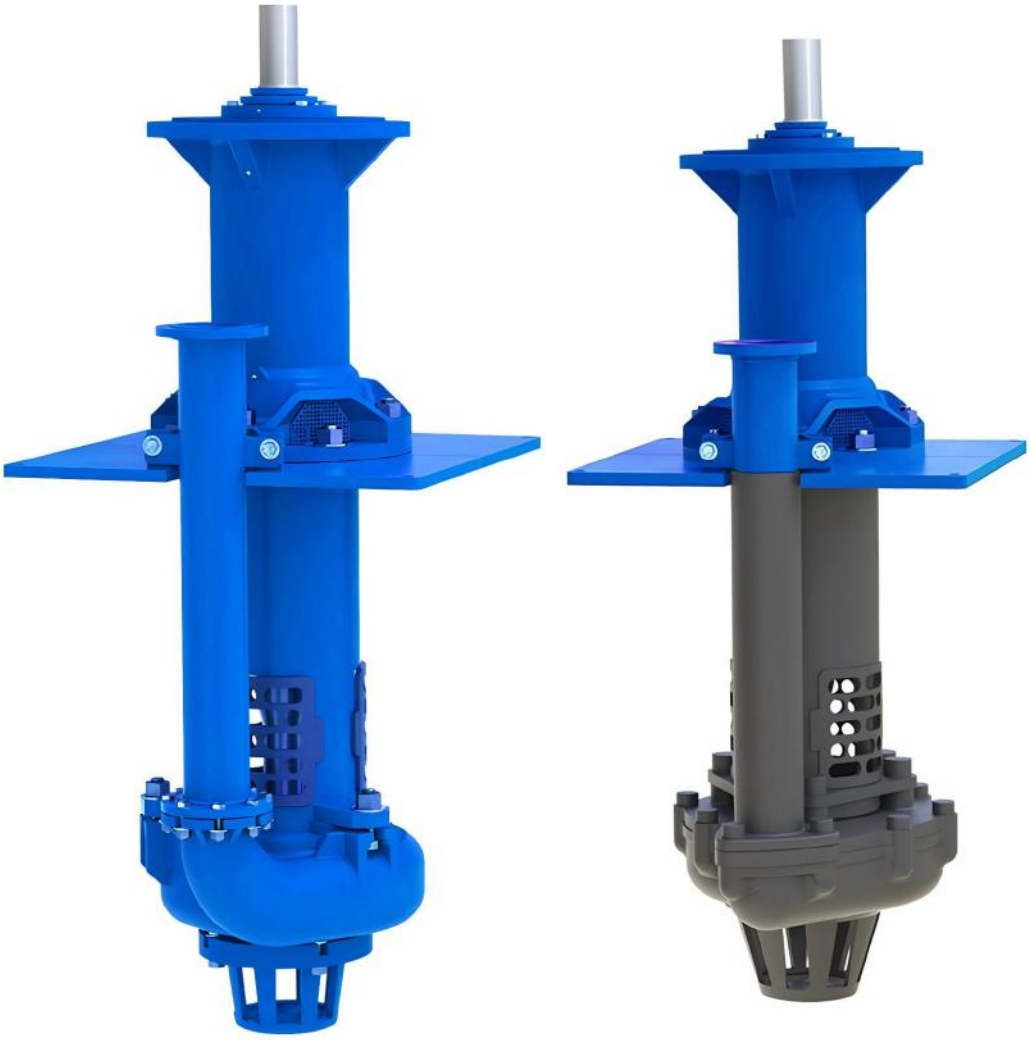
TYPE OF FSP & FSPR

# VERTICAL SUMP PUMP

## INSTALLATION AND OPERATION INSTRUCTION



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# Notes:

1、 **Before using this product, must carefully read this instruction manual and related products manual! In the process of installation, use and maintenance, must be in compliance with the safety operation procedures of the product and related equipment.**

2、 **Check the veer of driver is correct before install the coupling or belt. The pump rotates lockwise viewed from motor end, forbidden reverse run! Otherwise it will cause personal injury and equipment damage.**

3、 **The pump shall not for a long time operation in the condition of small flow or no flow, otherwise it will cause pump unit vibration and even pumping liquid, caused personal injury and equipment damage.**

4、 **Water pump is rotating equipment, cut off the power before the installation and maintenance of pump unit, and otherwise may cause personal injury!**

5、 **When the pump unit running, forbidden hand into or remove the protective cover, otherwise it will cause personal injury.**

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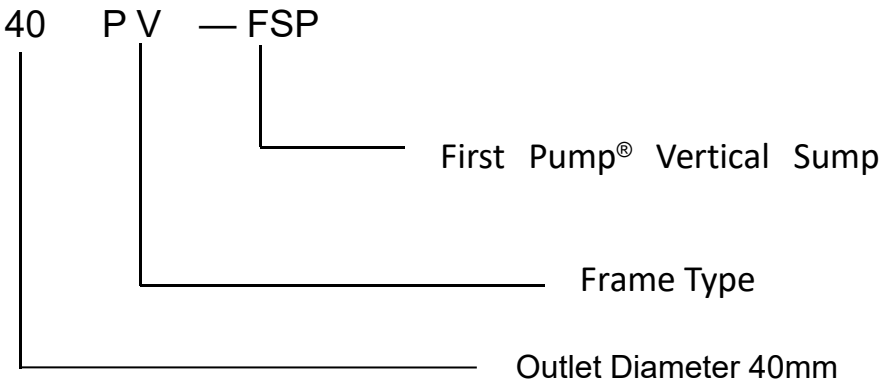
# Ⅰ. General

Type FSP and FSPR pumps are vertical, centrifugal slurry pumps submerged in sump to work. They are designed for delivering abrasive or corrosive slurries. Type FSP and FSPR sump pumps' structure are the same. Wet parts and shaft of type FSP pump are made of abrasion-resistant metal, suitable for conveying corrosive slurries. Wet parts and shaft bushing of type FSPR pump are lined with abrasive-resistant and corrosive-resistant rubber liner.

They are suited to transport abrasive and corrosive slurries. Type FSP and FSPR sump pump is widely used in Metallurgical, Mining, Coal, Power Plant, Building materials etc.

Pump Model Explanation:

For Example：



## II.Structure Introduction

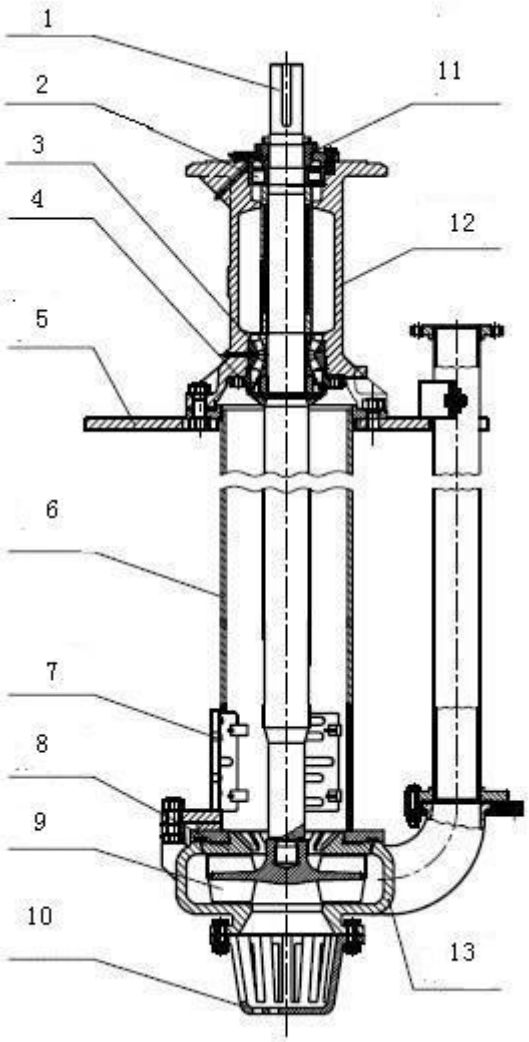
The pump body, impeller and liner plate of type FSP sump pump are made of abrasion-resistant material, simple structure, convenient installation. The pump body bolted to support and the bearings body place the upper of support. Bearing body on pump end adopts double rows of taper roller bearings and driving end adopts single row taper roller bearings, which can bear the maximum axial load of the pump. Motor base or motor bracket are installed on the bearing body, which can take the direct coupled or Vee-belt drive, change pulley to change the rotation speed of pump and satisfy the change of working condition or the changes of the performance after abrasion. A split on the mounting plate can be easily mounted on steel or concrete basis. Pump should be submerged in the slurry pool, the suction with strainer to prevent the larger particles into the pump.

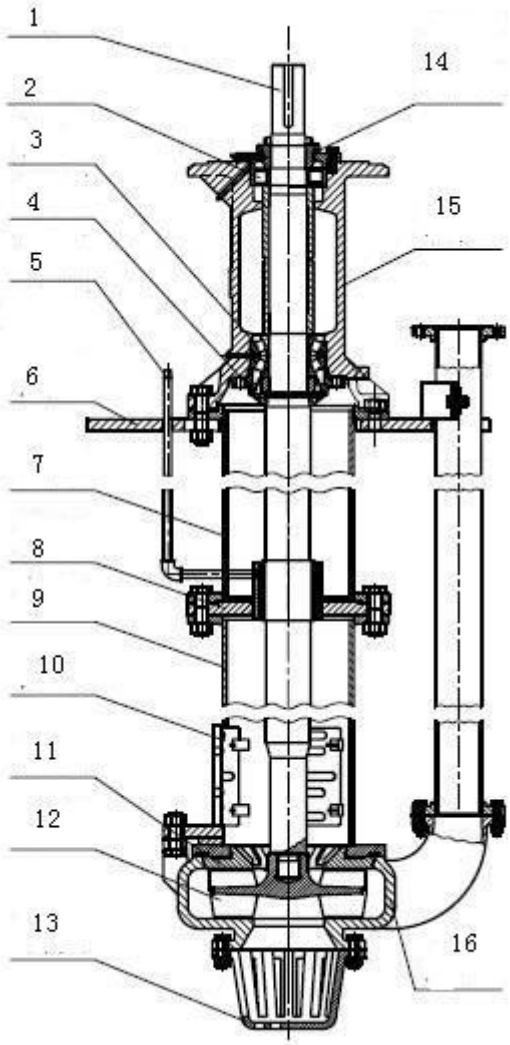
Type FSPR and FSP type pump are exactly the same, the difference is only in the parts of submerged slurry are lined with wear-resisting, corrosion resistance rubber(including shaft, pump body, impeller, liner plate and strainer). All immersed connecting bolt have rubber sleeve. The driving parts are exactly the same with type FSP pump.

The structure of type FSP and FSPR sump pump and lengthened shaft FSP and FSPR pump shown in figure 1 and figure 2. Lengthening shaft series increases the guide bearing parts, equipped with water pipe. Rinse water pressure, water quantity, water pipe specifications shown in table 1.

Table 1

| Type | Pressure MPa | Water l/s | Spec. | Type | Pressure MPa | Water l/s | Spec. |
|---|---|---|---|---|---|---|---|
| 40PV-FSP | ≥0.2 | 1 | 3/8″ | 100R V--SP | ≥0.2 | 1 | 3/8″ |
| 40P V--FSPR | ≥0.2 | 1 | 3/8″ | 100R V-SPR | ≥0.3 | 1.2 | 3/8″ |
| 65Q V--FSP | ≥0.2 | 1 | 3/8″ | 150S V--SP | ≥0.2 | 4 | 3/4″ |
| 65Q V--FSPR | ≥0.2 | 1 | 3/8″ | 250T V--SP | ≥0.3 | 5 | 3/4″ |
| 65Q V--FSP（Special） | ≥0.3 | 2 | 3/8″ | 300TV-SP | / | / | / |




| | | |
|---|---|---|
| 1.Shaft | 2.Bearing | 3.Bearing |
| 4. Lubricating Ring | 5. Mounting Plate | |
| 6. Bracket | 7. Stranier | 8. Back Liner Plate |
| 9. Impeller | 10. Lower Strainer | |
| 11. Piston Ring/ Labyrinth Sleeve | | |
| 12. Bearing House | 13. Pump Body | |

| | | |
|---|---|---|
| 1. Shaft | 2. Bearing | 3. Bearing . Lubricating Ring |
| 5. Guide Bearing Water Pipe | 6. Mounting Plate | |
| 7. Upper Bracket | 8. Bearing Base | 9. Bracke |
| 10. Strainer | 11. Back Liner Plate | 12.Impeller |
| 13. Lower Strainer | 14. Piston Ring/ Labyrinth Sleeve | |
| 15.Bearing House | 16. Pump Body | |

Fig 1 Type FSP and FSPR Sump Pump

Fig 2 Lengthened Type FSP and FSPR Sump Pump

## Ⅲ. Assembly Notes

**1、 Bearing Assembly**

It is advisable to preheat bearing assembly(never exceed 120℃). The lower bearing with double row taper roller bearings, inner ring, outer ring and shaft spacer is complete sets, can't interchangeable with the corresponding parts of similar bearings. Noted that the lip seal surface should face to the outside when installing the bearing lower cover, lubricating ring must comply with the positions of assembly drawing. Installing a labyrinth ring must pay attention to the piston ring gaps should be staggered diametrically. Although the axial clearance may be not required to adjust because the end pay may be guaranteed by themselves, but after assembled, it is recommended that check the end pay clearance follow the values listed in the table below.

| Bearing Assembly | End Clearance（mm） |
|---|---|
| PV | 0.074～0.160 |
| QV | 0.114～0.208 |
| RV | 0.084～0.211 |
| SP | 0.064～0.206 |
| TV | 0.127～0.259 |

**2、 Bracket, Mounting plate and pump body installation**

Connected bearing assembly and support with bolt, installed the split mounting plate outside the circumference of bracket with double end studs fixed, and then back liner plate, impeller, pump body. Pay attention to the relative position among the bearing body, bracket, mounting plate of pump body, ensure the relative position of outlet pipe and nozzle, see figure 3.

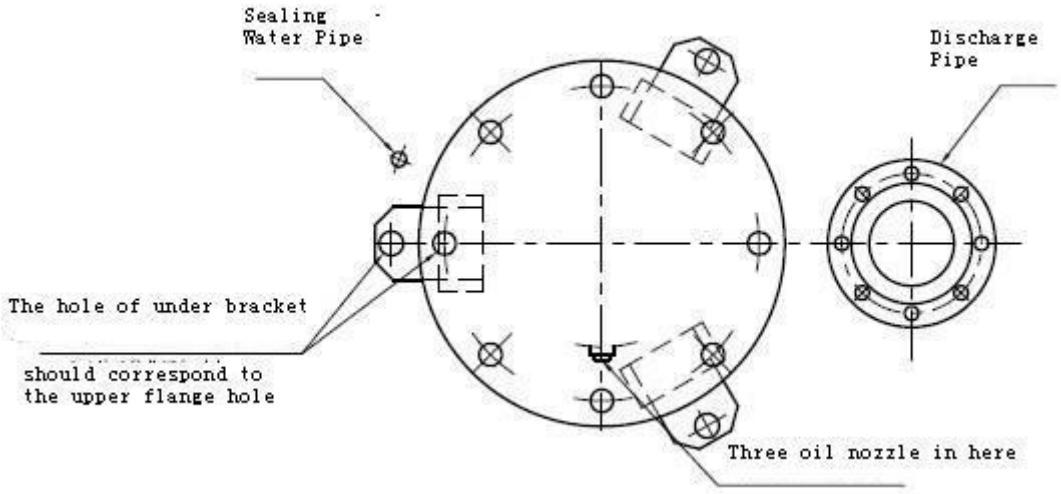
Lengthened shaft FSP and FSPR type pump increases the guide bearing part and the upper bracket. When installation should be paid attention to:

1) Guide bearing parts installed between the upper bracket and bracket;

2) The shaft sleeve be installed thermal and processing with the shaft together, cannot remove;

3) The bearing shell of metal pump fixed on the bearing base with screws. Rubber liner pump shell with 406 adhesive to the bearing base;

4) Pay attention to the relative position of each component when the assembly, see figure 3.




Tighten the bolt that connectted the bracket with the pump body. Check whether the impeller rotating smoothly. If there is friction, add washer in the bearing body and support connection place. Finally install the upper and lower strainer and discharge pipe. Fix the upper discharge pipe on the mounting plate with screws.

## Ⅳ. Operation

**1、Starting：**

Before starting the following steps must be taken.

(1) The pump request to be installed on a stable foundation, which can bear the total weight of pumping equipment system, eliminate the vibration. All hold-down bolts should be fully tightened.

(2) Pipelines and valves should be supported independently of the pump. Appropriate joint rings must be used at the pump flanges. In some pumps, the metal liner projects a short distant past the flange. Don't to over tighten the flange bolts so as to not damage the joint rings.

(3) Before start pump, rotate pump shaft by hand(clockwise) to insure that the impeller turns freely within the pump. If any scraping noises, the impeller clearance must be adjusted.

(4) Check motor rotation. Be sure the motor rotation same with the arrow rotation on pump casing. IMPORTANT: never contrarotation! Or the pump will unscrew the impeller from the shaft causing serious damage to the pump.

(5)For direct coupled, the pump and motor shaft should be accurately aligned. In V-belt driven, the pump shaft must be parallel with the motor shaft. The position of pulley should be adjusted in order to make it perpendicular to belt and to prevent them from excessive wear and vibration.

(6)Finally recheck all nuts are tight, shaft is flexible rotation.

Note: Before starting lengthened shaft pump, connect the guide bearing rinse water 5 minutes. It's better to start pump with clear water before pumping slurry.

**2、Operation**

Observe all kinds of instrument during operation, check the pump rotation speed, flow and electric current. When occurred flow fall, power reduction, outlet pressure decrease or no flow in operation, all possible for large particles block the strainer,suction or impeller passage. When a numbers of large particles are concentrated in the discharge pipe can also blocked,cause the pump does not work, pay attention to clean blockages in time. Installed the pump not smooth will cause vibration. Lengthened shaft pump, in the process of operation, ensure the supply of guide bearing water continuously.

**3、Shutting Down**

Whenever possible, the pump should be allowed to operate on water only for a short period to clear any slurry through the system before shut down. Shut down the pump first and then valves.

For lengthened shaft pump, shut down guide bearing rinse water after 5 minutes pump stop.

Note: 1. The height of Liquid level shall not exceed the location of the mounting plate that shown in figure 1 and 2. Avoid the water into bearing

2. Guide bearing flushing water shall be clean water.

**4、Pretension Adjustment of Vee-Belt**

We only introduce our recommendation adjustment method as followsfor reference.

① Firstly calculate pretension Q

$$Q = \frac{510 \cdot (2.5 - C_1) P \cdot C_2}{C_1 \cdot Z \cdot V} + mV^2 \text{（Newton）}$$

② e value can be looked up from the curve based on pretension and Vee-belt typea( see Fig4)

③ Through formular $f = \frac{e \cdot L'}{100}$ and F

④ R value related with the [illegible] can be looked up in Table 1. According to the method and the centerline distance adjusting between two pulleys, the required pretension Q will be reached.

Where：Q — Minimum pretension of suspended distance of each Vee-belt at static( unit: newton).

f — Total pressed amount in suspended distance(unit: mm).

C1 — Angle coefficient(0.9 about).

C2 — Working coefficient(1.4 about).

L'— Centerline distance of Pulleys.

P — Motor rated power(unit: kw).

Z — Piece number of Vee-belt.

V — Line velocity(m/s).

m — Centrifugal force coefficient(see in Table 2).

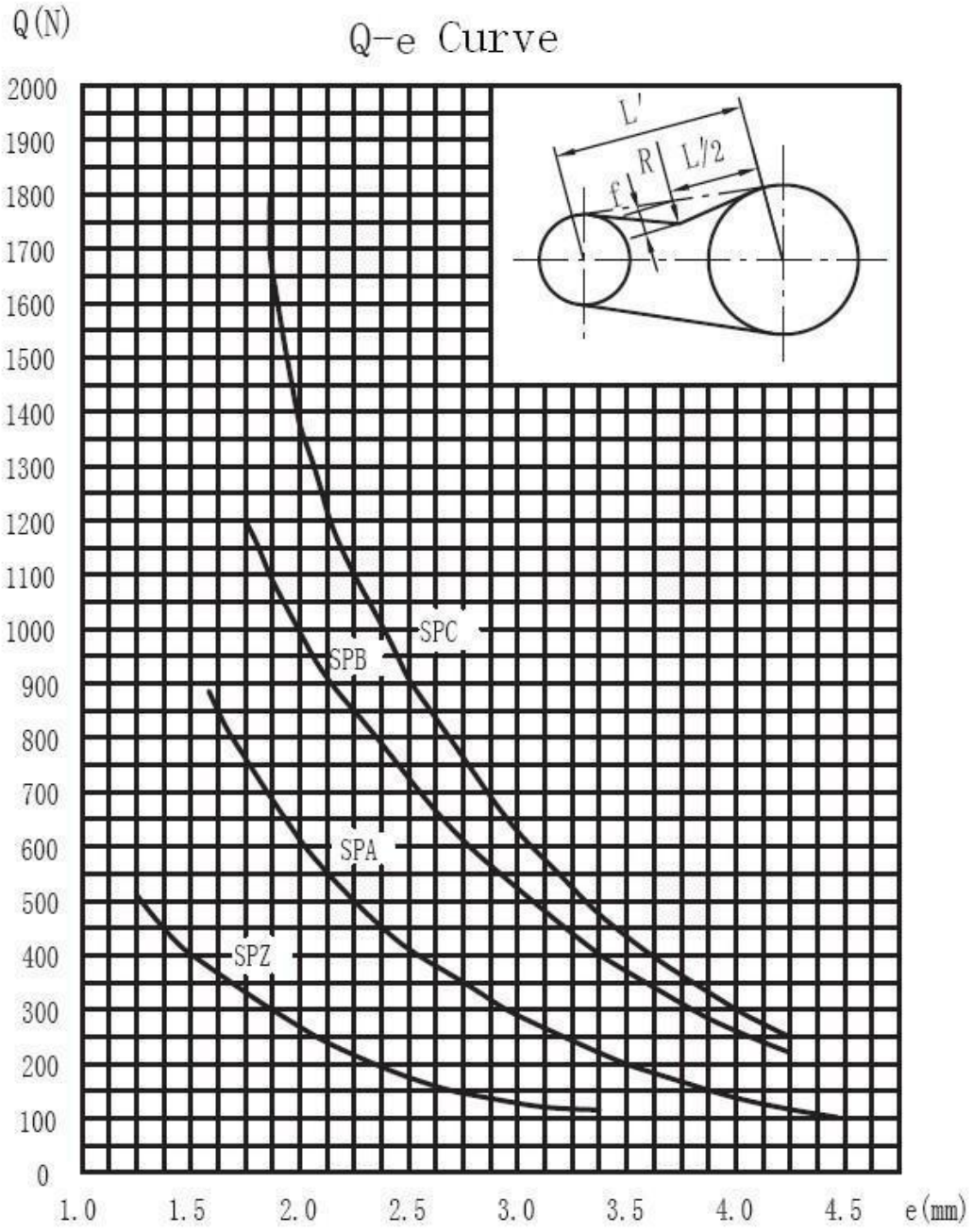
e — Pressed amount e(mm) in 100mm length of suspended distance(see in Fig.4).。

As Vee-belt is been adjusted to final pretension the maximum load will be on Vee-belt. It is best that pretension will be minimum. After adjustment , recheck the normal ratation of impeller, if any possible, start the pump by clean water before pumping slurry, open valve in suction pipe to check the pressure and flow rate of outlet.

Table 2

| Type | SPA | SPB | SPC | SPZ |
|---|---|---|---|---|
| R | 60 | 90 | 120 | 30 |
| m | 0.12 | 0.20 | 0.38 | 0.08 |

Note： R value in the table 2 is in the unit of Newton.




## Ⅴ. Maintenance

The structure of type FSP and FSPR pump is strong and durable. For long trouble-free service with a minimum amount of maintenance it must pay much attention to following items:

**1、Impeller Adjustment**

Type FSP and FSPR pump the clearance between impeller and the pump body should be in 0.5 ~ 1 mm (can be adjusted through change the washer between the bearing base and bracket), make the pump run efficiently. When the wear of impeller and pump body lead serious loss to the performance and efficiency and cannot satisfy the use requirement, should replace worn parts.

**2、Bearing Lubrication**

Bearing in the assembly, have joined the right amount of grease. Periodically add grease through the two nozzle on the bearing body in the progress of operate. Grease injection can not be too much, too much will cause bearing heating. With different operating work condition, the cycle and injection of the grease change bigger. Pay attention to keep grease clean and not allowed to enter the dirt.In normal circumstances under continuous operation, bearing lubrication cycle may refer to table 3. The lithium base grease bearing grease recommended # 2 or # 3. The grease quantity of every bearing use for the first assembly can refer to table 4.

**3、Spare pumps should be turned in a quarter of turn so that the bearings may support static load and vibrition from outside evenly.**

Table 3

| Bearing Assembly | Type | Add Amount（gram） | Pump Speed （r/min） | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 400 | 600 | 800 | 1000 | 1200 | 1400 | 1600 | 1800 | 2000 | 2200 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pump End | PV | P009 | 30 | — | — | — | 1700 | 1400 | 1200 | 1000 | 900 | 800 | 750 |
| | QV | Q009 | 55 | — | — | 1800 | 1400 | 1100 | 900 | 750 | — | — | — |
| | RV | R009 | 85 | 3200 | 2000 | 1400 | 1100 | 800 | — | — | — | — | — |
| | SP | S009 | 115 | 2600 | 1500 | 1000 | 700 | — | — | — | — | — | — |
| | TV | T009 | 250 | 2000 | 1200 | 700 | — | — | — | — | — | — | — |
| Driving End | PV | P009 D—1 | 15 | — | — | — | 8500 | 7000 | 6000 | 5000 | 4500 | 3500 | 3000 |
| | QV | Q009 D—1 | 25 | — | — | 9000 | 7500 | 6000 | 5000 | 4000 | — | — | — |
| | RV | R009 D—1 | 40 | 16000 | 10000 | 7500 | 6000 | 4000 | — | — | — | — | — |
| | SP | S009D —1 | 60 | 14000 | 8000 | 6000 | 4000 | — | — | — | — | — | — |
| | TV | T009 D—1 | 120 | 12000 | 6000 | 4000 | — | — | — | — | — | — | — |

Table 4

| Bearing Assembly | Driving End （gram） | Pump End（gram） |
|---|---|---|
| PV | 60 | 90 |
| QV | 130 | 225 |
| RV | 300 | 450 |
| SP | 400 | 550 |
| TV | 450 | 2200 |

## Ⅵ. Possible Faults and Solutions

| Faults | Reason | Solutions |
|---|---|---|
| Pump fails to discharge any liquid. | Incorrect direction of pump rotation & impeller worn.<br>Suction pipe blocked. | Check direction of rotation and replacing impeller.<br>Removal blockage. |
| Shaft power consumption is excessive | Rotating component rubbing on a stationary part.<br>Bearings worn.<br>Drive belt tension too tight.<br>Flow rate too large.<br>Pump speed & ratio too high<br>Misalignment or unparallel of drive shaft and pump shaft. | Removal the rubbed part.<br>Replace the bearing.<br>Adjusting belt.<br>Modifying the pump duty and speed.<br>Adjusting drive & pump shaft. |
| Hold shaft | The pressure and amount of guide bearing sealing water does not conform to the requirements or without shaft seal water | Connect guide bearing sealing water and adjust the pressure and amount to meet the requirements |
| Bearing is over heating | Lubricants too much or less.<br>Containing impurities in the lubricant.<br>Bearing worn. | Lubricating as requirments.<br>Replace new lubricant.<br>Replace new bearing. |
| Bearing has short life. | Misalignment or unparallel of drive and pump shaft.<br>Shaft bent.<br>Impeller unbalanced due to wear.<br>Foreign object entered into the bearing or insufficient lubrication.<br>Incorrect procedure followed in fitting bearings. | Adjusting drive and pump shaft.<br>Replace shaft.<br>Remove rubbing and replacing new impeller.<br>Clean the bearing.<br>Replacing or refitting the bearings |
| Pump vibrates or is noisy. | Bearings worn.<br>Impeller unbalanced.<br>Flowrate non-uniform and pump not primed. | Replace by new bearings.<br>Replace by new impeller.<br>Improve on the pump feeding. |