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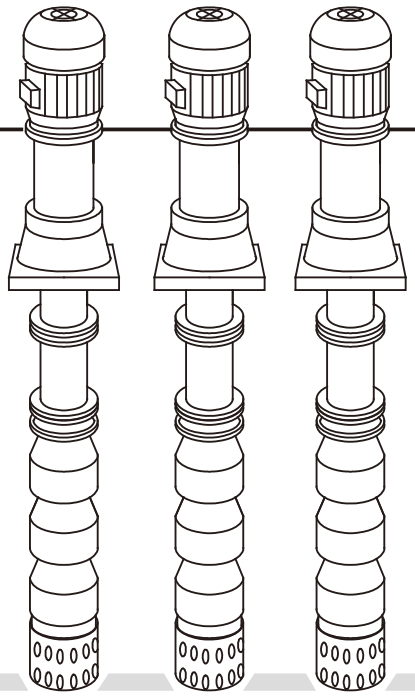
OPERATION INSTRUCTIONS



Long Shaft Turbine Pump

VT Series

ENG

Please check the following points before installation.

- The product is meeting with the specifications ordered.
- Defective or damages, if any.
- All related accessories and tools are ready.
- These instructions contain fundamental information and precautionary notes.
- Please read the manual thoroughly prior to installation of unit for proper operation.
- Keep these instructions near location of operation for easy access.
- Any failure or accidents caused by erroneous installation and/or wrong operation.Non-compliance with the instructions will not be warranted.

General

The pumps have been developed in accordance with state-of-art technology. They are manufactured with utmost care and subject to continuous quality control. These instructions are intended to facilitate familiarity with the pumps and its designated use. The manual contains important information for reliable, proper and efficient operation. Compliance with the operating instruction is of vital important to ensure reliability and a long service life of the pump and to avoid any risks.

Safety

These instructions contain fundamental information, which must be complied with during installation, operation and maintenance. Therefore the manual must be read and understood both by the installing personnel and the responsible trained personnel/operators prior to installation and commissioning, and it must always be kept close to the location of the unit for easy access. Marking of Safety sign in the instructions.The safety instructions contained in this manual non-compliance of which might cause hazards to person are specially marked with the common hazard sign, namely,

（Safety Mark）

Non-compliance with Safety instructions. Non-compliance with safety instructions can jeopardize the safety of personnel, the environment and the machine itself. Non-compliance with these safety instructions will also lead to forfeiture of any and all rights to claim for damages.

In particular, non-compliance can, for example, result in;Failure of important machine / unit functions,

- Failure of prescribed maintenance and servicing practices,
- Hazard to persons by electrical, mechanical and chemical effects.

Safety awareness

It is imperative to comply with the safety instructions contained in this manual, the relevant national and safety regulations and operator's own internal work, operation and safety regulations.

Safety instructions for maintenance, inspection and installation work

The operator is responsible for ensuring that all maintenance, inspection and install ation work be performed by authorized, qualified specialist personnel who are thoroughly familiar with the manual.Working on machine must be carried out only during standstill. The shutdown procedure described in the manual for taking the machine out of service must be adhered to without fail. Pump handling media injurious to health must be decontaminated. Immediately following completion of work, all safety-related and protective devices must be re-installed and/or re-activated.

Unauthorized modification and manufacture of spare parts

Modification or alterations of the machine are only permitted after consulted with the manufacturer. Original spare parts and accessories authorized by the manufacturer ensure safety. The use of other parts can invalidate any liability of the manufacturer for consequential damage.

CONTENTS

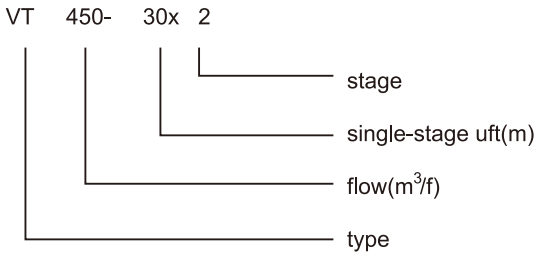
1 Summarization

1.1 Brief introduction of the multistage vertical turbine pump

The multistage vertical turbine pump comprises of a single or multiple centrifugal or mixed-flow impellers and blower inlet casing, lifting pipe, transmission shaft, pump base, motor and so on. The pump base and motor is designed at the upper part of well (or water pool); the dynamics of motor is forwarded to the impeller shaft to produce flow and pump lift through the transmission shaft that is homocentric with the lifting pipe.
The multistage vertical turbine pump is an equipment to pump and drain water, suitable for power plant, iron works, ore mine, chemical, fire-control, tap water, agriculture irrigation and other industries.

1.2 Performance scope (as per the design point:)

Flow Q：3~2000m3/h
Elevation H：300m(max)
Power N：900kW （Max）
Rotating speed n：2940、1460、980r/min
The performance parameter of the pump is detailed in Mode-selection Sample.
Model Description:
For instance: VT 450-30×2



1.3 The pumping media is required to comply with the following requirements, i.e.:

The temperature is less than 40□; the content of solid substance (as per the weight) is less than 0.01%; PH value is between 6.5~8.5; sulfureted hydrogen content is less than 1.5mg/l; No any oil or grease is contained (When using in deep well, please keep the pitshaft upright; no compound bending is allowed).

1.4 Safety

Any people who install or use the pump must read carefully and understand all contents of the Operation Instruction, and abide by the Operation Instruction for any operation. If disobeying the Operation Instruction to cause machine problem or personal injury, our company shall not bear any legal responsibility.
The installer and user of the pump must be the trained professional staff with given technologies;
When making any mechanical or electric installation or maintenance on the deep-well pump, please ensure the lifting device and maintenance device safe and reliable.
Before or after installing or using the deep-well pump, please keep the equipment base and working environment safe and reliable;

Before making any mechanical or electric installation or maintenance on the deep-well pump, please disconnect the general power of motor; when making maintenance, please stop the motor firstly;
When making maintenance, the pump may start immediately if the general power source of motor is not shut off; which will possibly cause people injured or equipment damaged; if the general power source of motor is not shut off, it may possibly cause electric shock, burn wound, death or other accidents.

1.5 Model selection note

Selecting proper deep-well pump will postpone the service life of pump, motor and well; this is very important !

1.5.1 The pump base contained in the pump model number refers to the one that the pump can be put in the deep well larger by 25mm than the base number; when the depth in the well exceeds 30m or the well pipe is the cast iron pipe or cement pipe, the actual diameter of well should be larger by 50mm or more than the pump base number.

1.5.2 The flow in the deep-well pump should not be more than the normal water inflow of the well.

1.5.3 The pump lift of the deep-well pump will be calculated based on the formula, i.e.:
H=(H1+H2+△h)×1.1
Where: H—the desirous pump lift (m);
H1—the distance from the dynamic water level in well to the outlet center of pump base (m)
H2- the vertical height from the outlet center of pump base to the ground where flow reaches (m)
△h—Resistance loss of lifting pipe and water pipe at the rear of outlet of pump base (m)
△h See Table 1 and Table 2.
Evaluation Table for Control Loss of Water Pipe Per 100 Meters (Unit: m)

Evaluation Table for Control Loss of Water Pipe Per 100 Meters

Table 1

Pipe Diameter mm	Flow rate(m^3/h)									
	10	20	30	40	50	60	70	80	90	100
50	4.74	18.97								
65	1.66	6.64	14.95	26.75						
75		3.25	7.31	12.99	20.3	29.23				
100				3.08	4.82	6.94	9.44	12.33	15.61	19.27
150								1.62	2.06	2.54

Pipe Diameter mm	Flow rate(m^3/h)									
	110	120	130	140	150	160	170	180	190	200
100	23.31	27.75								
150	3.07	3.65	4.29	4.97	5.71	6.5	7.33	8.22	9.16	10.15
200							1.74	1.95	2.17	2.41

Pipe Diameter mm	Flow rate(m^3/h)									
	220	240	260	280	300	350	400	450	500	550
150	12.28	14.62	17.15	19.89	22.84					
200	2.91	3.47	4.07	4.72	5.42	7.38	9.63	12.19	15.05	18.21
250					1.78	2.42	3.16	4.00	4.93	5.97
300								1.61	1.98	2.40

Pipe Diameter mm	Flow rate(m^3/h)									
	600	650	700	750	800	850	900	950	1000	1200
250	7.10	8.34	9.67	11.10	12.63	14.26	15.89	17.81	19.73	28.41
300	2.85	3.35	3.89	4.46	5.07	5.73	6.42	7.16	7.93	11.42
350		1.55	1.80	2.06	2.35	2.65	2.97	3.31	3.67	5.28
400								1.70	1.88	2.71

Pipe Diameter mm	Flow rate(m^3/h)									
	1400	1600	1800	2000	2200	2400	2600	2800	3000	3500
350	7.19	9.39	11.89	14.67	17.76	21.13	24.8	28.76		
400	3.69	4.82	6.1	7.53	9.11	10.84	12.72	14.75	16.94	23.05
450	2.05	2.67	3.38	4.18	5.05	6.01	7.06	8.19	9.4	12.79
500			2	2.47	2.98	3.55	4.17	4.83	5.55	7.55

Valve and converted length of bending pipes

Table 2

Type	Multiple of the diameter of converted pipe	Remarks
Full-open gate valve	13	Double if it is opened incompletely
Check valve	100	
Bottom valve	100	Double if some is blocked
90° Bending pipe	23	

2 Structure Introduction

2.1 Structure introduction

The multistage vertical turbine pump compises of three parts, i.e.: working parts, lifting pipe and part above the well.

2.1.1 Working parts

The working parts comprises of the blower inlet casing, impeller, taper sleeve, shell-type bearing and impeller. The impeller is of the closed-structure, with the casing to be connected by bolts (some are connected by screws); on the blower inlet casing and impeller, there is provided the wearing ring.

2.1.2 Lifting pipe

The lifting pipe comprises of the pipe itself, transmission shaft, shaft coupling and rack..The lifting pipe is connected by flange or pipe thread. The transmission shaft is made of #45 steel, with the bearing to be chrome-plated. When the bearing wears, the lifting pipe to be connected by the screw thread can be changed the installation position of two short lifting pipes for continuous use; whereas the lifting pipe to be connected by flange can be changed the direction of the transmission shaft for continuous use. For the deep-well pump where the lifting pipe is connected with screw thread, it is designed a special locking ring at the junction of pump base and the lifting pipe on the upper end, which shall prevent the lifting pipe from being dropped off efficiently.

2.1.3 Part above the well

The part above the well is composed of pump base components, deep-well pump motor (when the power is over 260kw, it will be the common vertical motor designed specially for the deep-well pump), motor shaft, shaft coupling and so on. Optionally it can select electric control box, short outlet pipe, in take and vent valve, pressure meter, check vavle and stainless steel or rubber expansion joint.

3 Installation of pump set

3.1 Preparation before installation

3.1.1 Check the quality of pitshaft and cleanning of pitshaft: Check the inner diameter of pitshaft and straightness to see if it complies with the application requirement of deep-well; remove all sluge and impurities from the deep well (water pool);

3.1.2 Check the foundation quality and pump room: the foundation of well opening should be able to bear overall weight of pump set and ensure the pump to be away from deformation in long-term use; the pump room should be constructed to make pump set dismantle or install easy and keep the part above the well away from influence of natural conditions;

3.1.3 Preparation of tools and equipments: Except the paid clamp and rack wrench provided by the manfuacturer, the following tools and equipments are required to prepare, i.e.:

a) one triangle rack in 4m tall at least, which must be able to bear the weight of pump set;

b) one electric hoist with sufficient capacity to bear the weight of pump set;

c) a set of bench-work tools;
d) two grip wrenchs and one chain plier suitable for the pump;
e) one steel wire rope in 10m long, which must be able to bear the weight of pump set;
f) multiple crossties with the specification of 200mmX200mm.
Besides, it is required to prepare grease, cotton gauze, steel brush, blade and others.

3.1.4 Check and clean the components of pump set: Count out the components and documents of pump set as per the Packing List provided. Clean the mating place (thread, seam allowance, end surface and so on) of all components by kerosene. Keep the rubber bearing away from any oil to prevent deformation. Check if the mating surface of all components are collided, scratched or oily dirted. If yes, please clean and patch and coat oil to prevent rust.
The components assembled in producing factory should not be dismantled, but it should check if the driving components turn averagely, flexibly and if the axial slip complies with the given requirement.
Put both ends of the transmission shaft up with V-shape iron frame, then use the dial indicator to check the bending status of transmission shaft; the circular jerk value should be less than 0.4mm along the full length; otherwise please calibrate once more.

3.2 Installation sequence

3.2.1 Put the water filter on the bottom of working component, install the short pipe on the top of working component; use clamp to hold the short pipe, then use hoisting device to move the working component into the pitshaft; afterwards put the clamp on the two crossties placed on the well opening previously.

3.2.2 Tighten the short transmission shaft with the impeller shaft through the shaft coupling (the screw of transmission shaft should be the left-hand thread); then put the rack inside the concave seam allowance of the flange of lifting pipe (for the lifting pipe to be connected by screw thread, it should screw the rack into the middle part of union coupling), keeping close contact with the end surface of lifting pipe.
When the lifting pipe is hoisted, it should fix the transmission shaft inside the lifting pipe and install the union coupling on the transmission shaft firstly; and thus use the rope to tie; afterwards it can move the lifting pipe into the pitshaft completely.
Note: When installing, it should observe if the assembled pump shaft is in the middle of lifting pipe. If yes, please put the rack into the concave seam allowance of the flange of the lifting pipe (for the lifting pipe to be connected by screw thread, please screw the rack into the middle part of union coupling, and then use the rack wrench to tighten); at thie moment it should measure the distance from the end surface of shaft to the plane of rack. Keeping measuring every time when installing a group of lifting pipe and transmission shaft; check if it is consistent. If yes, it proves that the installation is made correctly; otherwise please stop installing for seeking problems. If the transmission shaft becomes inclined, and deviating from the middle position of the lifting pump, it should lift the shaft a bit and turn 180º, and then put it down; if the inclination of transmission shaft is changed, it proves that the shaft is bend already; if so it should replace or calibrate the shaft; if the inclinationor does not change, it proves that the lifting pipe is not straight, so it should remove the lifting pipe and check its end surface and if the top and bottom surface of rack is flat or stayed any impurities; if yes please remove and then install once more.

3.2.3 Install the motor shaft on the top of transmission shaft.

3.2.4 Combine the lifting pipe on the top with the pump base components. Lift the pump base component and place it on the upper part of well opening, making the motor shaft pass throug the feeding box hole in the middle of pump base; connect the short pipe and the lifting pipe on the well opening; for the pump to be connected with the lifting pump with screw thread, it should lift the whole pump and tighten the locking ring again.

3.2.5 Remove the rain shield on the top of motor, and then the adjusting nut and the driving disc; lift the motor and make the motor shaft pass through the hollow shaft of motor, and then use the bolts to fix the motor onto the pump base; check if the motor shaft is aligned with the hollow shaft; if not, please adjust and ensure a sound alignment; afterwards calibrate the rotation direction of motor.
How to check if the motor shaft is aligned with the hollow shaft of motor: screw on the adjusting nut, lift the shift a bit and turn 180º; and then remove adjusting nut and observe if the inclination of shift is changed; if the inclination is not changed, it proves that the pump is placed unevenly; if the inclination changes, it proves that motor shaft is bent and it should be straightened and re-installed; as long as the motor shaft is aligned with the hollow shaft, it can be allowed to proceed the next steps;

3.2.6 Put on the driving disc and the stock key on the top of motor;

3.2.7 Put the adjusting nut on the motor shaft; adjust the axial gap of impeller rotor, tighten the fixing screws; the thread of the adjusting nut is the right-hand thread; turn the adjusting nut by one cycle, the transmission shaft will be lifted by a thread pitch. The adjusting of axial gap is detailed in Section 4.1.1.

3.2.8 Put the rain shield of motor and then switch the power on;

3.3 Installation Precautions

3.3.1 When lifting, please keep the part to be lifted away from colliding with the ground or other hard articles, and keep the cleaned parts away from collision or scratch, sand or other dirty articles;

3.3.2 All mating surfaces, such as the screw thread and seam allowance should be coated the butter before installing; for the rubber bearing, it should use the talcum powder, and make it away from contacting with oil;

3.3.3 When connecting the transmission shaft with the union coupling of shaft, please keep it contact with the two end surfaces of transmission shaft closely; the contact surface should be located in the middle part of union coupling;

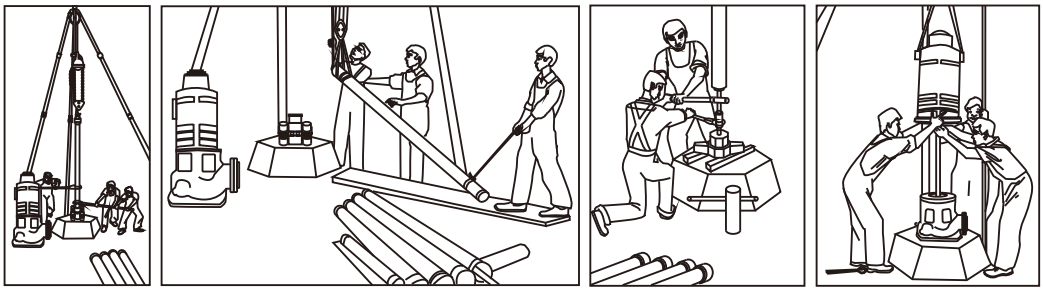
3.3.4 The check ring, locking ring and other joints to be connected by screw thread should be tightened;

3.3.5 After the lifting pipe is installed and before the rack is installed, it should use the sample or gauge to check if the shaft is homocentric with the pipe; if there is large deviation, it should seek the possible reason or replace the lifting pipe or transmission shaft;

3 Installation of pump set

3.3.6 Every time when installing 3~5 lifting pipes, it should check if the extended length of shaft changes; if the extension length changes obviously, please check the reason and make adjustment accordingly;

3.3.7 After assembling, the ones that are left are the spare parts and tools; keep the spare parts and tools in safe place to prevent loss.



Installation Diagram

4 Start and Stop

4.1 Preparation before start

4.1.1 Adjustment of lifting slip of transmission part of pump

When the pump works, the transmission shaft will extend under the axial pulling force; the purpose to adjust the lifting slip to relieve such influence and ensure the pump to work normally; the method used to adjust is: rotate the adjusting nut on the motor shaft to lift the shalf; due to the self-weight, the transmission shaft will be pulled, but not pressed, thus it will produce certain extension; therefore when turning or adjusting the nut, it should keep turning the motor shaft anticlockwisely. When it becomes easy to turn and free of bounce, it will prove that the end surface of impeler comes out the casing rightly; at this time the position to adjust the nut is the original position to adjust the axial slip.

At the starting position, turn the adjusting nut to

What it should be noted is that the Original Position should be preferrably determined by multiple operations; before putting into use after starting, the slip should be readjusted; when the slip is admusted, please use screws to fix the adjusting nut.

4.1.2 Pre-lubricating

Before starting the pump, it should inject clean water into the lifting pipe through the injection hole on the pump base to lubricate and clean the rubber bearing. The water injected should be more than 0.5m3; the pre-lubricating and cleaning operation is preferred to be done in the first 5 minutes before starting; when water comes out from the started pump, please stop supplying water immediately.

4.2 Operation

When the newly installed pump starts operation, it must expereince 4 hours for commissioning. During this period, it should specially enhance maintenance and observe if it occurs any of the following problems, i.e.:

a) The ampere meter fluctuates hugely or the current exceeds the rated value;

b) The water pump vibrates over much;

c) The temperature at the bearing part of motor exceeds 95º (keep the ambient temperature less than 40 º);

d) When the ambient temperature is less than 40 º and the heigh above the sea level is less than 1000m, the B-grade insulation exceeds 80K and F-grade insulation exceeds 105K (the temperature rise limit of motor is measured by resistance method);

e) When the water pump and motor goes wrong.

After commissioning, it should stop for inspection; if there is no any problems, please put into use normally.
When the water pump works normally, please give the following maintenance and make records accordingly, i.e.:

a) Inspect the current value and voltmeter reading; check if machine set vibrates and goes wrong;

b) Check the drainage volume of water pump; keep the water pump run with the rated flow as much as possible; the flow can be adjusted by outlet valve;

c) Check the airtightness of feeding box; a small amount of leakage is allowable; it can be realized by tightening the nut on the gland cover; normally the fillings should be repalced every 1 or 2 months;

d) Check the temperature at the bearing position of motor (keeping it less than 90º) and volume of lubricating oil. Normally the lubricating oil should be replaced every 3 monthes;

e) Observe the sand content of water. Normally it will contain a great amount of sand in water, which shall wear the pump quickly and reduce the service life of water pump.

4.3 Stop

4.3.1 When the water contains sands or when water is too turbid, it should stop the pump and inject clear water into the lifting pipe through the injection hole on the pump base to rinse the rubber bearing; the clear water that will be injected should be over 0.5m3, with the cleaning time to be over 30 minutes at least;

4.3.2 When stopping, it should not start the water pump again; otherwise the temperature of motor will go rise and water flow will produce large impact; keeping the start interval over 30 minutes;

4.3.3 If using the water pump to give a long-distance water transmission, or the high place or water tower, and there is no check valve on the outlet of pump, it should close the gate valve first, and then the shut the power source off.

5 Common problems and troubleshooting

Problem	Reason	Troubleshooting
The motor does not turn and produces abnormal noise after switching the power on	1. The single phase of stator is of short-circuit; 2. One phase of power source has not electricity; 3. The joint of coil is connected with the terminal board incorrectly; 4. The motor turns incorrectly; 5. The inner hole of rubber bearing deforms.	1. Repair the circuit; 2. Check and eliminate the reason why there is no electricity;' 3. Clean-up phase stator coil and re-connect; Clear the phase of stator's coil; 4. Change the joint; 5. Remove and replace pump.
The motor rotates at low speed after starting.	1. The head end and the tail end of phase winding is connected incorrectly. 2. The voltage becomes too low.	1. Clear the phase winding and re-connect; 2. Boost the voltage and then use the water pump;
The motor produces abnormal sound and heats when working.	1. The winding is of short-circuit.	Repair the winding of motor
The non-return device inside motor goes wrong.	1. The check pin is worn or dirty; 2. The slotted hole of check disc is worn;	1. Replace or clean the check pin; 2. Deepen the slotted hole or replace the check disc.
The temperature at the bearing part of the motor is too high.	1. The bearing load is too heavy or bearing is damaged; 2. The lubricating oil is insufficient or too much; 3. The lubricating oil is unclean or too dense;	1. Change the bearing; 2. Replenish or reduce the lubricating oil; 3. Change appropriate lubricating oil.
The current of motor goes up when pump works.	1. The power is too low; 2. The motor bearing is damaged; 3. the impeller rubs against the casing; 4. The pump gets plenty of mud and sands.	1. Stop the pump and boost voltage, and then start again; 2. Dismantle to inspect and change bearing; 3. Stop the pump and re-adjust the axial gap; 4. Remove the pump, clean the well or repair the well.
No water does come out from water or the water comes out discontinuously	1. The dynamic water level drops to the water filtering net; 2. The transmission shaft is broken; 3. The lifting pipe is broken.	1. Add 1~2 lifting pipes or transmission shafts; 2. Remove the pump and fine the damage reason; 3. Replace the damaged parts.

5 Common problems and troubleshooting

Problem	Reason	Troubleshooting
The water discharge of pump declines.	1. The dynamic water level of well drops too much; 2. The rotating speed is incorrect; 3. The water filtering net is blocked; 4. The lifting pipe or casing joint leaks water; 5. Some impellers become loose and hard to move; 6. the power frequency is too low; 7. The seal ring of pump is worn seriously; 8. The gap between the impeller and the slope of intermediate housing is too much	1. Add the lifting pipe and transmission shaft if possible; 2. Adjust and make it satisfy the rated rotating speed; 3. Remove the pump to clean the water filtering net; 4. Replace the damaged components; 5. Dismantle the pump body and re-assembly; 6. Make power frequency same as the given requirements; 7. Replace the sealing ring and repair the impeller ring; 8. Reduce the axial gap between the impeller and the intermediate housing.
The water vibrates intensely.	1. No water is added to lubricate the bearing when starting; 2. The impeller rubs against the casing when working; 3. The transmission shaft and motor shaft is bent; 4. The rubber shaft is worn too much; 5. The motor shaft and the transmission shaft are homocentric; 6. The well has large inclination or is bent seriously.	1. Stop and inject water to lubricate; 2. Stop and adjust the axial gap; 3. Dismantle the pump and straighten the shaft; 4. Dismantle the pump to replace the bearing; 5. Re-install; 6. Repair the pitshaft or use the pump with small diameter of well.
The feeding tank leaks water.	1. The feeding device or motor shaft is worn; 2. The fillings is too hard; 3. The fillings is too loose; 4. The shaft is bent or deformed;	1. Replace the feeding or motor shaft; 2. Replace the fillings; 3. Tighten the feeding gland cover; 4. Straighten and calibrate the shaft;
The feeding tank involves in a high temperature.	1. The motor shaft is bent; 2. The feeding tank leaks few of water or leaks nothing.	1. Straighten and calibrate the motor shaft; 2. Unscrew the feeding gland cover and loosen the fillings.

6 Complete packet & warranty condition of pump

The multistage vertical turbine pump is normally provided in complete set. However the quantity of the lifting pipes, types and quantity of the easily damaged parts, types of fittings and transmission devices and installation tools (clamp, bearing wrench) shall be provided as per the Purchasing Contract. For the types of the necessary equipments, tools and fittings, please see the Packing List provided with the pump.

The electric control box, companion flange, intake and vent valve, pressure meter, check valve, gate valve and stainless steel or rubber expansion joint will be optional for selection on the request of user.

When user installs or uses as per the rules of Operation Instruction, the pump will be under a period of 18 months from the delivery date of manufacturer or 12 months from the date to use for the warranty period; if the pump is damaged or fails to work normally since the production quality during the period, our company shall be liable for repairing or replacing

for user free of charge. The normal wear of the easily damaged parts shall not be covered by this warranty.
The quality of motor and optional parts and components are under the responsibility of the original manfuacturer.
Special instructions:

1. If the pump is out of use for a long time, please make it start one time each month at least and make it run over 30 minutes;
2. The use and maintenance details related to the motor is described in the Operation & Maintenance Instruction of Motor.

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