

# INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

## INI - ITAP



"Quality Management System  
ISO 9000:2008."


## Mr. Proprietor

Congratulations! You just have purchased an easy to assemble equipment, designed and manufactured with the most advanced technology, having an excellent performance and 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 piece of equipment according to the technical specifications and the instructions of this manual. **IMBIL** also recommends that this piece of 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 ignorance of these service orientations. This Manual should be used by the people in charge of installation, operation and maintenance.

 Pumping Solutions	
Model:	
Serial number:	
TAG:	
IMPELLER [Ø]:	
ROTATION:	
DIRECTION:	
FLOW [Q]:	
THD/ PRESSURE:	
Manufactured in:	

IMBIL IND. E MAN. DE BOMBAS ITA LTDA - [www.imbil.com.br](http://www.imbil.com.br)  
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In case the equipment needs to be verified or when ordering spare parts, please indicate the part code, model, pump series and also the serial number. This information found on the identification plate, and engraved in low relief on the suction flange

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

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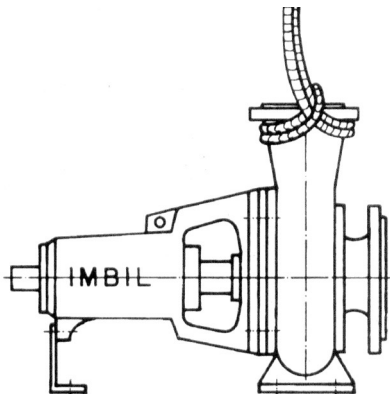
## INSPECTION UPON RECEIPT

Inspect the equipment as soon as it is received, check it against the invoice, and notify immediately if any parts are missing or damaged.

## TRANSPORT

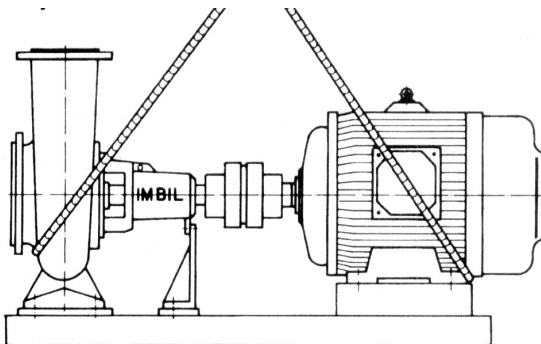
- 1 - Transport of the connected assembly or of separate parts of the equipment must be done carefully and in accordance with security standards.
- 2 - Before the motor and pump are coupled, they must be transported by the hoisting eye or by the flange, as shown in the figure below..

### Transport of the Pump using the discharge flange



- 3 - The motor-pump assembly must be transported in accordance with the figure below.

### Transport of the Motor-Pump Assembly



## STORAGE

- 1 - When it is necessary to store a pump until it can be installed, do not remove the protection flanges from the nozzles or any other protection sent by IMBIL.
- 2 - The bearing housing are lubricated in the factory. This lubrication protects against oxidation for a short period of time.
- 3 - For pumps stored for periods longer than 30 days, special precautions will be required.
  - Remove the packings to avoid corrosion of the sleeves.
  - Every 30 days sprinkle oil on the bearing housing and on the pump.
  - Rotate the shaft weekly by hand so that all moving parts are lubricated.

**NOTE:** Before installation of the pump, clean the shaft end, sleeve and flange protections with a proper solvent and follow the instructions of this manual.

## LOCALIZATION

Choose the site for installation so that:

- 1 - It is easily accessible for inspection and maintenance.
- 2 - It is above flood level.
- 3 - The pipings are simple and direct so that the NPSH available is sufficient, avoiding cavitation.
- 4 - There is sufficient space to remove the motor.
- 5 - The foundation is stable, causing it not to move horizontally or vertically, to avoid the pump bearing supported by the pipings.
- 6 - The identification plates on the pump and on the motor are visible.
- 7 - There is sufficient air circulation around the motor to ensure perfect cooling.

$$*NPSH_r = 10 - H_s + \frac{V^2}{2g} + 0,5$$

Where:

NPSH<sub>r</sub> = required suction height (m)

H<sub>s</sub> = suction height (m)

V = suction velocity (m/s)

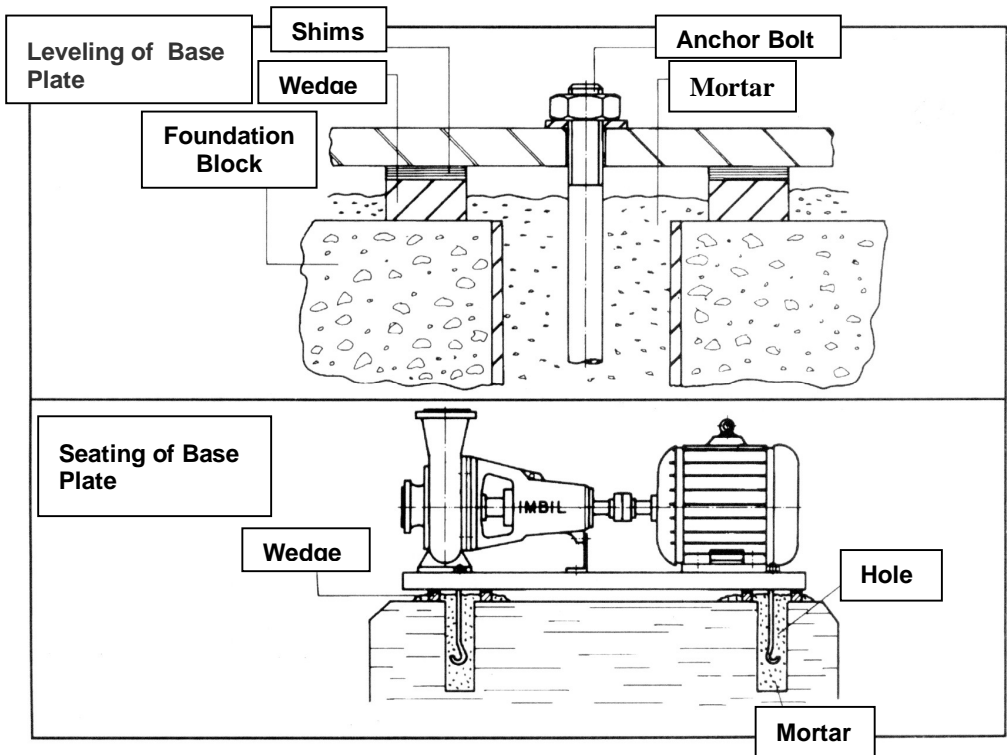
g = acceleration of gravity (m/s<sup>2</sup>)

## FOUNDATION

The pump shall be preferably installed in a horizontal position. Use a single base for the pump and the motor, on a permanent concrete or structural steel foundation with enough mass to absorb normal vibrations, preventing any distortions in the assembly or any impairment of its alignment.

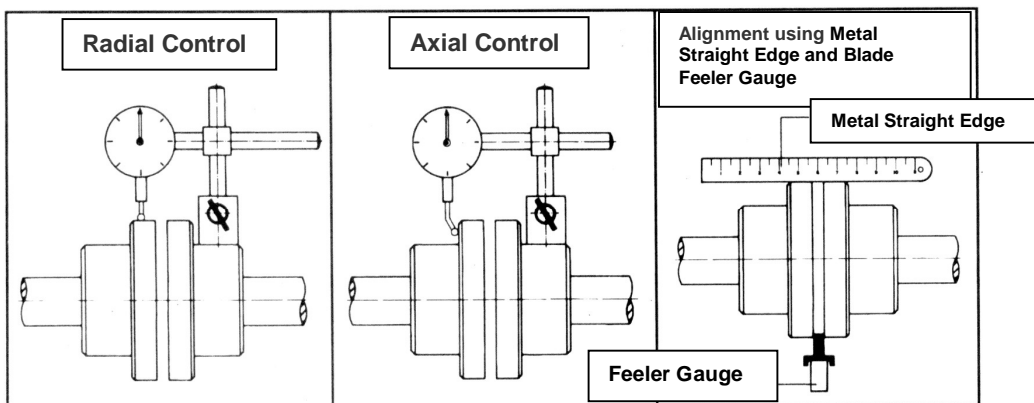
## LEVELING AND SEATING OF THE BASE

- 1 - Place the anchor bolts in the holes in the foundation block under the base holes. Between the anchor bolts and the base plate, place metallic wedges for the leveling.
- 2 - Insert specific cement mortar around the anchor bolts and under the base through the existing openings, filling all spaces for solid attachment.
- 3 - Tighten the nuts of the anchor bolts after the mortar has cured, checking the transverse and longitudinal leveling, assuring a precision level. If the assembly is not leveled, add shims between the base plate and the wedge to adjust



## ALIGNMENT OF THE COUPLING

- 1 - Perform alignment with the suction and discharge pipings already connected.
- 2 - With the aid of a dial gauge or, if unavailable, a metal straight edge and a blade feeler gauge, control any radial and axial misalignment in order to avoid abnormal vibrations which could impair the durability of the equipment.



- 3 - When the transmission is performed by belts, the pump and the drive shafts must be parallel, the pulleys must be aligned with each other and the belts must be stretched correctly.
- 4 - Radial and axial alignments must remain within a tolerance of 0.3 mm, and the clearance between the motor and the pump shaft ends must comply with coupling manufacturer's specifications.
- 5 - For greater safety of operation, a Coupling Protector or Operation Protector must be installed (for example, belt guard), as required by Law 65/4, regulation MTb 3214 (NR 12 item 12.3).

## GENERAL RECOMMENDATIONS FOR THE PIPING

### For suction and discharge pipings

- 1 – The piping must be connected to the pump flange only after the mortar securing the base has cured.
- 2 – In order to avoid head losses, the piping, whenever possible, must be short and straight, and the curves, when necessary, must be long-radius.
- 3 – The pump must not serve as a support for the piping. The piping flanges must be connected to those of the pump totally free of tension, and without transmitting any forces to the volute casing, in order to avoid misalignment and its consequences.
- 4 – Expansion joints must be provided when the pumped liquid will be subject to large variations in temperature.

### For suction piping only

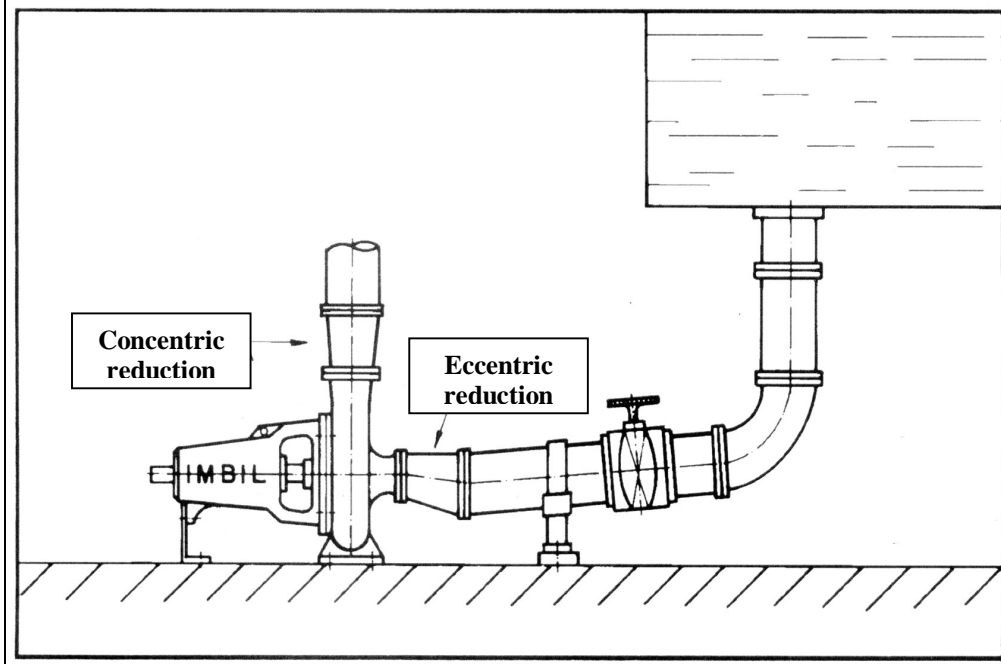
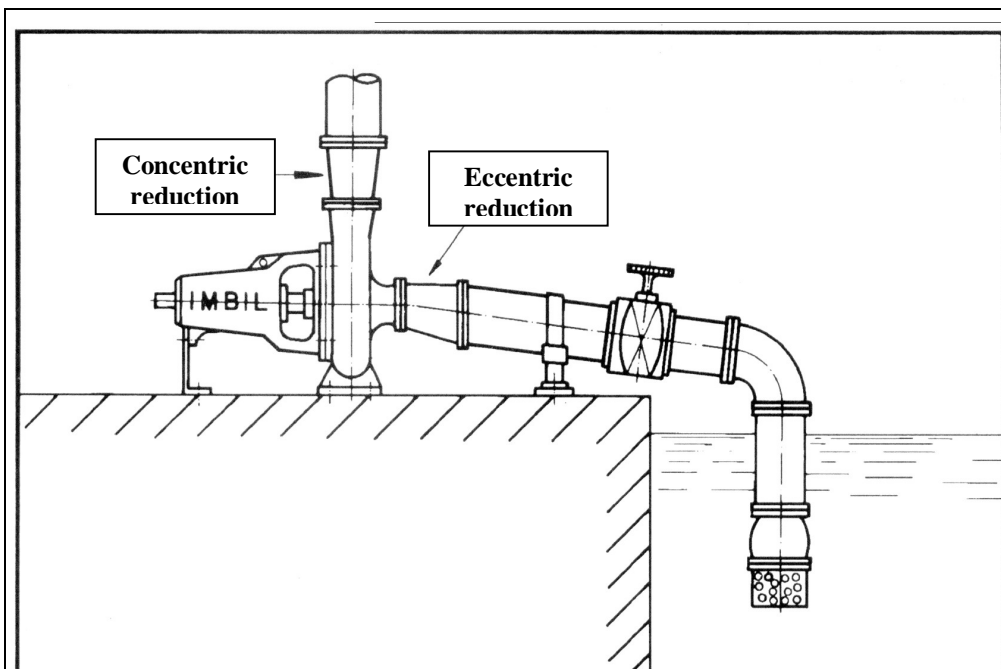
- 1 - The horizontal industrial application of the suction piping, if positive, must be installed with a slight inclination in the pump-suction tank direction, and if negative with a slight decline in the same direction, avoiding air pockets. See figures on page 9.

- 2 - The nominal diameter of the pump suction flange does not determine the nominal diameter of the suction piping. The speed of the flow of the liquid must be established between 1 and 2 m/s. When it is necessary to use a reduction, it must be eccentric and assembled with the cone down avoiding air pockets. See figure on page 9.
- 3 - Foot valve, when applicable, generally receives a filter in order to prevent foreign particles from reaching the pump.
- 4 - Ensure that the area for passage of the valve is 1.5 times larger than the area of the piping, and that the area of free passage of the filter is 3 to 4 times larger than the area of the piping.
- 5 - In installations with positive suction, installation of a valve to block the passage of the liquid is recommended. Make sure that during pump operation the valve remain completely open.
- 6 - It is advisable to avoid assembling more than one pump to a single suction piping, especially when the absolute pressure in the piping is lower than the manometric head with the pump in operation.
- 7 - A valve must be provided for each pump in installations where various pumps are suctioning from the same tank, and the tank and suction piping must be connected with changes in direction of less than 45 degrees.

### **For discharge piping only**

- 1 - It is necessary to install a valve for regulation of the volumetric flow and pumping pressure immediately after the discharge flange of the pump.
- 2 - It is advisable to install a check valve between the pump outlet and the valve when the length of the discharge piping is relatively long and the total elevation of the pump is greater than 15 meters.
- 3 - When the diameter of the piping is different from the diameter of the discharge flange, the connection must be made by means of concentric reduction.
- 4 - Provide air valves where it is necessary to blow down the air.
- 5 - For pumps installed in parallel, each pump must have its own check valve in order to prevent return or overloading of the foot valve when one of the pumps is disconnected.





## PROCEDURE START-UP

### THE PUMP SHOULD NOT WORK WITHOUT OIL IN BEARING HOUSING

- 1 - Check if the assembly is aligned and well connected to the base, if the suction and discharge flanges are well connected to the piping, and then, put into operation the auxiliary connections.
- 2 - Remove possible dirt and humidity from the bearing housing and fill it with the quantity and quality of oil specified in the "Bearing Housing Maintenance".
- 3 - Make the electrical connection in a manner that guarantees that the motor protection system works properly.
- 4 - Check the rotation direction of the drive with the pump disconnected.
- 5 - Prime (fill) the pump and its suction piping, removing any air present. Rotate the pump shaft by hand in order to guarantee good priming  
Priming may also be performed by vacuum, pump.
- 6 - When there is a valve in the suction piping, it must be kept completely open. It must never be used to regulate the volumetric flow of the pump, avoiding the possibility of cavitation. It should be used only for insulating the pump for maintenance.
- 7 - The valve in the discharge piping must be closed at the beginning of operation, in order not to overload the motor and the electrical network during start-up.
- 8 - After reading the nominal rotation, open the discharge piping valve slowly in order to regulate the pump capacity.
- 9 - In long and empty discharge pipings, it is essential to close the discharge valve pump start-up

## IMMEDIATE STEPS AFTER START-UP

- 1 - Make sure that the assembly operates without abnormal noises or vibrations.
- 2 - Control the voltage of the network and the amperage of the electric motor.
- 3 - Control the temperature of the bearing. It shall not exceed 45° C above ambiente temperature.
- 4 - Adjust packing by tightening the nuts on the stuffing box packing gland uniformly, allowing for dripping (following the minimum escape values of 10 cm<sup>3</sup>/minute and maximum 20 cm<sup>3</sup>/minute). Lubrication of the packing is performed by the pumped liquid itself.
- 5 - Check the suction pressure, discharge pressure and flow rate.

**NOTE:** Control the above items every 30 minutes in the first two hours, then hourly during the next 10 hours, and weekly after that.

## STEPS FOR STOPPAGE OF PUMP

- 1 - Close the valve in the discharge piping.
- 2 - Close the suction valve when maintenance is necessary.
- 3 - Disconnect the drive, observe the gradual stoppage of the equipment.
- 4 - Close any auxiliary piping.

## BEARING HOUSING MAINTENANCE

- 1 - The pumps are supplied without any oil in the bracket. After checking that it is free of dirt and humidity, supply the bracket with oil to a level between the marks on the oil level gauge.
- 2 - The first oil change must be performed after the first 250/300 hours of operation. The second change must be performed after 1800 hours of operation, and after that every 7000 hours of operation.
- 3 - The bearing housing must be washed every two years.

### Table of recommended oils

FABRICANTE	TILL 3000 rpm	ABOVE DE 3000 rpm
<b>CASTROL</b>	HYSPIN - 68	HYSPIN - 46
<b>ATLANTIC</b>	EUREKA - 68	EUREKA – 46
<b>ESSO</b>	TURBINE OIL - 68	TURBINE OIL – 46
<b>MOBIL OIL</b>	DTE - 26	DTE – 24
<b>IPIRANGA</b>	IPTUR AW - 68	IPTUR AW – 46
<b>PETROBRÁS</b>	MARBRAX TR - 68	MARBRAX TR – 46
<b>SHELL</b>	TELLUS - 68	TELLUS – 46
<b>TEXACO</b>	REGAL R & O - 68	REGAL R & O - 46

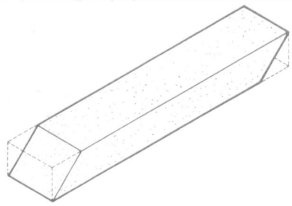
## MAINTENANCE OF THE PACKING

If the stuffing box packing gland has already been tightened more than 8 mm and there is still excessive leakage, change the packings as follows:

- 1 - Loosen the nuts of the stuffing box packing glands, which is split. Push the halves to the side of the bracket cover and then remove the stuffing box packing gland..

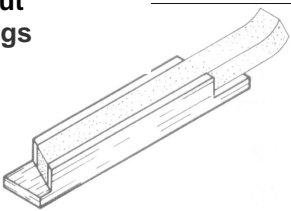
- 2 - Carefully remove the packings using a flexible rod, and clean well the packing housing, removing any residue.
- 3 - Check if the surface of the shaft sleeve is smooth, with no grooves or marks, which could harm the packing. If the shaft sleeve is marked, it may undergo re-machining at its external diameter to a maximum of 1 mm, or it must be replaced.
- 4 - The packings are usually provided as continuous strips, which must be cut into rings with oblique ends of proper size for the diameter of the shaft sleeve and assembled according to the instructions below.

## Oblique Cut of the Packing



- 5 - To cut the packing rings, it is recommended the use of a simple device as shown in the figure below:

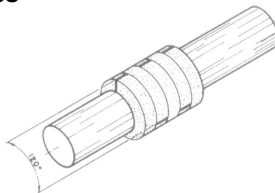
### Device to cut packing rings



**After cutting the first ring, make sure its size is correct, for a perfect adjustment in the packing housing.**

- 6 - Spread a thin layer of grease on the internal and external diameters of the packing rings and assemble one at a time in the following order:
  - One packing ring.
  - One lantern ring.
  - The other packing rings.
 Displace the splice of the second ring approximately 120 degrees from the position of the first ring, and proceed consecutively in this manner until the last packing ring matches the figure below:

### Position of rings no degrees staggered



- 7 -** Check if the shaft can be rotated after the assembling of each ring, place the stuffing box packing gland compressing the last ring, tighten the nuts by hand and rotate the shaft to confirm that it does not rest on the stuffing box packing gland.

### AREAS OF WEAR

- 1 -** When the pump presents excessive internal leakage flow or insufficient pressure due to ring wear, the wear rings must be replaced. IMBIL and its Authorized Resellers can supply parts with the proper tolerances and maintenance services.
- 2 -** Replacement should be undertaken when the clearance between impeller and cover rings or volute casing shows wear three times greater than the original clearance.

### EQUIPMENT PERIODIC INSPECTION

WHAT?	WHEN?			
	Weekly	Monthly	Semiannually	Yearly
Abnormal vibrations and noises.	■			
Leaking of the packings.	■			
Point of Operation of the Pump.	■			
Suction pressure.	■			
Oil level	■			
Chain worn by the motor voltage in the network.	■			
Bearing housing temperature		■		
Oil change interval (See Bearing House Maintenance item).		■		
Alignment of Motor- Pump assembly.			■	
Fixation bolts of the Pump, Base plate and Drive.			■	
Replacement of packing, if necessary.			■	
Lubrication of coupling, when applicable.			■	
Disassemble the Pump for maintenance and inspect thoroughly: bearing housing and bearings, retainers, O'rings, joints, impellers, inside of volute casing, thickness of walls, areas of wear, coupling, etc.				■

\* Annual inspection may be in installations operating in good conditions and when the pumped liquid is not the pump materials.

## OPERATING ANOMALIES AND LIKELY CAUSES

### TEN SYMPTOMS

- |   |   |
|---|---|
| 1 – Pump does not pump<br>2 – Insufficient capacity<br>3 – Insufficient pressure<br>4 – Pump loses priming after start-up<br>5 – Pump overloads the motor | 6 – Mechanical seal leaks excessively<br>7 – Mechanical seal has low durability<br>8 – Pump vibrates or makes noise<br>9 – Bearings have low durability<br>10 – Pump overheating or knocking. |
|---|---|

LIKELY CAUSES	SYMPTOMS (NUMBER)									
	1	2	3	4	5	6	7	8	9	10
Pump was not primed.	■									■
Pump or suction piping not completely filled with liquid	■	■			■			■		
Suction height is excessive.	■	■			■		■	■		
Minimal difference between vapor pressure and suction pressure.	■	■						■		■
Excessive quantity of air or gas in the liquid.		■		■	■					
Admission of air into suction line.		■			■					
Admission of air through the mechanical seal, sleeve joints, volute case joint or plugs.					■					
Foot valve too small		■						■		
Foot valve partially obstructed.		■						■		
Suction piping inlet insufficiently submerged.	■	■			■			■		
Rotation too low.	■	■		■						
Rotation too high.						■				
Wrong rotation direction.	■			■		■				
Total height greater than the pump was designed for.	■		■	■						
Total height lower than the pump was designed for						■				

LIKELY CAUSES	SYMPTOMS (NUMBER)									
	1	2	3	4	5	6	7	8	9	10
Density of liquid different from that used for selection.						■				
Viscosity of liquid different from that used for selection.			■	■		■				
Operation at greatly reduced capacities.								■		■
Operation of pumps in parallel inadequate for this application.	■		■	■						■
Foreign particles into the impeller.	■		■			■		■		
Misalignment due to expansion of piping.						■	■	■		■
Improper foundations.								■		
Warped shaft.						■	■	■		■
Rotating and stationary parts rubbing.						■		■		■
Worn bearings.							■	■		■
Worn wear ring.				■		■				
Damaged or corroded impeller.			■	■					■	
Leakage under sleeve due to deterioration of the sealing ring or joint.							■			
Shaft sleeve worn, corroded or rotating off center.							■	■		
Mechanical seal incorrectly installed.						■	■	■		
Type of mechanical seal incorrectly selected for the operating conditions.						■	■	■		
Shaft rotating off center due to wear or misalignment of bearings.							■	■	■	■

LIKELY CAUSES	SYMPTOMS (NUMBER)									
	1	2	3	4	5	6	7	8	9	10
Unbalanced impeller, resulting in vibration.							■	■	■	■
Solid abrasives in the pumped liquid.						■		■		
Internal misalignment of the parts, preventing the stationary seat and the rotating ring of the seal from properly adjusting to each other.							■	■		
Mechanical seal operated dry.							■	■		
Exaggerated axial load due to internal mechanical faults.									■	■
Excessive grease in the bearings.									■	■
Bearings not lubricated.									■	■
Bearings assembled incorrectly (damage during assembling, wrong type of bearing, etc.).									■	■
Corroded bearings due to admission of water through the retainer.									■	■
Excess, lack or use of wrong bearing housing oil.								■	■	■
The clearance in the coupling is not being followed according to the instructions.								■		
The motor is operating in two phases only.	■	■	■		■			■		■
Admission of air into the sealing box.	■	■	■	■	■					
Wear of internal parts.	■	■	■	■				■		
The pump-drive assembly is misaligned.					■			■	■	■



## RECOMMENDED SPARE PARTS

For 2 continuous years of operation, IMBIL recommends the quantities of spare parts shown in the table below, according to the number of pumps used:

Part	PUMPS							
	1	2	3	4	5	6 e 7	8 e 9	10 ou mais
	SPARES							
Shaft	1	1	1	2	2	2	3	30%
Impeller	1	1	1	2	2	2	3	30%
Bearing (Set)	1	1	1	2	2	3	4	50%
Bearing Housing	-	-	-	-	-	-	1	2 unidades
Retainer (Set)	1	2	3	4	5	6	8	50%
Packing (5 rings)	1	4	4	6	6	6	8	40%
Wear Rings (Set)	1	2	2	2	3	3	4	50%
Shaft Sleeve	1	1	1	1	2	2	2	20%
Joint Set	4	4	6	8	8	9	12	150%
O'ring Set	4	4	6	8	8	9	12	150%
<b>FOR MECH SEAL EXEC.</b>								
Set of Joints	4	4	6	8	8	9	12	150%
Set of O'rings	4	4	6	8	8	9	12	150%
Entire Mechanical Seal	2	2	2	3	3	3	4	20%