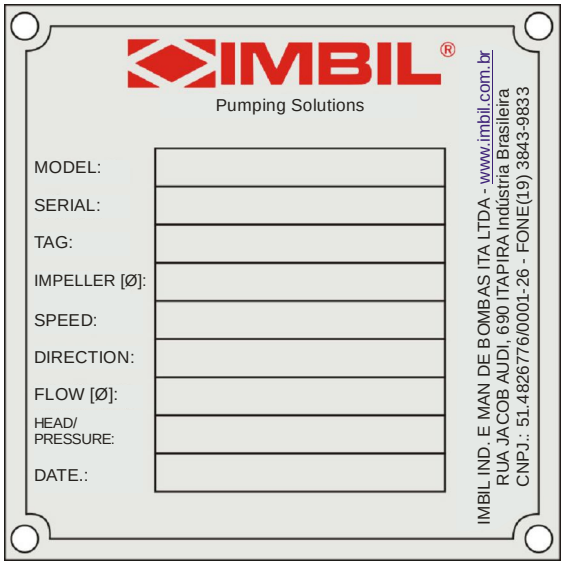
Dear Owner

Congratulations! You have just purchased easy-to-assemble construction equipment, designed and manufactured with the most advanced technology, with excellent performance, providing easy maintenance.

The aim of this manual is to inform the user about the details of the equipment and the proper techniques for Installation, Operation and Maintenance.

IMBIL recommends the installation and handling of this equipment according to the technical specifications and the instructions of this Manual. It is also recommended that this equipment be used according to the service conditions for which it was selected (volumetric flow, total head, speed, voltage, frequency and temperature).

IMBIL is not responsible for faults due to the inobservance of these service orientations. This Manual should be used by the people in charge of installation, operation and maintenance.



In case the equipment needs to be verified or when ordering spare parts, please indicate the part code, model, pump series and also the series number found on the identification plate.

NOTE: Right after receiving the WARRANTY DEED of your equipment, please fill in the data and send the stub to IMBIL, so that the information exchange between IMBIL and the client can be facilitated.

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WARNING

The Imbil Pump is a pressure vase and a rotating piece of equipment. All the safety concerns for such equipment should be checked, before and during the installation, operation and maintenance.
Safety concerns must be followed for auxiliary equipment (MOTOR, BELTS, COUPLING, SPEED REDUCERS, SPEED CONTROL AND ETC.). It is recommended to check the instruction manuals before and during the installation, operation and maintenance.

WARNING

The starter rotation shall be verified before the installation of belts and coupling.
Pump operation in the contrary direction may cause personal wounds and equipment damage.

WARNING

Do not operate the pump under any different conditions from those originally sold without consulting your Imbil representative.
Such operation may cause equipment damage and personal wounds.

WARNING

Do not operate the pump in low or zero volumetric flow for long periods of time, or even under any other circumstances which could make the pumped liquid change into vapor. Pressure originated from such procedures could cause equipment damage and personal wounds.

NOTE

The checking of all the pump system including tanks, pipings, valves, controls, etc, shall be done in order to avoid prejudicial effects to the pump.

SECTION 1

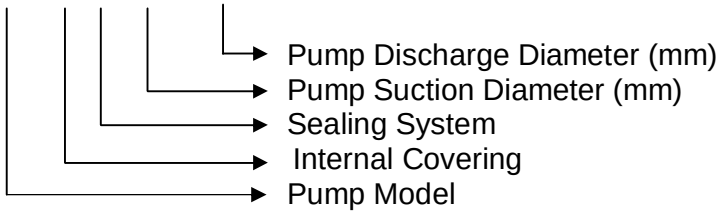
1) PUMP IDENTIFICATION

Every Imbil Pump has an identification plate attached to its base.

The Pump series number and the identification code are printed on the identification plate.

The Pump identification code consists of numbers and letters, arranged as follows:

Exemple: IS – M/G 150 x 100, where:



Internal Covering

M – Pump Covered with metal internal parts (Ni-Hard, AISI 316).
B – Pump Covered with internal parts in elastomers (Natural Rubber, Clorobutyl).

Sealing System

G – Sealing system through gland and packings.
E – Sealing system through centrifugal seal (Expeller).
M – Sealing system through mechanic seal.

2) PUMP ASSEMBLING

The following pages contain step-by-step illustrated instructions for the complete assembling and Imbil pump transportation.

3) FOUNDATIONS

The efficient service of the pump can be obtained only by means of the pump installation in appropriate foundation.
Steel foundation must be solid and the concrete foundations must be heavy.
Both of them shall be designed to support all the pump and motor loads, in additon to absorbing any vibrations.
All the fixation bolts shall be completely tightened.
In general, the place chosen for the installation shall be as close to the feeding as possible, with an appropriate space to provide access for inspection and maintenance.

4) ALIGNMENT

Either directly coupled or started by means of a V belt, the pump and the motor shafts shall be precisely aligned.
When starting the pump by means of direct coupling, bad alignment causes unnecessary vibration and the wear of the coupling, in addition to reducing the average life of the bearings.
When starting the pump by means of V belt, the non-parallel shafts cause excessive belt wear.
It is not recommended the use of rigid coupling.

5) PIPING

The piping and the valves shall be aligned appropriately with the pump flanges and shall be supported independently from the pump. The appropriate Imbil joints shall be used in the pump flanges.
In certain pumps, the metal covering projects a little distance beyond the flange. Special care must be taken in such cases, in order not to overtighten the flange bolts, so that the joint is not damaged. A piece of removable pipe shall be used on the suction side.
The pipe shall have enough length to allow for the removal of the front body of the pump and to make possible the access to the parts subject to wear.
The suction piping must be specifically designed to minimize the loss by attrition.
The suction pipe removal becomes easier if a flexible joint is used instead of one of the flanged connections.

NOTE

In case of a serial or parallel pump system, check the manufacturer for the procedures and the recommendation regarding the piping. All the piping joints must be air-proof in oder to ensure the pump priming.

6) STARTING

Before starting an Imbil pump for the first time, the following steps should be taken:

a) SHAFT SEALING CHECKING

For pumps sealed through glands, check the sealing water in order to assure that it contains enough quantity and it is at the right pressure.

In pumps transporting solids, the sealing water pressure shall be aproximately 0.5 kgf/cm² above the pump discharge pressure.

Loosen slightly the gland and adjust it so that a little flow along the shaft can be obtained. The pumps supplied directly from Imbil factory usually have tightened glands in order to minimize the shaft vibration during transportation.

For centrifugally sealed pumps, rotate the grease fitting down – only some turns – in order to load the sealing box with grease. Rubber-covered pumps with rubber expeller box use sealing which does not need grease.

b) MOTOR ROTATION CHECKING

Remove all V belts or disconnect completely the shaft coupling, according to the case.

Start the motor, check the rotation and correct it if necessary for producing the pump shaft rotation indicated by the arrow in the front body. Couple again the V belts or the flexible coupling between the pump shafts and the motor.

When stretch the belts, keep the shaft aligned.

Important: Pump rotation in opposite direction according to the indication in its volute case will unscrew the shaft impeller, causing serious damage to the pump.

c) STARTING THE PUMP

Once more, make sure that all the bolts are fastened and the impeller rotates freely.

Make sure that the shaft sealing and the sealing water supply pressure are correct, when used.

Whenever possible, it is recommended to start the pump with water before introducing solids or pulp. When turning it off, it is also desirable that the pumps can pump only water for a short period of time before turning them off.

Open the suction valve (if there is one) and check if there is water available in the suction inlet. Start the pump and make it work until it reaches the proper speed. If the pump presents negative suction, prime it.

- ✓ Check the suction and discharge pressure (If gauges are provided);
- ✓ Check the volumetric flow by inspecting the gauge or the discharge pipe;
- ✓ Check the leakage in the gland. If the leakage is excessive, tighten

the gland nuts until the flow is reduced to the desired level (dripping). If the leakage is not sufficient and the gland is getting heated, try to loosen the gland nuts. If the gland is still heating, the pump operation must be interrupted, letting the packing box cool down. The gland nuts shall be loosened, so that one can open the packing box.

NOTE

It is usual for the sealing water that flows off the gland to be hotter than the supply water, because it takes out the heat generated by the attrition in the packing box. The low pressures (single-stage operation) needs very little leakage and it is possible to operate the pump with a small quantity of water leaving the gland. It is not necessary to stop the pump operation due to the gland heating, unless the vapor or smoke is produced.

Such difficulty is normally experienced in the placement or in the initial operation in pumps sealed by gland. When the initial heating of the packing box is recorded, it is usually necessary only to start it, stop it, wait for it to cool down and start it again. This procedure should be carried out two or three times before the packings are placed correctly and the gland rotates properly.

It is preferable to have excessive leakage in the beginning of the operation rather than not having leakage enough. After the pump has worked for 8-10 hours, the gland bolt can be adjusted to provide optimal leakage.

If the gland heating persists, the packing must be removed and placed again.

For 10kg/cm² (150psi) pressure, use braided asbestos with mica lubrication. Over 10 kg/cm² (150psi), use asbestos joint and braided teflon. Over 21kg/cm² (300psi) it is usually necessary to use a ring between the gland and the last packing ring.

d) ABNORMAL STARTING

In case the pump stops priming, the possible causes may be:

- ✓ Blocked suction pipe:
  When the pump has not been operated for a certain period of time, the pulp may rest on the suction pipe. If the pump is operating in a well, the water cannot reach the pump impeller. A manometer on the pump suction side can be used to verify the pump suction pressure, which must be over the pressure required by the pump (required NPSH);

- ✓ Air admission in the gland:
  If one of the following conditions below is applied, the air can be admitted into the pump through the gland. This can prevent the pump from performing its priming. It can also cause priming interruption during operation;
- ✓ Very low sealing water pressure;

- ✓ The packing is excessively worn;
- ✓ The sealing water connection in the packing box is blocked.

The inspection in the packing box will readily show one of the faults above.

e) OPERATIONAL FAULTS

- ✓ Blocked suction pipe:
  During the normal operation of the pump it is possible for a foreign body to be sucked by the pump and partially obstruct the pump suction. This will cause the efficiency reduction in addition to decreasing the discharge pressure and the amperage, consequently increasing the vacumm reading in the pump suction. This can cause intense pump cavitation and vibration;

- ✓ Blocked Impeller:
  The impellers have free passages among its vanes, which allows for certain size of particles to pass through. If any bigger particle enters the suction pipe, it can rest on the impeller center, restricting the pump efficiency. Such obstruction will cause reduction in the motor amperage, in the discharge pressure and in the suction vacumm reading. Pump vibration will also occur due to unbalance;

- ✓ Blocked Discharge Pipe:
  Blocked discharge pipe can be caused by the high concentration of thick particles in the pump discharge pipe or by the low speed of the particles present in the pulp, inside the discharge pipe. Such obstruction will result in an increased discharge pressure and in and decreased motor amperage and suction vacumm reading.

f) TURN-OFF PROCEDURES

Whenever possible, the pump should operate with water only for a short period of time, in order to clean any remaining pulp in the system, before turning it off.

- ✓ Turn the pump off;
- ✓ Close the valves (if there is any);
- ✓ If there is some sealing water in the packing box, leave it for all the subsequent operations, namely: starting, operation, disconnection and return. The sealing water can be disconnected only after all these steps are taken.

NOTE

For serial or parallel pump systems, refer to the factory for starting procedure recommendations.

7) MAINTENANCE

Imbil pumps are of solid constrution. When correctly assembled and installed, will provide a long time of service, free of trouble and with least maintenance.

a) SPECIAL CARE REGARDING SHAFT SEALING

In pumps sealed by gland, check the sealing water periodically, regarding supply and pressure. Keep always a small quantity of clean water to be leaked along the shaft, adjusting the gland regularly. When the gland adjustment is not possible any longer, replace the packings.

In centrifugally sealed pumps, lubricate the sealing box regularly by means of the grease fitting. The rubber expeller box does not require lubrication.

b) BEARING LUBRICATION

A correctly assembled and pre-lubricated bearing assembly (See bearing installation: Attachment of the shaft to the bearing house box) will have long average life free of trouble, provided it is protected against water admission or any other foreign body, and receive appropriate maintenance. Only the maintenance personnel should decide when to open the bearing house boxes at regular intervals (not more than twelve months) to inspect and lubricate the bearings.

The frequency and the quantity of lubricant to be added periodically depends on several and combined aspects: speed, bearing size, non-operational period of time, usual environmental conditions (temperature, operating environment, presence of contaminants). In most pulp pump applications, the speed ranges are lower, allowing for the bearings to have a longer average life. However, there is still damage risk by overlubrication, which may cause the tempeture to increase in the bearings, consequently causing irreparable damage. Therefore, some criteria and experience shall be the decisive factors to establish the routine lubrication procedures. It is advisable to frequently check the bearings when they are operating, considering any uncommon combination related to temperature and cleaning.

Check if the bearing house assemblies are equipped with a greaser in every bearing end, located in the bearing house cover. In addittion, there is a plug in the very bearing end. This plug must be removed only in case of lubricant insertion (based on criteria, experience and guidelines from page 13). In unusual circumstances, in which extreme conditions require additional lubrication, use only recommended clean grease.

C) REPLACEMENT OF PARTS SUBJECT TO WEAR

The solid transportation wear rate is a function of the pump service and of the abrasive properties of the handled material. For this reason, the parts subject to wear, such as the impeller, the volute case covering, etc. are

different, depending on the installation. The worn parts shall be replaced when the operation of the pump does not meet the demands of a specific application any longer.

When the pump is operated for the first time and especially where the worn parts could cause serious consequences, it is recommended to open the pump at regular intervals. The parts must then be inspected and evaluated within their wear rate, so that the remaining average life can be established.

For installing new parts subject to wear, see the appropriated sections in this manual.

d) EXTRA PUMP

Where the extra pumps remain inactive for a long period of time, it is recommended to rotate their shafts once a week a quarter of turn by hand. This way all the bearing rolls are submitted to load the static loads and the external vibrations.

8) SPARE PARTS

Spare parts for Imbil pumps comprise mainly covering, impellers, bearings, shaft sleeves and sealing in retainers. Depending on the average life of each part, it is recommended to keep in stock one part of each item mentioned, in order to assure the maximum use of the pump.

In large plants, it is usual to stock a bearing assembly for every ten pumps (or less) of the same size. It enables fast replacement of the bearing house assembly in any pump. This operation is often performed when the parts subject to wear are being replaced. The removed bearing house assembly can be inpected and, if necessary, repaired and kept in stock to be used in the next pump.

This procedure avoids damage, and all pumps are constantly in optimal conditions, with the minimum of inactive time.

9) LUBRICANT GREASE

It is recommended that the lubricant grease used in the bearings comply with the following characteristics:

- ✓ Lithium base in the mineral oil with oxidation inhibitor, rust preventive and EP chemical agent;
- ✓ N.L.G.I. n-2 consistence;
- ✓ Drop point of 350º degrees;
- ✓ Penetration 77ºF A.S.T.M.- 265-295;
- ✓ Shell Alvania 2 is one of the recommended types.

The initial quantity of grease recommended for each bearing is:

FRAME	**GRAMS / BEARING** (Operation side / Pump side)
B – 38/25, 50/38	30/30
C – 75/50, 100/75	50/50
D	100/100
E – 150/100, 200/150	200/200
F	500/500
N & NP	30/80
P	50/150
Q	100/350
R & RS – 250/200	220/650
S & ST – 300/250, 350/300	300/800
T & TU	500/3500

The grease fitting for centrifugal sealing must be filled with grease containing these characteristics: (Pumps with rubber-covered expelling box have no grease fitting).

- ✓ N.L.G.I. n – 3 Consistence;
- ✓ Drop point 21;
- ✓ % Mineral oil – 84;
- ✓ Oil viscosity at 210 (ssu) -133;
- ✓ Penetration 77ºF A.S.T.M. - 240-260;
- ✓ Shell Alvania R2 is one of the recommended types.

Intervals suggested for lubrication (hours)

	FRAME	ADD/ BEARINGS	BEARING ROTATION/MINUTE								
		GRAMS	200	300	400	600	800	1000	1200	1500	2000
Both sides	B	15					3000	2400	1800	1500	1000
	C	20				3600	2400	1800	1600	1200	900
	D	30				2500	2000	1500	1200	800	500
	E	45		5000	3600	2200	1600	1100	800	500	
	F	70	7000	4200	2000	1800	1200	700	400		
Pump side	N, NP	25						2400	2000	1600	1100
	P	40					2400	1800	1500	1100	800
	Q	70				2900	2000	1500	1200	800	500
	R, RS	100			3000	2000	1400	1000	600	400	100
	S, ST	130		3800	2800	1500	900	500	300		
	T, TU	300	4800	3000	1800	900	400				
	U	620	4000	2400	1500	500					
Operation side	N, NP	15						4800	4100	3000	2000
	P	25					5600	4300	3600	2400	1800
	Q	35				6500	4500	3600	2600	1900	1400
	R, RS	60			8000	4800	3500	2800	2200	1500	900
	S, ST	75		8000	6000	3600	2400	1600	1200		
	T, TU	140	8000	7000	4500	2500	1500				
	U	200	7000	6000	4000	2000					

IMPORTANT

What is seen above is based on normal operational conditions and intends only to provide guidance. Very dirty or humid atmospheric condition will require a level of recommendation that prevents contaminants from entering the bearings.

However, criteria and experience must be the determining factors when establishing the routine lubrication procedures.

NOTE: The quantity and interval table shown above applies to the internal side pin: the plug. The greaser on the external side adds grease to the labyrinths.

SECTION 2

BEARING HOUSE BOX ASSEMBLING INSTRUCTIONS

B,C,D,E,F & G FRAMES

This section refers to designated pumps with B, C, D, E, F & G Frames.

For example:

- 100/75 C - AH
- 150/100 E - AH
- 200/150 E - AH

As illustrated in Fig 1, the pump bearing configuration consists of opposite TimKen Bearings.
If your pump belongs to the one of the designations "**N, NP, P, R, RS, S, ST, T & TU**" refer to section III.

IMPORTANT
Read the instructions below before starting the bearing assembling.

GENERAL NOTES RELATED TO THE BEARING HOUSE BOXES

When installing new bearings, clean the bearing house box, shaft and everything in the assembly, so that no dirt, protective layer or grease stick on them. Do not remove the lubricant which is used in the factory for greasing the bearing. The manufacturer used a high-quality lubricant, not acid, free from all chemicals and impurities that may cause corrosion. Any lubricant added must be absolutely clean. In order to guarantee it, the following is suggested:

- ✓ Keep always the grease can covered, to prevent dirt from entering;
- ✓ Make sure the instrument which will be used to remove the grease from the can is clean. Avoid using the wooden scoop. Use preferably a steel blade or a scrubbed, smoothened and clean spatula;
- ✓ In cases in which the lubrication pistol is used to introduce the grease in the bearings, perform the same precautions regarding the pistol cleaning, especially the beak and the accessories.

WHY TO EMPHASIZE BEARING CLEANING

More than 90% of all faults in bearing rolls are due to the dirt inside them or negligence before or during the assembling, or by the user after the unit has been started.

The dirt is composed of infinite hard particles such as diamond. When mixed with the lubricant, they form a stone cutting compound. Thus, the revolving action of the rolls in operation will gradually rub the bearing and ruin its precision and efficiency.

The critical period for the bearing occurs when it leaves the warehouse in order to be assembled, because the protective covering box is about to be removed. Then it is under the assemblers' responsibility. The first rule to handle the bearing is: clean hands and tools. Make use of many clean cloths frequently. Do not use refuse paper because shreds and fine strips stick fast to the oily surface. Keep hands and workplace clean.

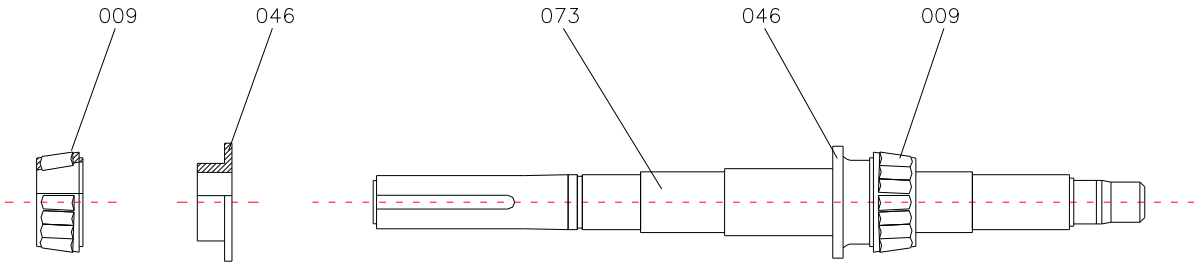


Fig. 1

BEARING INSTALLATION: Attachment of the bearing cones (073) to the shaft.

FRAMES: B, C, D, E, F & G.

a) Apply oil or light grease to the shaft, to the points where the bearing will be assembled;
b) Make the grease retainer slide (046) against the shaft prop;
c) Adjust the bearing cone (009) (the larger diameter side) until the retainer is reached;
d) It is advisable to pre-heat the bearing cone (the pre-heating must not exceed 120ºC). We suggest oil immersion in a hundred (100) parts of water. With the shaft in vertical position, the heated cone can be slid and pressed or slightly hit to the grease retainer (046);
e) Place another grease retainer and another bearing cone as above;
f) It is important that both grease retainers be strongly placed against the bearing props and against each other. This has to be verified after the bearings cool down;
g) Pulverize the bearings with “Drying Fluid” to remove all the humidity.

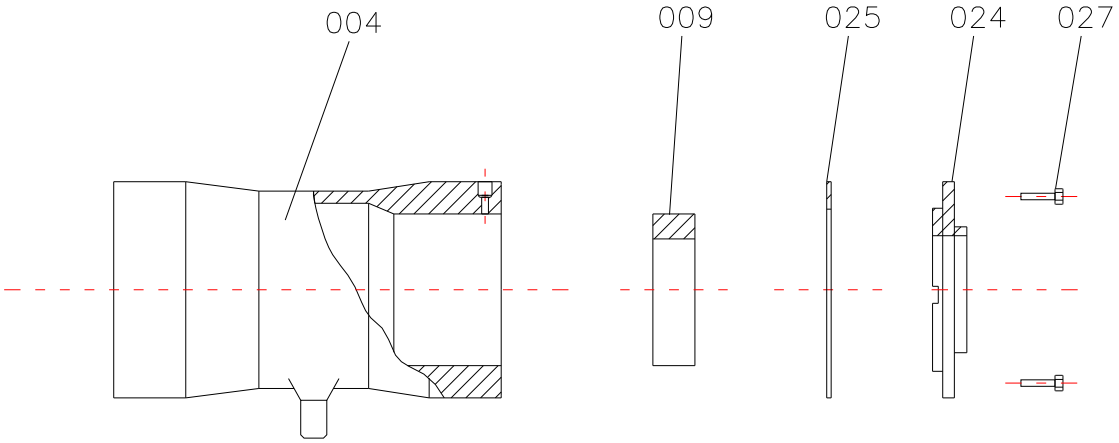


Fig. 2

BEARING ASSEMBLING: Attachment of the bearing cover on the impeller side to the bearing house box.

FRAMES: B, C, D, E, F & G.

a) Apply oil or light grease to each side of the bearing house box (004);
b) Press or hit carefully the bearing cover (009) by using a plastic hammer into the bearing box end, until the cover is slightly below the box end face;
c) Put the Cover in the Bearing House (024) with a packing (025) in the box, and insert the bearing house cover bolts (027);
d) Tighten the regulating bolts equally. The bearing house cover will now push the bearing cover to its right position.

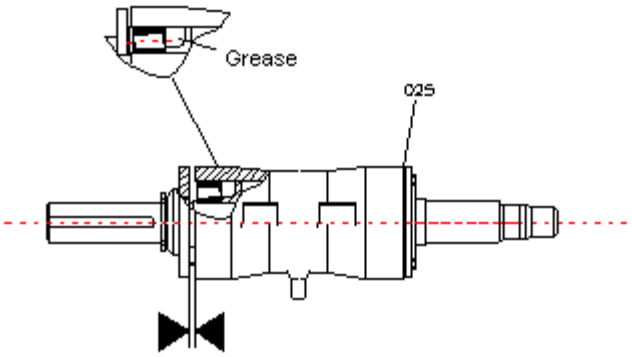


Fig. 3

BEARING ASSEMBLING: Attachment of the Shaft to the bearing house box.
FRAMES: B, C, D, E, F & G.

1. Obtain the recommended grease type and quantity for each bearing;
2. Apply grease to the bearing by hand to fill the space between the cone and the rollers. Spread the remaining grease between the bearing and the grease retainer (see fig. 3);
3. Proceed equally with the other bearing;
4. Place the shaft with the threaded end inside the box;
5. Press the bearing cover into the box;
6. Place the cover in the bearing house (024) in the box and insert the bolts in the bearing house cover (027). Do not use wedges in this stage. They will be used afterwards (See fig. 4);
7. Rotate the shaft by hand slowly and tighten the regulating bolts slowly until the bearing cover has been pushed right to the top of the bearing cone. Make the shaft rotate only, and make sure the bearing virtually does not have end pitching.

CAUTION: Do not tighten the regulating bolts too much. Check the clearance between the bearing house cover and the bearing house box face.
For assemblies up to the C frame, the procedure above can be carried out with the bearing house box in the horizontal position. For larger sizes, it is recommended to assemble them in the vertical position, so that the bearings will be concentrically adjusted.

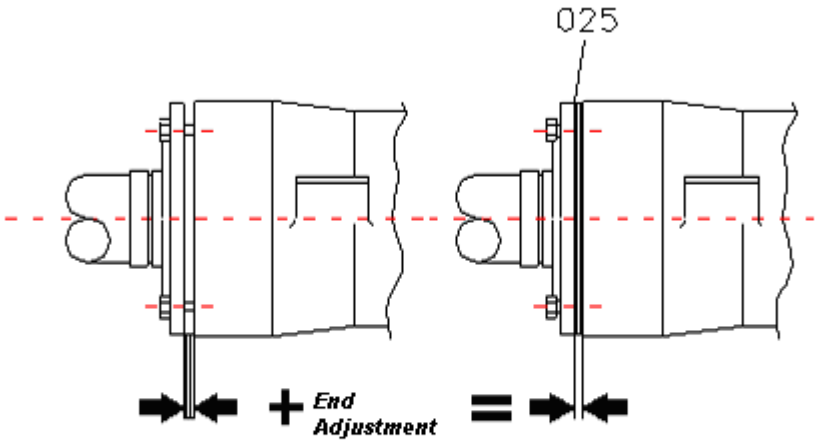


Fig. 4

BEARING ASSEMBLY: Clearance measurement (operation side)

FRAMES: B, C, D, E, F & G.

1- Measure the clearance between the bearing house cover flange end and the box face by using the clearance measuring device.
Provided the regulating bolts have been uniformly tightened, this is usually the proper method. The bearing house cover can be alternatively removed, according to the measurement performed by means of a depth micrometer.

a) Bearing cover depth below the box end face;
b) Prop depth of the bearing house cover.

The clearance is obtained subtracting (a) from (b).

2- Choose total thickness packings (025) with the same total thickness as the clearance (obtained above), in addition to the “End Pitching “ (See the following table).

3- Place the wedges, replace the bearing house cover and insert the bearing house cover bolts.

Keep the bolts completely tightened.

NOTE

Any other method for determining the necessary thickness for the wedges can be used under the following condition: the right pitching for the bearing ends must be obtained (See table below).

END PITCHING TABLE

FRAME	END PITCHING (COLD)
A	0.001" – 0.002" (0.03 – 0.05 mm)
B	0.002" – 0.004" (0.05 – 0.10 mm)
C	0.004" – 0.006" (0.10 – 0.15 mm)
D	0.005" – 0.007" (0.13 – 0.18 mm)
E	0.007" – 0.009" (0.18 – 0.23 mm)
F	0.010" – 0.012" (0.25 – 0.30 mm)
G	0.014" – 0.016" (0.36 – 0.41 mm)

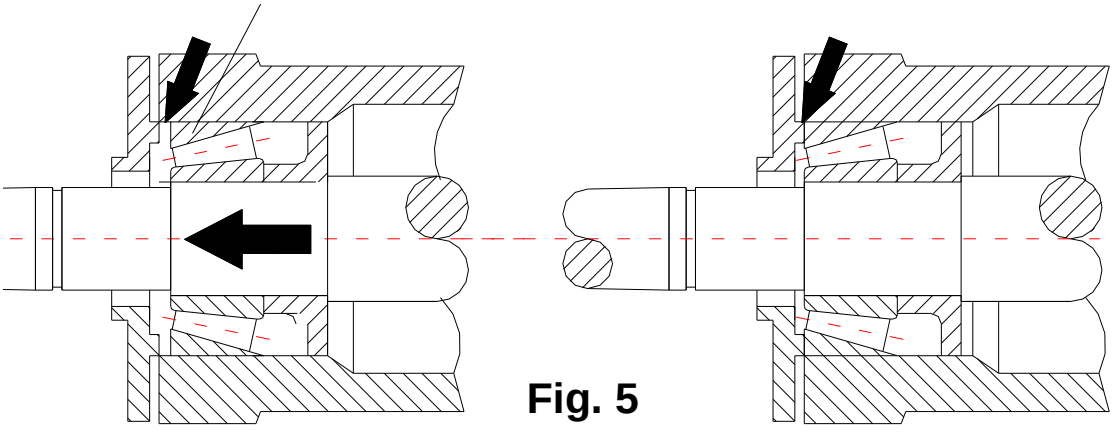


Fig. 5

BEARING ASSEMBLING: Bearing cover adjustment
FRAMES: B, C, D, E, F & G.

With the wedges inserted (Fig. 4), it is necessary to move the bearing cover end back to the bearing house cover, in order to provide the bearing end pitching.

1- Press or hit slightly the shaft in the impeller end until the bearing cover in the opposite end has been relocated in the bearing house cover, loosely attached. Be careful not to damage the screw thread.

2- Tighten uniformly the regulating bolt in order to move the bearing cover towards its right position.

Both bearing covers shall be now firmly attached against their respective bearing house covers, finally providing the end pitching.

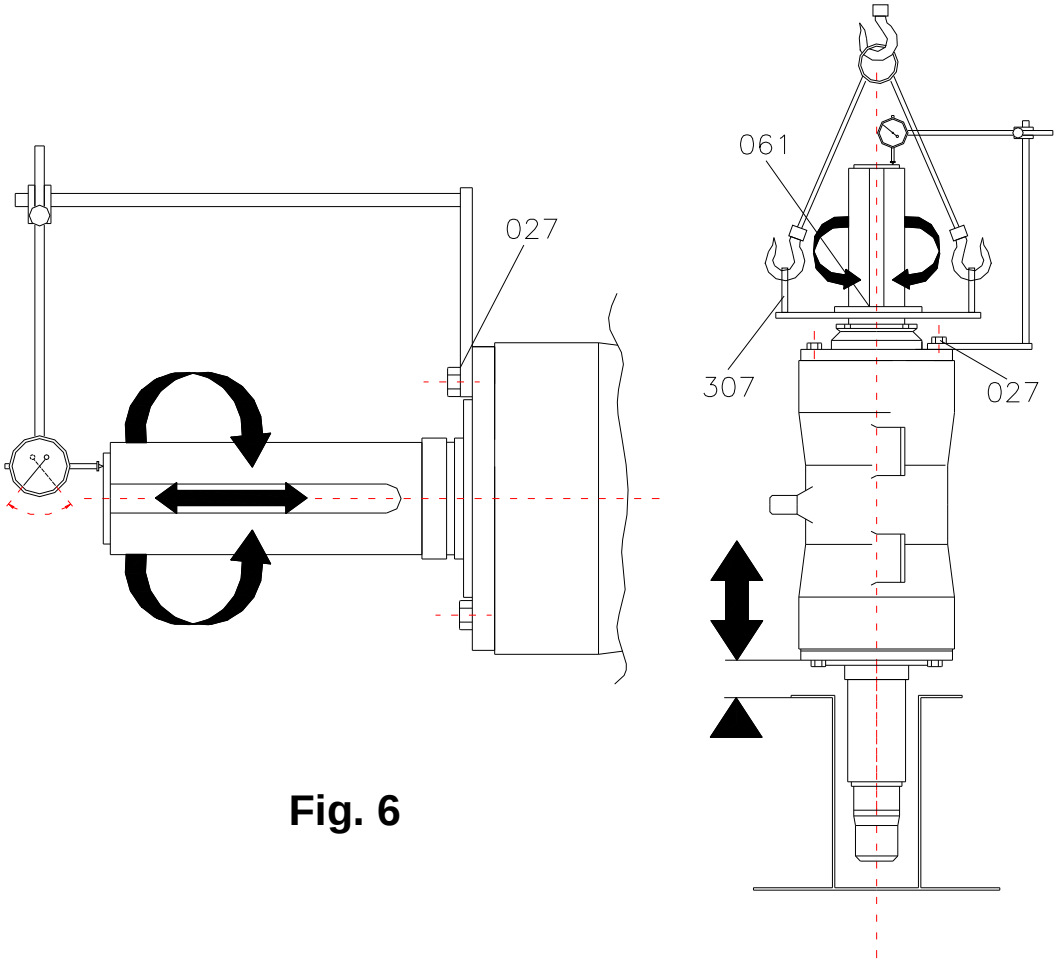


Fig. 6

BEARING ASSEMBLING: End pitching measurement

FRAMES: B, C, D, E, F & G.

It is necessary to measure precisely the real end pitching in the bearing assembly after having moved the bearing cover end back to the bearing house cover (Fig. 5), and having tightened the regulating bolts completely.

FRAMES: B & C

1- Place horizontally the bearing assembly with the box firmly sustained. If possible, attach it to the bench lathe.
2- Attach the assembling bracket, with a dial indicator, to the box by means of a bolt (027) and place the “dial indicator” pin against the shaft end.
3- Push the shaft back and forth by hand several times, in order to establish a dial consistent reading and write down the total movement.

FRAMES: D, E, F & G

1- Place the bearing assembly vertically, impeller end down. Lean the assembly on the bearing house cover, with the shaft free. The whole assembly must be placed in a position so that it can be reached by a winch (crane).
2- Place the assembling bracket with the dial indicator as described above.
3- Adjust the lifting plate (307) (eyes up) to the upper shaft end. Tighten the locking nut (061) in the shaft temporarily. Attach the cable ends, suspended by a crane, to the eyes in the lifting plate (See Fig.6).
4- Move the shaft up and down. Check the maximum and minimum reading in the dial indicator. Repeat the movement several times, until the reading is consistent. Write down the total movement.

ALL THE FRAMES

In case the end pitchings are out of their boundaries (See table on page 20), the wedges shall be added or removed, if necessary (operation side).

a) If the wedges need to be removed, place the bearing house cover again and tighten the bolts after the wedges are removed;
b) If it is necessary to add wedges, follow the procedures for wedge placement and for the bearing cover movement back to the bearing house cover, as describe in Figure 5.

After the end pitching is adjusted again by means of wedges, the actual pitching must be measured again by using the dial indicator.

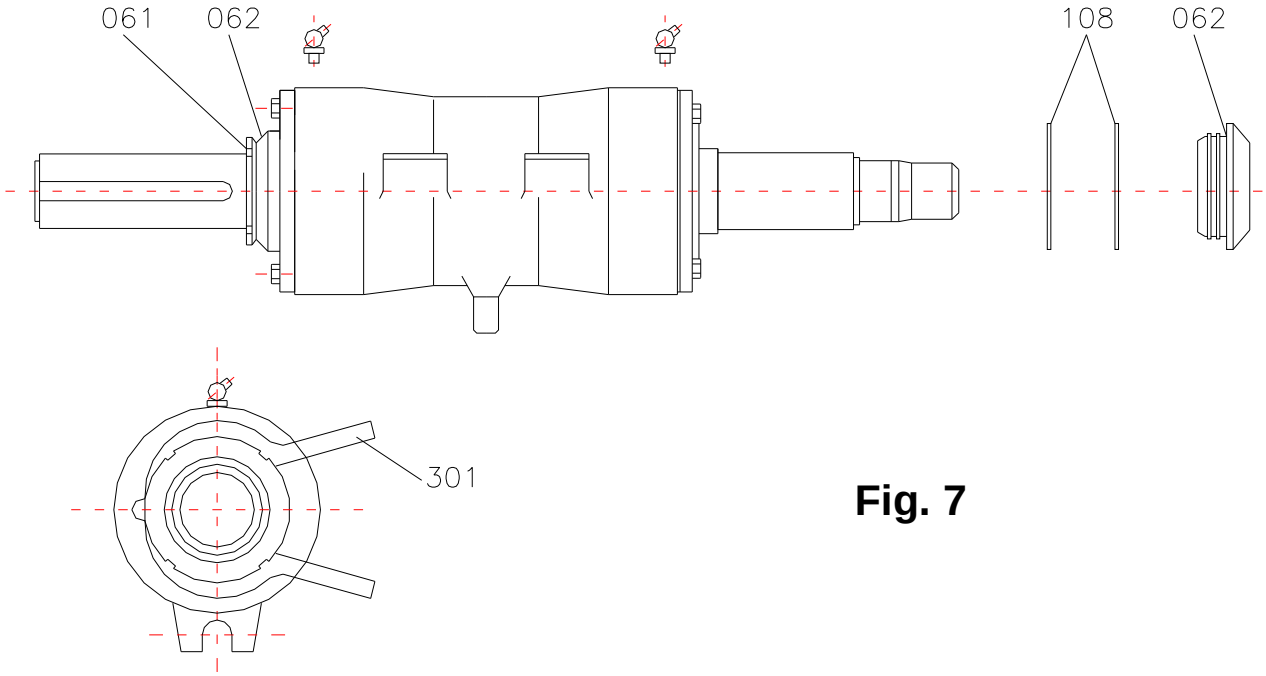


Fig. 7

SECTION III

BEARING HOUSE BOX ASSEMBLING INSTRUCTIONS FRAMES: N, NP, Q, R, RS, S, ST, T & TU

See Figure 8 for the bearing configuration.

IMPORTANT
Read the instruction below before starting the bearing assembling.

GENERAL NOTES RELATED TO THE BEARING HOUSE BOX

When installing new bearings, clean the bearing house box, shaft and everything in the assembly, so that no dirt, protective layer or grease stick on them. Do not remove the lubricant which is used in the factory for greasing the bearing. The manufacturer used a high-quality lubricant, not acid, free from all chemicals and impurities that may cause corrosion. Any lubricant added must be absolutely clean. In order to guarantee it, the following is suggested:

- ✓ Keep always the grease can covered, to prevent dirt from entering;
- ✓ Make sure the instrument which will be used to remove the grease from the can is clean. Avoid using the wooden scoop. Use preferably a steel blade or a scrubbed, smoothened or clean spatula;
- ✓ In cases in which the lubrication pistol is used to introduce the grease in the bearings, perform the same precautions regarding the pistol cleaning, especially the beak and its accessories.

WHY TO EMPHASIZE ROLLER BEARING CLEANING

More than 90% of all faults in bearing rollers are due to their internal dirt or due to negligence before or during the assembling. The faults can also be caused by the user after the unit has been started.

The dirt is composed of infinite hard particles such as diamond. When mixed with the lubricant, they form a stone cutting compound. Thus, the revolving action of the rolls in operation will gradually rub the bearing and ruin its precision and efficiency.

The critical period for the bearing occurs when it leaves the warehouse in order to be assembled, because the protective covering box is about to be removed. Then it is under the assemblers' responsibility. The first rule to handle the bearing is: clean hands and tools. Make use of many clean cloths frequently. Do not use refuse

paper because shreds and fine strips stick fast on the oily surface. Keep hands and workplace clean.

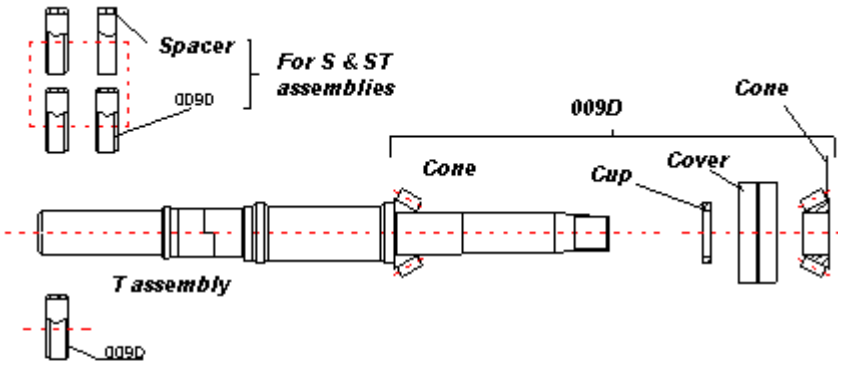


Fig. 8

BEARING ASSEMBLING: Attachment of the bearing internal ring to the operation side and the bearing to the impeller side.
1- Apply oil or light grease to the seating surface in the shaft (073).
2- Place the bearing internal ring (009D) on the shaft starting end against the prop. For the S bearing assembly, (that is, S and ST Bases), place two internal rings on the shaft starting end, against the prop. For certain applications in the S base pump, only one bearing is placed on the starting end. In this case, place the spacer against the shaft prop; then place a bearing internal ring (009D) on the starting end.
It is advisable to pre-heat the internal rings or cones (never over 120º C).
We suggest immersion in boiling solution of at least one (1) part of soluble oil in a hundred (100) parts of water. With the shaft in vertical position, the internal rings or cones can be slid, pressed or hit to the prop.
3- Turn the shaft end down (the impeller end up), place the bearing cone (009) (larger diameter) against the shaft prop.
4 – Place the spacer of the bearing cone (009) in the shaft, against the smaller end of the cone. For “T” Bearing House Assemblies (that is, T and TU Bases), the cover consists of three (3) separate parts. The bearing is the same as if the cover were only in one part; just the two (2) covers are separated by a Spacer.
5- Place the second Bearing cone (009) in the shaft with the smaller end against the cone spacer.

It is important that the cones and the spacer are firmly placed one against another and then against the shaft prop.

NOTE
The Bearings (009) are supplied with spacers and are pre-assembled sets. The spacers have finish to fit in each bearing assembly and the component parts of an assembly are interchangeable with a similar assembly. An identifying "series number" is marked on every cover, cone and spacer, in some large bearing house assemblies, in order to prevent the parts from getting mixed before using them. All parts having the same series number must be kept together.
Some small pre-assembled sets are not marked with a series number, but they are still not interchangeable and the component parts must be assembled as they are received.

6-Pulverize the bearings with drying fluid in order to remove all humidity.
7-Apply the recommended grease by hand, both sides of the bearing, until the grease appears from the cover holes.

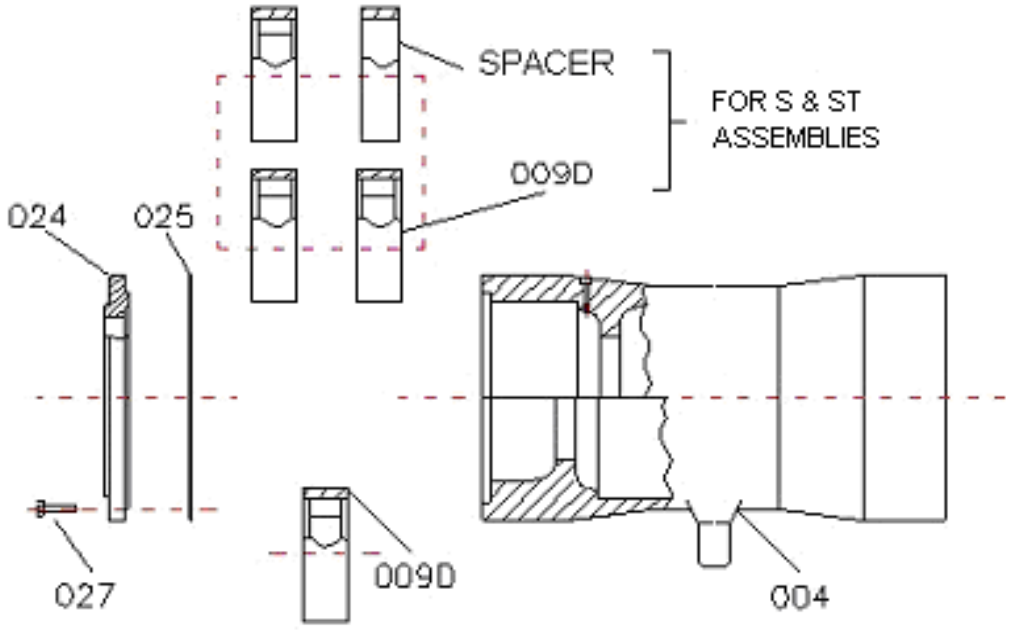


Fig. 9

BEARING ASSEMBLY: Attachment of the bearing to the bearing house box, on the operation side.

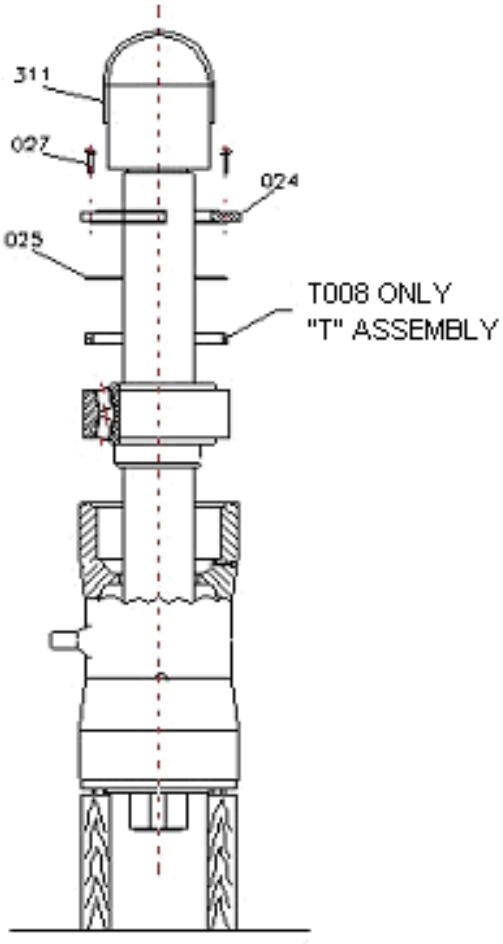
1 – Apply light grease or oil to the hole on the operation side (marked Operation Side) in the Bearing Box (004).

2 – Lean the box with the operation side up and place the External Bearing (009D), then, hit uniformly against the box prop using a plastic hammer: For the “S” Bearing House Assemblies (that is, S and ST Frames), place two (2) External Bearings (009D). Only one bearing on the operation side must be used. Place an External Bearing Spacer against the box prop and then place an external Bearing (009D).

3 – Apply recommended bearing grease (refer to pages 12 and 13) to the bearing(s), in the box, then apply a great amount of it inside the bearing(s). Leave a space between the grease retainer and the bearings half-full of grease.

4 - Slightly grease the internal surfaces of the Bearing House Cover (024).

5 - Place the bearing house cover with the packing (025). Insert the Bearing House Cover bolts (027) and tighten them uniformly.



. Fig. 10

BEARING ASSEMBLY: Attachment of the shaft to the Bearing House Box

1 – Place the Bearing House Box on two wooden blocks with the bearing house cover down; clean and slightly grease the internal diameter of the bearing.

2 – Screw the Lifting Nut of the Shaft (311) in the shaft end, on the impeller side, by means of a crane. Lift it carefully and put it into the box. Hit the bearing until it leans against the prop of the bearing house box.

3 – For "T" Bearing House Assemblies (T and TU Frames) put the Bearing Spacer (T008) in the bearing house box and hit it until it leans against the bearing cover.

4 – Slightly grease the internal surfaces of the Bearing House Cover (024).

5 – Place the bearing house cover with the packing (025) in the box. Insert the bearing house cover bolts (027) and tighten them uniformly.

BEARING ASSEMBLY: Verification of the bearing end pitching. Although the bearing assemblies are mounted and do not require adjustment, we suggest that the end pitching be checked, according to the table below:

BEARING ASSEMBLY	END PITCHING
0.0045" – 0.0020"	(0.114 – 0.051 (mm)
0.0046" – 0.0026"	(0.117 – 0.066 (mm)
0.0065" – 0.0040"	(0.165 – 0.102 (mm)
0.0060" – 0.0032"	(0.152 – 0.081 (mm)
0.0070" – 0.0024"	(0.178 – 0.061 (mm)
0.0090" – 0.0065"	(0.229 – 0.165 (mm)

Before measuring the end pitching, it is necessary to obtain the pressure against the labyrinth (impeller end) while on test. This way, the bearing cone (impeller end) remains in its correct position in the shaft and the end pitching, whatever it is, will remain constant. This may be performed firstly by joining the three Relief Collar segments (239) with its bolts and by tightening them firmly. Then adapt the Relief Collar, which is mounted against the labyrinth (flat face out).
Slide a piece of pipe over the shaft against the Relief collar and keep the lifting nut of the shaft (311) tightened to the impeller screw thread. Note that the relief collar is adjusted. Otherwise, the angled bearing surface in the labyrinth may be damaged. N, P, Q and R frames have no relief collar.

In order to measure the end pitching of the bearing house assembly, proceed as follows:

a) Rest the assembly, impeller side up, on two wooden blocks. The whole assembly must be placed in a position which may be reached by a crane;

b) Attach a dial indicator to the assembly so that the relative axial movement between the shaft and the box can be measured. The use of a dial indicator with a magnetic base is recommended. The base may be placed on the bearing house cover and the dial indicator rod positioned in the upper part of the lifting nut of the shaft (311);

c) Move the shaft up and down, lifting the whole assembly. Note the maximum and minimum readings in the dial indicator. Repeat it several times until the readings become consistent. Write down the total movement and check if it is within the given values in the table. If they are not within these limits, examine the assembling process.

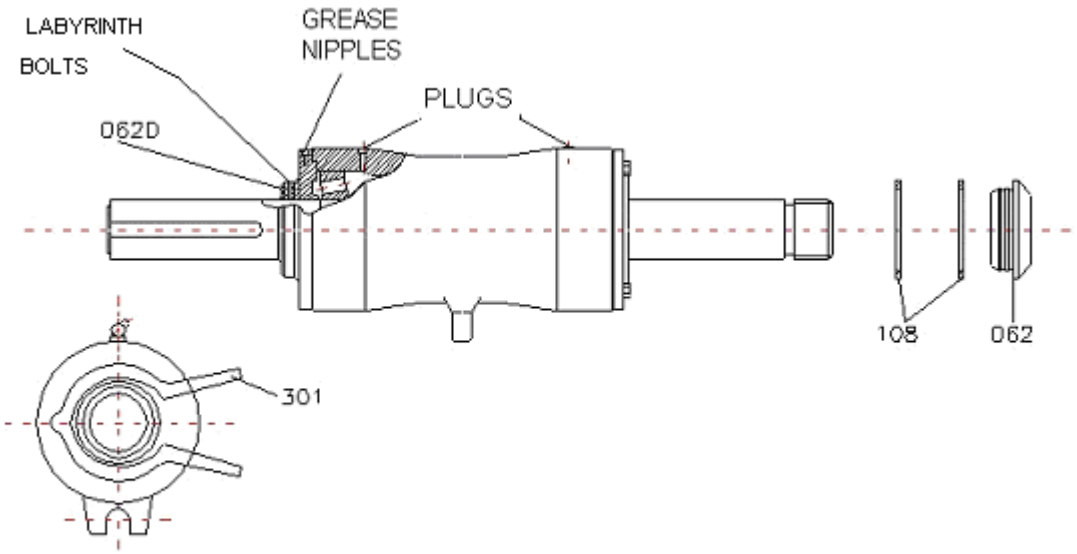


Fig. 11

BEARING ASSEMBLY: Attachment of the labyrinth, piston rings and locking bolts.

1 – Grease the piston rings (108) and place two rings in the grooves of each labyrinth (062) and (062D). Place the openings of the piston rings diametrically opposite.

2 – Slide the labyrinths over the shaft. Note that the labyrinth (062D) is attached to the operation side. Push the labyrinths into the bearing house cover, until the piston ring prevents them from entering any further.

3 – Compress the rings with the ring key (301). Push the labyrinths directly in the bearing house covers.

4- Place two bolts in the labyrinth, on the operation side, and lock them to the shaft.

5 – Place the plugs in the bearing house box and the grease nipples on the bearing house covers.

6 – Pump grease in each labyrinth, in case the work requires a greased labyrinth.

The bearing house assembly has the Imbil Part number 005 and must be ready for installation.

SECTION 4

BEARING ASSEMBLY: Test

In some cases, the operator may wish to test the functioning of the assembly before operating the unit or putting it in stock.
This operation may be performed by mounting the assembly in a test structure or on a 003 bearing housing.
In order to obtain the required speed, connect the shaft to a small motor, either by coupling or by pulleys.
It is necessary that there is pressure against the labyrinth (impeller end) while the test is performed, due to the bearing arrangement. This may be performed firstly by joining the Relief Collar (3) segments (239), firmly tightening and placing them against the labyrinth (flat face out). Slide a piece of pipe over the shaft, against the relief collar and keep it tightened by means of a nut in the threaded shaft end. Note that the relief collar is adjusted. Otherwise, the angled bearing surface in the labyrinth may be damaged. N, P, Q and R frames have no relief collar.
This way, the bearing cone (impeller end) remains in its right position in the shaft. The end clearance, whatever it is, will remain constant.

Test it for one hour. One of two things will take place:

a) If the end pitching and the amount of grease used are correct and all the components are in good shape, there must be little or no heat after this period
OR
b) If one or both bearings heat up fast and excessively, the test must be interrupted. Wait for the assembly to cool down.

Excessive heat occurs when it is impossible to keep the hand on the bearing box for more than a few seconds.
A short period of increase in the heating is frequently caused by an excessive amount of grease in the bearings. Let the assembly cool down and then restart the test. If it heats up again, interrupt the test.
If the heating persists, interrupt the test, disassemble the assembly and inspect all the components. Look carefully for any foreign body in the grease and in the component parts.

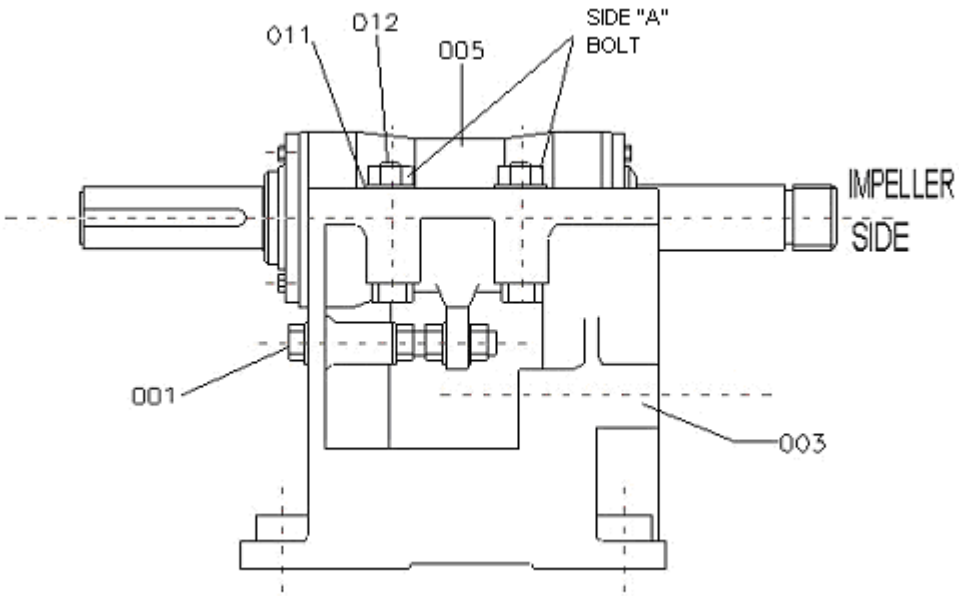


Fig. 12

FRAME ASSEMBLING: Attachment of the bearing house assembly to the bearing housing.

1 – Insert the adjusting bolt (001) in the rack/bearing housing (003) from the outside. Screw a nut and tighten it completely. Screw two additional nuts with two smooth washers in the middle. These nuts must be let loosened and maximum distance between them must be kept.

2 – Apply grease to the machined surfaces (bearing house box base) in the base.

3 – Lower the bearing house assembly (005) to the base. Match approximately the machined surfaces of the box with the surfaces in the base.
Make sure that the salience of the bearing house box is placed on the adjusting bolt in the base. Check also if it is among nuts and washers.

4- Place the bolts (012) through the base from the bottom. Place a washer (011) on each bolt and screw the nuts.
See also figure 18. The bolts on the opposite side “B” must not be tightened at this point. They should be left just in order to maintain the alignment, but, at the same time, to allow for some axial movement.

5- Grease the shaft that projects from the labyrinth, at the impeller end. This grease application will help in the placement and in the removal of the shaft components and will prevent damage caused by humidity in the shaft.

6 – Place two wooden pieces on the lower part of the base or the appropriate assembly bearing housing (see figure 13), in order to prevent the pump from inclining forward during the mounting of the pump end itself.

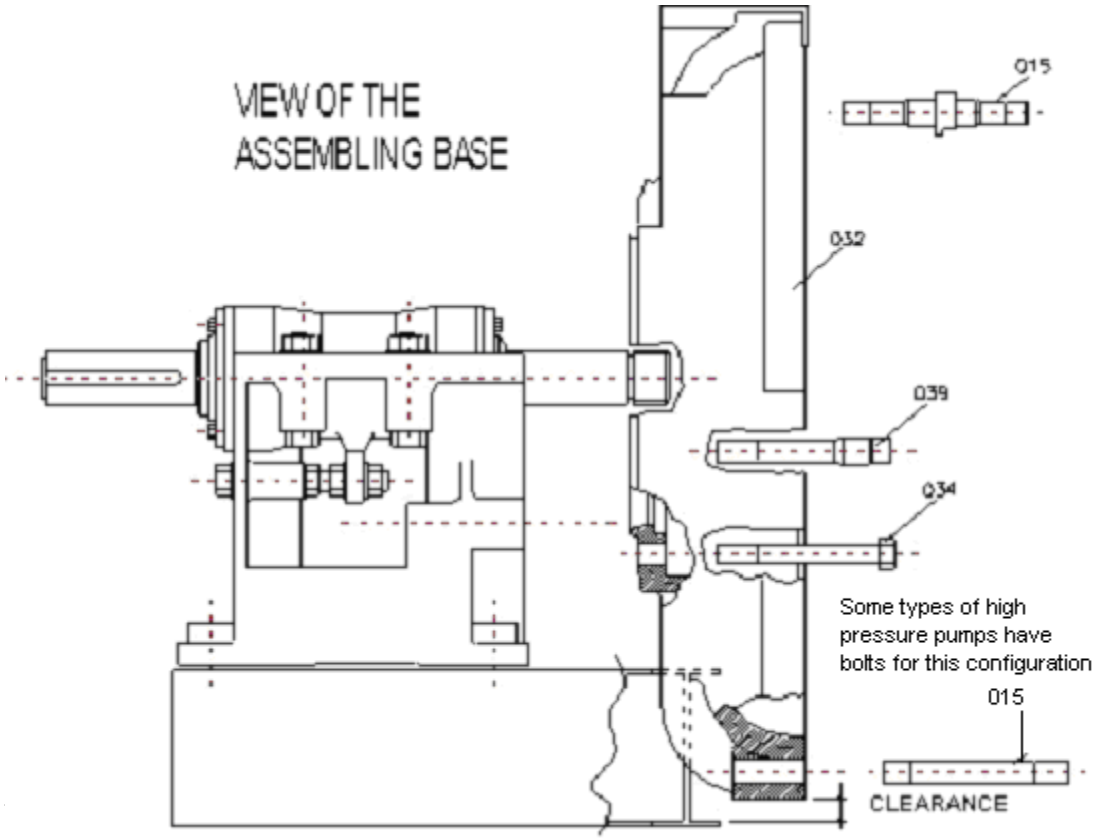


Fig. 13

REAR BODY ASSEMBLING: Attachment of the rear body and attachment of the front body bolts.

1 - Adapt the rear body (032) to the base, ensuring that the rear body prop has fitted to the correspondent lower part on the base.
In large pumps, the rear bodies are supplied with radially threaded holes for the placement of eye bolts, in order to facilitate the lifting.

2 – Insert the rear body volutes (039) or rear body bolts (034), according to the pump type. Place the nuts and tighten completely.

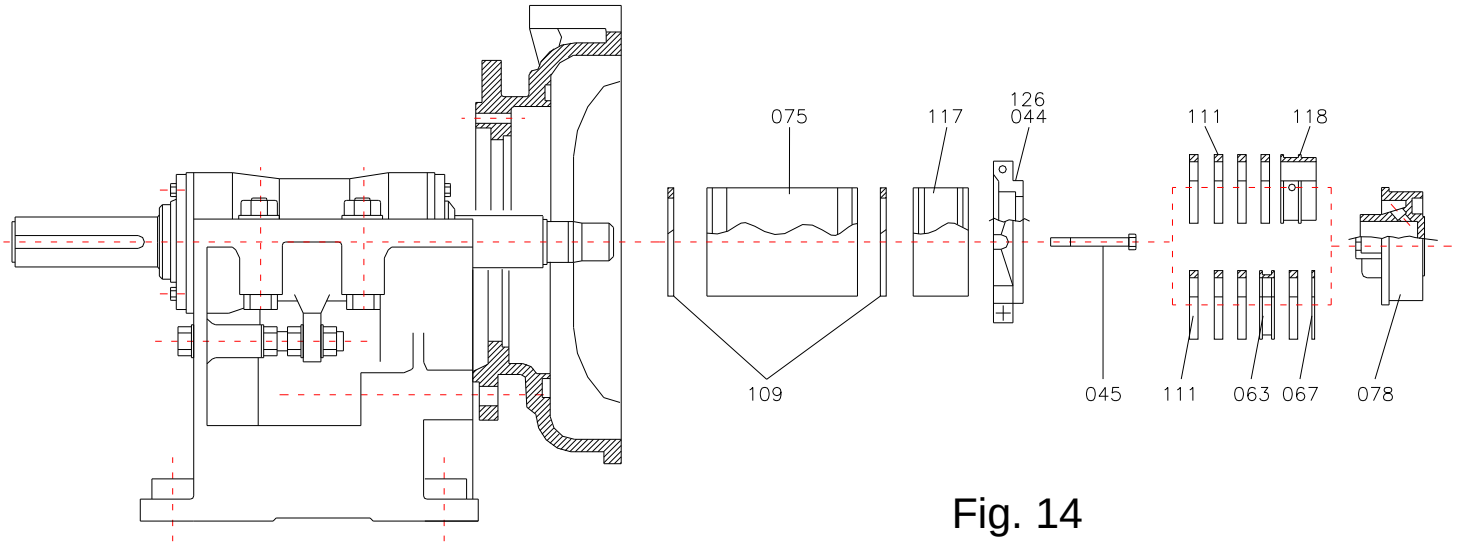


Fig. 14

GLAND ASSEMBLING: Attachment of the packing box, prop rings of the packing and brack; packing, shaft sleeve, spacer and shaft sleeve O'ring.
FRAMES: B, C, D, E, F, N, NP, P, Q, and R

1 – Place the Packing Box (078) on the workbench (gland side up).

2 – Place the Restrictor Ring (118) (small diameter down) in the gland indentation.
In certain applications, the "Prop Ring of the packing (067)/Brack Ring (063)" arrangement is used instead of the restrictor ring.

3 – Place the shaft sleeve (075 or 076) through the restrictor ring.

4 – Place the packings (111). The packings must be of proper length. They must also be flattened and the cuts must be alternated.

5 – Assemble the gland halves (044), insert the gland bolts (126) and tighten them completely. Place the packing box glands and push them down in order to compress the packing rings. Insert the gland bolts (045) and place the nuts only in order to sustain the shaft sleeve.

6 – Place the shaft sleeve O'ring (109) in the shaft and slide it to the labyrinth.

7 – Insert the assembled packing box in the rear body and slightly hit it towards its position. Place the packing box with the water connection up.
The shaft sleeve will probably remain forward. It must be pushed to the labyrinth and to the O'ring.

8 – Adapt the second O'ring of the shaft sleeve and push it towards the indentation, located at the shaft sleeve end side.

9 – Place the spacer (117) in the shaft and press it to the shaft sleeve.
(**NOTE:** If the shaft sleeve is a long model (076), the spacer (117) is not used).

10- Use a great amount of grease the shaft screw thread.

FRAME: S-HH

The procedure is the same as described above, except for the following subparagraphs. They must substitute the instruction (6):

a) Place the O'ring in the shaft and slide it to the labyrinth;
b) Join the three (3) segments of the relief collar (239) with their bolts and tighten them firmly. Place the relief collar (flat face out) in the shaft, to the labyrinth. Grease the flat face of the relief collar;
c) Slide the shaft sleeve spacer (179) in the shaft to the labyrinth;
d) Adapt a shaft sleeve O'ring (109) in the shaft and slide it to the flattened face of the spacer.

FRAMES: S, ST and TU

1 – Place the packing box (078) straight on the workbench (gland side up).

2 – Place the restrictor ring (118) in the gland indentation. Note that the grooved hole must be adjusted downwards.
In certain applications, the "brack ring (063)/prop ring" arrangement of the packing (067) is used instead of the restrictor ring.

3 – Position the shaft sleeve (076) (long) through the restrictor ring. Use the shaft

sleeve (075) (short) in pumps with centrifugal sealing.

4 – Place the packings (111). The packings must be of a proper length and flattened. The joints must be placed alternately.

5 – Assemble the gland halves (044), insert the gland bolts (126) and tighten them completely. Place the gland in the packing box and push it down in order to compress the packing rings. Place the gland bolts (045) and tighten nuts well enough in order to sustain the shaft sleeve.

6 – Adapt the shaft sleeve O'ring (109) in the shaft and slide it to the labyrinth.

7 – Join the three (3) segments of the relief collar (239) with their bolts and tighten them firmly. Place the relief collar (flat face out) in the shaft to the labyrinth.

8 – Place a shaft sleeve O'ring (109) in the shaft sleeve end.

9 – Insert the assembled packing box in the rear body and slightly hit towards its correct position. Place the packing box with the water connection up. The shaft sleeve must be pushed up against the relief collar.

10 – Use a great amount of grease the shaft screw thread.

NOTE
All O'rings in their respective grooves will be compressed and completely covered by these metallic parts when the impeller is screwed in the shaft.

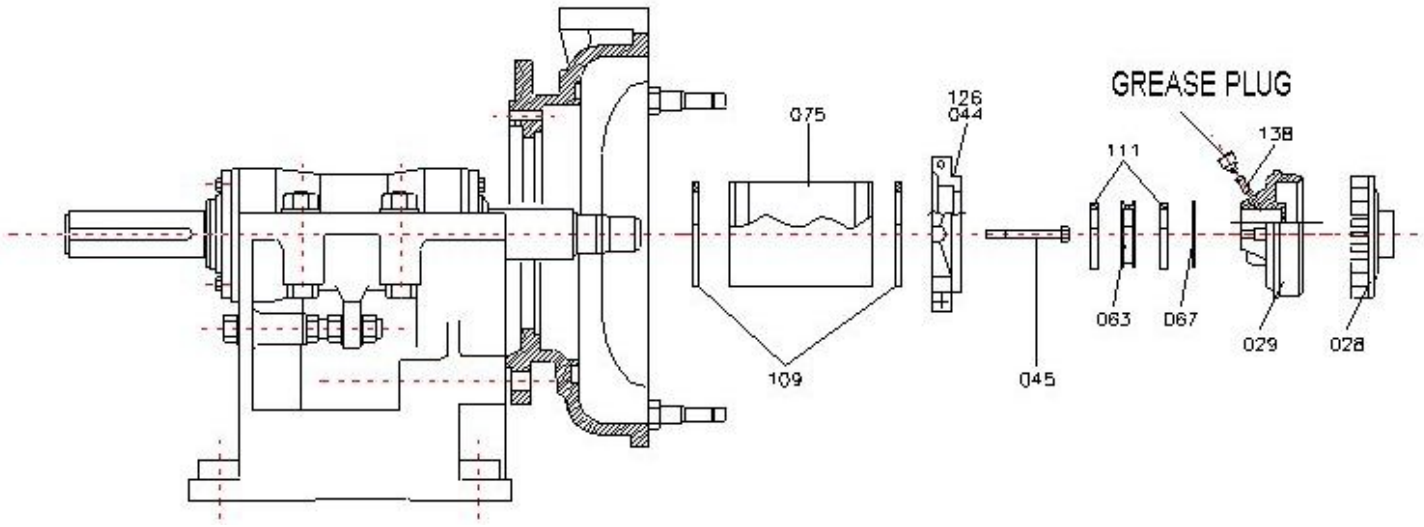


Fig. 15

ASSEMBLING – CENTRIFUGAL SEALING

(Metal Expeller Box)
Attachment of the Expeller Box, Prop Rings of the Packing and brack, Packings, shaft sleeve, shaft sleeve O'rings and Expeller

FRAMES: B, C, D, E, F, N, NP, P, Q and R

1 – Place the Expeller Box (029) on the workbench (gland side up).
2 – Place the Prop Ring of the Packing (067) in the gland indentation.
3 – Place the Shaft Sleeve (075) in the end, through the prop ring of the packing.
4 – Place the following items, one at a time:

a) First, the Packing (111) of a proper length to fill the space completely;
b) Brack Ring (063), pressed down in order to flatten the first ring;
c) The remaining packing rings (alternate the joints) until the space is almost completely filled.

5 – Assemble the gland halves (044), place the gland bolts in the expeller box and push them down in order to compress the packing rings. Insert the Gland Bolts (045) and tighten the nuts well enough in order to sustain the shaft sleeve.

6 – Place the Shaft Sleeve O'ring (109) in the shaft and slide it to the labyrinth.

7 – Insert the Expeller Box assembled in the rear body, and slightly hit it until it reaches its position. Place the expeller box with the grease inlet up.
The shaft sleeve will probably remain forward. It must be pushed back until it reaches the labyrinth and the O'ring.

8 – Place the second Shaft Sleeve O'ring (109) and push it into the indentation, on the shaft sleeve end side.

9 – Place the Expeller (028) in the shaft and press it to the shaft sleeve.

10 – Use a great amount of grease to lubricate the shaft screw thread.

11 – The Assembling of lubricating parts of the packings will be performed after all the other parts of the pump are mounted.
Attach the Adaptor of the Grease Fitting (Grease Plug) (138) and the Grease Fitting to the expeller box. Fill the fitting with recommended grease and screw the cover down to load the brack ring. The fitting top must stay up.

FRAME: S-HH

The procedure is the same as described above, except for the following subparagraphs. They must substitute instruction (6).

a) Place the CSC 210 O'ring in the shaft and slide it to the labyrinth;
b) Join the three (3) segments of the relief collar (239) with their bolts and tighten them firmly. Place the relief collar (flat face out) in the shaft to the labyrinth. Grease the flat face of the relief collar;
c) Slide the shaft sleeve spacer (179) in the shaft to the labyrinth;
d) Adapt a shaft sleeve O'ring (109) in the shaft and slide it to the flattened face of the spacer.

FRAMES: ST and TU

1 – Place a shaft sleeve O'ring (109) in the labyrinth groove.

2 – Join the divided Relief Collar (239), with its bolts, and tighten them firmly. Place the collar (flat face out) in the shaft to the labyrinth.

3 – Place a second shaft sleeve O'ring (109) beside the collar.

4 – Slide the Shaft Sleeve (075) over the shaft. Place the Shaft Sleeve O'ring (109) and push it into the indentation in the shaft sleeve end.

5 – Freely adapt the Brack Ring (063), followed by the Prop Ring of the packing (067) over the sleeve and push both against the bearing house box.

6 – Attach the Expeller Box Lifting Beam (310) to the Expeller box on the opposite side of the saliences, by using three bolts. Check it to make sure that the grease inlet is aligned with the lifting beam in the expeller box (See fig. 19).

7 – Lift the Expeller Box with the lifting beam by means of a crane and insert the Expeller Box in the rear body, slightly hitting it until it gets to its right position.

8 – The assembling of all parts of the Gland in the Expeller Box will be performed after all other parts of the pump are mounted, in the following way:
a) Slide the Prop Ring of the Packing (067) inside the Expeller Box;
b) Place the first Packing Ring (111), of a proper length in order to fill the space. Slide it against the prop ring of the packing;
c) Slide the Brack Ring (063) and press it to flatten the first ring;
d) Place the remaining packing rings to fill the space almost completely.
(Alternate the packing joints and flatten each ring);
e) Assemble the Gland halves (044) on the shaft sleeve with the gland neck towards the Expeller Box. Insert the Gland Bolts (126) and tighten them completely. Push the halves into the Expeller Box in order to compress the packing

rings. Insert the Gland Bolts (045) and tighten the nuts till they are fastened;
f) Attach the Grease Fitting Adaptor (138) and the Grease Fitting to the Expeller Box. Fill the fitting with recommended grease and screw the cover down in order to load the brack ring. Fill the fitting again.

9 – Place the second shaft sleeve O'ring (109) and push it into the indentation, in the shaft sleeve end.

10 – Place the Expeller (029) in the shaft. Slide it over the spacer and press it to the shaft sleeve.

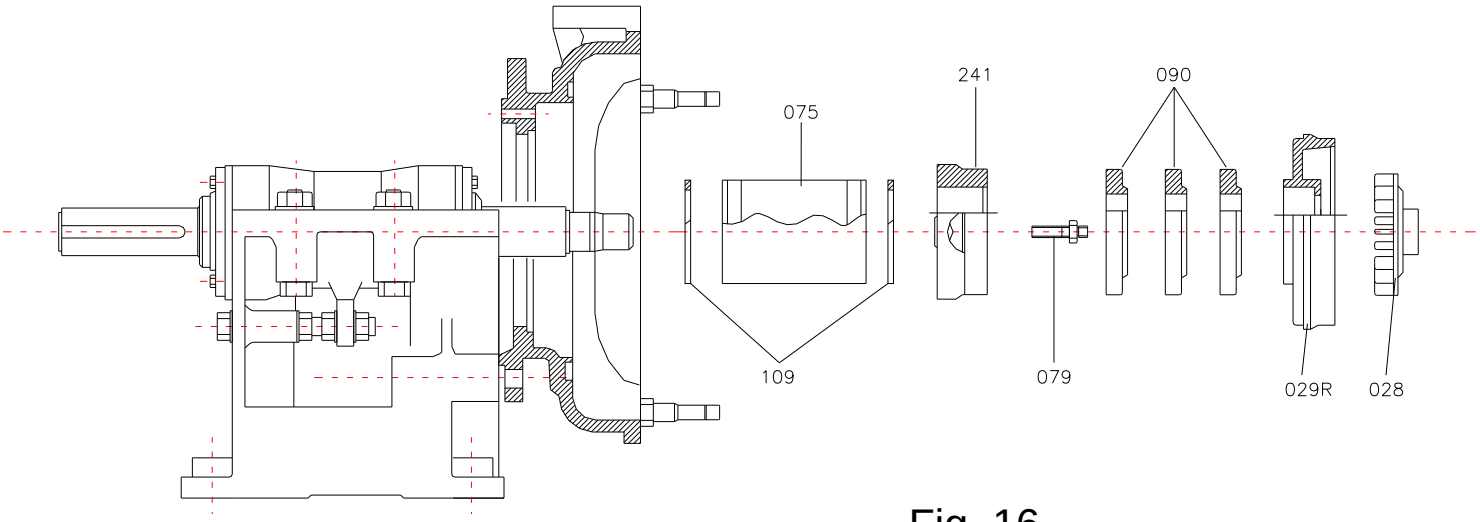


Fig. 16

<u>ASSEMBLING – CENTRIFUGAL SEALING</u>: Attachment of the Expeller Box, Retainers, Gland Bolts, Shaft Sleeve, Shaft Sleeve O'rings and Expeller.

All the Frames (Expeller Box Assembling):
1 – Place the Expeller Box (029R) in the workbench (gland side up).
2 – Place the two volutes of the expeller box (079) in threaded holes of the expeller box and tighten them completely.

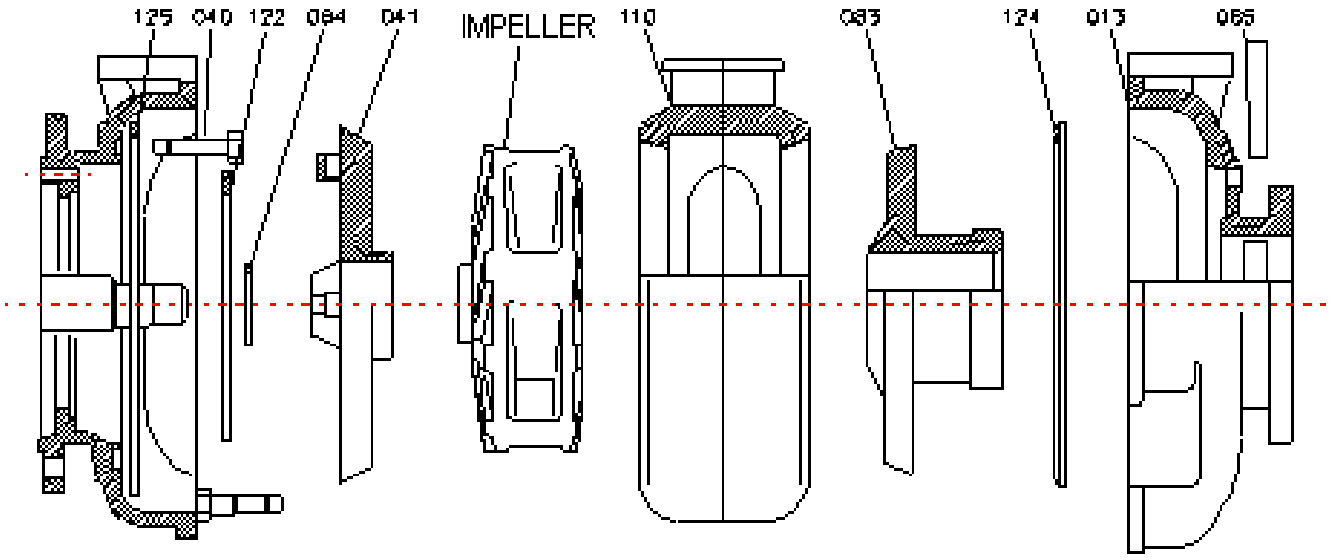


Fig. 17

PUMP ASSEMBLING (Metal Covering): Attachment of rear internal covering, volute covering, sealing ring, covering sealing, impeller O'ring, impeller and front body.

1 – Apply some grease (heavy) in the expeller groove or spacer groove and place in the same shaft sleeve O'ring (109). Make sure that the O'ring is sustained in its position.

2 – Attachment of the 122 Sealing ring
This sealing is of two types:

a) **Frames: B, C, D, E, F, N, NP, P, Q, R**
The sealing is of Section "C". Attach them to the packing box edge or the metal expeller box. The use of a rubber glue in order to sustain this part in its position is recommended.

b) **Frames: S, ST, T and TU**
The sealing is an O'ring. Place it in the groove, on the packing box edge or metal expeller box.

3 – Attachment of Covering Sealing (124 or 125):
This sealing is also of two types:
a) 38/25, 50/38 and 75/50 Pumps
The sealing is an O'ring. It is mounted afterwards – (See 4c below).
b) All other pumps

The sealing is of Section “C” and it is performed by internal pressure. Place it (Smooth face rested on the rear body) inside the rear body groove. Use rubber glue preferably.

4 – Attachment of the Internal Covering (041) and Impeller

38/25, 50/38 and 75/50 Pumps

a) Have the impeller as indicated for the specific application of the pump. Rest the impeller (salience up) on a flat surface. Apply grease to the impeller screw thread. Place the internal covering (041) on the impeller and screw the impeller in the shaft;

b) Place the shaft key (070) and shaft lock (306) on the key. By holding the shaft with the key and turning the impeller with a bar between the vanes, tighten the impeller in the shaft, but not excessively.
Make sure the bolts (012) on side B of the base (See fig. 12 and 18) are attached well enough to sustain the bearing house assembly horizontally, but do not lock it
In order to keep internal rear covering temporarily in its correct position, move the bearing house assembly backwards by means of a nut in the adjusting bolt (011). The covering can be performed manually, if necessary;

c) Place the covering sealing (125) (O’ring type) on the internal rear covering, against the rear body.

100/75 to 350/300 Pumps
In these internal rear coverings, the storage of the volutes or bolts for the assembling of the rear body coverings was predicted. The only exception is the 4/3 AH Pump.

Proceed as follows:
d) Screw and tighten the covering volutes (026) in threaded holes as predicted in the internal rear covering. Alternately, depending on the pump type, place the bolts (040) in “T” slits as predicted in the covering. Wedge small pieces of rubber under the bolt heads in order to keep them in their position;

e) Elevate the lifting pipe (302) by means of a crane (See Fig. 19).
Place the internal rear covering and push the lifting pipe into the covering hole. Lift the pipe with the covering and slide it over the shaft screw thread. Align the volutes or bolts with the holes and push the internal rear covering against the rear body.
Check if the sealings have not been displaced. Screw the nuts, but do not tighten them. Remove the lifting pipe;

f) Place the key (070) and the shaft lock (306) over the key. Make sure that the bolts (012) on side B of the Base (See Fig. 12 and 18) are placed well enough only

to sustain the bearing house assembly horizontally, but not locked.
Keep the shaft with the key and screw the localizer nut (103) in the shaft. The conical face will place the internal rear covering correctly. Tighten all volutes or bolts in the covering and then remove the localizer nut;

g) Obtain the correct type of impeller, according to the specific application of the pump. Rest the impeller (salience up) on a plain surface. Apply grease to the screw thread.
Lift the impeller by means of a crane, using a rope or a hook and screw it in the shaft. Use a bar among the vanes and keep the shaft with the key in order to tighten the impeller. Make sure that the several O'rings in the shaft are not damaged during assembling and that they are completely covered with many sleeves etc.

NOTE
The importance of this stage must be extremely emphasized. If the sealings are damaged, a leakage will certainly occur, and in order to repair it the disassembling process will be required.

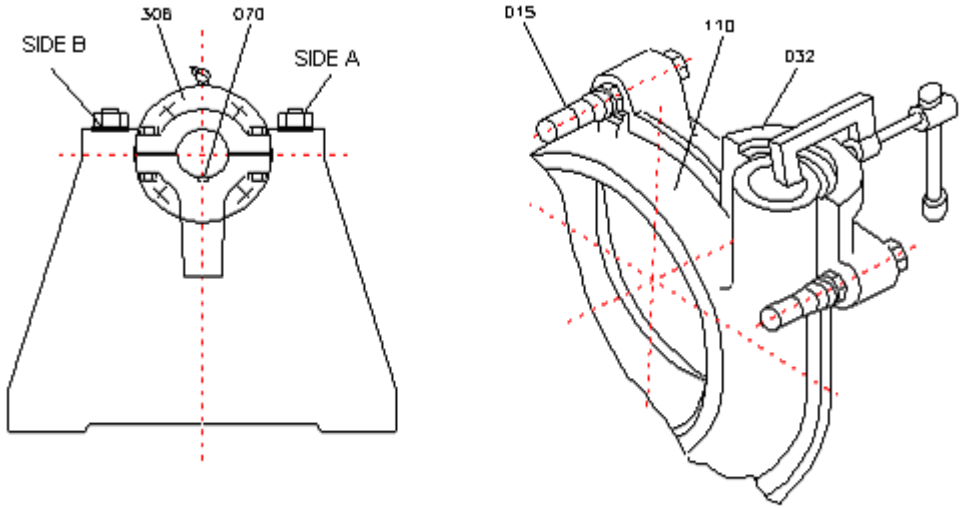


Fig. 18

5 – Attachment of the Volute Covering (110) and Suction Covering

38/25, 50/38, 75/50 and 100/75 Pumps

a) In these pumps, the suction covering is an integral part of the volute covering (110).

Lift the volute covering over the impeller and push it back into the rear body so that the conical internal rear covering hooks the correspondent conic in the volute covering. Make sure that the covering sealing has not been displaced. To keep the volute covering temporarily in this position, use a “Type C Fixer”, in order to attach the discharge block of the volute covering located at half flange from the rear body (See fig. 18).

150/100 to 350/300 Pumps

b) By using the Lifting Beam (304) and a crane to lift the Volute Covering (110) from the floor, pass it over the impeller and place it over the conical edge of the internal rear covering.
Make sure that the covering sealing has not been displaced.

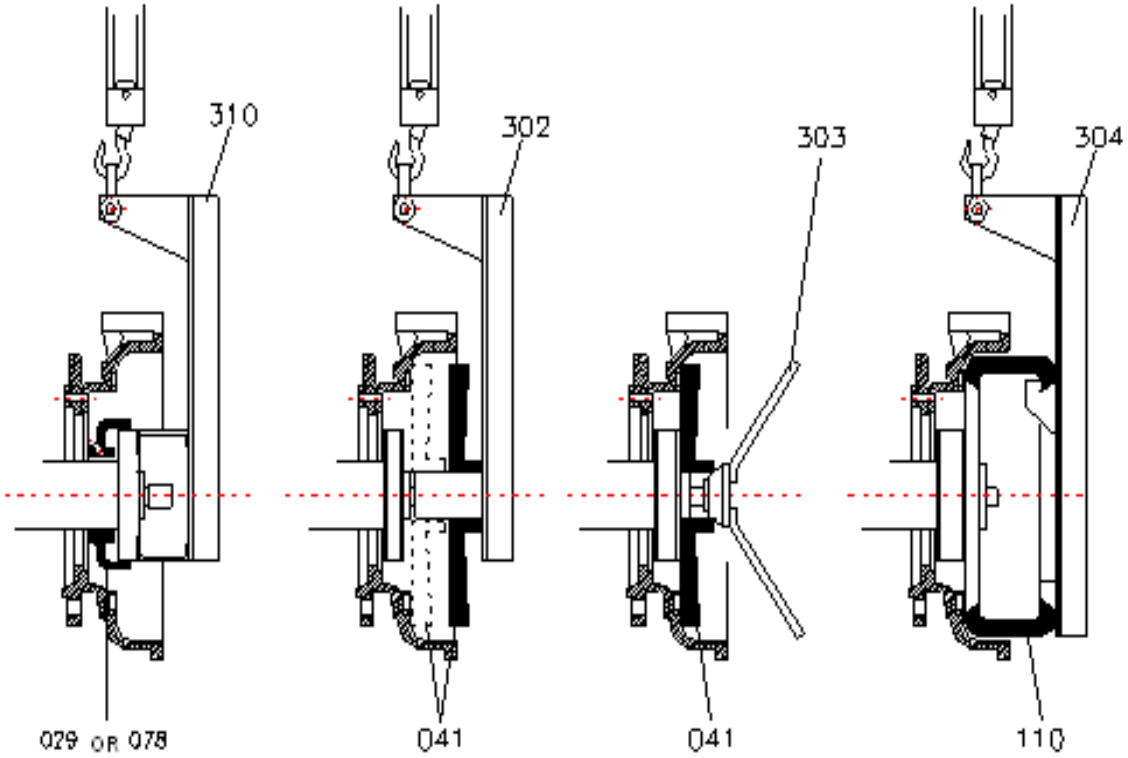


Fig. 19

Attach the volute covering temporarily to this position, as shown in 5(a).

In large pumps, saliences around the periphery of the covering are predicted. These saliences are positioned so that some body bolts, with special slits, can be adapted over them. These bolts must be removed before assembling the volute covering and they must be replaced while the volute covering is being kept in its place with the crane. This will ensure that the covering is not displaced from its position.

In order to avoid accidents, it is very important that the volute covering is firmly sustained during the final assembling stages.

c) Rest the front body (013) (inlet flange down) on adequate brackets, so that the flange stays approximately one inch above the floor.
d) Place the Covering Sealing (124) (flat face down) in the groove of the front body.
e) Lower the suction covering in the front body.
f) Insert the wedges (085) through the slits in the front body suction. Hit them slightly, carefully and uniformly, until the moment the suction covering is firmly sustained in the front body.

6 – Attachment of the Front Body (013)
Place the front body, with the suction covering, where applicable, over the volute covering and align the holes with the body bolts (015), already placed in the rear body.

NOTE
Front and rear bodies are supplied with radially threaded holes for an eye bolt so that their lifting is facilitated.
Screw the nuts in the body bolts. Do not tighten them. Remove the “Type C Fixer” from the volute covering by uniformly tightening all the body bolts, according to the torque table.
Check all the covering bolts and the suction covering wedge.

Placement of Gland Parts in the Metal Expeller Box or Packing Box.
The Assembling of gland parts for the ST, T and TU Frames must be concluded according to what is described in the “Assembling – Centrifugal Sealing” item (Check Fig. 14 or 15).

Torque table – body bolts

Maximum Torque		
Size	feet.pounds	N.m
38/25	35	48
50/38	35	48
75/50	35	48
100/75	80	108
150/100	160	217
200/150	160	217
250/200	420	570
300/250	420	570
350/300	700	950

Pump assembling (Rubber Covering)

Attachment of the coverings, impeller O'ring, impeller and body

Pump Size	2 Parts Ref. Fig. 20	3 Parts Ref. Fig. 21	4 Parts Ref. Fig. 22
38/25	X	-	-
50/38	X	-	-
75/50	X	-	-
100/75	X	-	-
150/100	-	X	-
200/150	-	X	-
250/200	-	X	-
300/250	-	X	-
350/300	-	-	X

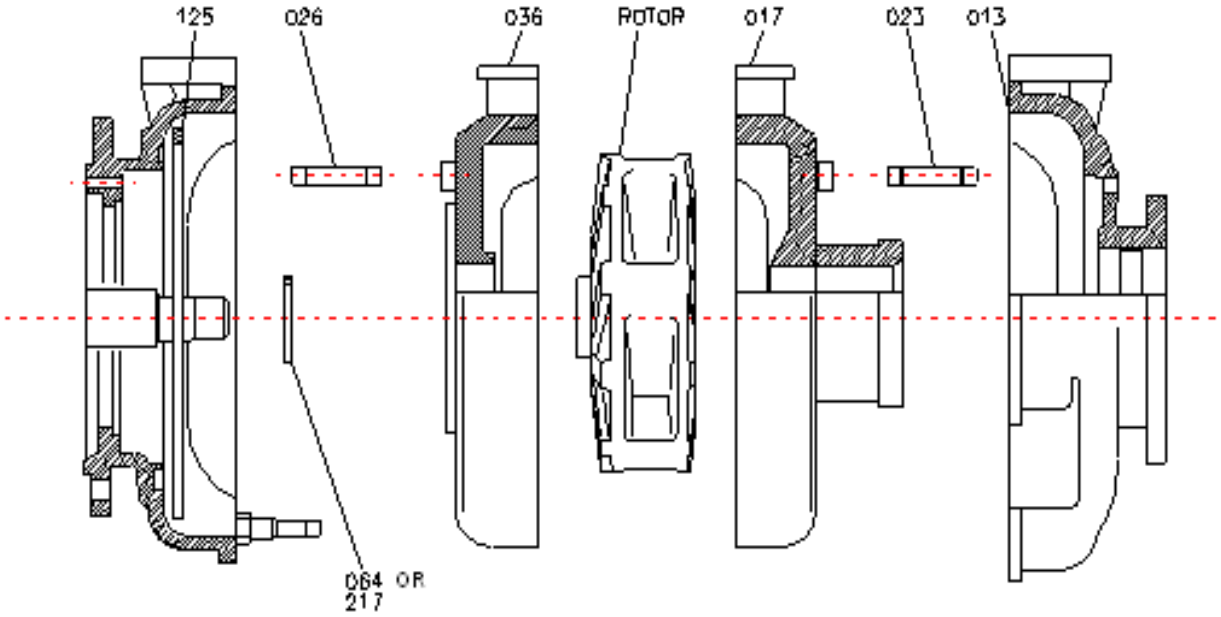


Fig. 20

PUMP ASSEMBLING (Rubber Covering) – (Two Parts):

1 – Apply some grease (heavy) to the expeller groove or spacer groove and place in the same impeller O'ring (064 or 217) or, according to the pump, the Shaft Sleeve o'ring (109). Check the appropriate component diagram. Make sure that the O'ring is kept in its position.

2 - Attachment of the Rear Covering (036)
a) Screw and tighten the volutes (026) in the threaded saliences, predicted in rear covering;
b) Lift the covering in the position, align the volutes with the holes and push them into the rear body. Place the nuts into the volutes.

3 - Impeller Attachment
a) Have the correct type of Impeller, according to specific application of the pump. Rest the impeller (salience up) on a flat surface. Apply grease to the screw threads and then screw the impeller in the shaft.

b) Place the key (070) and the Shaft lock (306) over the key. By keeping the shaft with the key and rotating the impeller with a bar among the vanes, attach the impeller to the shaft. Do not tighten it too much. Make sure that the several O'rings in the shaft are not damaged during assembling.

4 – Attachment of front Covering (017) and front body (013)
a) Screw and tighten the volutes of the internal covering (023) in the threaded saliences, when predicted, in the Front Covering (017);
b) Place the front covering on the floor (suction flange up).
Apply a great amount of rubber lubricant to the suction flange and inside the suction covering.

- Place the front body over the covering, align the volutes with the holes and press the front body down until the covering is against the front body. Insert a small iron-lever between the suction neck and the covering. Lift the flange outwards. Attach the nuts to the volutes.
- Lift the front body with the covering and align the holes with body bolts (015) already assembled. Screw the nuts in the body bolts and tighten them uniformly.

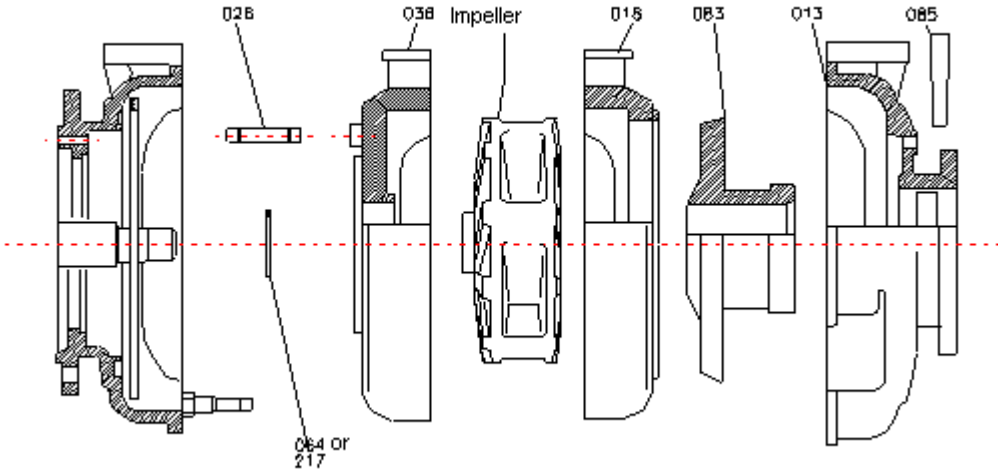


Fig. 21

PUMP ASSEMBLING (Rubber Covering) – (three parts)

1 - Apply a little bit of grease (heavy) to the spacer groove and place the Impeller O'Ring on the spacer groove (064 or 217) or, depending on the pump type, the Shaft O'Ring (109). See the appropriate component diagram. Make sure the O'ring is kept in its position.

2 – Attachment of the Rear Covering (036)
a) Screw and tighten the rear covering volutes (026) located at the threaded saliences in the rear covering;
b) Lift the covering in the position, align the volutes with the holes and push it into the rear body. Screw the nuts in the volutes.

3 – Attachment of the impeller
a) Place the key (070) and screw it to the shaft lock (306) on the key. Make sure the bolts (012) on B side of the base are placed well enough just to keep the bearing house assembly horizontally. Do not lock it;
b) Obtain the correct type of impeller according to the specifications for the pump operation. Apply grease to the screw thread, lift the impeller using a crane by means of a cable and screw it in the shaft. Use the bar between the vanes and sustain the shaft using a 306 key in order to tighten the impeller. Make sure the several O'rings in the shaft are not damaged during assembling.

4 –
a) Rest the 013 front body (suction flange down) on a proper bracket, so that the

flange is approximately 25 mm above the floor;
b) Place the 124 covering sealing (smooth side down) in the front body groove;
c) Place the 023 volutes in the 083 suction covering (when applicable), align the volutes with the front body holes and lower the suction covering. Thread the nuts in the volutes and tighten them;
d) Place the 085 wedges (when applicable) through the slits in the front body neck and hit them carefully and evenly until the moment the suction covering gets firmly attached to the front body;
e) Thread the 023 volutes in the threaded saliences predicted in the 018 front covering, place the covering in the front body and make sure the volutes are positioned with their respective holes in the front body. Screw the nuts in the volutes and tighten them.

NOTE
The 124 covering sealing is integral in some pumps with the 018 front covering. In such cases, proceed as follows:

5 – Attachment of the Front Covering (018), Suction Covering (083) and Wedges (085).
a) Place the front covering (018) (Flange down) on the floor with a block in the center, the height leveled or slightly above the covering and rest the suction covering on the block (083) (suction flange up);
b) Apply a large amount of rubber lubricant to the conical edge of the suction covering and to the covering sealing;
c) Lift and lean the covering in order to hook the covering sealing on a third part of the suction covering diameter. Pass a small rounded-edge iron-lever between the suction covering and the covering and lift the covering sealing in order to hook it on the back part of the suction covering. Make sure the edge is properly placed. Such operation must be carefully performed in order not to damage or break the sealing;
d) Lift the front body (013) (suction flange up) and place it on the suction covering and covering;
e) Insert the wedges (085) through the slits in the front body neck and hit them carefully and uniformly until the moment the suction covering is kept firmly in the front body.

6 – Attachment of the Front Body (013)

Lift the front body with the suction covering and covering, and align the holes with the body bolts (015), which were already located at the rear body.

NOTE
Large front bodies are supplied with radially threaded holes for an eye bolt, so that the lifting is facilitated.
Screw the nuts in the body bolts and tighten them uniformly.

7 – Attachment of the Gland Parts in the Metal Expeller Box or Packing box.
The assembling of the gland parts for the ST, T e TU Frames must be concluded according to the description in the “Assembling – Centrifugal Sealing” item (See Figure 14 or 15).

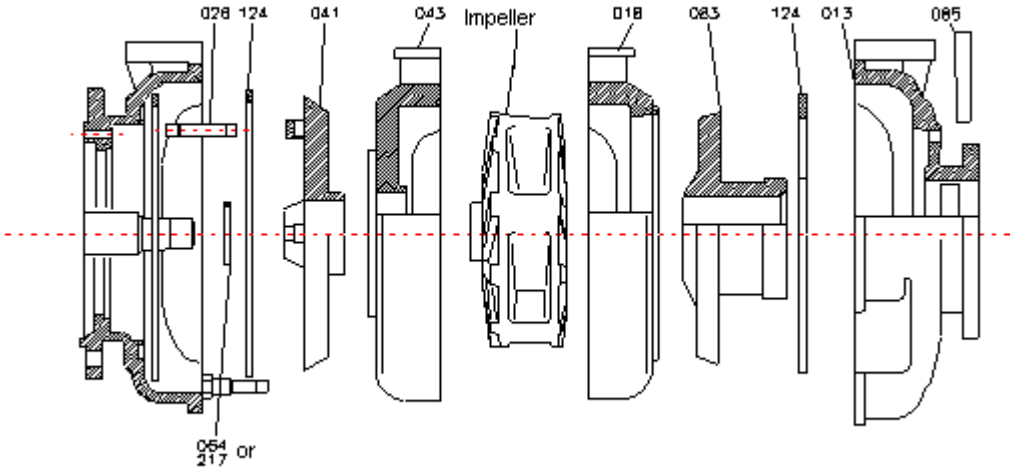


Fig. 22

PUMP ASSEMBLING (rubber covering) – (four parts)

1 – Apply a little bit of grease (heavy) to the expeller groove or spacer groove, and place the impeller O’ring on the groove (064 ou 217) or, depending on the pump type, shaft sleeve O’ring (109). See the appropriate component diagram. Make sure the O’ring is kept in its position.
2 – Attachment of the COVERING SEALING (124), INTERNAL REAR COVERING (041) and VOLUTES (026), REAR COVERING (043) and VOLUTES (023):
a) Place the covering sealing (124) (smooth side resting on the rear body) on the rear body groove;
b) Screw and tighten the volutes (026) in the threaded saliences predicted in the internal rear covering (041);
c) Lift the lifting pipe (302) using a winch (See Fig. 19). Lift the internal rear covering touching lightly the groove end of the lifting pipe. Push the lifting pipe into the central covering hole. Lift the pipe with the covering and slide the pipe over the shaft screw thread. Align the volutes with the holes and push the covering against the rear body. Place the nuts but do not tighten them. Remove the lifting pipe;

d) Thread and tighten the volutes (023) in the threaded saliences of the rear covering (043);
e) Lift the rear covering towards its position using a winch and align the volutes with the rear body holes. Push the covering against the rear body. Thread the nuts.

3 – Attachment of the IMPELLER:
a) Place the key (070) and screw the shaft lock (306) on the key.
Make sure the bolts (012) on the B side of the base (see Figures 12 and 18) are placed well enough just to keep the bearing house assembly horizontally, but not locked.
Retain the shaft using the lock (306) and thread the localizer nut (303) in the shaft. The conical face will place the internal rear covering correctly. Tighten all the volutes in the internal rear covering and rear covering. Remove the localizer nut;
b) Obtain the correct type of impeller, according to the specifications for the pump operation. Apply grease to the screw thread, lift the impeller by means of a crane, using a cable or a hook, and screw it in the shaft.
Use a bar between the vanes and keep the shaft with the key (306) in order to tighten the impeller. Make sure the several O'rings in the shaft are not damaged during assembling and that they are completely protected by the several sleeves etc.

4 – Attachment of the FRONT COVERING (018), SUCTION COVERING (083) and WEDGES (085), COVERING SEALING (124), FRONT COVERING (018), VOLUTE (026):
a) Rest the front body (013) (flange down) on proper brackets in order to keep the flange aproximately 25 mm above the floor;
b) Place the covering sealing (124) (flat side down) in the existing groove in the front body;
c) Place volutes (026) in the suction covering (083) (when applicable). Align the volutes with the front body holes and lower the suction covering in the position, thread the nuts in the volutes and tighten them;
d) Insert the wedges (085) (when applicable), through the slits in the front body neck and hit them carefully and uniformly until the moment the suction covering is firmly kept in the front body;
e) Thread volutes (023) in the threaded saliences of the front covering (018), place the covering in the front body aligning the volutes with the respective front body holes, thread the nuts in the volutes and tighten them;
f) Lift the whole corpo dianteiro with suction covering and front covering and align the holes with the body bolts (015) already located in the rear body.

NOTE
Large front bodies are supplied with radially threaded holes for an eye bolt, so that the lifting is facilitated.
Screw the nuts in the front body bolts and tighten them uniformly.

6 – Attachment of the Gland Parts For the Metal Expeller Box in the Packing Box.
The Assembling of the gland parts for the ST, T e TU Frames must be performed according to the description shown in the “Assembling – Centrifugal Sealing” item (See Figures 14 or 15).

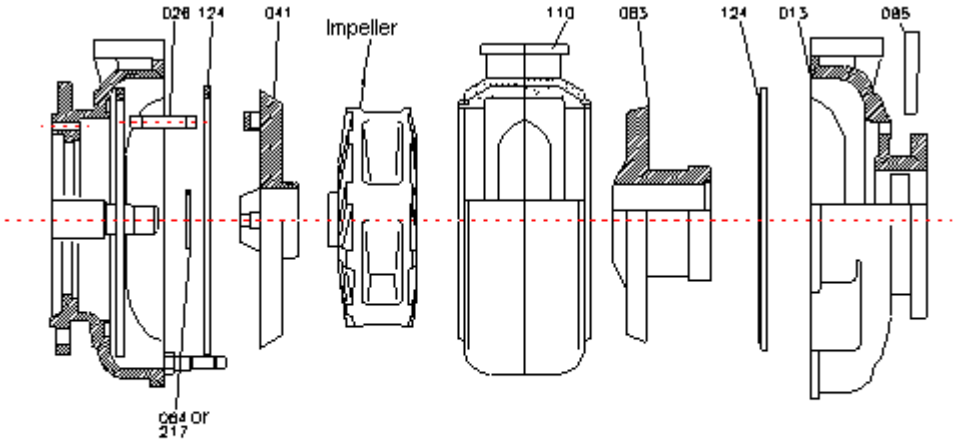


Fig. 23

PUMP ASSEMBLING (Rubber Volute Covering)

Internal rear covering, volute covering, suction covering, impeller O’ring, covering sealing, impeller and front body.

1 – Apply a little bit of grease (heavy) to the expeller groove or spacer groove and place in the same impeller O’ring (064 or 217) or, depending on the pump type, shaft sleeve O’ring (109). See the appropriate component diagram. Make sure the O’ring is kept in its position.

2 – Attachment of the Covering Sealing (124 or 125)

The sealing is of “Section C”, and is performed by internal pressure. Place it (smooth side resting on the rear body) on the rear body groove. Use preferably a rubber sticker.

3 – Attachment of the Internal Rear Covering (041) and Covering volutes (026).
a) Screw and tighten the volutes (026) in the threaded saliences, predicted in the

internal rear covering (041);
b) Lift the Lifting Pipe (302), by means of a winch (See Figure 19). Keep the internal rear covering on the edge and push the lifting pipe;
c) Lower the suction covering (083) in the front body;
d) Insert the wedges (085) through the slits in the front body neck and hit them carefully and uniformly until the moment the suction covering is firmly kept in the front body.

4 – Attachment of the front body

a) Lift the front body, with the suction covering, above the volute covering and align the holes using the body bolts (015), which are located in the rear body.

NOTE
Large front bodies are supplied with radially threaded holes for the eye bolts, so that the lifting is facilitated.
Screw the nuts in the front body bolts and tighten them uniformly.

7 – Attachment of the gland parts for the metal expeller box in the packing box.
The assembling of the gland parts for the ST, T, TU, and AHP frames must be concluded according to the description shown in the “Sealing Assembling” item (See Figures 14 or 15).

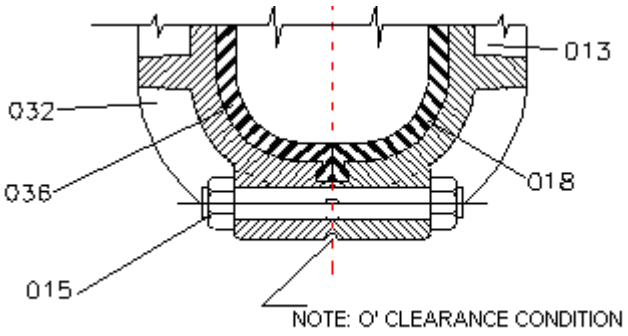


Fig. 23A

Figure 23A shows the special characteristic of the Project: High Pressure Imbil Pulp Pump (assigned by the "AHP" suffix).
Note the secure locking of the rubber coverings (036 and 018) through the integral grooves in the rear body (032) and front body (013).
This characteristic provides a better sealing due to the restriction of the rubber displacement.

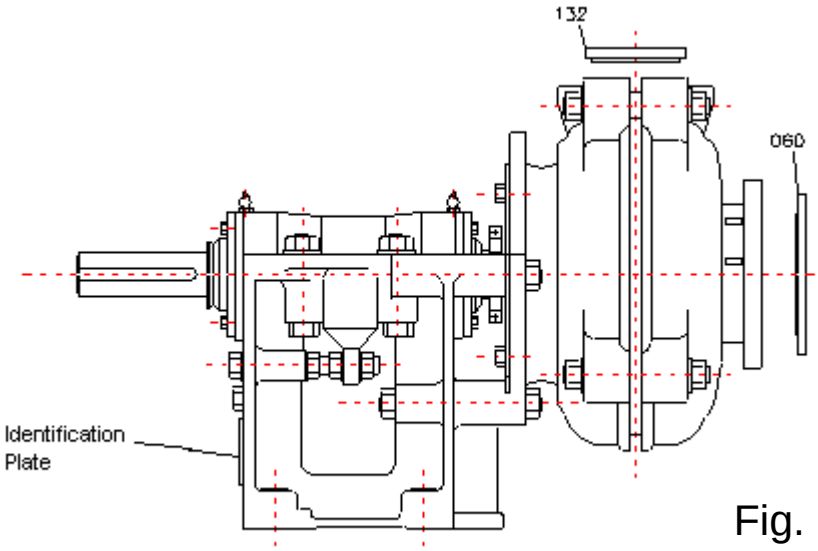


Fig. 24

PUMP ASSEMBLING: Assembled Pump

Now the pump is completely assembled. The suction joint (060) and the discharge joint (132) are supplied upon request.
The impeller clearance must now be adjusted.

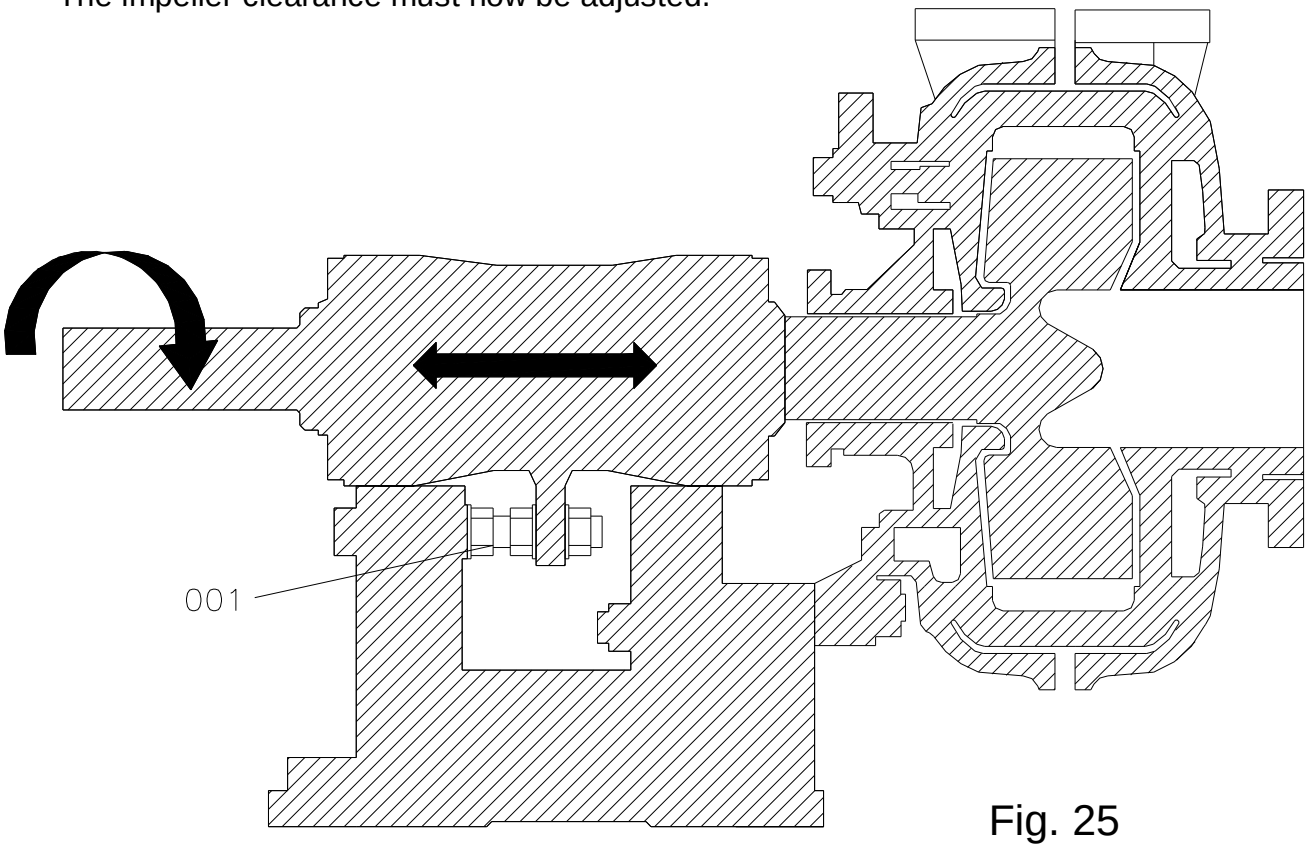


Fig. 25

PUMP ASSEMBLING: Impeller Clearance Adjustment

In Metal-Covered Pumps, the impeller must have minimum clearance in the front covering. In the Rubber-Covered Pumps, the impeller must have equal clearance at the front and in the back.

1 – Rotate the shaft clockwise by hand and move ahead the bearing house assembly (towards the front body) by tightening the rear nut in the adjusting bolt (001) until the moment the impeller starts to rub the front covering.
a) Metal-Covered Pumps: Loosen the nut half a turn, move back the bearing houses assembly, by means of the front nut until the box salience touches the rear nut
OR
b) Rubber-Covered Pumps.

2 – Measure the distance between the back part of the base and back part of the bearing house cover.
Loosen the rear nut completely, rotate the shaft clockwise by hand and move back the bearing house assembly by means of the front nut, until the impeller starts to rub the rear covering.
Measure again the distance from the back part of the base to the back part of the bearing house cover.
Calculate the average distance and adjust the bearing house forward at this distance.

3 – Tighten the Bolts (012) on the B side (Refer to the Figures 12 and 18). The bolts on the A side were previously tightened.

4 – Tighten both nuts of the adjusting bolt against the box salience.

5 – Rotate the shaft and if there is attrition, repeat the adjustment as indicated above.

PUMP DISASSEMBLING

The pump disassembling instructions oppose the assembling ones, except for the impeller removal in large pumps.

In order to unscrew the impeller easily, the Relief Collar (239) must be removed before the impeller is unscrewed. Remove the three bolts from the relief collar, insert them in the radially threaded holes and press the three relief collar segments outside the shaft. Then the impeller can be unscrewed.

Part Number	Part Name
001	Regulating Bolt
003	Base or Bearing Housing
004	Bearing House Box
005	Bearing House Assembly
008	Bearing Spacer
009	Bearing
009-D	Bearing (Operation Side)
011	Washer
012	Bolt
013	Front Body
015	Body Bolt
017	Front Covering
018	Front Covering type Suction Cov.
023	Front Covering Volute
024	Bearing House Cover
025	Packing or Wedge Assembly
026	Rear Covering Volute
027	Bearing House Cover Bolt
028	Expeller
029	Expeller Box
029-r	Rubber expeller Box
032	Rear Body
034	Rear Body Bolt
036	Rear Covering
039	Rear Body Volute
040	Internal Rear Covering Bolt
041	Internal Rear Covering
043	Rear Covering (middle)
044	Gland
045	Gland Tightening Bolt
046	Grease Retainer
052	Impeller, 3 vanes, open
060	Suction Joint
061	Locking nut
062	Labyrinth
063	Brack ring

064	Impeller O'ring
067	Prop ring of the packing
070	Shaft key
073	Shaft
075	Shaft sleeve, short
075	Shaft sleeve, long
078	Packing Box
079	Expeller box volute
083	Suction covering
085	Wedge
089	Bearing Retainer
090	Retainer
108	Piston ring
109	Shaft sleeve O'ring
110	Volute covering
111	Packing
117	Spacer
118	Restrictor ring
122	Sealing ring
124	Covering sealing
125	Covering sealing
126	Gland bolt
127	Impeller, 5 vanes, closed
132	Discharge joint
138	Grease fitting adaptor
147	Impeller, vanes, closed
179	Shaft sleeve spacer
217	Impeller O'ring
239	Relief Collar
241	Gland for retainer
-	Grease Nipple

Operational Faults

Common pumping problems and their likely causes are placed in tables in the following pages. The necessary instruments for determining the causes are the following:

“VAC” - Vacuum meter
“MAN” - Manometer
“AMP” - Amperemeter

Reading Simbology

“N” - Normal reading
“HI” - Above-normal reading
“LO” - Under-normal reading

POSSIBLE PROBLEMS

Possible problems	Instruments			Likely faults
	VAC	MAR	AMP	
Pump does not pump	LO	LO	LO	A1, A2, A4, A5, A6, A7, A8, A1, B1, B3, B5, B9
	LO	LO	HI	B4
	HI	LO	-	A4, A9
	LO	HI	LO	B10
Low volumetric flow pump and low discharge pressure	LO	LO	LO	A2, A4, A5, A6, A7, A8, A11, B1, B3, B5, B8, B9
	HI	LO	-	A3, A10
	-	N	HI	B2
Low volumetric flow pump increases discharge pressure	LO	HI	LO	B6, B15
Pump stops priming, (that is), localized air.	LO	LO	LO	A1, A2, A3, A4, A5, A6, A7, A8, A9, A10, A11, A12
Suction tank overflows	LO	LO	LO	A1, A2, A3, A4, A5, A6, A7, A8, A9, A10, A11, A12, B1, B2, B3, B5, B8, B9
	-	-	HI	B4, B11, B12
	-	HI	LO	B6, B10, B15
Excessive power consumption	-	-	HI	B2, B3, B4, B7, B11, C1, C3, C4, C8, C9, C12
Excessive leakage in the packing box				C1, C3, C6, C7, C8, C9, C10, C12, C13
Packings have short life				C1, C3, C6, C7, C8, C9, C10, C12, C13, C23
Excessive leakage in the expeller box when in operation				B13, B16, C14
Pump vibrating with noise				A2, A3, A4, A9, A10, A11, B14
Water-contaminated bearing house box				C15, C16
Bearings have short life				C1, C3, C4, C5, C6, C10, C15, C16, C17, C18, C19, C20, C21, C22
Pump overheats				A4, B14, C1, C4, C5, C6, C10, C17, C18, C19

Faults in the suction system (A:)	Usual indications		
	VAC	MAN	AMP
1 – Pump does not prime	LO	LO	LO
2 – Suction pipe not completely full of liquid	LO	LO	LO
3 – NPSHa smaller than NPSHr due to the high suction resistance	HI	LO	LO
4 – NPSHa smaller than NPSHr due to the low HATM-HVAP value	-	LO	-
5 – Excessive amount of foam, air or gas entering or dissolving into the liquid.	LO	LO	LO
6 – Air bubbles in the suction line	LO	LO	LO
7 – Air admission in the suction line	LO	LO	LO
8 – Air admission in the pump through the packing box	LO	LO	LO
9 – Blocked suction filter or suction pipe	HI	LO	LO
10 – Partially blocked suction filter or suction pipe	HI	LO	LO
11 – Suction pipe inlet insufficiently immersed	LO	LO	LO
12 – Air admission in the pump through centrifugal sealing	LO	LO	LO
Faults in the pump and system (B:)	Usual indications		
	VAC	MAN	AMP
1 – Very low pump rotation	LO	LO	LO
2 – Very high pump rotation	-	N	HI
3 – Incorrect direction for the pump rotation	-	LO	-
4 – Pump full of resting solids	LO	LO	HI
5 – Blocked or partially blocked impeller by foreign body	LO	LO	LO
6 – System resistance higher than specified	HI	HI	LO
	LO	HI	LO
	HI	LO	LO
7 – System resistance lower than specified	HI	HI	HI
8 – Impeller must be adjusted (towards suction side)	LO	LO	LO
9 – Worn impeller (replacement needed)	LO	LO	LO
10 – Blocked discharge pipe	LO	HI	LO
11 – Sm higher than originally specified	-	-	HI
12 – Dissolving liquid viscosity higher than originally specified	-	-	HI
13 – Very high Hs/Hd ratio	-	-	HI
14 – Pumped volumetric flow intensely below normal	LO	LO	LO
15 – Partially blocked discharge pipe	LO	HI	LO
16 – Impeller needs to be adjusted (towards shaft side)			

MAINTENANCE FAULTS (C:)

1 – Disalignment of the coupled shaft.
2 – Pump foundation insufficiently rigid.
3 – Warped pump shaft.
4 – Locked shaft.
5 – Worn bearings.
6 – Excessively unbalanced impeller due to wear, damage or foreign body in the impeller.
7 – Worn or scored shaft sleeve.
8 – Packing rings irregularly assembled.
9 – Packings made of wrong material for the specified working conditions.
10 – Pump shaft rotating off center due to wear in the bearings or shaft sliding in the packing box.
11 – Excessively stretched belts.
12 – Excessively tightened gland.
13 – Presence of abrasive solids in the sealing water.
14 – Worn or blocked expeller.
15 – Penetration of water originated from the excessive leakage in the packing box. Rain or condensed air in the bearing house box.
16 – Sealing water or pumped liquid entering the bearing house box through the shaft due to damaged O'rings.
17 – Excess of grease in the bearing house box, increasing the temperature and the wear of the bearing.
18 – Insufficient lubricant.
19 – Bearings incorrectly assembled.
20 – Filth entering the bearings due to careless assembling, maintenance or lubrication.
21 – Rust in the bearings due to aspiration or water submergence.
22 – Incorrect amount of grease or quality of grease in the bearing house box.
23 – Very high sealing water volumetric flow or pressure.
24 – Very low sealing water volumetric flow or pressure.

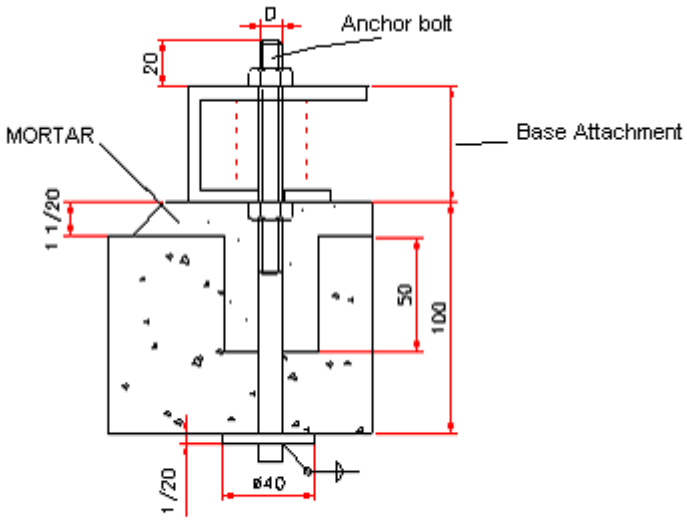


Fig. 26

1 – The foundation must be 50mm higher than the base to be mounted on it, on every side.
2 – It must be made of highly compression-resistant concrete, with proper anchor bolts, attached according to the figure. There is an indicative figure for the placement of the anchor bolts. The figure must be certified.
3 – After the foundation has cured, clean and align all the anchor bolts. In order to adjust the base, the verification of the screw threads with a fastening nut is recommended.
4 – Install the inferior nuts in the anchor bolts, according to the figure.
5 – Install the base in the anchor bolts.
6 – Align the base at the correct level, using the inferior nut at the base installed in the anchor bolt.
7 – Once the desired level is obtained, install the locking nuts (superior) applying the pre-assembling torque.
8 – Apply mortar and foundation in all base end.
Cut it in angles according to the figure.
9 – After the mortar has cured, provide final torque in the locking nuts.

NOTE
Imbil pumps are typically manufactured in order to provide total structural resistance, absorbing dynamic forces by the external edges.
For that reason, the mortar does not need to penetrate under all the base area.

IMBIL PUMPS
INSTRUCTIONS FOR ASSEMBLING AND MAINTENANCE
'M2' SUPPLEMENT
IMPELLER RELIEF COLLAR

Index

1 – Introduction

The 'm2' supplement must be read together with the instruction manual for the proper assembling and maintenance for the specific Imbil pump type, when assembled on base (003) that uses a relief collar (239); that is, the FF, FAM, FFAN, G, GG, GAM, GGAM, H, S and T bases.

2 – Purpose of the relief collar

All Imbil pumps use a screw thread to attach the impeller to the pump shaft. The larger pumps incorporate an impeller Relief Collar (239) in order to facilitate the impeller removal, because the impeller removal may be difficult. The impeller relief collar basically consists of 3 segments that form the ring, attached by high tension tap bolts. One face of the collar is square and the other is conical (see figure 1). The collar is assembled on the shaft using an one-piece part and when the impeller removal is needed, the collar segments can be removed from around the shaft, this way relieving any forces under the impeller screw thread, allowing for its easy removal. (See figure 1a).

3 – Installation

The installation of the impeller relief collar is best performed after the bearing house set (005) is assembled, and then positioned and attached to the base (003), that is, before the assembling of the pump components on the base.

The recommended assembling procedure is as follows:

1. Clean up the protective covering of the RELIEF COLLAR components (239);
2. Burr the collar segments, taking special care when dealing with the two sides which attach against the LABYRINTH (062) and the SHAFT SLEEVE (075 or 076);
3. Apply lubricant such as the "NEVER-SEEZ", anti-knocking or a similar product to the thin threads of the tap bolts. Unite the three segments of the relief collar with its tap bolts and attach them firmly;

4. Apply lubricant such as the “never-seez” type or a similar product to the lateral walls, internal diameter, tap bolt holes and radial holes;
5. If the pulp being treated dries and hard-to-remove deposits are formed, provide plastic or wooden regulating tap bolts in the tap bolt holes. These tap bolts can also be used to seal the three radially threaded holes.

   NOTE
   These wooden or plastic tap bolts must be leveled or below surface to avoid eventual damage while the pump is operating.

6. Install the SHAFT SLEEVE O’RING (109) in the labyrinth groove. Check the cross-section drawing if necessary;
7. Slide the RELIEF COLLAR (239) over the shaft, making sure that the conical face in the collar matches the correspondent conical face in the labyrinth;
8. Install the SHAFT SLEEVE O‘RING (109) in the groove contained in the relief collar. Check the cross-section drawing if necessary;
9. Proceed the assembling of the pump components on the base.

4 - Removal

The Relief Collar removal effectively loosens the screw thread that attaches the impeller to the pump shaft end. It consequently allows for an easy impeller unscrewing for removal. The procedure is the following:

1 – Unscrew and remove all the three tap bolts from the relief collar – check figure 1;
2 – Using a ram and a hammer – hit the end of each one of the segments – check figure 1.

NOTE
Special care is needed when hitting it. Excessive hits can lead to marks on the bearings similar to the Brinell hardness test.

3 – All the three segments must be entirely removed. The segment removal has the same effect as to remove a wedge, because a lateral face of the collar is conical. The interstice formed by the relief collar removal loosens the impeller screw thread, allowing for its easy unscrewing.

4 – To help in the segment relief collar removal, the three tap bolts after the removal can be screwed in the radially threaded holes in each segment and used to take the segments out of the shaft.
This method can be used together with the application of hits in the segments, as shown above in (2).

5 – Re-utilization of the impeller relief collar

Since the impeller relief collar has not been distorted or damaged – particularly the two lateral faces and screw thread – it can be cleaned and reinstalled as described in section 3 – “Installation”.

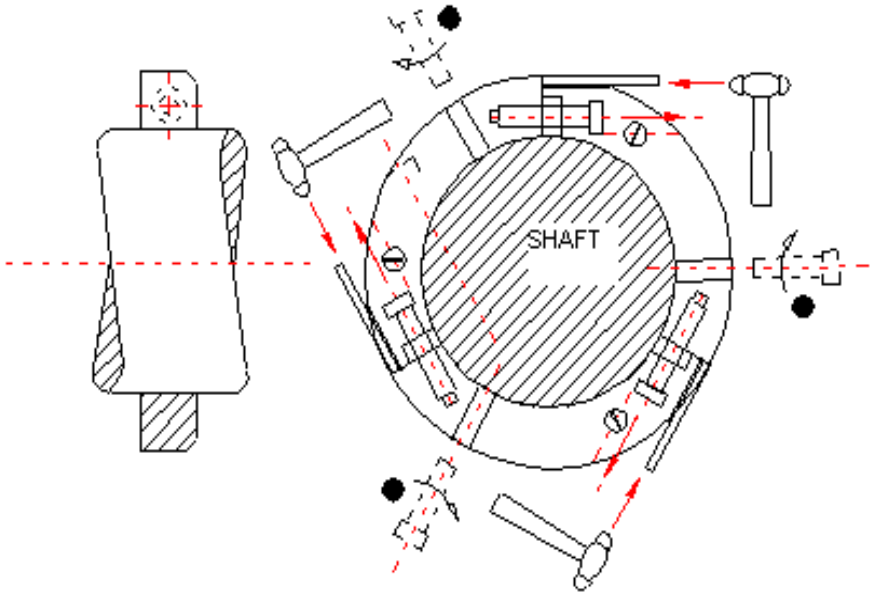


Fig. 27

Relief collar removal

1 – Remove 3 tap bolts;
2 – Use the hammer and hit the three segments;
3 – To help in the removal, use tap bolts in the radially threaded holes (take the segments out of the shaft), use together with (2).

Remove 3 segments from the relief collar.

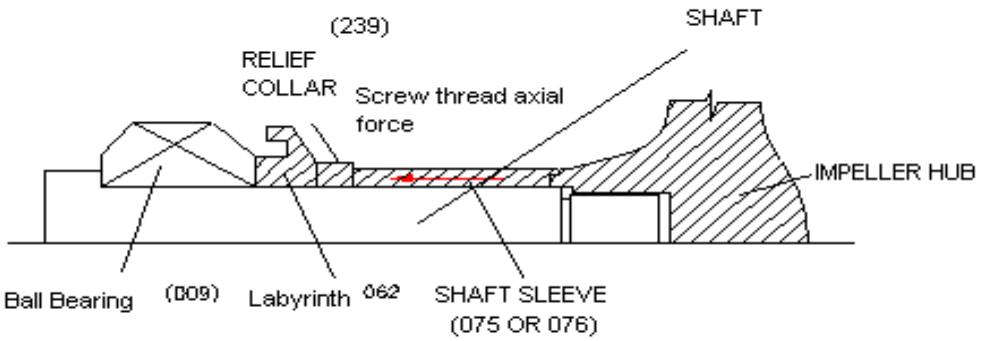

(239)
SHAFT
RELIEF
COLLAR
Screw thread axial
force
IMPELLER HUB
Ball Bearing
(009)
Labyrinth
062
SHAFT SLEEVE
(075 OR 076)

Fig. 28

ORIGINAL

WARRANTY CERTIFICATE

WARRANTY TERM

The present "**Warranty Term"** has as objective to guarantee to the user all equipment shipments and/or the materials produced by the manufacturer, under the following conditions:

This term is valid for 12 (twelve) months from the effective start-up date of the equipment or 18 (eighteen) months from the invoicing date to the original user, whichever happens first.

The equipments and materials are covered by this warranty in regards to the repair or substitution of parts by IMBIL factory or by the authorized IMBIL technical assistance service against materials or fabrication defects, as long as there is evidence of these defects and against invoice presentation, with the following restrictions:

- All the material / equipment made by IMBIL or substituted part removed against warranty will become property of the manufacturer.
- Any repair, modification or exchanges against warranty will not prorogate the original equipment or substituted part warranty term.
- The manufacturer cannot be held responsible for losses caused by the equipment stop (Loss or Damage to Property).

The warranty does not cover:
- Transportation of the defective materials from the facility where they are installed to the manufacturer plant / technical assistance service and the later return to the original costumer facilities.
- Travel and hotel expenses from the manufacturer technician, which will be charged according to the current pricing at the time of the repair service, when this it is performed at the installation site.

This warranty loses effect if the problem happens due to the following cases:
- Operational conditions that differ from the indicated by the manufacturer.
- Normal wear caused by the use or by erosion, abrasion or corrosion.
- Incorrect use, lack of knowledge from the operator, improper use, inadequate transportation, movement or stocking, assembly or operation other than the recommended by the technical manual provided by the manufacturer.

The equipments, due to constant improvements, are subject to changes without previous notice. The warranty is effective only if this slip is sent to the manufacturer.

COSTUMER WARRANTY CONTROL

Serial No._____ Invoice _____ Date _____/_____/_____

Name: _____

Address: _____

ZIP Code: _____ City: _____ State: _____ Country: _____

IMBIL®

Pumping Solutions

_____

Reseller – Stamp and Signature

TOLL FREE NUMBER – COSTUMER SERVICE CENTER (BRAZIL): 0800 14 8500

MANUFACTURER WARRANTY CONTROL

Invoice _____ Date ____/____/____

Serial No. _____

Name: _____

Address: _____

Zip code _____ City _____ State: _____ Country: _____

IMBIL® Pumping Solutions

_____

Owner Signature

_____

Reseller – Stamp and Signature

Please fill out this form, detach it and send it to the manufacturer.

IMBIL®
Soluções em Bombeamento
(Pumping Solutions)

CUSTOMER SATISFACTION SURVEY

Dear Customer,
The biggest concern of IMBIL Group is to offer the best Customer Service, Product, Associated Services and Technical Support. For us, it is very important to know your opinion about the IMBIL´s Quality. In knowing so IMBIL Group will be able to continually improve its quality.
You can contribute by filling out this Customer Satisfaction Survey.

IMBIL GROUP thanks for your help.

Customer: _____

Address: _____

City: _____ State: _____ Zip Code: _____

Contact: _____ Date: / /

Department: _____ Function: _____

Phone: ( ) - _____ E-mail: _____

Region:

BRAZIL
- ☐ North
- ☐ Northeast
- ☐ South
- ☐ Southeast
- ☐ West Central

WORLDWIDE
- ☐ Africa
- ☐ Central America
- ☐ North America
- ☐ South America
- ☐ Asia
- ☐ Europe
- ☐ Oceania

Application:
- ☐ Sugar and Ethanol Industry
- ☐ Distilleries
- ☐ Mining / Steel Industry
- ☐ Sanitation
- ☐ Pulp and Paper
- ☐ Irrigation
- ☐ Valve
- ☐ Air Conditioning
- ☐ Chemical / Petrochemical / Naval
- ☐ Food Industry / Textile
- ☐ Steam Generation / Cogeneration
- ☐ Fire Fighting
- ☐ Other _____

Product purchased: (Please indicate product's description and/ or serial numb _____

Acquisition of product: ☐ IMBIL ☐ Authorized Distributor _____ ☐ Representative _____

	Complety Satisfied	*Very Satisfied*	*Satisfied*	*Dissatisfied*	*Completely Dissatisfied*
1. CUSTOMER SERVICES QUALITY					
* Facility for contact, agility and efficiency in providing the information requested.	☐	☐	☐	☐	☐
2. COMMERCIAL CONDITIONS	*Complety Satisfied*	*Very Satisfied*	*Satisfied*	*Dissatisfied*	*Completely Dissatisfied*
* Meeting your expectations related to commercial conditions.	☐	☐	☐	☐	☐
3. DELIVERY TIME	*Complety Satisfied*	*Very Satisfied*	*Satisfied*	*Dissatisfied*	*Completely Dissatisfied*
* Meeting your expectations related to delivery time.	☐	☐	☐	☐	☐
4. TECHNICAL INFORMATION	*Complety Satisfied*	*Very Satisfied*	*Satisfied*	*Dissatisfied*	*Completely Dissatisfied*
* Meeting your expectations related to technical data provided with the product.	☐	☐	☐	☐	☐
5. DELIVERY QUALITY	*Complety Satisfied*	*Very Satisfied*	*Satisfied*	*Dissatisfied*	*Completely Dissatisfied*
* Meeting your expectations related to product shipping conditions (packaging, visual aspects).	☐	☐	☐	☐	☐
6. OPERATION QUALITY	*Complety Satisfied*	*Very Satisfied*	*Satisfied*	*Dissatisfied*	*Completely Dissatisfied*
* Meeting your expectations related to product and operation conditions promised.	☐	☐	☐	☐	☐
7. POST SALES	*Complety Satisfied*	*Very Satisfied*	*Satisfied*	*Dissatisfied*	*Completely Dissatisfied*
* Efficiency on services performed	☐	☐	☐	☐	☐

Would you have any suggestion on how to increase customer satisfaction on IMBIL's Products / Service?

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