

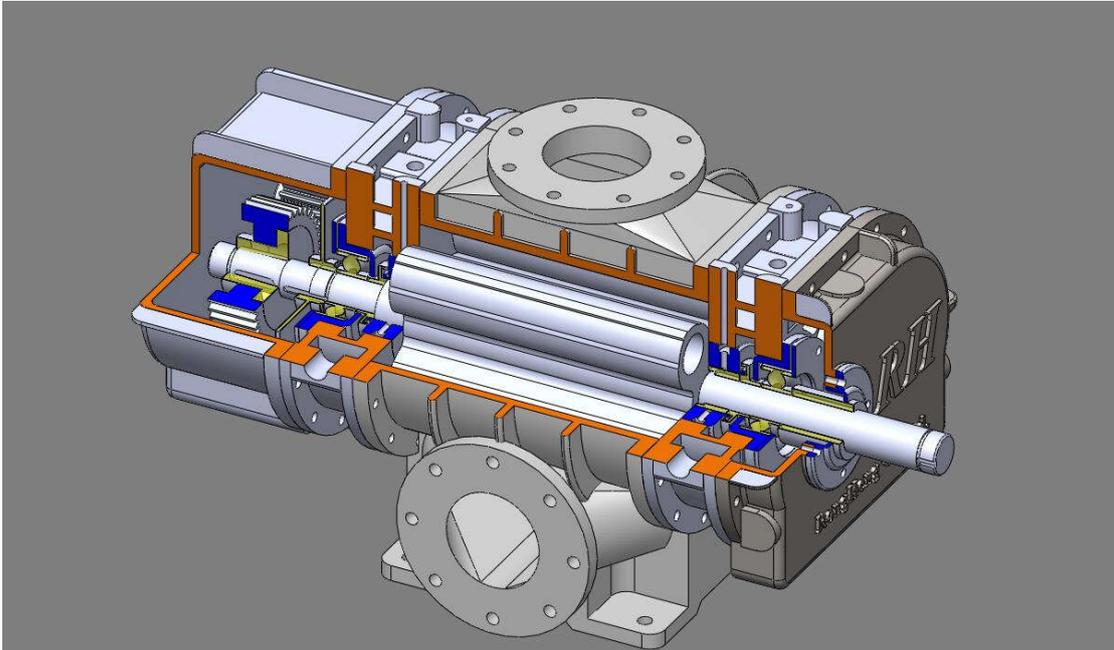


荣 恒

高效 HIGH-EFFICIENCY 节能 ENERGY-SAVING 低噪音 LOW-NOISE 微振动 NO VIBRATION

# 三叶型罗茨鼓风机

THREE-LOBED ROOTS BLOWER



## 使用说明书

OPERATING INSTRUCTION MANUAL

南通荣恒环保设备有限公司

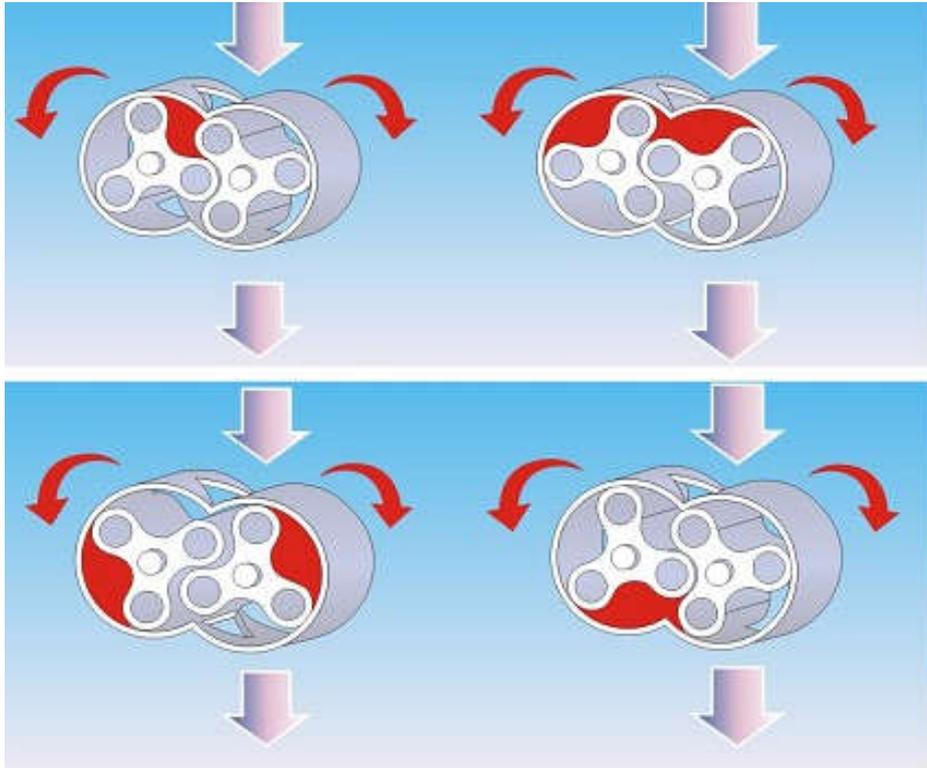
NantongRongHeng Environmental Device Co., Ltd.

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## Preface



Picture (1)

### ***Working Principle:***

Finishing the motions of inspiration and expiration by the meshing impeller of THREE-LOBED ROOTS BLOWER' spinning inside the cavity, it is a positive displacement rotary air blower with a property of force output of constant torque. The pressure will change automatically with the change of the system pressure. It has fortissimo adaption and superior pneumatics feature.

But the tradition TWO-LOBED ROOTS BLOWER has series problems of big noise and high consumption etc in practical work. So the THREE-LOBED ROOTS BLOWER is created. Because during the working course, there are additional venting and compression process, and its pressure fluctuation is small, the work is stable, so the noise is reduced obviously. However, because there is an additional blade that occupies the space of the machine body, the volumetric efficiency is therefore decreased.

### ***Product's Features :***

For the above problems, on the basis of the original successful machine mode, the THREE-LOBED ROOTS BLOWER produced by our company adopts the advanced international design technology and after five years of accumulation, our company autonomously developed the new impeller modeled lines and Realized the THREE-LOBED ROOTS BLOWER actual volume efficiency for more than TWO-LOBED ROOTS BLOWER target. At the same time, we also keep the smooth tooth action (theoretically, the tooth action uneven is less than 0.01MM) during work of the air blower, and realized the perfect balance of noise, flow and volumetric efficiency.

After two generations' effort, this series roots blower has undergone: Manual drawing, photoprinting, two-dimensional computer graphics, three-dimensional computer modeling era and finally realizes the full parametric design and check. This makes the R&D Cycle of our company much shorter than that of our competitors. We can realize the development of the customized products and our Product design efficiency and ability in the industry is far ahead.

This product adopts the brand-new design concept, and the part types are reduced by 30%, the appearance of the parts is exquisite, simple and capable what's more, the actual strength is increased substantially so consequently realize the more optimized generality and maintainability of the part.

The air blowers of this series can be divided into air blower of free maintenance and simple structure and the general air blower of generality, high performance and multi-functions. See chapter 2.1 for the main structure of the product and chapter 3.1 for maintenance.

### ***Application :***

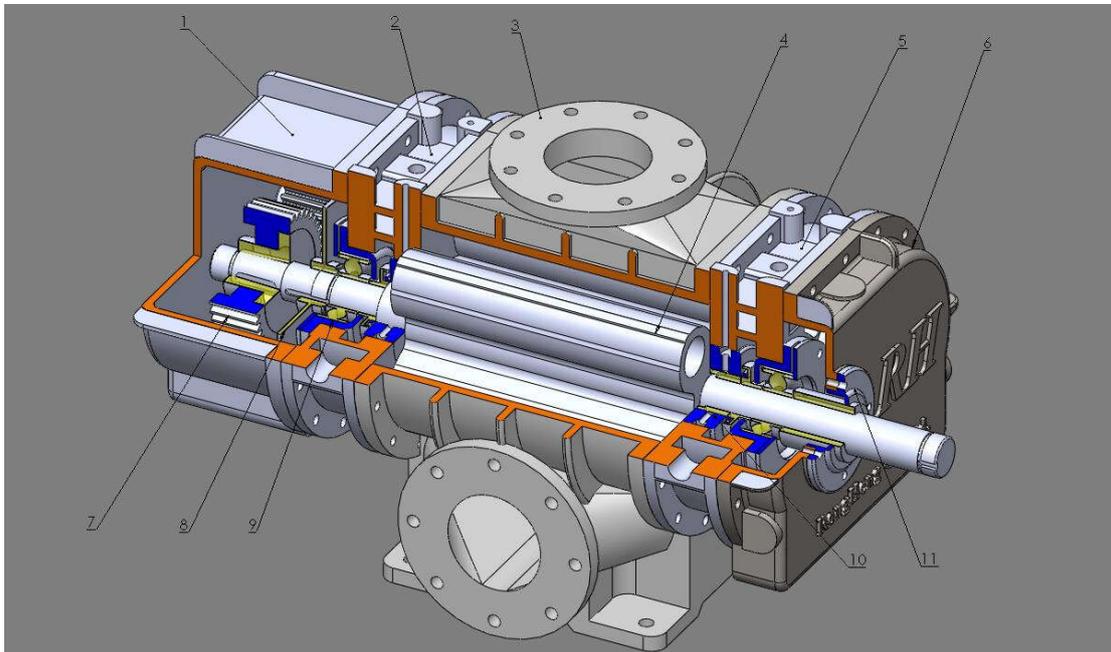
As general machinery, this product is widely applied in fields of pneumatic transmission, Sewage treatment, soot desulfurization, conveying, gas and inflammable and explosive gas transmission, heavy oil spray combustion, smelting blast furnace, aquaculture, pesticide chemical synthesis, formaldehyde etc.

The main transmission mediums are mainly clean air, clean coal gas, sulfur dioxide and other inert gases. And when inflammable and corrosive gases such as coal gas and sulfur dioxide etc conveyed, the customer should timely contact our company so our company can properly handle the product. When Carbon dioxide, hydrogen, helium of which the molar masses are far different from that of the air are conveyed, or when the product would work on the plateau, the flow, energy conversion should be made for a reasonable selection.

## Product Structure

### *Structural chart:*

See the following picture for the structure. The airflow direction of the series product is top-in and bottom-out.



Picture (2)

### Detailed Component Sheet

Sequence	Component name	Sequence	Component name
1	Master oil tank	7	synchronizing gear
2	Main wallboard	8	Oil throwing component
3	Shell	9	Bearing component
4	Impeller and shaft assembly	10	Seal component
5	Auxiliary wallboard	11	Shaft seal component
6	Auxiliary oil tank		

Table (1)

***Overview:***

- A. The No.3 machine shell is made of HT250 material and receives treatments of drawing temper and ageing treatment.
- B. No.2 main wallboard and No.5 auxiliary wallboard are made of HT250 material and receive treatments of drawing temper and ageing treatment. The main wallboard and auxiliary wallboard as well as the machine shell constitute the machine body so as to form the air chamber by taper pin positioning.
- C. The No.4 Impeller and shaft assembly, is made of QT500 high brand ductile iron by the numeral controlled equipment or uses HT300 as blade base and uses 40Cr to make the master shaft and then the hydraulic system is used to press them into a whole body.
- D. The No.7 synchronizing gear made of 20CrMnTi by microfinishing, frequency quenching and then gear grinding. When it comes to tooth form, there are straight tooth and heliacal tooth to choose from.
- E. No.9 bearing assembly, according to the difference between the positioning terminal and the free terminal, respectively adopts the double-row centripetal ball bearing and single row roller bearing. We can realize the precise positioning of the impeller component and the thermal expansion free outspread at the same time.
- F. For No.10 seal assembly, we use the default piston ring seal, and can also offer different sealing arrangements according to client's requirement.

### ***Lubrication:***

A. The general air blower uniformly adopts the lubricating method of oil throwing and splashing which makes it convenient to maintain the air blower.

The oil-injection is: open the upper and lower oil filling plugs of No.1 master oil tank and the No.6 auxiliary oil tank to release the ineffective lubricating oil and then lock the lower oil releasing plugs, and then through the oil injecting hole on the top of the oil tank, inject 100# machine oil until to the 1~3mm above the oil central line.

B. Air blower of free maintenance adopts the sealed bearing and can normally operate for about 50000 hours, and can realize life-long life. Once the bearing is damaged, can open the cap of the bearing and change the bearing under the guide of our After-sales Department.

### ***Cooling:***

A. The air flower of free maintenance is usually small and has a good work condition, so it can cool down naturally.

B. The general air flower does not need water cooling equipment when the wind pressure is less than 6000mmH<sub>2</sub>O. If a better cooling effect is needed, about 2L 25# cooling liquid can be injected into the No.2 master wallboard and No.5 auxiliary wallboard through our component. However, should purchase our components under the guide of our technical personnel and should discharge the cooling liquid when the temperature is below -20°C in winter, otherwise the machine would craze or product failure would appear, and our company would not be responsible for that.

C. When the wind pressure is more than 6000 mmH<sub>2</sub>O, the general air blower can be cooled down by water or the outside hanging circulating water cooling system of the patented "freezing point" series of our company. It can effectively reduce the operating cost and avoid phenomenon of product fever etc.

### ***Installation:***

The product installation can refer to the general mechanical equipment installation specifications, and shall also pay attention to the following items:

A. The stone bolt hole of universal air blower adopts the secondary grouting, while the stone

bolt hole of maintenance-free air blower uses expansion bolts.

- B. The base surface for machine unit installation should be smooth. According to the maintenance requirements, there should be 50cm spare position left on all sides of the base.
- C. First check the inside machine body during the installation, confirm that it has no debris, and clear the iron pipe welding slag in the pipeline, and then connect it with the air blower, ensuring no leakage on faying surface of each the Flange.
- D. When the dust content of transmission air media is over 100mg/m<sup>3</sup>, it is recommended to install an air filter at the front-end of muffler in the air inlet.
- E. Muffler should be first installed between the air outlet and inlet of the air blower.
- F. The pressure gauge should be installed on straight tube which is near the air out of air blower, and when the air blower is in load conditions, the gauge should reflect the over-pressure condition.
- G. In order to protect the safe operation of air blower, the body itself which may not carry any pipe, valve, frame and other external loads except the air inlet muffler must find out the correct location of air blower and motor during the installation, and the position should allow the base and the base plane to conduct the horizontal adjustment by adjusting the sizing block, whose allowable error is less than 0.2/1000mm.
- H. It is forbidden to damage assembly gap of the air blower when installing, and the blower rotor after installation should be rotating and flexible, without any impact and friction phenomena.
- I. The check valve must be installed on the pipeline of the blower air outlet (when using two or more blowers in parallel, may cause significant machine damage accident if there is no check valve.)
- J. Check valve should be installed on the horizontal pipeline, which is perpendicular to the pipeline direction.

### ***Use:***

#### **● Operating Requirements**

- A. The air temperature at the inlet should not exceed 40 °. If it exceeds, it is required to be cooled through the condenser.
- B. The content of solid particles in the air should not be more than 100mg / m<sup>3</sup>, and the maximum size of particle depends on different types, which should does not exceed the one shown in the below table.

Type of Air Blower	Maximum Diameter of Particles	Type of Air Blower	Maximum Diameter of Particles
1#	0.04mm	5#	0.10mm
2#	0.05mm	6#	0.12mm
3#	0.06mm	7#	0.15mm
4#	0.08mm		

Table (2)

- C. The index of coal tar contained in gas should be consistent with the provisions in TJ28-78 city gas design specifications.
- D. The maximum bearing temperature should not exceed 95 °.
- E. The pressure shown by the pressure gauge on the air blower should not exceed the boost scope specified by the nameplate, or else must stop the machine to check whether the air inlet in the system is blocked, whether the valves at inlet and outlet are fully open, and take corresponding measures.

• **The preparatory work before starting the air blower**

- A. Check the installation quality of each fastener and locating pins.
- B. Check the installation quality of intake and discharge pipelines, valves and others.
- C. Check whether the installation gap of the air blower meets the requirement.
- D. Check the coaxiality of the air blower and motor and the coaxiality of driving shaft and motor shaft, whose error should not exceed 0.1mm, or it will cause blower vibration, oil spills and other phenomena and affect the service life of the blower.
- E. Check whether all the sides around the base of the machine unit are solid, stone bolts are tightened.
- F. The air blower should oil # 100 machine oil into main and auxiliary fuel tanks to the center of

oil pointer by 2\_3mm before putting into operation.

**G.** Because of the pressure between main and auxiliary fuel tanks, the upper and lower oil plugs on the main and auxiliary fuel tanks should be tightened, or it will cause oil spills.

**H.** If there are cooling orgnaization, pour the antifreezing cooling liquid into the cooling end.

**I.** Open all the valves at the inlet and outlet of the air blower, move the rotor and pay attention to listen whether there are any abnormal noises in each parts.

**J.** Check the rotation of the electric motor to make it in accordance with the direction noted on the sign, or the motor cannot exhaust correctly, including such accidents which may happen as fan blade clashes, reversed water inflow into the motor in aeration and the carrier material inhalation into the motor in air slide.

**•The test runs of no-load fans**

**A.** The fan which is newly installed or overhauled should experience the no-load test runs.

**B.** The concept of no-load test runs is the running of fans under the condition that the intake and exhaust valves are open to the air.

**C.** Pay attention to the splash conditions of the lube in test runs and regulate the oil mass when there is too much or little of it.

**D.** There should not be abnormal odors or smoking phenomena, clashes or gratings.

**E.** The fan should be put into on-load operation after the 30-minutue normal runs..

**•The on-load normal runs of the blower**

**A.** Regulate the fan by inches as required to rated burden and the regulation to the rated burden at one time is not allowed.

**B.** The rated burden index refers to the static pressure difference between the intake and exhaust noted on the sign. Under the normal condition of the exhaust pressure, pay attention to the pressure change of the intake to avoid overload.

**C.** The long-time direct contact to the intake which may change the temperature of the fan is not allowed, or it will influence the safety of the fan.

**D.** The entire close of the exhaust valves and over-load running are not allowed when the fan runs normally.

**E.** Generally, the surface temperature of the antifriction bearing of the fan should not be over 95

degrees when the fan runs under the rated condition.

F. Pay attention to the splash conditions and oil level of the lube often. If the oil level is lower than the central line of the oil pointer, you should refuel it to the demanded level.

G. When the belt works, should care about the tensity of the belt. The new air blower has been adjust well when leaves the factory, so the belt should be fastened 24 hours after the machine starts running and the belt should be periodically fastened hereafter to ensure the normal operating of the air blower.

H. When the v-belt changed, the whole belt should also be changed at the same time, the type and the specification of the belt should be uniform; when the belt installed, the shaft axles should parallel each other and the belt and axis should be at right angles; the tools should be never hung in by force and should be fastened by fastening device.

●**Stopping**

The blower should not abruptly stop when operating with full load but should stop after a gradual load removal to avoid from damaging the machine. And for the principle of emergency stopping, the user can define it by drafting detailed rules.

***Maintenance and Repair :***

The operating and service life of the blower is subject to the daily maintenance. Beside the general maintenance procedure, the following points should also be highly emphasized:

A. Inspect the fastening situation of each part and inspect that if the positioning pin is loose, and if it is loose, fasten it.

B. To check if there is water or oil impregnating inside the blower.

C. Periodically clear the scaling and deposits inside the blower to ensure that the blade of the blower can roll flexibly.

D. Take care that if the situation of lubricating oil cooling is normal, and pay attention to the quality of the lubricating constantly listen attentively to that if there is hum when the blower is running, and pay attention to that if the blower is working under the irregular work conditions.

E. The overload of the blower sometimes would not display immediately so we should pay attention to the input and output air pressure, the bearing temperature and the change of the motor electricity to judge if the machine is normal.

F. When tearing the machine, the corresponding sizes of the machine should be measured and recorded and the marks should be made on the components so as to ensure that the recombination can meet the original requirements.

G. The new machine or the overhauled blower should operate according to the using procedure. It is recommended to change all the lubricating oil after operating for 8 hours.

H. Under normal circumstance, it is requested to change the lubricating oil after the machine operates for 1000 hours and repair or inspect for one time after 4000 hours and overhaul the machine annually and change the reinforced seal. The daily maintenance of the machine should be carried out according to Table 3.

Maintenance frequency Project	Each time you drive	Every day	Every three months	Every year	Note
Remove pipe of foreign bodies	○				
Tighten the joint	○		○		Fan pipeline, etc
Check valve operation	○				
Check circuit	○		○		
Check the gas within the oil amount	○	○			Refueling to oil standard center upward 2-3mm
Check the oil leakage	○	○			
Check fan rotation direction	○				Steering scutcheon shown direction
Check pressure	○	○			
Check the voltages and currents	○	○			
noise	○	○			
vibration	○	○			
temperature	○	○			Compressed air ,blower、 motor
Gear and bearing operation and steadiness	○	○			
Clean inhaled muffler eyewinker				○	

Table (3)

***Failures and Elimination Method:***

Roots blower failure and reason, happen involves using conditions and operating conditions factor, very difficult for simple words to clarify its causes and Exclusion methods, need to be analyzed according to actual situation after elimination, table 4 provided "fault and exclusion", only of common fault and Exclusion methods heteronormativity ".

<b>Failure appearance</b>	<b>Reasons</b>	<b>Elimination Method</b>
Insufficient wind	1.Increase clearance caused by the blade and body friction	1.Change the wear part
	2.The fit clearance is changed	2.Adjust upon request
	3.System leakage	3.Check and eliminate
	4.The belt is not tight enough and the belt wheel slips	4.Tighten the belt
Overload of the Electromotor	1.System pressure change	
	A. The filtering mesh of the input is blocked, or some other reasons make the resistance increased and then the negative pressure created (the differential pressure of the air input and air output increases while the output pressure does not change.)	Check and eliminate
	B. The systematic pressure of the output is increased	Check and eliminate
	2.Occurred by the abnormal parts	
	A. The static and dynamic rub	Adjust clearance
	B. Gear damage	Change
	C. Bearing damage	Change
Overheat	1.Machine body	
	A. The pressure increased	Check and eliminate
	B. Because the input gas temperature is increased	Check and eliminate
	C. The static and dynamic rub	Adjust the clearance

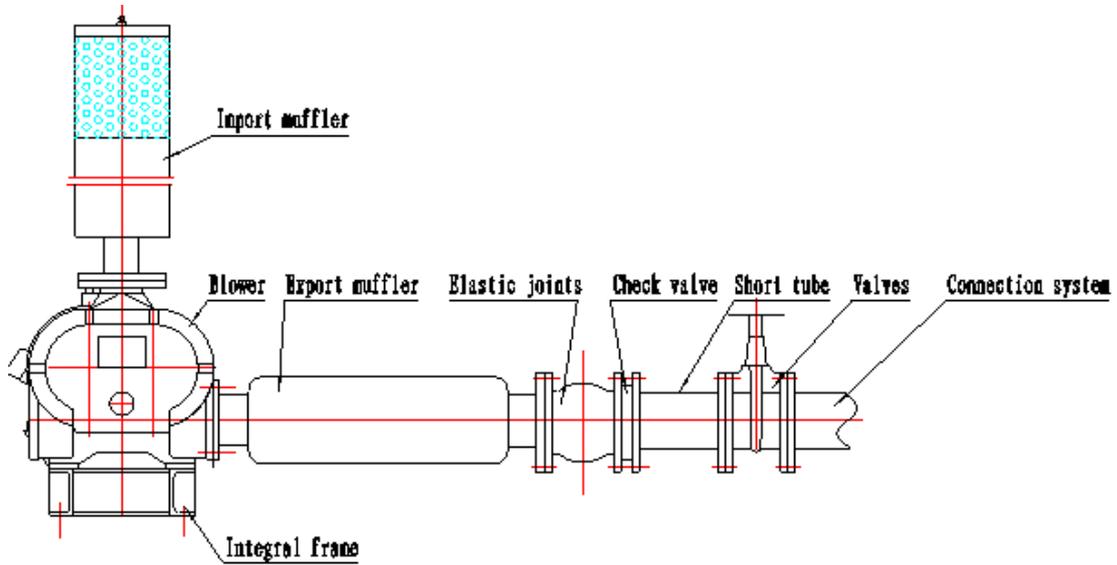
	2.Bearing	
	A. Bearing damage	Change
	B. Lubricating oil: lubricating oil is not enough or is too much	Adjust the oil mass
	C. The temperature of the lubricating oil is too high or the oil quality is not good	Change the clean and good lubricating oil
	3.Lubricating oil	
	A. The cooling water breaks or is insufficient	Check, eliminate or adjust
	B. Abnormal gear action or gear damage	Check, eliminate or adjust
	C. Bearing damage	Change
	D. The lubricating oil is not good	Change
Impeller and impeller between friction	1.The output rim and the fastener of the gear hub become loose and offset, $\delta 1$ is out of tolerance	Adjust the clearance, positioning and tightening
	2.Tooth surface wears so the tooth clearance increased and then leads to clearance change between the blades	If badly wears, should change, if not badly wears, adjust it
	3.Gear hub key and blade key become loose	Change the
	4.Driving and driven bearing is over bent.	Straightening or change the bearing
	5.Impurities sneak into the machine body or medium deposit	Clear the impurities or Deposit
	6.Antifriction bearing wear, the backlash enlarged.	Change the bearing
	7.Operation with over rate pressure	Find out the reason for overpressure and then eliminate
Racial friction between Impeller and the enclosure	1.Clearance $\delta 2$ is out of tolerance	Adjust
	2.Antifriction bearing wear, the backlash enlarged.	Change the bearing
	3.Driving and driven bearing is over bent.	Straightening or change the bearing
	4.operation with over rate pressure	Find out the reason for overpressure and then eliminate

Friction between Impeller and wallboard	1. clearance $\delta_{3\delta 4}$ is out of tolerance	Adjust
	2. There are some impurities between the blade and the wallboard or Medium deposit	Clear the impurities or deposits
	3. Antifriction bearing wear, the backlash enlarged.	Change the bearing
Over shake	1. Low balance quality of the rotor	Adjust
	2. The rotor balance is damaged	Check and eliminate
	3. Bearing wear or damage	Change
	4. Gear damage	Change
	5. Foundation bolt or other fastener become loose	Check and then tighten it
	6. Coaxiality of the air blower and the motor is out of tolerance	Find out the right coaxiality
Gear damage	1. Overload operation or bears abnormal impact	Change
	2. The lubricating oil is too less or not good	Change
	3. Gear wear, and the side clearance exceeds 1/3 of the blades clearance	Change
Bearing damage	1. Lubricating oil or grease is not good or the lubricating oil or the grease is not enough	Change
	2. Exposed to corrosive gas (coal gas) because of the ineffective gas seal, so the bearing is damaged in short time	Change the bearing and recover the gas seal
	3. Long-term overloaded operation	Change
	4. Surpass the rated operating life	Change
The shaft seal leaks the oil	1. Reinforced seal ring is worn and ineffective	Change the reinforced seal
	2. The coaxiality of the driving bearing and the motor bearing offsets too much so the seal becomes ineffective ahead of time	Change the seal ring and adjust the coaxiality of the air blower
Oil plug leaks the oil	1. The oil plug is not screwed down	screw down the oil plug
	2. The gasket of the oil plug is damaged	Change the gasket of the oil plug and fasten it

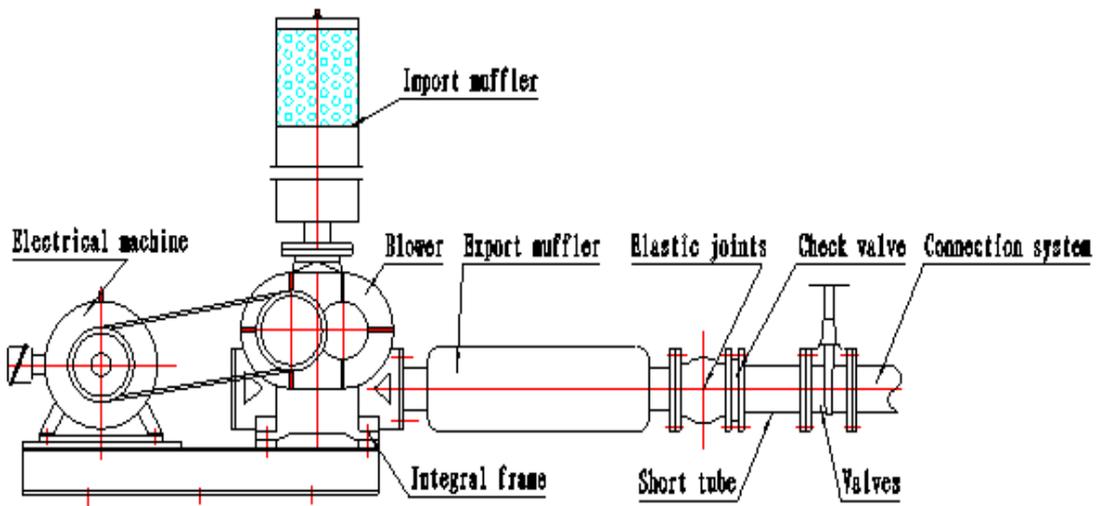
Table (4)

## Assembly pipeline reference pictures

### A. Direct connection transmission



### B. Belt transmission







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感谢您使用“荣恒”牌三叶型罗茨鼓风机

*Thank you for using “RONGHENG” THREE-LOBED ROOTS BLOWER*

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