pompetravaini

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# DISASSEMBLY AND ASSEMBLY INSTRUCTIONS FOR LIQUID RING VACUUM PUMPS

## TRVK 2003 to 5003

## TRSK 2005 to 5005

CE

# INTRODUCTION

These instructions are for the maintenance staff in case of repair for the following pumps:

| | |
|---|---|
| TRVK 2003 | TRSK 2005 |
| TRVK 2503 | TRSK 2505 |
| TRVK 3003 | TRSK 3005 |
| TRVK 3503 | TRSK 3505 |
| TRVK 4003 | TRSK 4005 |
| TRVK 5003 | TRSK 5005 |

These instructions are supplied and integrated with the manual of “OPERATING MANUAL LIQUID RING VACUUM PUMPS”. They provide a reference for safe operation, installation, maintenance and repairing of the pumps.
Prior to working on the pump it is recommended to follow the instructions of safety listed in chapters 2 and 15 of the above manual, and is absolutely important to:

- wear safety clothing, hard hat, safety shoes, safety eye glasses
- disconnect the electrical power
- close suction valves and service liquid valves
- remove pump from installation without damaging other system components
- assume all safety measures if pump has been handling dangerous fluids
- drain pump casings through the draining connections and flush the pump with clean liquid, if required.

When requesting spare parts or technical information for the pump, always quote the pump model number and serial number which is printed on the pump nameplate: therefore it is recommended not to remove the pump nameplate or, in case this action will be necessary, write the serial number on the pump (for example on the flange).
Should additional information be required, please do not hesitate to contact POMPETRAVAINI or the closest representative. Should there be any difficulties in repairing the pump, it is recommended to send the pump for repair to POMPETRAVAINI or the local authorised representative.
Any pump repairs and/or system work carried out by others will not be guaranteed by POMPETRAVAINI.
NOTE: The numbers identify all pump components. Refer to parts list in chapter 9 and to the section drawings in chapter 10.
All drawings are schematic only and are not certified for construction.
For further information please consult POMPETRAVAINI or its closest representative.

# INDEX



The liquids and the gases handled by the pumps and also their parts could be potentially dangerous for persons and environment: provide their eventual disposal in conformity with the laws into force and a proper environment management.


The present manual is not assigned for pumps subjected to the ATEX 94/9/CE directive. In case the pump is assigned in environments subjected to the application ATEX 99/92/CE directive or in case the pump is provided with a nameplate indicating the ATEX stamp, it strictly forbidden proceed to start up the pumps but necessary to consult POMPETRAVAINI for clarifications.
For pumps subjected to the ATEX 94/9/CE directive it is available a dedicated integrative manual.

In preparing this manual, every possible effort has been made to help the customer and operator with the proper installation and operation of the pump. Should you find errors, misunderstandings or discrepancies please do not hesitate to bring them to our attention.

## 1.1- DISASSEMBLY OF PUMPS TYPE TRVK 2003 TO 3003 AND TRSK 2005 TO 3005

For construction, refer to fig. 9.
Separate the pipes and take out the coupling. If belt drive, remove the pulleys.

1.1.1 - Disassembly of Front Bearing (referring to fig. 1)
Dismantle the bearing cap No.11 and then loosen the lock nuts, stop washer and oil catch ring.
Referring to the fig. 1, screw in the four M12 screws uniformly to the M12 threaded holes in the front bearing housing until the front bearing housing and the inner bearing cap are ejected.

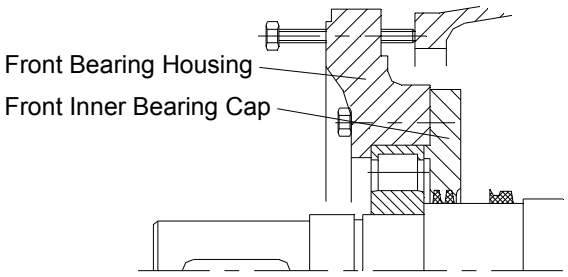


Fig. 1

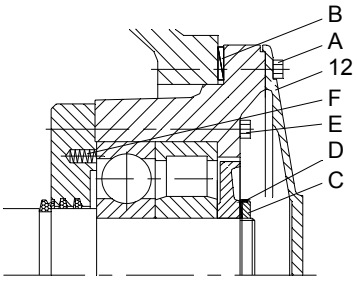


Fig. 2

1.1.2 - Disassembly of Rear Bearing (referring to fig. 2)
Unscrew the screw “A” one by one. Take out carefully each compensating washers set “B” on the screws with a small thin steel plate. Place different washers on floor with reference to the corresponding screws and then remove the outer bearing cap No.12.
**Note: The pumps are supplied with axial clearance set correctly between the impeller and port plates.**
**The compensation washers act adjusting the axial clearance between the impeller and both the front and rear port plates. When dismantling, care should be taken to distinguish among the washer sets. Store them separately. Make sure that they shall be re-mounted in their original places respectively. Otherwise, the front and rear axial clearances may be distributed unevenly, affecting the pump performances or causing the impeller to jam.**
Remove the lock nut “C” and the stop washer “D”.
Unscrew the screws “E” tightened evenly and take out the springs “F” distributed uniformly in the inner bearing cap.
Put on the stripping ring (see fig. 3) and then re-screw the screws “E” uniformly.
The Rear Bearing disassembly, such as dismantling bearing housing, inner bearing cap and etc., is performed in the same manner of that of the Front Bearing. The ball bearing inner race can not bear the force without using the stripping ring when disassembly of the bearing. In this case, the bearing will be damaged. The unit is supplied together with the stripping ring. Customers’ requirements for it are accepted.

Get the pump to stand up vertically across the two blocks with its drive end upward (see fig. 4). Dismantle it into pieces part by part. When the present condition limits, the pump may be disassembled with the whole unit placed horizontally. As a matter of fact, there are some ways to perform the disassembly. We are ready to provide the corresponding diagrams when the customers request.

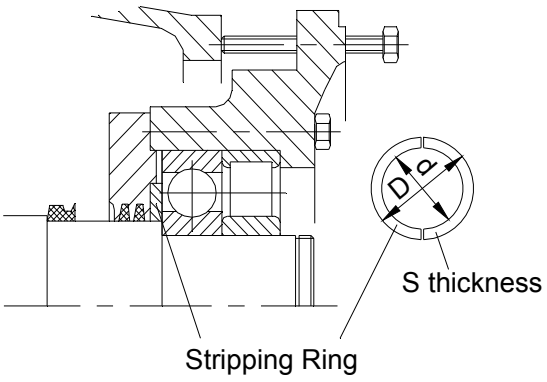


Fig. 3

Stripping Ring Size (mm)

| TRVK TRSK | d | D | S |
|---|---|---|---|
| 20… | 125 | 165 | 10 |
| 25… | 148 | 191 | 10 |
| 30… | 168 | 223 | 10 |

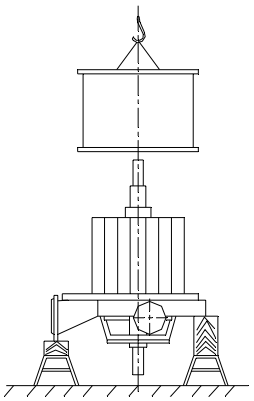


Fig. 4

### 1.1- DISASSEMBLY OF PUMPS TYPE TRVK 3503 TO 5003 AND TRSK 3505 TO 5005

Because of the bearings of TRVK 3503 to 5003 and TRSK 3505 to 5005 have large magnitude of interference, it may be difficult to remove in the manner stated in fig. 2 and 3. It is recommended that both the front and rear bearing are to be dismantled to the extent as shown in the fig. 5 and 6 and then the bearing inner face will act as bearing point to enable the bearings to be pressed out. Refer to the reference books for the methods of disassembly of bearings.

When the rear bearing is drawn out with its outer ring bearing force, it will be damaged.

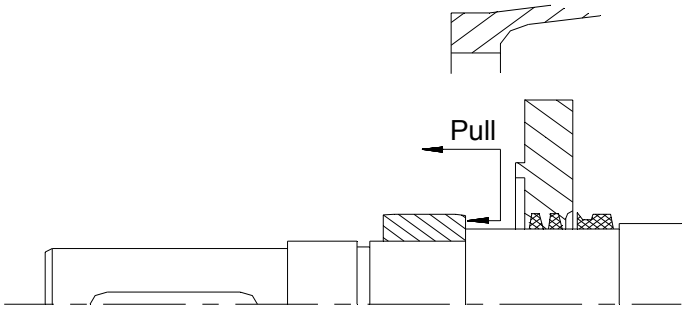



Fig. 5

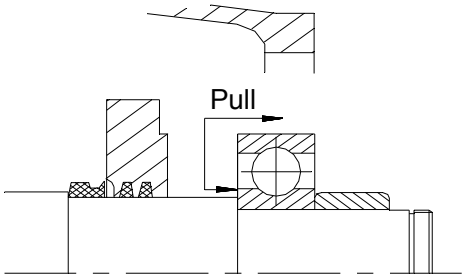



Fig. 6

## 2 – CHECK AND ACTION

It is an important task to examine and clean all the components after the disassembly. According to the real conditions. Carry out the repair, replacement on them or decide whether they are capable of continuing to work or not.

Bearings: Check for smooth running. According to the fault and corrosive state, renew them if necessary.

The Front and Rear Port Plates: They are subject to finish turning process when there are some deep scratch on the faces, which will affect the pump performances.

Shaft Bushing: Renew it based on the wear state.

Impeller: Its face is subject to finish turning process when it has been so worn out to affect the pump performances. As the difference between the impeller and the pump body in length is the axial clearance, the two should be reduced the same in length through finish turning process.

## 3 – ASSEMBLY

The assembly of the pump is performed in the reverse manner of the disassembly. In addition to that, attention should be drawn to the following points.

If the pump is assembled on a uneven floor, the four pump feet would not remain horizontal like a plane surface and the clearance between the impeller and the port plates would be reduced with possible impeller jamming after completing the assembly. The correct method is: the pump body is placed on its bed plate or on a even floor with its end shields mounted on it and then loosen the screws, tighten them after making sure that the four pump feet are in good touch with the plane surface.

Tighten the screws after replacing the compensating washers to their original places, which act as dominating the distribution of the axial clearance.

Adjust the axial clearance again where the rotor is renewed or the finish turning is performed on the impeller and the port plates.

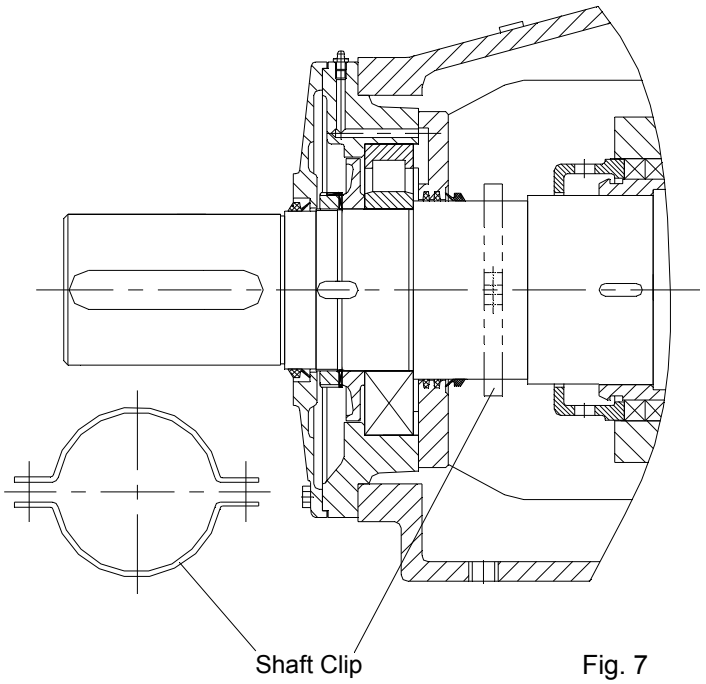



Fig. 7

**Adjustment of Axial Clearance**

Loosen the screws one by one (see fig. 9).
Put a shaft clip on AS end of the shaft.
Put a dial meter on the AS end of the shaft.
Pull the rotor toward AS with a steel stick to make it be in touch with the front port plate.
Set the meter at zero, push the rotor toward BS to enable it to be in touch with the front port plate.
The reading shown in the meter is the total axial clearance value Δ of the pump.
Replace the compensating washers in their original places. The washers, made of steel, take three sizes of 0.1 mm, 0.2 mm and 0.5 mm in thickness. All the washers sets are the same in thickness.
Secure the screws tightly. At the moment, the meter reads Δ/2. It is likely that the clearance on AS is slightly larger than that on BS. The minimum clearance on BS should be 0.2 mm. Otherwise, paper washers will be added to both ends of the pump body.

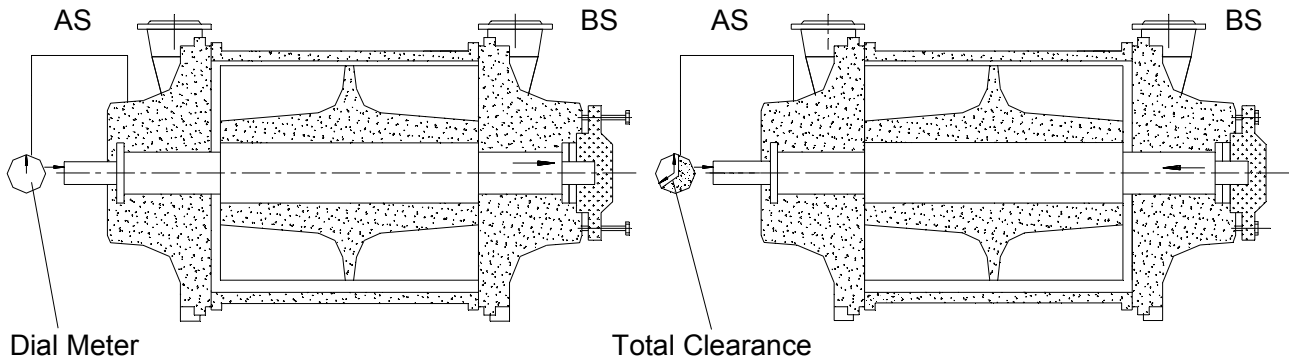


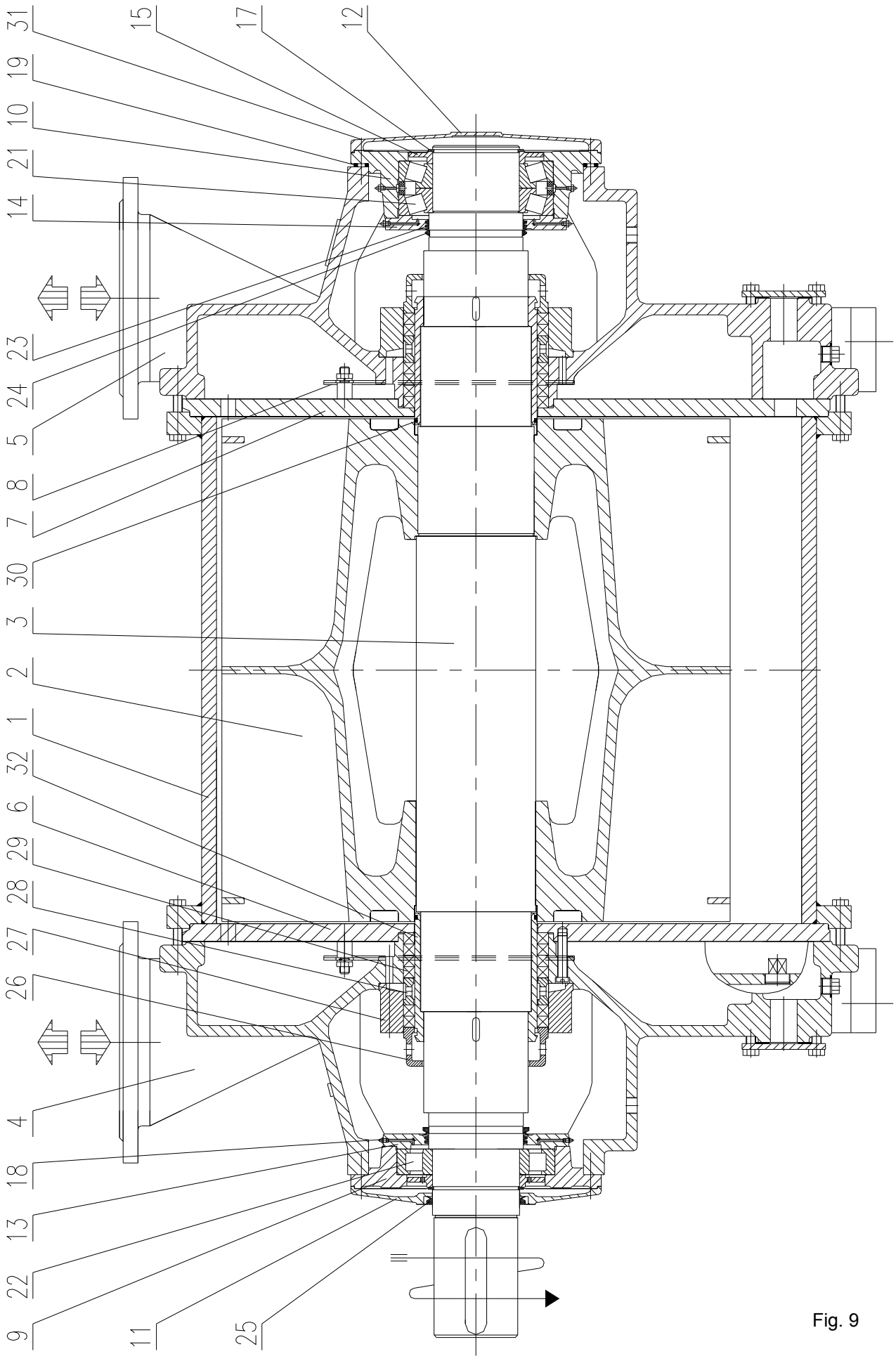

Fig. 8

## 4 – TROUBLESHOOTING

| | Symbols | Causes | Points to check and actions |
|---|---|---|---|
| 1 | Difficult in starting, Motor circuit–breaker trips or over-heat | 1- Water level too high inside when starting;<br>2- Packing gland too tight;<br>3- Belt too tight;<br>4- Wear developing in pump;<br>5- Discharge pressure too high;<br>6- Failure to adjust the current protection of the electric cabinet. | 1- Start with the water level specified;<br>2- Loosen the gland adequately;<br>3- Loosen the belt adequately;<br>4- Turn the rotor with force and flush with water;<br>5- Check if the pipes and valves are too small in diameters;<br>6- Adjust the thermal relay to the rated current setting. |
| 2 | Jamming during trial or normal operation | 1- Welding slag or other foreign matters have been drawn in from new pipes with coming gas.<br>2- Heavy lime deposit | 1- Loosen both the front and rear shrouds, turn the rotor and flush it with water until it rotate freely and then secure them. In case of failure, open it for checking.<br>2- Dismantle for cleaning or acid washing. |
| 3 | Pump capacity low.<br>Vacuum degree low. | 1- Speed low due the belt slippage;<br>2- Insufficient water feed or water too hot;<br>3- Leakage occurring in the system;<br>4- Excessive clearance in the pump due to excessive corrosive allowance or corrosive substance in the medium;<br>5- Leaks from packing seal;<br>6- Heavy lime deposits in pump;<br>7- Corrosion in pump;<br>8- Axial clearance not in conformity with the requirements after repair;<br>9- Damage to the flexible valve plate. | 1- Tighten the belt;<br>2- Adjust the water flow. Check the feed pipes for clogging;<br>3- Check the joints for sealing;<br>4- Clean the medium preventing solids from entering. Replace the worn parts;<br>5- Tighten the packing gland;<br>6- Remove the lime deposits;<br>7- Replace the parts if necessary;<br>8- Calibrate the axial clearance.<br>9- Replace the valve plate. |
| 4 | Unexpected noise | 1- The belt too loose;<br>2- Gas blowing and ejecting;<br>3- Suction and discharge pipes' walls too thin;<br>4- Cavitation occurring when the pump running under vacuum. | 1- Tighten the belt;<br>2- Move the discharge opening to outdoor;<br>3- Use the pipes with thicker walls;<br>4- Use cooler working water or replenish gas in the suction side; use gas ejector. |
| 5 | Excessive vibration | 1- The bed plate connected with foundation badly, the anchor bolts loose;<br>2- Misalignment | 1- Pour mortar around and under the base plate. tighten the bolts;<br>2- Make re-alignment and lock. |
| 6 | Bearings overheat | 1- Belt too tight;<br>2- Misalignment of pump with motor;<br>3- Inadequate lubricating, the grease too dry or too much;<br>4- Bearings inadequately mounted;<br>5- Wear, rust and damage developing. | 1- Loosen the belt adequately;<br>2- Make re-alignment;<br>3- Improve the lubricating conditions;<br>4- Re-mount the bearings.<br>5- Replace the bearings. |

## 5 – PARTS LIST

| No. | DESCRIPTION | | No. | DESCRIPTION |
|---|---|---|---|---|
| 1 | Impeller casing | | 17 | Lock ring |
| 2 | Impeller | | 18 | Grease nipple |
| 3 | Shaft | | 19 | Spacer |
| 4 | Front suction and discharge casing | | | |
| 5 | Rear suction and discharge casing | | 21 | Tapered roller bearing |
| 6 | Front port plate | | 22 | Cylindrical roller bearing |
| 7 | Rear port plate | | 23 | Shaft sealing ring |
| 8 | Flexible valve plate | | 24 | V-Ring |
| 9 | Front bearing housing | | 25 | V-Ring |
| 10 | Rear bearing housing | | 26 | Packing gland |
| 11 | Outer bearing cap, front bearing | | 27 | Stuffing box housing |
| 12 | Outer bearing cap, rear bearing | | 28 | Lantern ring |
| 13 | Inner bearing cap, front bearing | | 29 | Packing rings |
| 14 | Inner bearing cap, rear bearing | | 30 | O-Ring |
| 15 | Grease retaining ring | | 31 | Screw |
| | | | 32 | Shaft sleeve |


31
15
17
12
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10
21
14
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24
5
8
7
30
3
2
1
32
6
29
28
27
26
4
18
13
22
9
11
25

Fig. 9

## NOTES

| PUMP model | Serial Number | Computer Number | Year of manuf. |
|---|---|---|---|
| ..... | ..... | ..... | ..... |

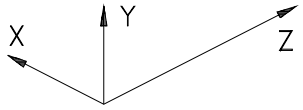
| GAS handled | Capacity | Suction Pressure | Discharge Press. | Temperature |
|---|---|---|---|---|
| ..... | .....$m^3/h$ | .....mbar | .....mbar | .....°C |

☐ Lethal ☐ Toxic ☐ Noxious ☐ Corrosive ☐ Malodorous ☐ .....

| Service LIQUID | Capacity | Temperature |
|---|---|---|
| ..... | .....$m^3/h$ | .....°C |

| TOTAL WEIGHT |
|---|
| .....KGS. |

MAXIMUM DIMENSIONS




X =.....cm
Y =.....cm
Z =.....cm

NOISE (measured at 1 m)
Pressure =.....dB(A)
Power =.....dB(A)

INSTALLATION
☐ Inside ☐ Outside
☐ Explosive area ☐ .....

SERVICE
☐ Continuous ☐ Intermittent
☐ .....

| MOTOR type / Frame | No Poles | No Revolutions | Absorbed power | Installed power |
|---|---|---|---|---|
| ..... | ..... | .....RPM | .....Amp | .....kW / .....HP |
| **Frequency** | **Supply** | **Enclosure** | **Insulation class** | **Absorbed power** |
| .....Hz | .....Volt | IP..... | ..... | .....kW / .....HP |

**COMMENTS**

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Smontaggio TRVK-TRSK Inglese



ISO 9001

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