



E N G I N E E R I N G



## Operating instruction

-- ZJ, ZJP Series  
Roots Vacuum Pump

**English translation of original operating instructions**



Documentation

It is imperative to read the operating instructions prior to commissioning!

This document as well as all documents included in the appendix is not subject to any update service!

Subject to technical changes.

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# 1 Important basic information

## 1.1 Statement

These operating instructions form part of the technical documentation of the system, and are addressed to the person in charge of the plant, who is obliged to provide them to the staff responsible for the system set-up, connection, operation and maintenance.

He must ensure that all information included in the operating instructions and the enclosed documents have been read and understood.

These operating instructions are the exclusive copyright of

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Or its legal successor .

Any company or personal can not duplicate, transfer it to third party, or make illegal business use. Any operation on the pump should be in accordance with the instruction.

## 1.2 Warranty

The manufacture does not accept liability for damage to persons, animals, objects or incomplete observance of the safety precautions included in these operating instructions or by modifications to the system or use of improper spare parts.

**Warning:** Do not move and modify any safety and insulating device, which may cause great danger.

**Warning:** The pump can only pump gas. However, It can not pump any gas that is poisonous, inflammable, explosive and corrosive, either gas that reacts with vacuum gas. The pump cannot used to transit gas. It could be used to pump gas with few particles, however, it can not pump Chemicals, condensates, powders and other granules which will damage equipment, reduce

performance and shorten service life.

**Warning:** Do not put the pump in rain, steam and humid air which may cause an electric shock, a short circuit and the damage of the whole system.

**Warning:** Whenever changing the wire, please use qualified wire.

**Warning:** Use suitable fuses to prevent short circuit.

**Warning:** Do not put hands or other stuff into the pump when it operates. The behavior will cause bodily injury and damage of pump parts.

**Attention:** (please ignore if the pump use air cooling. This is for water cooling type only) The pipe of the cooling water cannot be obstruct, otherwise the temperature of pump will be too high .

**Attention:** The pump needs regular maintenance; otherwise there will be damage, or even reduction of its life. Cut down circuit before check and repair, and only operate when power is off.

**Attention:** The temperature of operation environment should be 5°C-40°C to prevent the pump from damaging and shortening the life of use.

**Attention:** The pump should be put at safe places with proper ventilation, solid and flat base , and clean floor, without corrosive gas. Otherwise, the pump will be damaged and the life of use will be shortened.

**Attention:** please ignore if the pump use air cooling. This is for water cooling type only) In cold area, the coolant jacket must be drained after car stopped. Otherwise the coolant may freeze and thus damage the pump shell.

## 2. Survey

### 2.1 Introduction

Roots pump have ZJ series and ZJP series. As the input pressure is between 6.5-65 Pa, the pumping speed is no less than 70L/s, 150L/s, 300L/s, 600L/s,1200L/s,1800L/s and 2500L/s. It is a kind of roots vacuum pump in which a couple of lobed rotors turn like 8-shape in high speed synchronously. Two rotors rotate and produce aspiration and exhaust which principle is just like a roots blower. As it works in a lower pressure, the free flow distance of gas molecule is longer and the resistance of gas passing a small gap is much larger. Thus, a bigger compression ratio can be gained so that it can also be used as a blower pump. But it can not discharge the gas to atmosphere directly and requires to be used with a fore vacuum pump in series connection. Then the sucked gas is discharged to atmosphere through the fore vacuum pump (as chart 1).

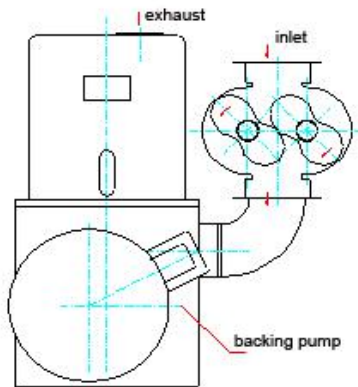


Chart 1

### 2.2 Features

- (1) There are definite gaps between rotor and pump's cavity, rotor and rotor which are not in contact. As a result:
  - a. No friction, lower power consumption that is compared with an oil sealed mechanical vacuum pump of the same pumping speed.
  - b. No Oil-sealing and lubrication so as to avoid being polluted to the vacuum pump by oil steam.
  - c. It is OK for pumping the gas with a little dust.
- (2) As the rotor has a good geometric

symmetry, its rotational speed is higher than a common oil-sealing mechanical vacuum pump and at the same pumping speed it has features of smaller volume and lighter weight.

(3) When the pump is in operation, there is less vibration and its volume operating ratio is about  $k_v \approx 0.5$ .

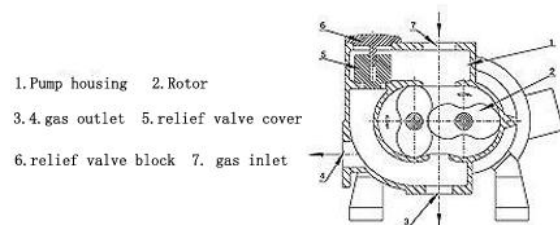
(4) There is no compression in the pump than that produced in a mechanical vacuum pump. So no discharge valve is required but agglutinative steam can be removed.

(5) The pump can be started quickly and a limit vacuum can be reached in a short time.

(6) When the pump is in a compression scope of  $1.3 \times 10^3 - 1.3 \text{ Pa}$

( $10^{-2}$  torr), it will have a stable pumping speed and quickly discharge gas so as to remedy the defects of diffusion pump and oil-sealed mechanical pump which are in a compression of  $1.3 \times 10^3 - 1.3 \text{ Pa}$  and a little pumping speed. So it is suitable for a blower pump.

Except the above features, ZJP series Roots Pump has own a relief valve which function is to control roots pump's differential pressure between air-inlet and air-outlet. When the differential pressure is over standard one the relief valve opens automatically. Because the pump's inlet-outlet is interlinked, some of gas returns to the inlet. At this time, the pump operates in a constant differential pressure. When the differential pressure is lower than that of a relief valve, the valve close automatically (shown as Diagram2)



### 2.3 Usage and model explanation :

Usage: vacuum degassing, vacuum smelting, vacuum heat treating etc, in metallurgical industry and can also be used in chemical industry., foodstuff, medicine. electrical manufacture etc. Especially when a water-ring vacuum pump is used for its fore pump,

it can extract the gas with large steam. So it is much suitable for productive procedures of distillation, evaporation, freezing and drying etc.

**Model explanation :**

**ZJ/ZJP-1200**

ZJ--roots vacuum pump; ZJP with relief valve (overflow valve)

1200--pumping speed 1200 L/S

### 3. Performance specification

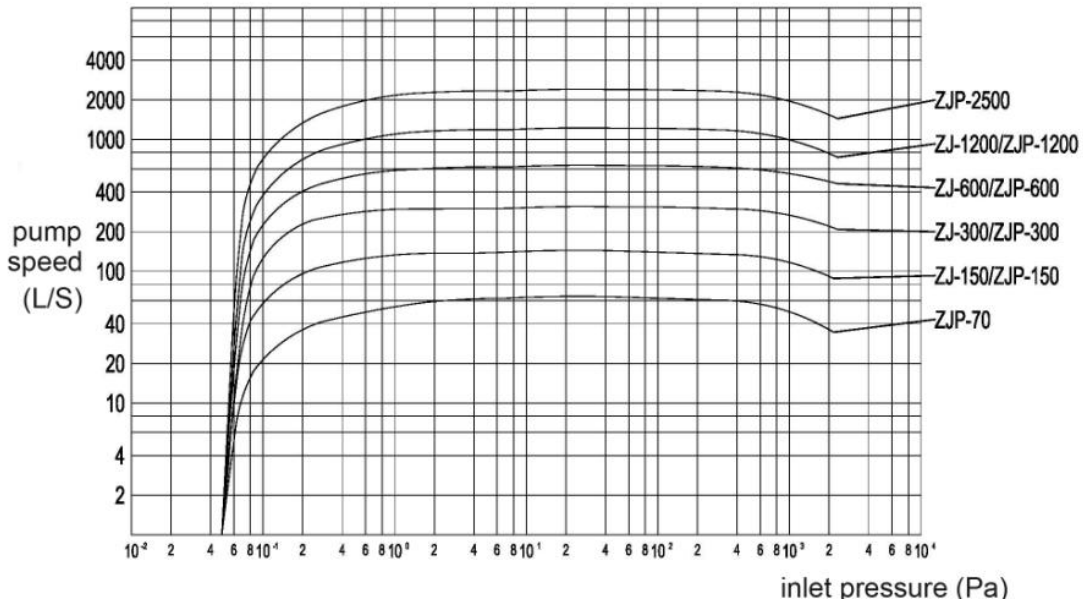
#### 3.1 ZJ model Technical data

Model		ZJ-150	ZJ-300	ZJ-600	ZJ-1200
Pumping speed (L/s)		150	300	600	1200
Ultimate pressure (Pa)	1stage piston pump as backing pump	5×10 <sup>-2</sup>			
	2 stage piston pump as backing pump	1×10 <sup>-1</sup>			
Max. allowable diff. pressure (Pa)		8×10 <sup>3</sup>		5×10 <sup>3</sup>	
Motor rotary speed (RPM)		3000			
Suitable motor power (kW)		2.2	4	7.5	11
Flange size	Inlet (mm)	100	150	200	250
	outlet (mm)	100	150	200	200
Cooling type		Air / water			
Ambient temperature for air cool		≤30℃ (please use water cool when ambient temperature over 30℃)			
Cooling water consumption (L/h)		120		150	
Allowable temperature (℃)		100			
Vacuum pump oil		100#			
Weight(without motor) (kg)		195	250	760	860

#### 3.2 ZJP model Technical data

Model		ZJP-70	ZJP-150	ZJP-300	ZJP-600	ZJP-1200	ZJP-2500
Pumping speed (L/s)		70	150	300	600	1200	2500
Ultimate pressure (Pa)	1stage piston pump as backing pump	5×10 <sup>-2</sup>					
	2 stage piston pump as backing pump	1×10 <sup>-1</sup>					
Diff. pressure at overflow valve (Pa)		4×10 <sup>3</sup>			2.7×10 <sup>3</sup>		
Motor rotary speed (RPM)		3000					
Suitable motor power (kW)		1.1	2.2	4	7.5	11	22
Flange size	inlet (mm)	80	100	150	200	250	320
	outlet (mm)	80	100	150	200	200	320
Cooling type		Air / water					
Ambient temperature for air cooling		≤30℃ (please use water cool when ambient temperature over 30℃)					
Cooling water consumption (L/h)		120			150		
Allowable temperature (℃)		100					
Vacuum pump oil		100#					
Weight(without motor) (kg)		110	205	265	780	880	1350

3.3 performance curve



4. Operating principle

The pump's operating principle is shown as Diagram 3. When the pump is rotating, the gas in an exhausted container directly enters the space encircled by two rotor and pump cavity and the gas entered before is merely encircled by space Vo (see the shaded parts in Diagram). The mixed gas in Vo is merely encircled, but not be compressed and expanded. With the rotation of a rotor, the rotor's top reaches the outlet port edge, the gas in pump's outlet port will spread to the space Vo, the mixed gas in Vo will be carried to a fore pump to be exhausted. Thus, with the rotor's continuous operation, more gas will be carried to outlet port and exhausted by the fore pump. That is the functional principle of the pump's volume.

When this pump is operating under a very low pressure, because of rotor's high speed (3000rpm), the linear speed of the rotor's surface is near to molecular heat pace. At this time, the gas impacted on the rotor is brought to an outlet port

with a higher pressure and removed by beforehand vacuum pump. That is the molecular functional principle of thin pump.

The combined action by the two principles makes this pump have features of a big pumping rate and a stable pumping rate curve in an interval of 1.3x10<sup>3</sup>~1.3 Pa.

According to this pump's characteristics and different operating condition, different fore pump can be freely chosen which is not required too high vacuum, but required to remove corrosive gas with large steam or little dust. Completed with a double-stage water-ring vacuum pump and a piston vacuum pump, the limit vacuum is lower and its power proportioning is different, too. Our company can specially design various pump's unit according to user's different requirements and operating conditions. Welcome to contact us by call or email.



Diagram 3. Working Principle

## 5. Installation

1. Before installation, checking each parts and make sure there have no damaged, and to see whether the product is fit to order contract.

2. The pump must be installed in a place of cleaning, no dust or a little dust and infection with dielectrics. According to its operating condition, the pump's inlet port can be equipped an anti-dust device (such as an oil-sealed mechanical pump used as fore pump).

3. The pump's operating environment temp. is 5-40 °C and the max. temperature rise is cannot exceed 100 °C.

4. According to operating condition, the pump can be installed to a cement base or steel frame base which should be calibrated. Otherwise, it will be seriously affect the pump's normal operation.

5. The gas inlet pipe should be kept sealing, even a small leakage will affect its vacuum.

6. The length of a pipe is as short as possible, using less joint and elbow with its diameter less than its pump's bore.

7. A flexible soft pipe such as a metal bellows

should be linked between this pump and a fore pump so as to prevent damaging this pump because of fore pump's vibration.

8. It is better to equipped a vacuum valve on the pump's inlet and outlet pipes so as to keep the vacuum of pump cavity after stopping operation.

9. (For water cooling type) A valve should be installed on inlet pipe for cooling water so as to regulate water quantity and control the outlet temperature of cooled water at 20-40 °C. **Pay attention to the water temperature not over 40 °C** so as to avoid producing sediment in a water tank.

10. An advance vacuum pump must be used as this pump's fore pump which is not used alone. If an oil-sealed mechanical vacuum pump is used as its fore pump, the two may be used in series connection. **So this pump is not suitable for drawing out the gases such as too much oxygen content, explosiveness, corrosion to ferrous metal, chemical reaction to vacuum oil and containing dust etc.** Otherwise, the service life of a fore pump will be shortening.

## 6. Operating instructions

### 6.1. Preparations before starting

- ① For water cooling type, make sure the cooling water pipe is open.
- ② Check there have enough lubrication oil in end cover A and end cover B, make sure the oil should be reached to the oil level of oil mirror.  
The oil cup of oil sealing should be filled full usually and keep clean. New pump's oil must be changed after operating 30 ~ 50 hours. After then, the oil can be changed according to the operating condition.
- ③ If there have dust and other metal powder in the exhausted gas, anti-dust or filter devices should be installed in front of air inlet port. If there have corrosive gas in exhausted gases, some neutralizing measures should be adopted.
- ④ Check there have no any loosening in various parts .Motor's rotational direction should be in accordance with arrow direction on a pump.

### 6.2. Starting

- ① Start the fore pump
- ② Open the gas inlet valve of this pump
- ③ For water cooling type, open the water cooling valve and start this pump.
- ④ The pump should be in a stable operation and the rotor without crash . Or should be stopped.
- ⑤ There is no leakage in the oil –sealed position of a pump's shaft.
- ⑥ During the operating, if the temperature rise is too high ,the reading of current meter is suddenly changed, an abnormal noise or other unusual phenomena appears ,the pump should be stopped immediately.

### 6.3. Stopping

- ① Close gas inlet valve which on inlet port at first.
- ② Stop pump ( and close the inlet valve )
- ③ Stop the fore pump
- ④ For water cooling type only, close the water inlet valve of water cooling pipe.
- ⑤ If the pump's operation is stopped for a long time or its operating in a cold zone, the cooling water must be drained out completely. Otherwise, the cooling water will be frozen and make the pump's castings in frost crack.

## 7. Maintenance & accessories

### 7.1 Safety information

The safety information was given in the following applies to all maintenance work.

**Warning:** Disconnect the electrical power before disassembling the pump and venting to atmospheric pressure. Make absolutely sure that the pump cannot be accidentally started. If the pump has been pumping harmful substances, determine the nature of hazard and introduce suitable safety measure.

When drying or blowing out the pump with compressed air, technician must observe and obey all safety regulations.

**Caution:** All maintenance and cleaning work described in this section must be only carried out by the trained person.

When handling the used oil pls observe the relevant environment regulations.

Improper maintenance or repairs may affect the service life and pump performance.

### 7.2 Oil change/gear box

**Warning:** Before pumping oxygen or other highly reactive gases at concentrations which exceeding 20% in the atmosphere will be necessary to choose a special pump. Such a pump have to modified and degreased as well as a special lubricant oil . Bearings consume a little oil and the gear under clean operating conditions. We recommend you to change the oil after the first 500hrs operation to remove any wearing residue. Then, under the normal operating conditions, change pump oil after every 3000hrs operating. Change oil much more frequently when pumping corrosive vapors or large amount of dust or when happing from the atmospheric pressure to working pressure usually.

**Warning:** Before removing the oil-drain/oil filling screw, the pump should be stooped at first and vent to atmosphere pressure( have no vacuum inside pump chamber).

When the pump has become warm during operation, the casing and the oil temperature may exceed 80 °C ,then should leave the pump to cooling down.

Always wear protective gloves to protect yourself against aggressive residues in the oil .

Loosen the oil-drain/oil-fill screw and then drain out the oil. Clean the sealing surface and firmly reinstall the oil-drain screw using a gasket which is in a perfect condition. Wipe off any oil residues from the casing. Fill in new oil. **Make sure to use the right kind of oil.**

**Caution:** We recommend the vacuum oil is N100 or N62. Make sure the oil level is correct .If the oil level is too low, the bearings and gearwheels will not lubricated adequately; if it is too high, oil may enter into the pump chamber. Clean the oil-fill port and reinstall the screw using a gasket which is in a perfect condition.

**Caution:** The oil fill port must be sealed tightly. Or the air will be entered into pump chamber through impeller seals .

### 7.3 Oil Change/Shaft Seal Housing

**Warning:** The oil in the shaft seal housing should be changed every 3,000hrs operating. Loosen the oil-drain screw under the shaft seal housing, drain out the oil and then screw the oil-drain with a gasket which is in a perfect condition. Fill in fresh oil through the oiler and the oil should be reached to the oil level. .

**Maximum level:**

- when the pump is warm = 1/2 of the height of the oiler.

- when the pump is cold = 1/3 of the height of the oiler. Wipe off any oil residues from the casing.

### 7.4 Cleaning the Fan and the Cooling Fins

**Warning:** The fans slits as well as the motor fins will be polluted when working in humidity conditions . In order to ensure a sufficient air enter into motor and the pump's casing, the fan grids must be cleaned using a cleaning brush when polluted. Any coarse dirt must be removed from the motor fins and the pump.

### 7.5 Cleaning the Pumping Chamber

**Warning:** Under dirty operating conditions, pump chamber and rotor will be getting polluted. After removing the two connecting lines, the contaminants can be blown out with dry compressed air or flushed out using a suitable

solvent. Contaminants that cannot be removing completely from the pump chamber with a wire brush, metallic sponge or scraper. Then change the oil.

**Warning:** During cleaning, the rotors must be turned only by hand. The loosened parts must not remain in the pump. After cleaning, check the pump by slowly turning the rotor. The rotor should be moved freely and without any resistance.

## 7.6 Disassembling and Assembling procedure

### 7.6.1 Disassembling procedure :

7.6.1.1 Loosen screw and take down End cover B

7.6.1.2 Loosen screw (ZJ/ZJP70-ZJP600) or using hydraulic gear device (for ZJ/ZJP1200-2500) to take down gear.

7.6.1.3 Loosen screw and take down the gear cover, bearing, bearing seat B, piston ring and piston ring cover.

7.6.1.4 Loosen screw and take down locating pin, and then disassembling side cover B.

7.6.1.5 Loosen screw and take down the motor ,disassembling coupling.

7.6.1.6 Disassembling the locknut in the active/driven shaft.

7.6.1.7 Take down the shaft, rotor from the side cover B direction.

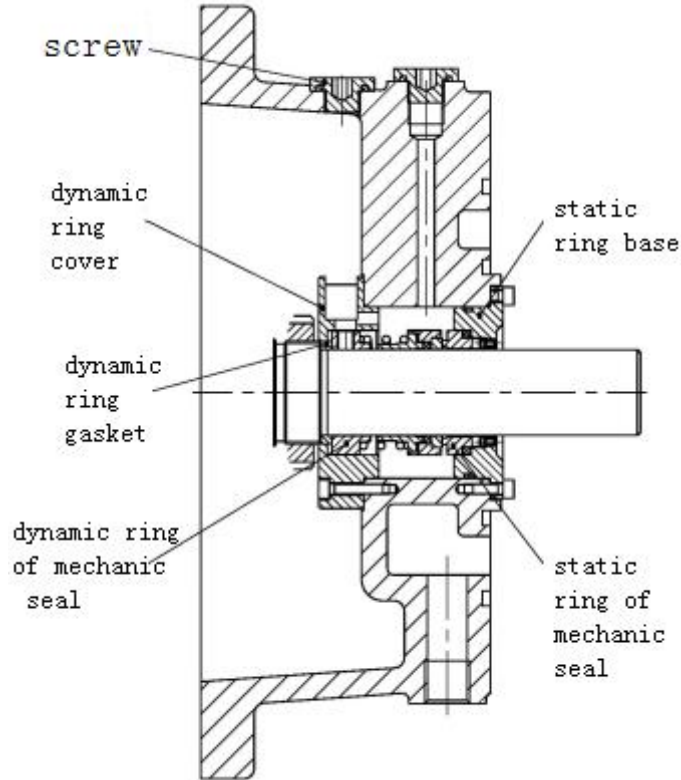
7.6.1.8 Disassembling the check ring, bearing cover, bearing seat A, side cover A, piston ring and piston ring cover.

### 7.6.2 Assembling procedure:

Checking all the disassembled spare parts carefully , change spare parts if damaged . Clean parts using petrol, diethyl ether or CCl4. Assembling all parts after dried . The pump body and side cover should be sealing in plane. Assembling procedure is an opposite of disassembling procedure. Technician should adjust the end cover clearance.

NOTE: Assembling the active/driven gear of ZJP1200/2500 should be using hydraulic gear device, using fastener to make sure the gear end cover come to the bearing end cover at first, and then depressurization the oil pump.

**7.7 Replace of mechanical seal (for air cooling type only)**



**Diagram 4. Mechanical Seal Installation Structure**

Mechanical seal belongs to easy-wearing parts, it should be replaced when the oil / air leakage occurs.

Followed is the disassemble step:

- a. Loosen the bolt, remove the static ring base (include static ring)
- b. Disassemble screw ( as per diagram 4, this screw is dynamic ring disassembling and assembling hole).
- c. Use a inside 4mm hex wrench to loose the set screw ( 2 pieces), remove the whole dynamic ring.
- d. Obey the contract sequence while install the mechanical seal ( C--B--A) .

Please check and repair the mechanical seal as followed step:

- a. Loose the bolt, disassemble the static ring base (include static ring), remove the static ring to check.
- b. Remove the dynamic ring seal to check.

**7.8 Accessories**

Model	ZJP70	ZJ/ZJP150	ZJ/ZJP300
Reinforced seal	40*57*10(1PC)	30*50*10(2PCS)	30*50*10(2PCS)
O-ring	70*4 ( 1PC ) 100*4(2PCS)	115*3.5(3PCS) 18*24*4(5PCS)	170*5.7(3PCS) 18*24*4(5PCS)

Model	ZJ/ZJP600	ZJ/ZJP1200	ZJP2500
Reinforced seal	55*75*12(2PCS)	60*80*12(2PCS)	70*95*12 ( 2PCS )
O-ring	220*5.7(3PCS) 18*24*4(5PCS)	220*5.7(2PCS); 270*5.7(1PC); 18*24*4(5PCS)	18*24*4 ( 5PCS ) 270*5.7(1PC) 340*5.7 ( 2PCS )

**7.9 Troubleshooting**

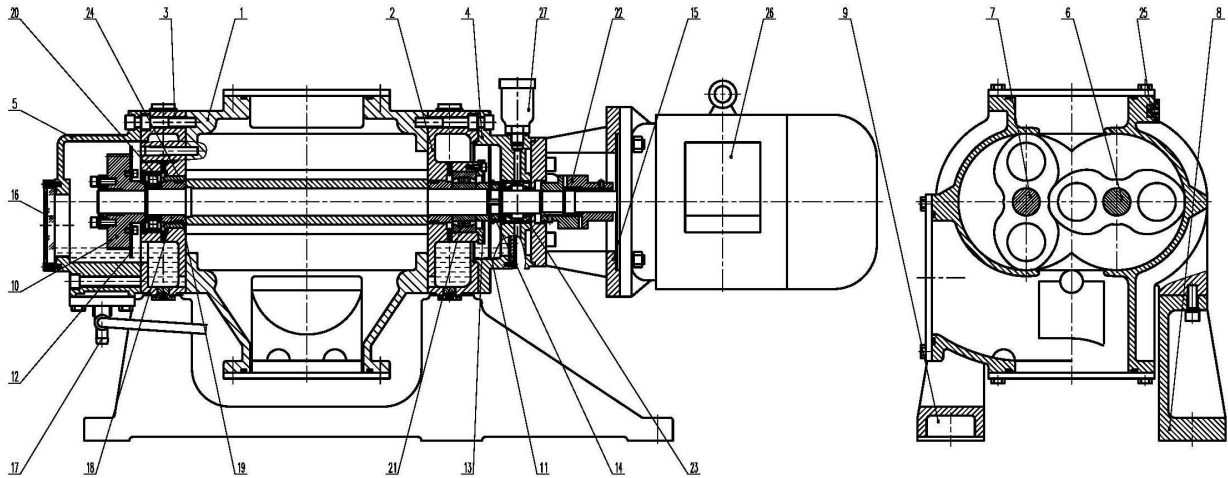
Fault	Possible cause	Remedy
Pump does not start.	Motor is connected incorrectly.	Connect the motor correctly.
	Faulty pressure switch.	Replace the pressure switch.
	Oil is too thick.	Change the oil or warm the oil and the pump.
	Motor rotor is malfunctioning.	After sales service.
	Pump has seized up: damaged impellers, bearings or gearwheels.	After sales service.
Pump gets too hot.	Ambient temperature is too high or cooling water supply is obstructed.	Install the pump at a suitable site or ensure enough cooling water.
	Pump is working in the wrong pressure range.	Check pressure values of vacuum system.
	Pressure differential is too great.	Check pressure values of vacuum system.
	Gas temperature is too high.	Check the vacuum system.
	Clearance between casing and impellers is too small due to: - contamination - distortion of pump.	Clean the pumping chamber. Ensure that the feet and connecting lines aren't placing a strain on the pump.
	Excessive frictional resistance due to contaminated bearings and/or oil.	Exchange oil.
	Oil level is too high.	Drain some oil to reach the correct level.
	Oil level is too low.	Add oil to reach the correct level.
	Wrong oil has been used.	Drain oil and fill in correct lubricant.
	Bearing are malfunctioning.	After sales service.
	overflow valve does not open.	Clean or repair the valve.
Power consumption of the motor is too high.	See fault "pump gets too hot".	See fault "pump gets too hot".
	Wrong mains voltage supply for the motor.	Connect the motor to the correct voltage supply.
	Motor is malfunctioning.	Repair the motor or exchange it.
	Oil is too thick.	Exchange the oil or warm up the oil and the pump.

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Fault	Possible cause	Remedy
Pump is too loud.	Clearance between casing and impellers is too small due to: -contamination -distortion of pump.	Clean the pumping chamber. Ensure that the feet and connecting lines aren't placing a strain on the pump.
	Bearing or gearing is damaged.	After sales service. Switch off the pump at once.
	Impellers strike the casing.	After sales service. Switch off the pump at once.
	Rotor runs out of true.	After sales service. Switch off the pump at once.
Pump loses oil.	Oil leak is visible: Oil drain plug is not tight.	Drain lubricant, firmly screw in the oil drain plug with a new gasket, fill in the correct quantity.
	No oil leak is visible; See fault "oil in the pumping chamber"	See fault "oil in the pumping chamber"
Oil level in the oiler drops	Oil leak is visible: Outer shaft seal is malfunctioning.	Exchange shaft seals.
	No oil leak is visible; Inner shaft seal is malfunctioning.	Exchange shaft seals.
Oil turns dark.	Oil has broken down.	Change the oil.
	Pump gets too hot.	See fault "pump gets too hot". After solving the problem change the oil.
Oil in the pumping chamber.	Oil level is too high.	Drain lubricant to reach the correct oil level.
	Oil leaks out of the system.	Check system.
	Pump is not installed on a flat horizontal surface.	Install pump correctly.
	Pump has an external leak.	Check proper fit of oil-fill and oil-drain plugs, replace gaskets if necessary.
	Pump has an internal leak.	After sales service.
	Impeller rings are malfunctioning.	After sales service.
Pumping speed of the pump is too low	Motor is connected incorrectly.	Connect the motor correctly.
	Motor fault.	After sales service.
	Pump or pump system has a leak.	Find and seal the leak.
	Overflow valve does not close.	Clean or repair the valve.
	Flow resistance in the intake or discharge line is too high.	Use intake and discharge lines of sufficient diameter.

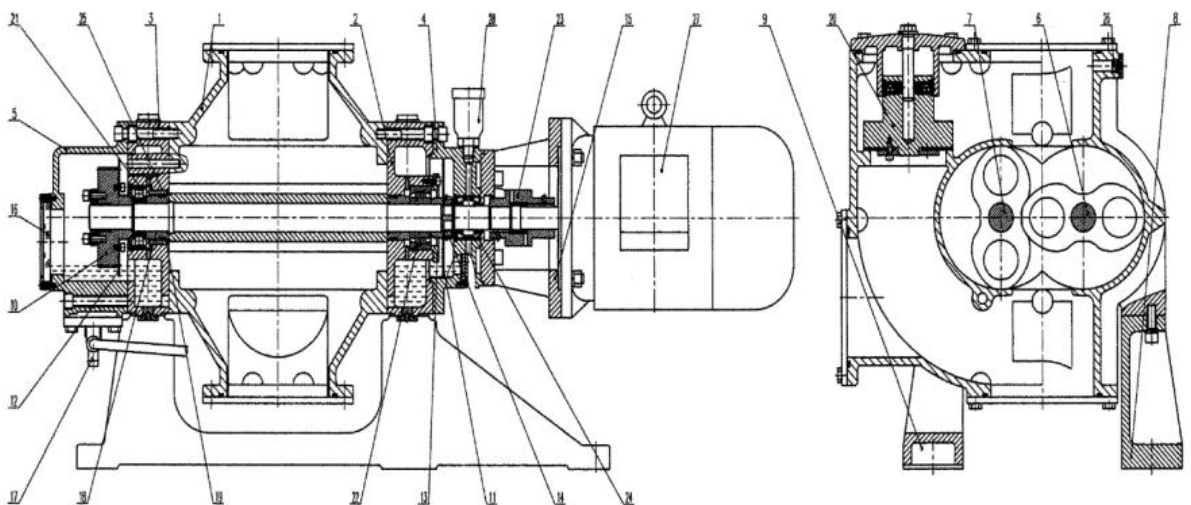
## 8. Pump structure

### 8.1 ZJ pump structure



Sr.	Name	Sr.	Name	Sr.	Name
1	Pump body	10	Gear	19	Side end cover
2	Side cover A	11	Oil shedding plate A	21	Bearing
3	Side cover B	12	Oil shedding plate B	22	Bearing
4	End cover A	13	Bearing cove	23	Coupling
5	End cover B	14	Locknut	24	Oil seal
6	Active rotor	15	Coupling seat	25	Piston ring
7	Driven rotor	16	Oil glasses	26	Screw G3/8
8	Right frame	17	Water pipe joint	27	Motor
9	Left frame	18	Piston ring cover	28	Oil cup

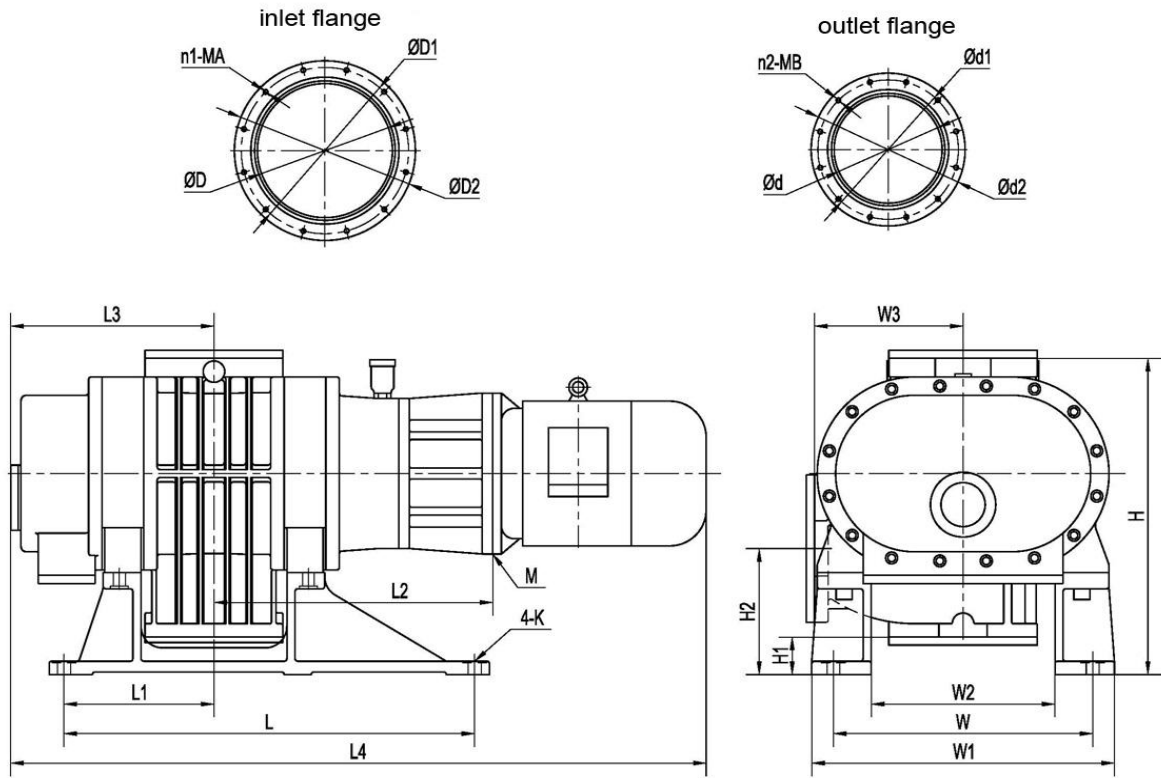
### 8.2 ZJP series pump structure



Sr.	Name	Sr.	Name	Sr.	Name
1	Pump body	11	Oil shedding plate A	21	Bearing
2	Side cover A	12	Oil shedding plate B	22	Bearing
3	Side cover B	13	Bearing cove	23	Coupling
4	End cover A	14	Locknut	24	Oil seal
5	End cover B	15	Coupling seat	25	Piston ring
6	Active rotor	16	Oil glasses	26	Screw G3/8
7	Driven rotor	17	Water pipe joint	27	Motor
8	Right frame	18	Piston ring cover	28	Oil cup
9	Left frame	19	Side end cover		
10	Gear	20	Overflow valve		

## 9. Installation drawing

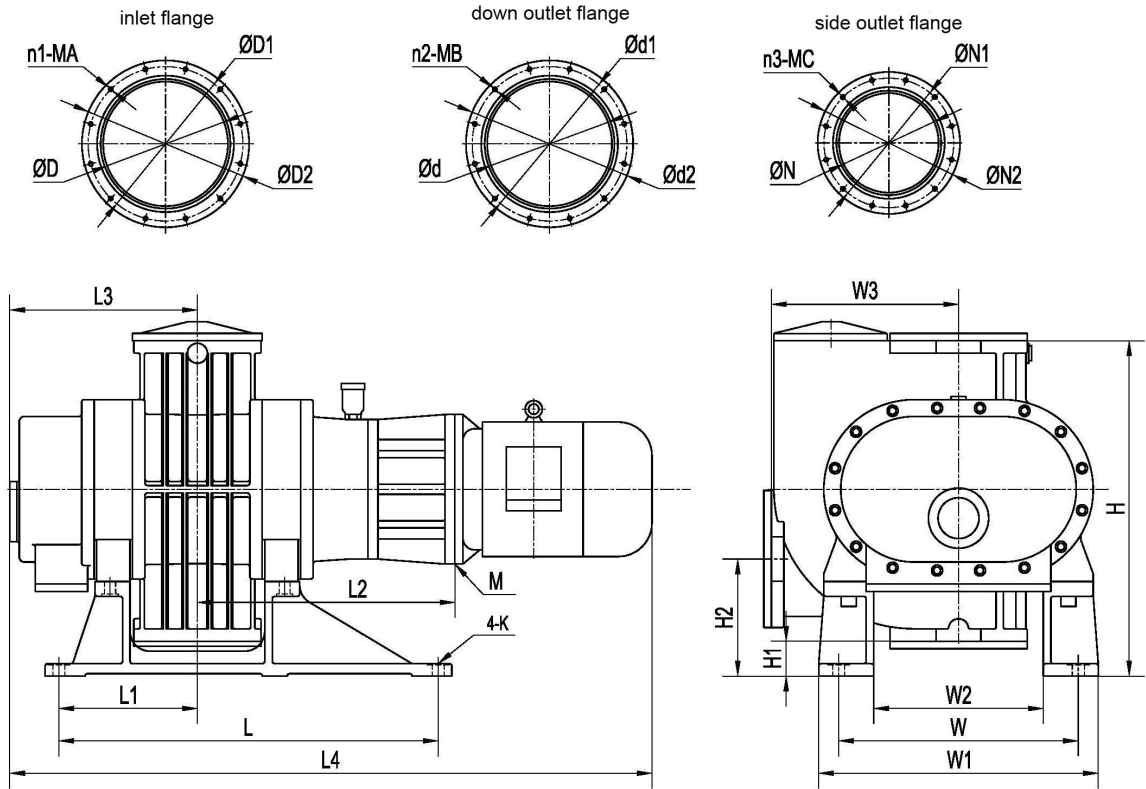
### 9.1 ZJ series installation size (Unit: mm)



Model	L	L1	L2	L3	L4	M	K	W	W1	W2	W3	H	H1	H2
ZJ-150	580	195	—	270	890	—	18	320	410	230	185	415	90	195
ZJ-300	740	275	—	350	1100	—	18	320	410	230	185	455	90	215
ZJ-600	760	277.5	—	375	1290	—	24	480	560	340	275	590	70	235
ZJ-1200	390	195	645	505	1665	M20	22	480	540	380	275	550	25	195

Model	D	D1	D2	n1-MA	d	d1	d2	n2-MB
ZJ-150	100	145	170	4-M10	100	145	170	4-M10
ZJ-300	150	195	220	8-M10	150	195	220	8-M10
ZJ-600	200	250	275	8-M10	200	250	275	8-M10
ZJ-1200	250	310	335	12-M10	200	260	285	12-M10

9.2 ZJP series installation size (Unit: mm)



Model	L	L1	L2	L3	L4	M	K	W	W1	W2	W3	H	H1	H2
ZJP-70	194	97	—	224	740	—	14	230	270	170	195	280	40	120
ZJP-150	580	195	—	270	890	—	18	320	410	230	245	475	90	195
ZJP-300	740	275	—	350	1100	—	18	320	410	230	285	525	90	215
ZJP-600	760	277.5	—	375	1290	—	24	480	560	340	375	673	70	235
ZJP-1200	390	195	640	505	1665	M20	22	480	540	380	425	635	25	210
ZJP-2500	830	415	764	605	1935	M24	26	610	700	440	460	705	40	220

Model	D	D1	D2	n1-MA	d	d1	d2	n2-MB	N	N1	N2	n3-MC
ZJP-70	80	125	145	8-M8	80	125	145	8-M8	50	90	110	4-M8
ZJP-150	100	145	170	4-M10	100	145	170	4-M10	100	145	170	4-M10
ZJP-300	150	195	220	8-M10	150	195	220	8-M10	150	195	220	8-M10
ZJP-600	200	250	275	8-M10	200	250	275	8-M10	200	250	275	8-M10
ZJP-1200	250	310	335	12-M10	200	260	285	12-M10	200	260	285	12-M10
ZJP-2500	320	395	425	12-M12	320	395	425	12-M12	250	310	335	12-M10