

# ACE Pneumatic

## Rotary Screw Air Compressor

*Installation, maintenance, and use manuals*

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# Safety Precautions

## I. Installation

The installation of the compressor should observe the relevant local laws, regulations and the following rules strictly.

1. The compressor should be lifted by the hoisting equipment whose bearing power is bigger than the weight of the whole unit. The lift speed and the acceleration rate should in the permit scope.
2. Locate the compressor in a cool, clean, well-ventilated place so as to provide it with cool, clean and dry air.
3. The air that the compressor takes in must not contain flammable gas and corrosive gas so as not to cause the explosion or inside corrosion.
4. The cooling water's quality of the water-cooled unit should conform to the requirements in page 11 and satisfy the following requirements: Inlet water temperature  $\leq 32\text{ }^{\circ}\text{C}$ ; The pressure should be between 0.2Mpa and 1.4Mpa.
5. The discharge of the compressor's sewage, waste oil should observe the local environmental protection laws and regulations.
6. The supply line of the compressor must match with its power and should be installed with safety devices such as air switch, fuse, etc. In addition, the electrical equipments must be touched with the ground for the electrical machine's safety.

## II. Debugging and running (Special attention)

1. The new machine must be debugged by debugging person who is appointed or approved by our company.
2. Remove the fixed transport trestles on the bottom of the compressor.
3. Water cooled unit: Please open the inlet/outlet valve, check the water temperature and the water pressure, make sure they meet the requirements.
4. Before starting the compressor, please make sure that there is nobody in the set and no articles or tools are left in it. Close the door of the compressor set. Inform the people near the compressor when starting the compressor in case any accidents would happen.
5. At the time of the test run, be sure to check the operation direction of the compressor. When the compressor is overturning, please shut down the compressor immediately, and disconnect the compressor from its power source. Exchange any two three-phase electricity line and restart the machine, otherwise it will damage the compressor (Special attention when the factory overhauls the power supply).
6. Compressor can not work over the pressure specified on nameplate, otherwise it may cause the motor to be overloaded and burned out.
7. While the compressor is under remote control, the machine may be started at any time, please make remarkable mark on it.
8. When there are something wrong with the compressor or some unsafe factors, do not start the machine, disconnect the compressor from its power source immediately and make remarkable mark on it.
9. There are high-speed transmission equipment and high-temperature parts in the compressor. It's dangerous to open the door when the compressor is running.

### **III. Maintenance**

**The maintenance of the compressor must be done with the guidance of the qualified personnel.**

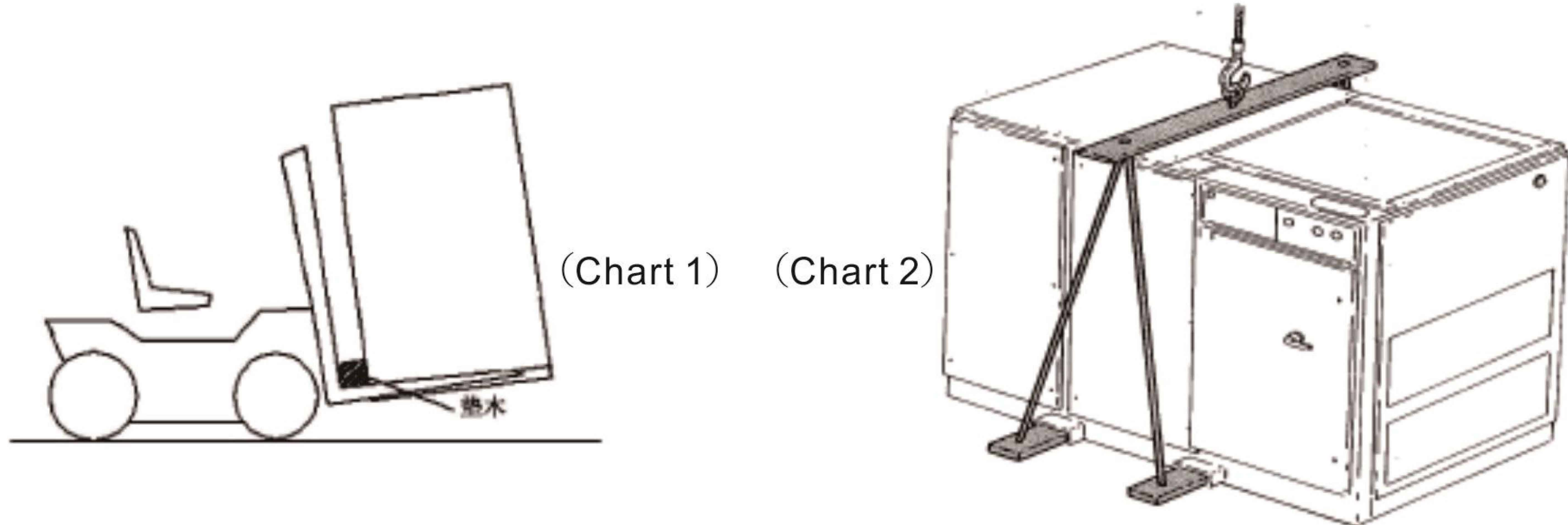
1. Compressed air and electrical apparatus are dangerous, while overhauling or maintaining the compressor, be sure to disconnect the compressor from its power source and hang the notice of "overhauling" or "No switching on" on the power source in case other person connect it from its power source and endanger the maintenance person.
2. While maintaining the compressor, please wait till the whole compressor has already been cooled and compressed air is discharged completely. The maintenance person should keep away from any compressed air outlets and close the related isolating valve.
3. While cleaning the spare parts, you should use the no-corrosive dissolvent. Inflammable, explosive and volatile cleaning agents are forbidden.
4. After the compressor has operated for some time, please examine the safety protection system regularly such as the safety valve. Make sure that they are sensitive and reliable. Generally speaking, you should examine them once a year.
5. The accessories of the compressor must be offered by qualified factories, its screw lubricant must adopt the appointed special lubricant of screw air compressor by our company. The deterioration of lubricant caused by the mixed usage of different brands or different types' lubricants may lead to a serious breakdown of the whole unit.

**Notice:** The compressor should be operated by the regular personnel. The operator should read through and understand the contents of the manual, abide by the operating procedure of the operation manual, observe the safety precautions, and comply with the maintenance norms. Any operation action against the safety precautions may cause the serious consequence.

# Installation Instruction

## I. Transportation

The transporting and installation of the compressor units should be processed according to the attentions. While transporting the compressor, you should put two square timbers between the forklifts and compressor in case of the breach of door panels (Chart 1). While using the slings, be sure to use the cross rods to counterbalance the side pressure produced by the slings (Chart 2). Attention: It's necessary to put some protection materials between the slings and the door panels. If not, the panels would be broken.



## II. Foundation

- (1) The compressor should be installed on a horizontal and hard floor, and good joint must be ensured between the casing bottom and floor surface, in order to prevent vibrations and noise.
- (2) If the compressor is installed upstairs, the user must do well against vibration on account of the safety of the compressor and the building.
- (3) The screw compressor does not need fixed foundation because of the little vibration, but the ground must smooth and hard. And it is better to spread a 5-10mm shock-proof cushion under the bottom of the compressor in case of the vibrations and noise.

## III. Installation

The location of compressor is often not paid enough attention to. It is often located at a random place without planning in advance which is the main reason of the difficulty of maintenance and the poor quality of the compressed air. So selecting a good installation place is the prerequisite correctly using the compressor.

1. A spacious and bright place facilitates the maintenance and operation of the compressor.
2. Low humidity, less dust, clean air and good ventilation.
3. The temperature must be lower than 40°C. Because the higher temperature, the less exchange air.
4. The pre-filtering equipment is needed if the environment is not good and the air is dusty.
5. Set aside some place for installation of the crane.
6. Set aside some place for maintenance (Chart 4): Models  $\leq 90\text{kW}$ : the distance between the compressor and the wall must be more than 70 centimeters, the distance between the top of compressor and the housetop must more than 150 centimeters; Models  $\geq 110\text{kW}$ : the distance between the compressor and the wall must be more than 150 centimeters, the distance between the top of compressor and the housetop must more than 300 centimeters.
7. For water-cooled compressor, the water pressure of the cooling water should be 0.2-0.4MPa, equipped valves in the inlet and outlet of the water. If there are any impurities, you should equip a filter. The requirements of the cooling water are follows:
  - a. The amount of the cooling water should meet the water flow connections of the cooler, and the water quality directly meets the requirements.

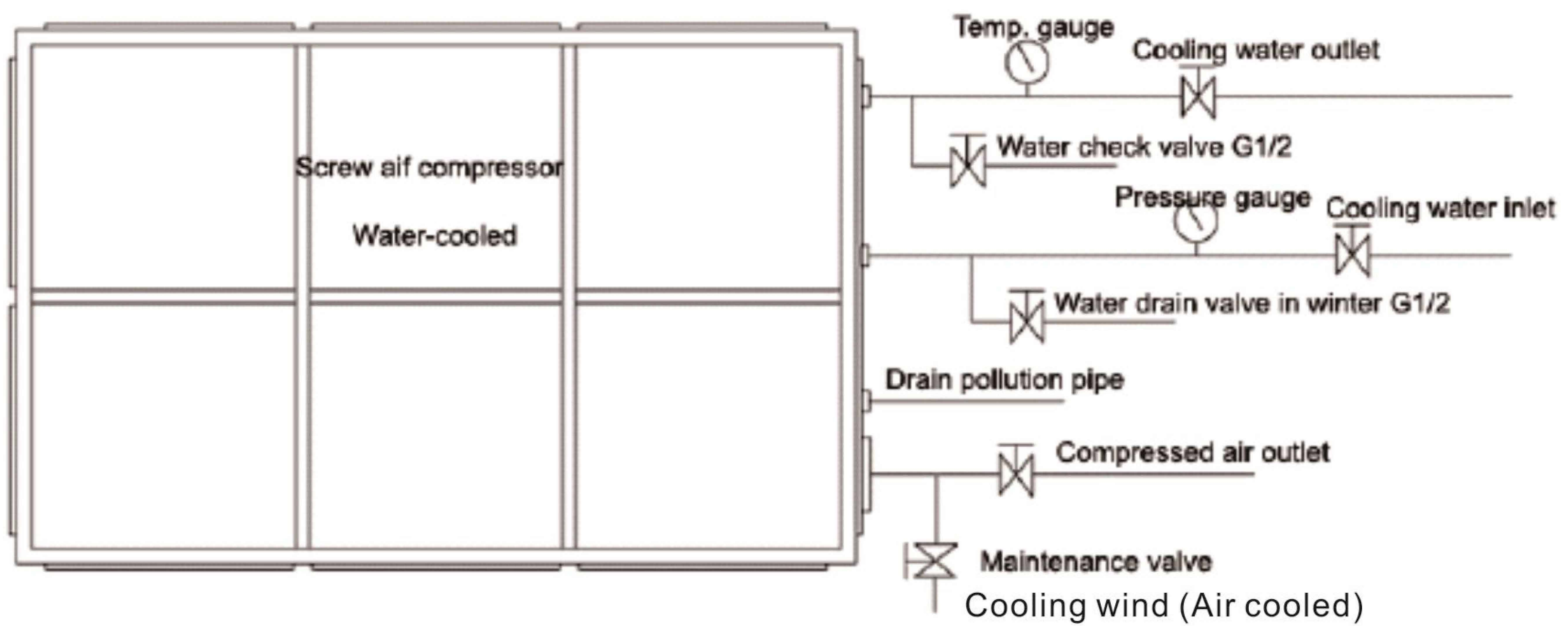
- b. When adopting the circle water, the amount of the supply water=24\* water amount/ temperature of the cooler tower.
- c. If the quality of the cooling water can't meet the requirement, please enlarge the amount of the cooling water. Make sure the exhaust water temperature  $\leq 50^{\circ}\text{C}$ .

8. As for air-cooled compressor, it's better to install a wind tube in order to drive the hot air out of the house. The exhaust pressure loss should be  $\leq 6\text{mm}$  water column, or you should add a drawing fan, the amount of the drawing wind should not be less than the data in the following table.

When you choose air-cooled compressor, you should pay more attention to the following advice:

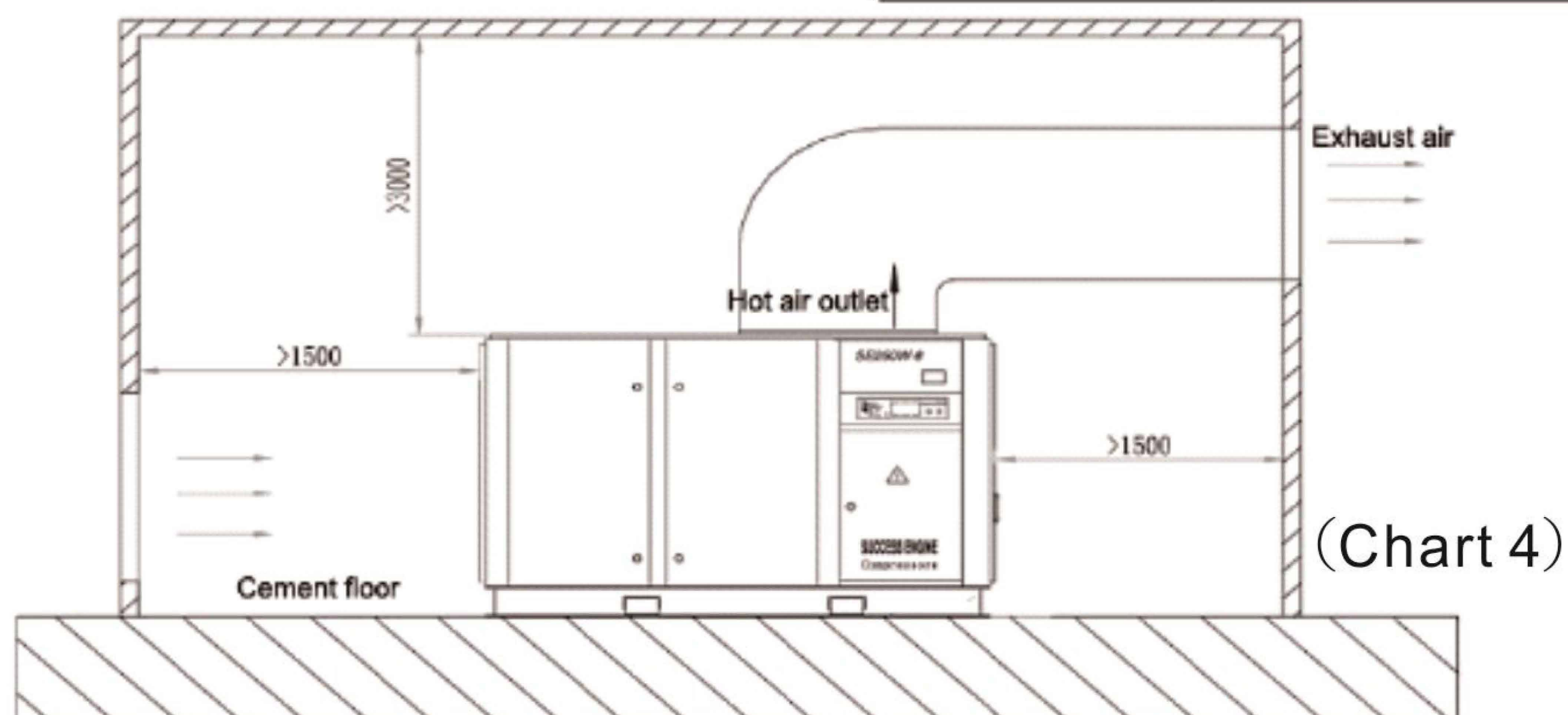
- a. You must take the ventilation environment into account . Do not install the compressor near the high temperature equipments in case high temperature air does harm to the unit.
- b. When the compressor must be installed in the smaller closed space, the ventilation equipment must be installed to speed up the air circulation. The capacity of ventilation equipment must be more than the exhaust volume of the cooling fan and the place of convulsion rim must suit the compressor's exhaust outlet.

**The flow chart of the water-cooled compressor (for reference)**



Motor power (kW)	Cooling air flow (m <sup>3</sup> /min)
45-55	190
65-75	280
110-132	490
160-180	600
200-250	900

The flow chart of the air-cooled compressor (for reference)

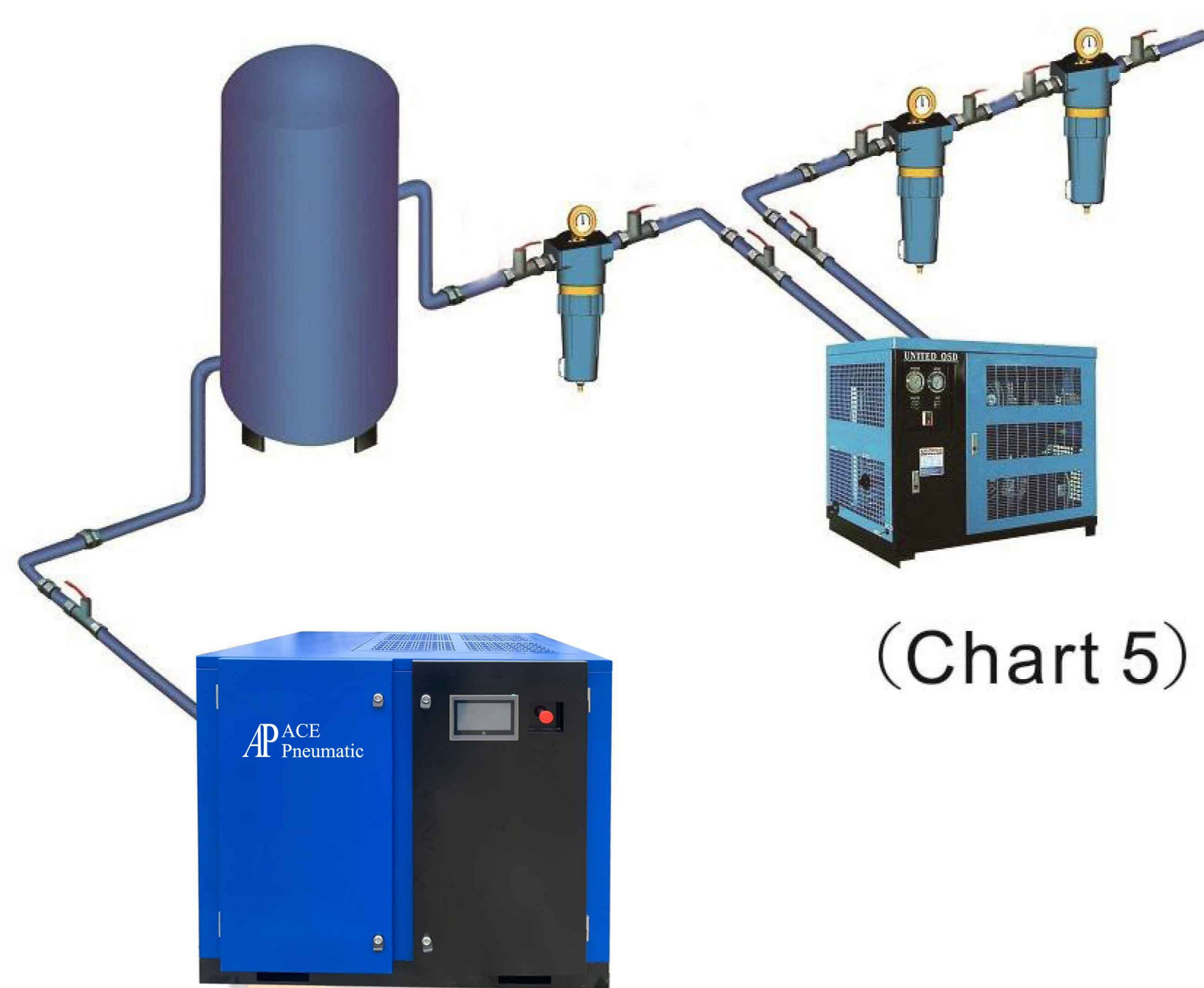


#### IV. Process piping

- (1) When processing the main pipe, the pipe must have an inclination pitch of  $1^{\circ}\sim 2^{\circ}$  which can facilitate the discharge of condensed water.
- (2) The pressure of main pipeline must be lower than the 5% of the compressor's rated pressure, so if the length of the main pipeline is  $\leq 30\text{m}$ , you should choose the pipe whose dimension is equal to the outlet of the compressor; if the length of the main pipeline  $> 30\text{m}$ , you should choose the pipe with a bigger diameter. The longer of the pipeline is, the larger of the diameter to be.
- (3) The lateral pipeline must be joined with the top of the main pipeline. The diameter of the lateral pipeline should conform to the actual compressed air consumption.
- (4) Control valve should be installed in the outlet of the compressed air. A G1/2 bypass valve should be installed in the front of the control valve in order to exhaust the compressed air when maintaining the compressor.
- (5) If a few machines are installed in parallel and the main pipe is too long, A ball valve or automatic drain valve should be installed at the end of the main pipe to let the condensate drain out.
- (6) The main pipeline should not be reduced arbitrary. The user must use reducing pipe if the pipeline must be reduced or enlarge in case of pressure loss caused by mixed flow.
- (7) If there are buffer devices and purification devices such as compressed air receiver and air dryer, the ideal configuration is illustrated in Chart 5. Then the compressed air receiver can remove partly cooling water and decrease the temperature of compressed air. The air with lower temperature and less water can reduce the burden of air dryer and air filters.
- (8) If the user needs a lot of compressed air in a short time, the air receiver must be fixed. Air receiver with bigger capacity is a better choice (The capacity should be 30% bigger than the max instantaneous air capacity). This method can reduce the times of load and unload and keep the machine running stably. In general, the capacity of the air receiver is 20% of discharge air.
- (9) If the system pressure is less than 1.5MPa, the flow speed in the pipeline must be less than 15m/sec in case of the pressure loss.
- (10) All of the elbow and valve should meet the rated pressure and should be used as possible in the pipeline in case of the pressure loss.
- (11) The ideal pipeline is the main pipeline circling the whole workshop, so the user can use the compressed air in any places. Reduce pressure difference if the certain branch line increases air consumption greatly suddenly. For examination and maintenance of the compressor, the circle pipeline must be equipped with valves.

#### The flow chart of the typical compressor station (For reference)

- ① Screw air compressor
- ② Air receiver
- ③ Pre-Air filter
- ④ Air dryer
- ⑤ After-Air filter
- ⑥ Final-Air filter



# Working Principle

## I. General introduction

Our screw air compressor is one stage double screw air compressor with directly drive or belt drive. The air is compressed by the airend which is driven by an electric motor. The system will be cooled by the injection oil. The oil-air mixture flows through after-air filter and final-air filter. Then the oil will be separated from the oil-air mixture. The clean compressed air enters the cooler and then exhausts out. The cooler is used to cool compressed air and oil.

### 1. Working process (Chart 6)

The dust and Impurity is removed by the air filter, and then the clean air enters into the suction volume cavity of the airend via the air intake valve. The air is compressed by female rotor and male rotor which perfectly mesh with each other. When the pressure of the compressed air matches to the rated pressure, the compressed air will be exhausted through the exchange port. And then the compressed air enters the oil-air separator, the mostly of its oil will be separated after collision, interception, gravity in the oil-air separator tank. We can get less oil-content compressed air after the separation of the oil-air separator element. Then the compressed air goes through the cooler and exhaust out. It's the whole process.

### 2. Air process

Atmosphere → Air filter → Air intake valve → Air end → Oil-air separator → Min. pressure valve → Cooler → Compressed air.

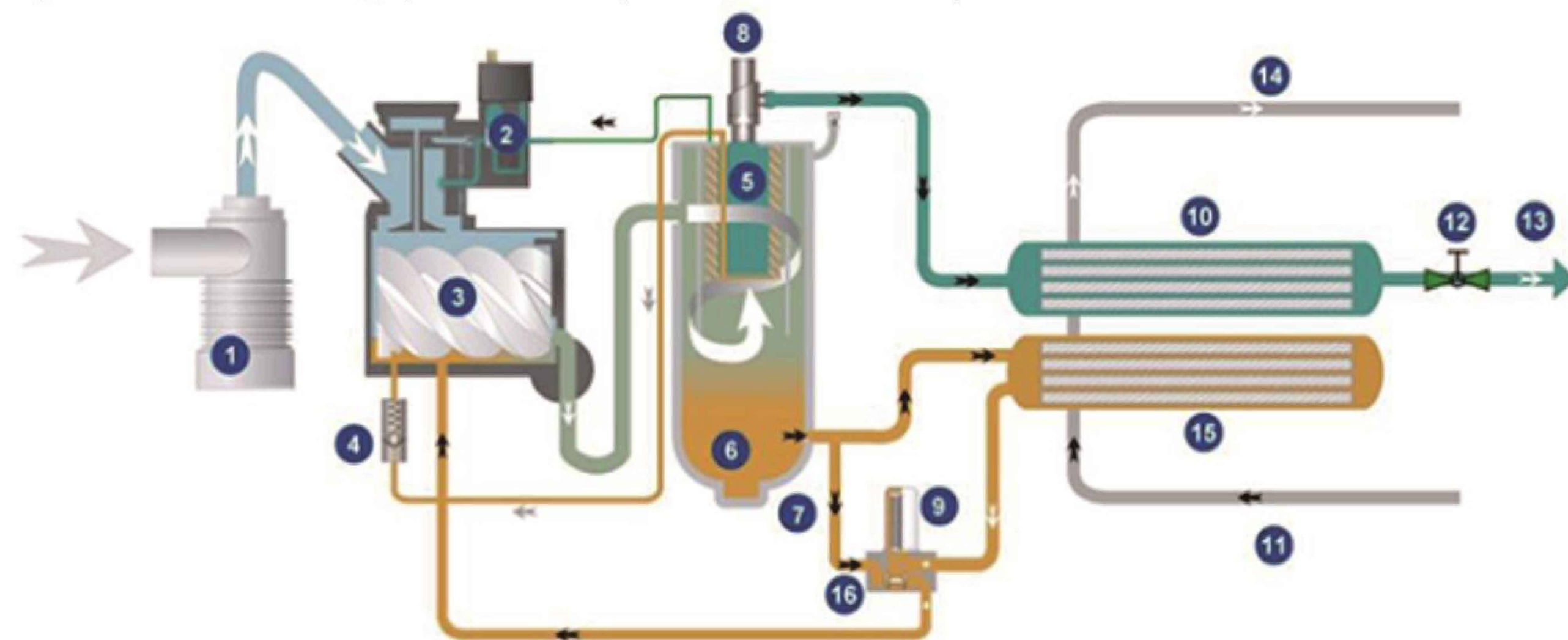
### 3. Lubricant process

Lubricant → Oil-air separator → Temperature control valve → Cooler (or bypass) → Oil-filter → Airend → Separation → Circle.

The hot lubricant in the oil-air separator flows into the temperature control valve. The temperature control valve control the proportion of lubricant which flow into the cooler or the bypass according to the temperature of the lubricant. So can guarantees the temperature not too low. (The water in the compressed air will be condensed in the oil-air separator if the temperature is too low and lubricant will be emulsified and reduce its useful life). The lubricant will be injected into the airend after being filtered in the oil-filter.

The circle of the lubricant will be maintained by the pressure difference between the oil-air separator and the low pressure chamber of airend. To keep the cycle lubricant, make sure the pressure in the oil-air separator is 0.2-0.3MPa. This is the function of min. pressure valve (the opening pressure is 0.4-0.45Mpa).

## II. The chart of system working process (For reference)



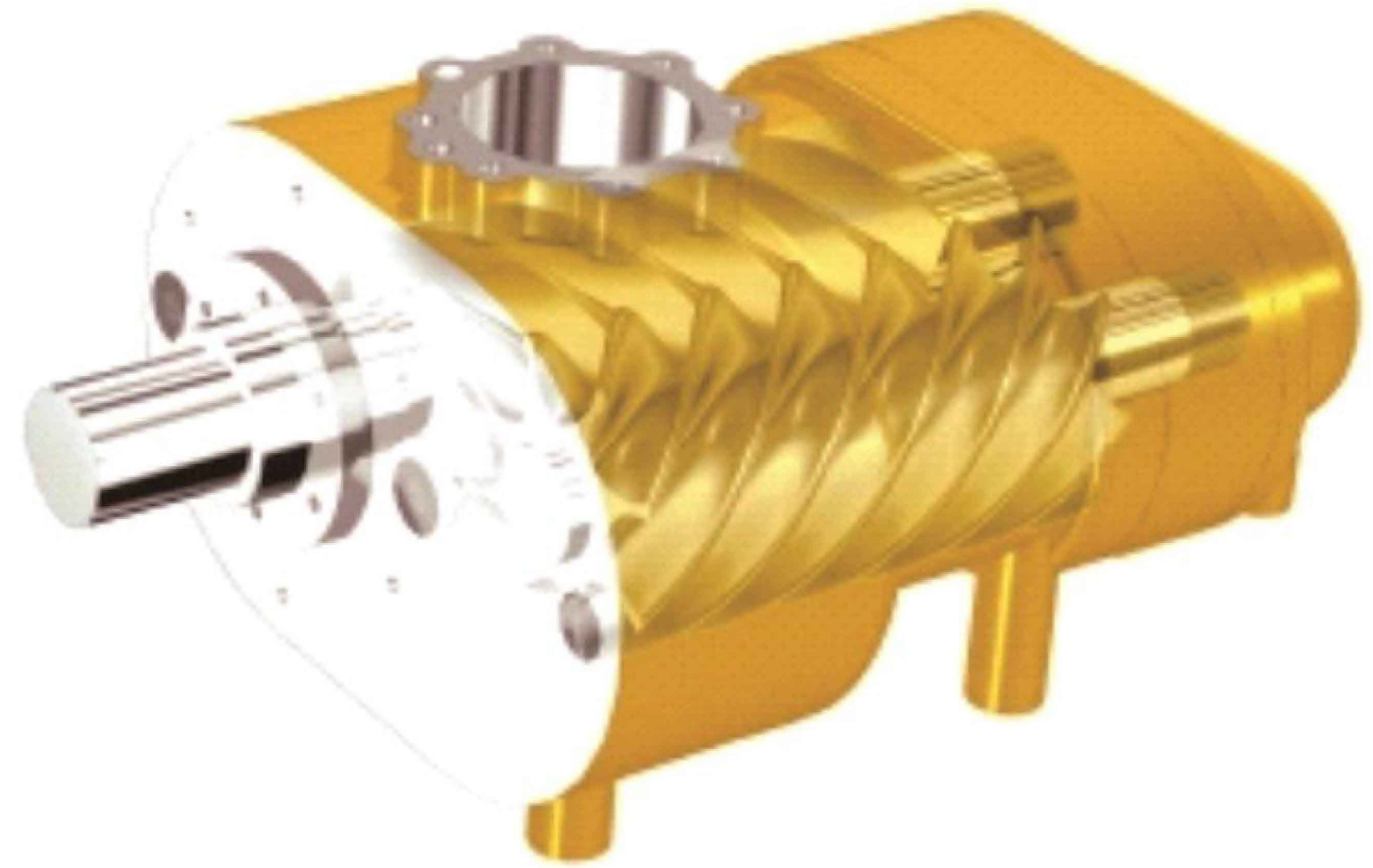
(Chart 6)

- |                               |                |                |                      |                   |
|-------------------------------|----------------|----------------|----------------------|-------------------|
| ① Air filter                  | ② Inlet valve  | ③ Airend       | ④ Check valve        | — Control line    |
| ⑤ Oil - Air separator element | ⑥ Oil          | ⑦ Oil-Air tank | ⑧ Min-pressure valve | — Intake air      |
| ⑨ Oil filter                  | ⑩ Aftercooler  | ⑪ Water inlet  | ⑫ Spherical valve    | — Oil             |
| ⑬ Air outlet                  | ⑭ Water outlet | ⑮ Oil cooler   | ⑯ Thermostat valve   | — Air Line        |
|                               |                |                |                      | — Air/oil mixture |
|                               |                |                |                      | — Water           |

## Main Functional Components

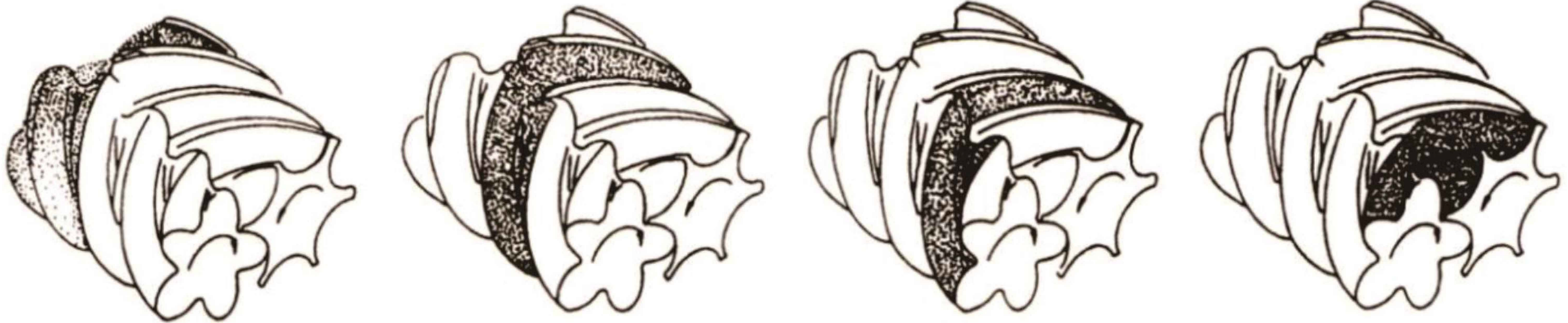
## I. Airend

The compressor Airend (Chart 7) consists of machine parts, male rotor and female rotor, bearing and bearing seal, etc. Airend is the most important part in the unit. All the parts are precise components, so be sure to keep the dust away from the compressor. In addition, in order to ensure the efficiency of the compressor, you should ensure the appropriate environment, normal oil system and appropriate oil level. Screw air compressor is one of the displacement compressors. The air is compressed by female rotor and male rotor which perfectly mesh with each other. The rotation of the rotors in the compressor make the volume of the air change periodically and the whole process of air suction, air compressing and air exhausting are finished along the axis of the rotor from the suction side to the exhaust side.



(Chart 7)

### Working processes of compressor



1.Suction process

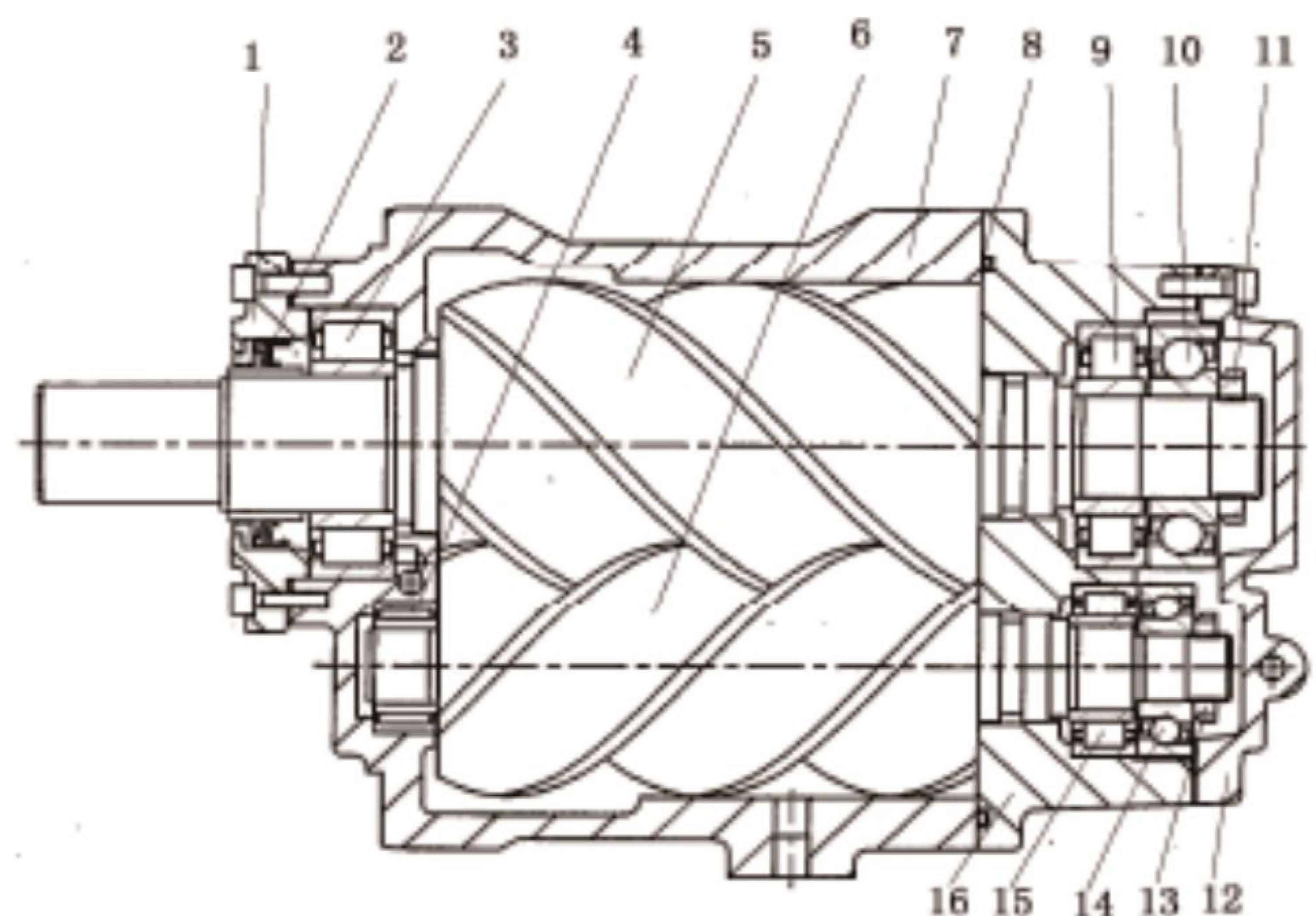
2. Sealing and delivery process

3.Compression and oil injection process

4. Exhaust process

### Structural Chart (Chart 8)

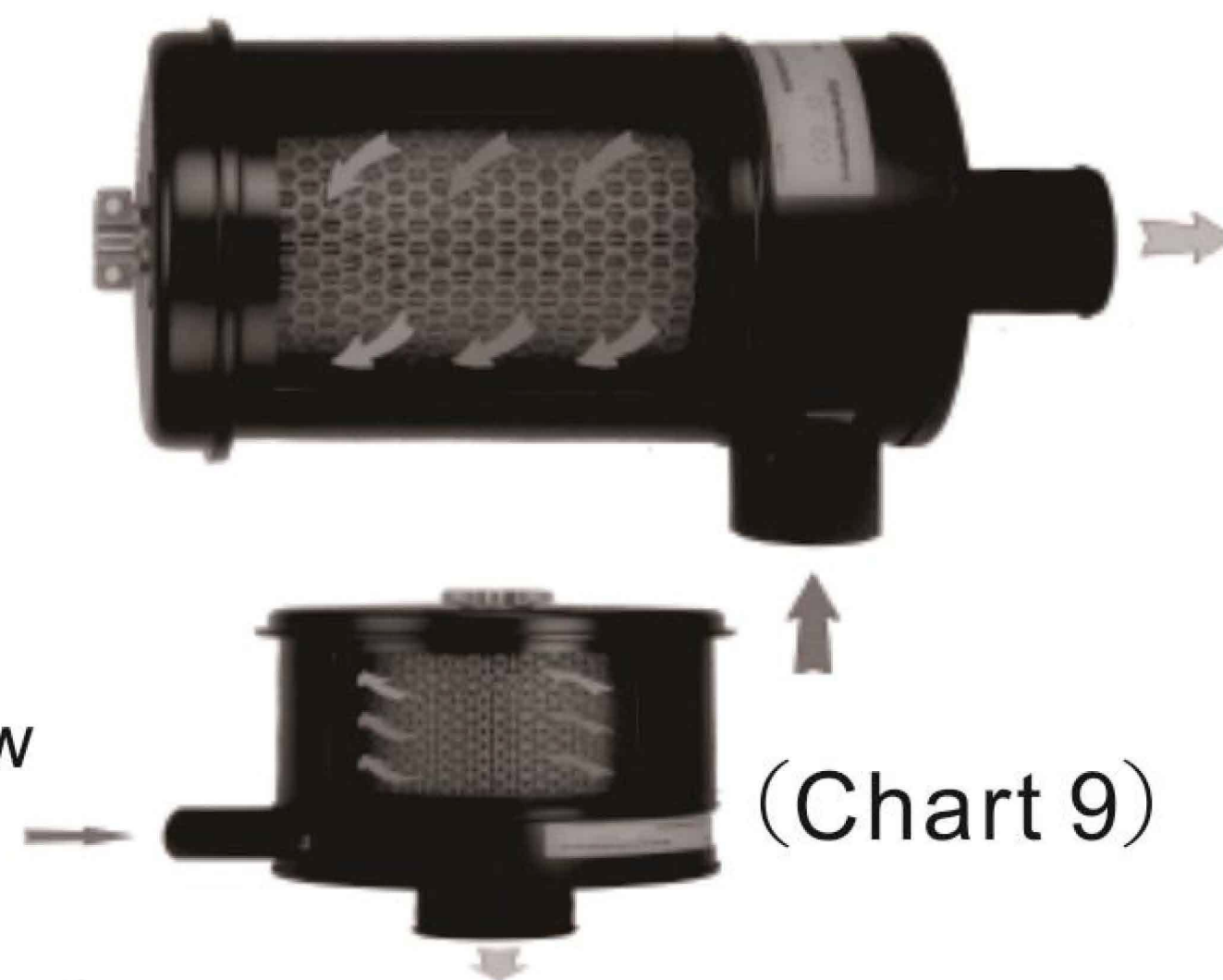
No.	Name	No.	Name
1	Bearing housing cover	9	Bearing
2	Bearing seal	10	Bearing
3	Bearing	11	Locknut
4	Bearing	12	End cover
5	Male rotor	13	Locknut
6	Female rotor	14	Bearing
7	Rotor housing	15	Bearing
8	Sealing ring	16	Exhaust cover



(Chart 8)

## II. Air filter (Chart 9)

The air filter consists of paper-making filter element and cover. When the air was taken into the compressor, the dust was blocked outside of the filtering element and the clean air flow into the compressor. Thus, it can reduce the abrasion of parts and oxidation of lubricant. The users should clean or replace the filter element according to the time of use and its environment. Clean the air filter according to the following method: Take out of the filtering element, knock on the upper/downer surface softly. Blow off the dust on the surface of the filtering element. Don't clean it with oil or water. Replace it when the filter paper is badly blocked or broken.



## III. Air intake valve (Chart 10)

The air intake valve mainly consists of valve body, valve, cylinder, proportional control valve, solenoid valve, etc (The components are different according to the motor power). And there is a control unit in the lateral aspect of the compressor. The cylinder is connected to proportional control valve and solenoid valve. It has the function of proportional adjustment of air suction, on/off adjusting, noise reduction, pressure reduction and air discharge, etc. It's the air intake valve that controls the amount of the air which is sucked into the compressor. When starting the compressor, the air intake valve is closed so as to reduce the startup burden of the compressor. When receiving the load signal, the solenoid valve will begin to work. It supplies air to the cylinder and open the valve, then the compressor is state of load. When the exhaust pressure rise up to the system rated pressure (about 0.05MPa, can be adjusted by the proportional control valve), the proportional control valve starts to work. The valve of the air intake valve becomes smaller when the pressure is higher. The displacement of compressed air becomes smaller too. We called this process "proportional adjusting process"; when the pressure rises up to the rated exhaust pressure, the PLC controller send a signal which power off the solenoid valve. Then the air intake valve will also be closed. When the pressure drops down to the rated value, the valve will be open again. Then the compressor will be running normally. This process is called on/off adjustment. When the compressor is in state of unload, a little amount of the air will enter through the gap or eyelet, which keeps the pressure of the air receiver maintaining between 0.2Mpa and 0.3Mpa and the normal operation of lubricant circle.

The function of air intake valve is auto-controlled by the system controller and the proportional valve. Then the sensitivity of the air intake valve is very important for the normal operation of the compressor. Thus, the air intake valve should be maintained on schedule. When undertaking the maintenance work, be sure to dismantle all the components. And check whether there are abrasions on the surface of the components. Pay special attention to the compressor with the cylinder; check whether there is any failure on the diaphragm in the cylinder. Before reassembling the compressor, clean all the components and lubricate all the metal parts.

The function of the solenoid valve: When unloading the compressor, supplies the pressure of separator tank for the compressor to balance the pressure between the pressure between the oil-air separator and airtend, and reduces the energy consumption and noise.

(Chart 10)

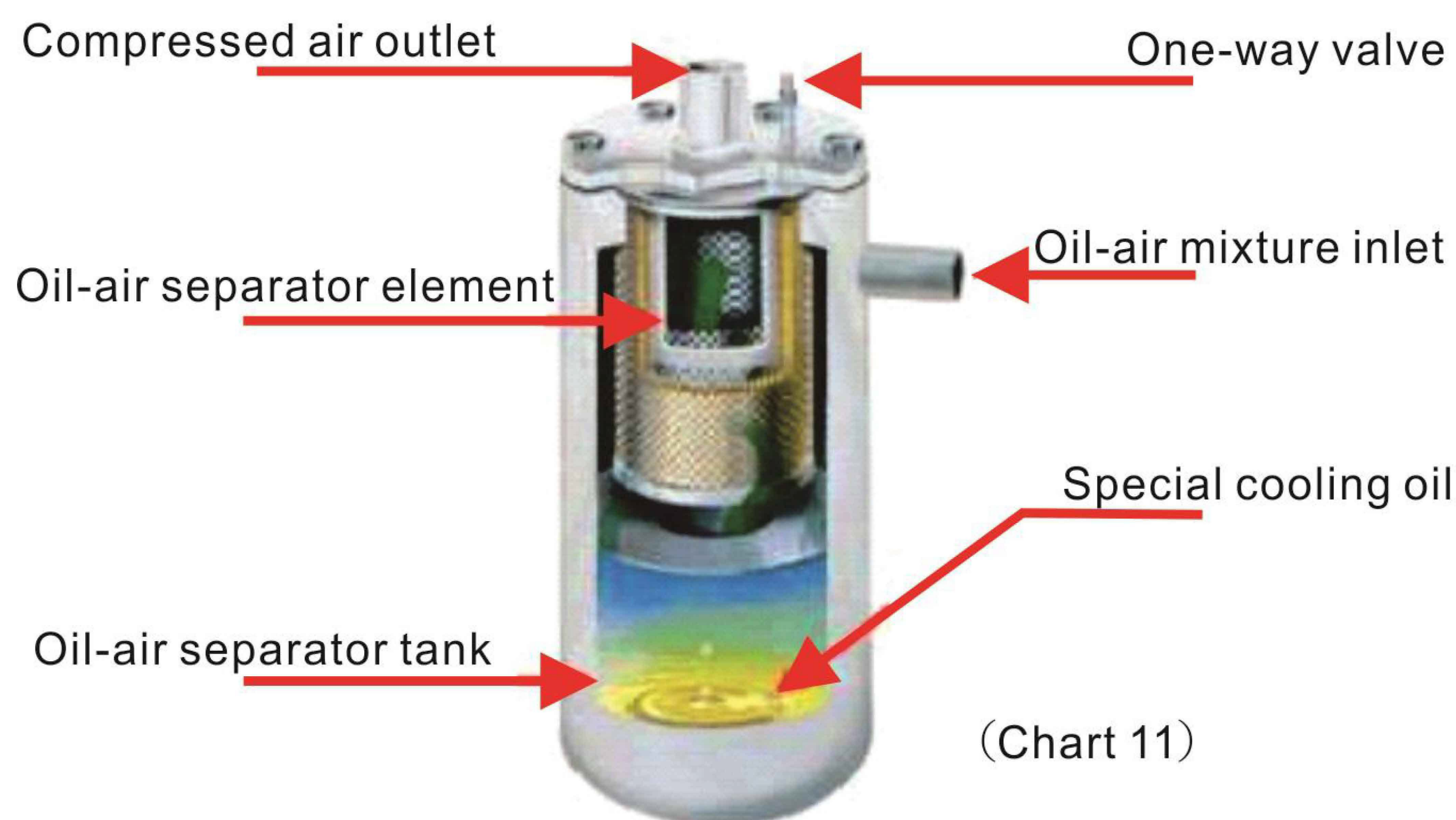


#### IV. Oil-air separator (Chart 11)

The Oil-air separator consists of oil-air separator tank and oil-air separator element. When the oil-air mixture discharged from the compressor air end flow through the air-oil separation tank, the oil is separated by the air-oil separating device and flow into the oil-air separator element. Then the oil separated from the oil tank was used in the lubricating system. The little oil in the oil-air separator will be drained via the oil return pipe which is inserted in the bottom of the air-oil separator element. Then the oil will flow back into the low pressure cavity of the air end via a one-way valve. The function of the one way valve is ensures that the oil at the bottom of the oil-air separator element is drained timely and little compressed air is discharged. The air-oil separator element will be filled with oil if the orifice is blocked. The other function of the one-way valve is to prevent the oil in the air end from flowing back into the air-oil separator element when the compressor is stop.

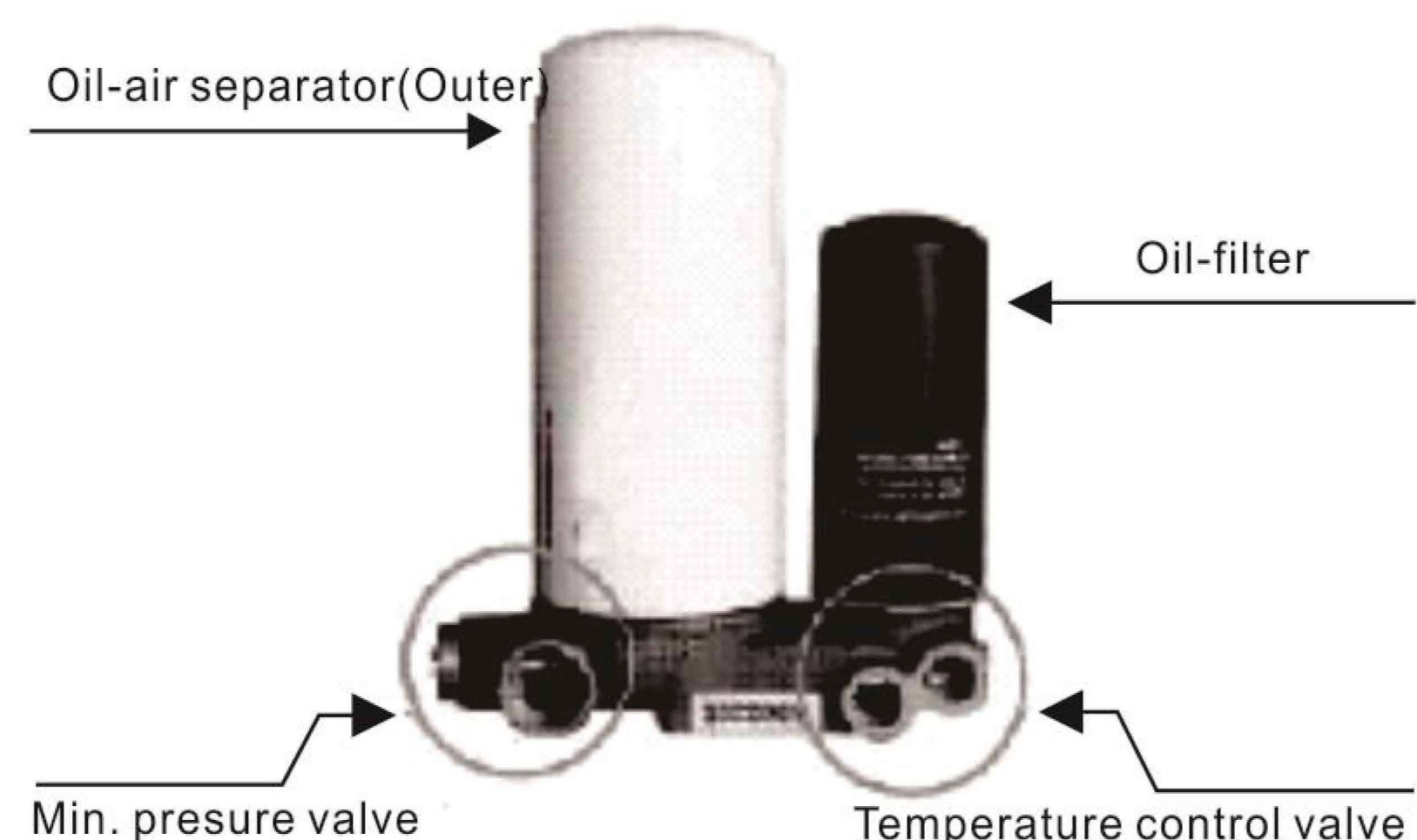
There is a safety valve equipped on the oil-air separator. The compressed air will be discharged through this safety valve when the pressure in the compressor is too high. This can ensure that the compressor run safely. There is oil port and oil level detector on the side of the tank, the oil level should be kept in the middle of the oil level detector.

There is a differential pressure indicator on the side of the tank of the compressor, whose power is above the 110kW. The function is to check whether the oil-air separator element is blocked. The differential pressure indicator will be running when oil -air separator element is blocked. The PLC controller will warn you that the oil-air separator element should be replaced in time. In addition, please check the oil-extracting pipeline and one-way valve whether they are blocked when there is too muck oil mixed into the compressed air. If not, take out of the air-oil separator element to check, if it is blocked, replace it.



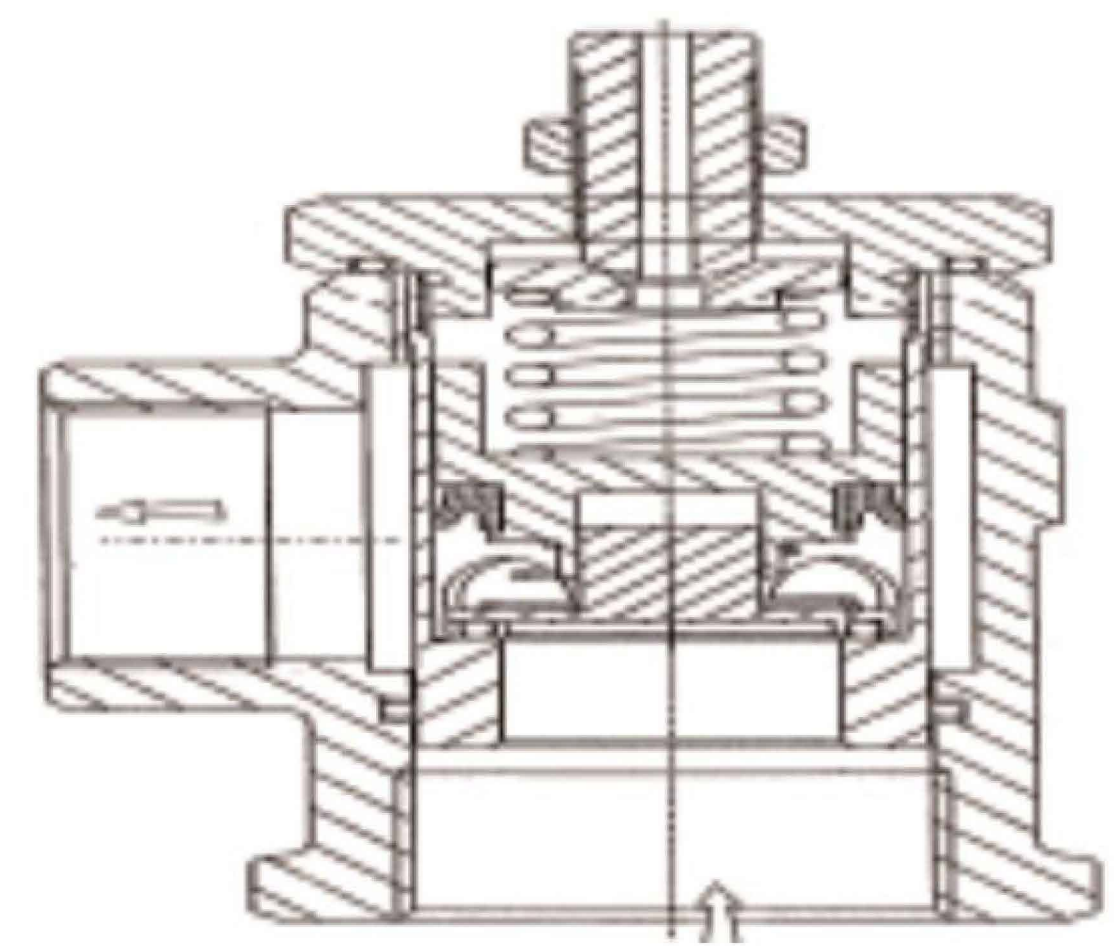
There will be condensed water at the bottom of the oil-air separator tank when the compressor has been running for a long time. Thus, in order to prolong the useful life of the lubricant, please drain the condensed water through the oil discharge valve at the bottom of the oil-air separator tank.

As for some models, the oil-air separators are external ones. The oil-air separator and the oil filter are equipped in an integrated module (Chart 12) which consists of temperature control valve and the min. pressure valve. The integrated module is equipped on the horizontal oil-air separator. Its working principle is familiar with the ones mentioned above.



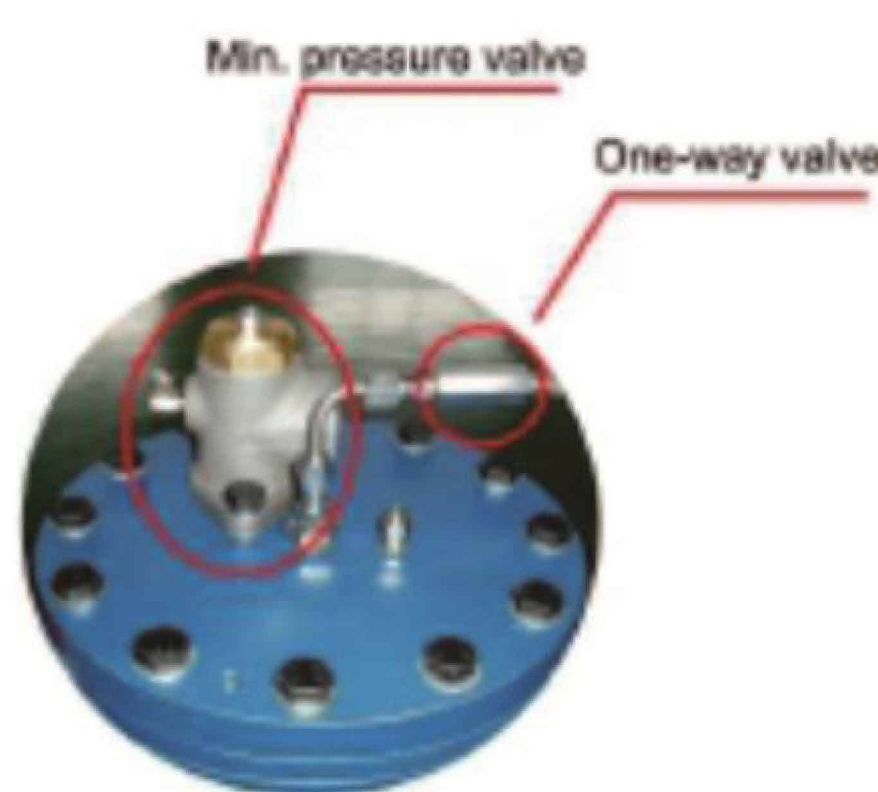
## V. Min. pressure valve (Chart 13、 14)

The min. pressure valve equipped on the outlet of the air-oil separator consists of valve body, valve core, spring, seal ring, adjusting screw, etc. Its function is to be keeping the pressure in the tank not less than 0.25MPa. Then, it can guarantee that the oil-air mixture can be separated finely and the consumption of the lubricant can be reduced. Meanwhile, it can guarantee the air pressure for the circle of the lubricant. It also has the function like the one-way valve which can prevent the back flow of the compressed air. The pressure of the min. pressure valve has been preset before leaving the factory. Adjust the pressure with the professional's guidance when it has been used for a long time.



(Chart 13)

(Chart 14 all kinds of the min. pressure valves)



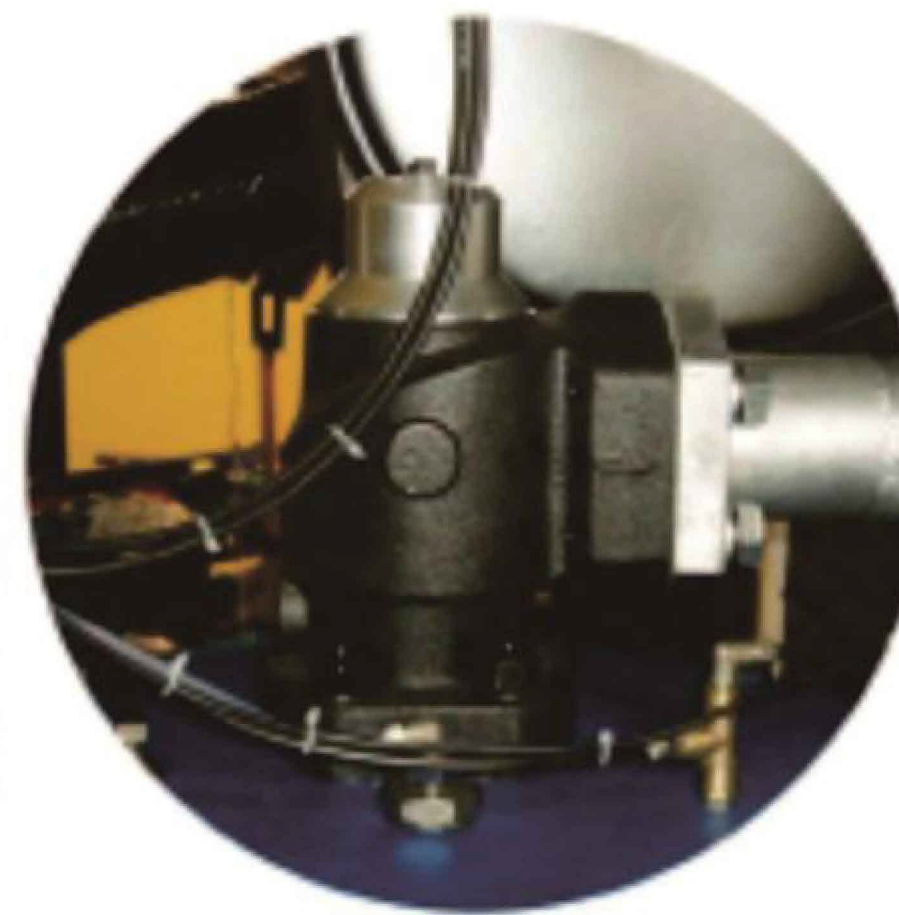
5.5-18.5kW



External ones

Min.pressure valve

(Chart 14)



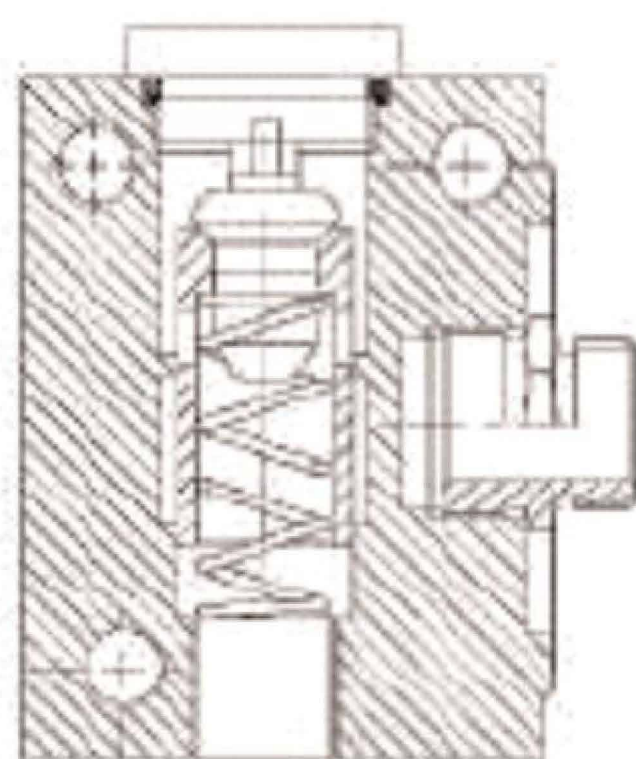
above 37kW

## VI. Temperature control valve(Chart 15)

The function of the temperature control valve is to control the lowest oil injection temperature. If the oil injection temperature is too low, the discharge air pressure will also be too low. Then there will be condensed water in the oil-air separator tank, the quality of the lubricant will be deteriorated gradually and its useful life will be reduced. When the oil injected temperature is higher than a certain temperature, the temperature of oil-air mixture will be higher than the dew point temperature.

The working principle is as follows: When the temperature is below 71°C, all the oil will flow into the aircend via the oil filter by the bypass pipeline; when the temperature is above 71°C, the temperature control devices will expand and push the piston. Then the bypass pipeline will be closed gradually and the pipeline to the cooler will be open gradually. The ratio of flow areas of the two pipelines is controlled by the inlet oil temperature. When the oil flowing into the cooler pipeline is cooled, it will converge with the oil flowing into the bypass pipeline and then flows into the aircend. The entire bypass pipeline will be closed if the inlet oil temperature is much too high. Then all the oil will enter the cooler and be cooled.

(Chart 15 All kinds of temperature control valves)



Inner structure



Below 45kW



55-90kW



110-180kW



Above 200kW

(Chart 15)

## VII. Oil filter (Chart 16)

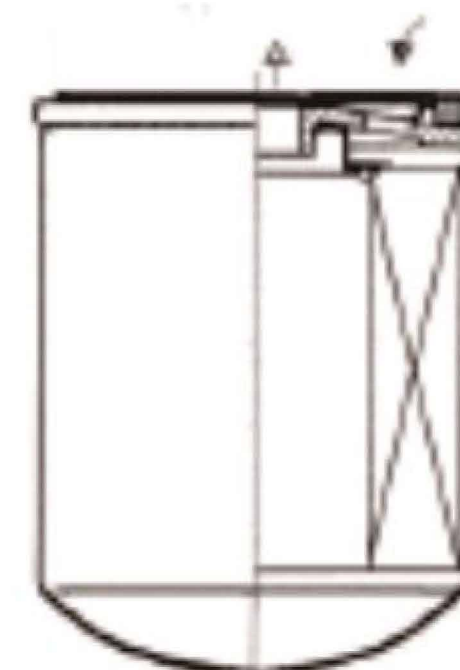
The oil filter is a paper-element one. Its function is to eliminate the impurities of the lubricant. Then it is good for the running of the bearings and rotors in the airend. When to replace the oil filter is decided according to the time of the settled by PLC controller and whether the filter element is blocked (refer to the 17 page of this manual “Replace the oil filter” and the PLC user manual).

It is better to equip a differential pressure indicator at the bottom of oil filter which the compressor’s power is above the 110kW. The differential pressure indicator will remind you that it is time to replace the oil filter when it is blocked.

When the oil filter is blocked seriously, it will result in the lack of oil in the airend and high discharge temperature, these will do harm to all the components of air compressor.



(Chart 16)

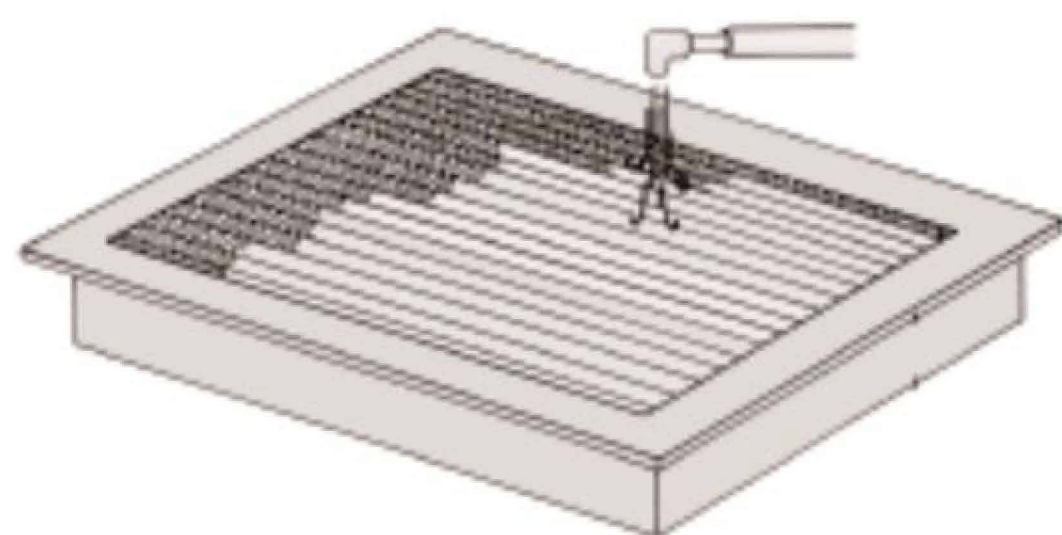


Oil-filter

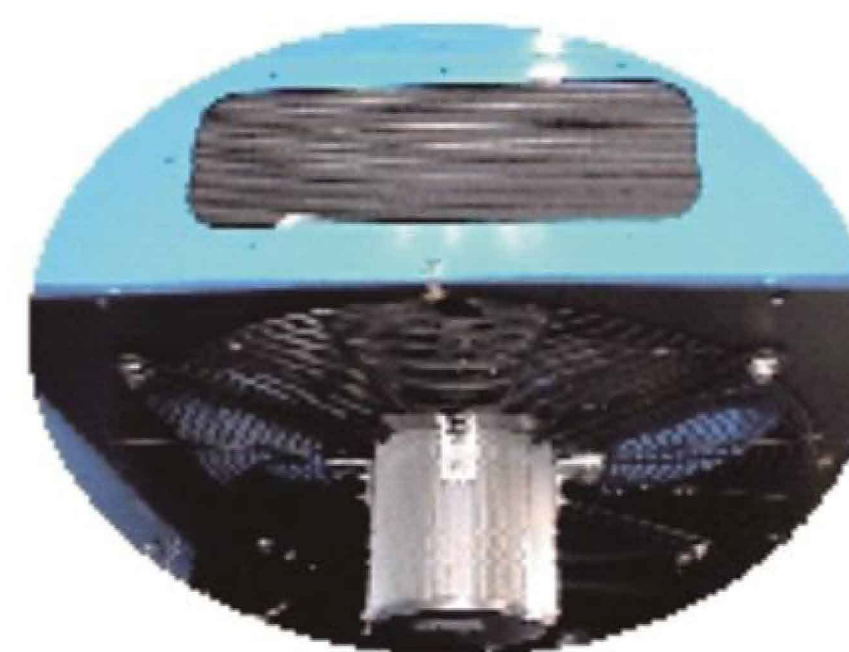
## VIII. Cooler

### 1. Air-cooled cooler (Chart 17)

The air-cooled unit adopts the plate-fin cooler (the air pipeline and the oil pipeline are combined together). All the materials are welded with aluminum alloys. The cooler is equipped on the top of the cooling fan, and the function is to cool the compressed air and the lubricant discharged from the air compressor. Most of the heat will be transferred by the lubricant and the forced air convection. The thermal resistance plays a leading part in the process of the heat exchange in the air-cooled unit. Thus, please clean the air-cooling fin regularly for good cooling effect. (page 19 “Clean the air-cooled cooler”)



(Chart 17)



### 2. Water-cooled cooler (Chart 18)

The element of the cooler consists of the high efficiency plate-fin copper tube. Most of the heat generated in the compressor is transferred by the lubricant and the forced air convection. In the process of the hot exchange, be sure to use clean cooling water in order to keep good effect of hot exchange and prolong the useful life of the cooler. And the inlet water temperature should be lower than 32°C. Clean the cooler at regular intervals when there is some water scale 20 of this manual” Clean the water-cooled cooler”)

The quality requirements of the cooling water are as follows:

1. The cooling water should be nearly the neutral, that is the concentration of hydrogen ion should be 6.5-9.5;
2. Both the organic substances and suspended mechanical impurities should be less than 25 mg/l, the oil-content should be less than 5 mg/l;
3. Temporary hardness shouldn't be more than 10° (Temporary hardness 1° means there are 10mg CaO and 7.19 mg MgO per liter water) .



(Chart 18)



# Compressed air control, safety device and electrical principle

## I. Principle of capacity control of compressed air

The control system can control the discharge compressed air automatically according to the consumption of the compressed air and make the compressor work on the pressure between the preset max. pressure and the min. pressure. In addition, the control system is based on the pressure change of the compressed air. This system mainly consists of pressure sensor, solenoid valve, air intake valve, etc.

When the compressor starts up, it is in the state of unload and its air intake valve is closed. The air inlet will be completely open when the compressor is in the normal state. The pressure of the oil-air separator will rise gradually, the compressed air will be discharged when the working pressure bigger than the rated pressure of the min. pressure valve. The compressor is operating under full load.

The system pressure will rise when the air consumption is smaller than the rated consumption. The proportional control valve starts working when the system pressure approaches the rated pressure (rated exhaust pressure is 0.05MPa) and the air intake valve will be closed gradually. When the air consumption reduces continually, the working pressure of the compressor will rise up to maximum level. Then the microcomputer will send a signal to the solenoid valve, and the power supply of the solenoid on the air inlet will be closed, the compressor will be in a unload state. If the pressure fall down to the min. level (the max. or the min. level can be set, 0.1-0.15 in general), the solenoid valve will be power on, and the air inlet will be open, the compressor will be in a full load state.

## II. Safety device

### 1. Safety valve

The safety valve is equipped in the oil-air separator. When there is any breakdown, the exhaust pressure will rise up to the opening pressure of safety valve. The compressed air will go through the valve core and be ejected to the atmosphere. The pressure in the oil-air separator will go down. When the pressure drops to the blow-down pressure of safety valve, the safety valve will close automatically. In general, the open pressure of the safety valve will higher than the rated pressure of the compressor by 0.1-0.2MPa.

### 2. Over pressure

When the actual exhaust pressure is higher than the rated exhaust pressure, pressure sensor will send a signal to the PLC controller. Then the power source will be cut down, the compressor will be stopped, the PLC will display the message of "overpressure broken"

### 3. High temperature protection

When the exhaust temperature is higher than the rated temperature or the motor temperature is higher than the rated temperature, the temperature sensor equipped in the exhaust hole and the temperature examination place will send a signal to the PLC controller. Then the power source will be cut down, the compressor will be stopped in immediately, PLC will display the related broken information.

As for the above 250kW model there are temperature sensors in the exhaust hole and the temperature examination place, the temperature sensors are collected to with two adjustable temperature switches in the electric box. When the temperature is higher than the rated temperature and the main sensor is out of service, the sensor will send a signal to the temperature switches. Then the power will be turned off and the compressor will be stopped.

### 4. Low cooling water capacity protection (water-cooled unit)

The cooling water capacity control is set by the users when they equip the water circulating system. We supply target type water flow switch according to the water pipe size, when the customer assert the claims in advance. Equip and connect to the control box, the water flow valve runs when the cooling water flow is too low. The compressor will disconnect from the power source after a delay 10 seconds, then the compressor stop.

### 5. Blocked alarm of air intake valve, Oil filter and oil-air separator

When the useful life of air filter element, oil filter, oil-air separator achieve the rated figure set by the PLC controller, PLC will display the replace information. As for the model which power is above 110kW, it should be equipped with a differential pressure indicator, when the differential pressure is up to 0.1-0.15MPa, the differential pressure indicator send a signal to the PLC controller, the PLC will display the rated information but the compressor doesn't stop.

## III. Electrical principal

The electrical principal could be seen in the "Electrical principal diagram" in the electrical box or the material bag.

Adopt Y- $\Delta$  start method. The eclectic protection functions are as follows: phase protection (Prevents the compressor from reverse-rotation), phase-lacking protection and overload protection.

# Pre-operational preparations

## I. Preparation before starting the machine (Refer to the PLC user manual)

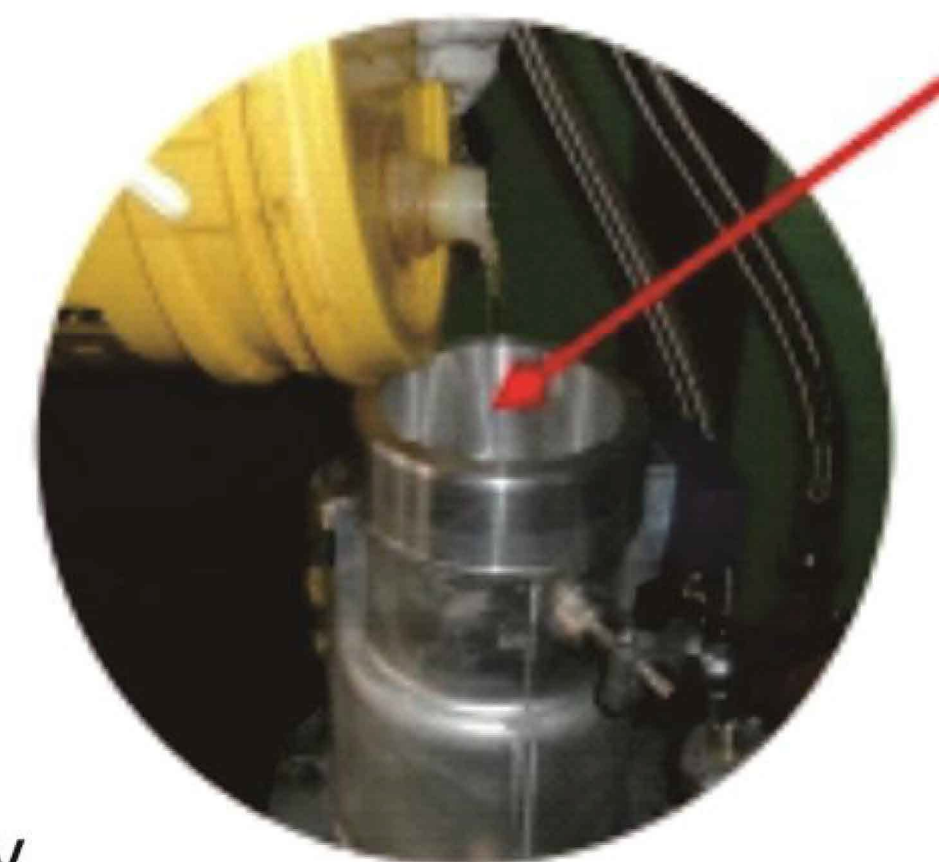
1. Remove the red transportation fixed trestles.
2. As for the belt drive compressor: Check the degree tightness of the belt, operate according to the Chart 19.
3. As for the water-cooled compressor: Make sure open the inlet and outlet valve, check whether the water pipe is unimpeded and the water pressure is 0.2Mpa-0.4Mpa.
4. Check all the components joints, if loose, fasten it in case of the oil leakage, air leakage and other accidents.
5. Check the lubricant through the view oil mirror, keep the normal oil level according the requirement (In the middle of the green mark), and add it if not enough.

When adding the lubricant, please use our synthetic screw lubricant. The deterioration of lubricant caused by the mixed usage of different brands or different type's lubricants may lead to a serious breakdown of the whole unit.

6. If the unoccupied time is over than 4 months after out of factory or stop compressor, please add about 3 liters lubricant (Chart 20). Rotary the compressor several times in case of the broken down of the airend caused by the long time no use. (Pay attention to the air intake valve in case that the sundry goods enter the airend cause accidents!). The lubricant should clean and no impurity. (Chart 20)
7. Rotary the compressor according to the direction of the arrow.
8. Input the copper core flexible cord with the powerful compressor into the electrical control cabinet and connect to the ground, test the voltage and the three-phase power source. Check the lines in the electrical control cabinet in case of accidents caused by the loose lines.
9. Clear away all the irrelevant components.

## II. Start

1. Connect from the power source.
2. Open the air outlet valve.
3. As for the water-cooled: Examine the water pipe and the water pressure whether it is 0.2Mpa-0.4Mpa.
4. Turn the red emergence stop button 90° in clock wise, the compressor will be in load state, examine whether the PLC display "normal state" or not. You can hear a sound and the PLC will display the "phase default" when the phase-sequence is wrong. Before resolving the problem, please press the red emergence stop button, disconnect from the power source. Change any two in three-phase lines, make sure there is not any default, and then can go to the next operation.
5. Start the compressor instantly; Check the direction of the compressor again. If the direction is wrong, stop the compressor and check it.
6. After normal start, make sure that the PLC display normally and there is no noise. If there is any problem, stop the compressor and resolve it immediately. If everything is ok, the pressure of the compressor will raise from 0 to rated pressure gradually. Examine the PLC display information again, if there is any problem of noise, vibration, oil leakage and air leakage, stop the compressor immediately.



7. When the compressor in normal operation, examine the controller parameter, record the running information for reference.



For the first start the atmosphere temperature is  $\leq 5^{\circ}\text{C}$ . Set the PLC to manual method. Stop the compressor 5 minutes after preheating compressor to change the control mode back to automatic model.

### III. Matters should be paid attention to

1. Pay attention to the oil level, if the oil level drops fast and there is too much oil content in the compressed air.
2. Pay attention to all the measuring appliance data whether they are in the normal range or not, the pressure of compressed air should in the rated range. The exhaust temperature should be  $80^{\circ}\text{C}$ - $95^{\circ}\text{C}$  (As for water-cooled compressor, the exhaust temperature can be adjusted through the open degree of the water inlet valve.)
3. When the pressure difference between the oil-air separator, oil filter and the air filter is too high, the PLC will alarm. Please replace new ones even if the compressor can still run in case of the accident caused by the lack of oil.
4. When the temperature is too high, the PLC will alarm and the compressor will stop automatically. Please resolve the problems before restarting the compressor.
5. Avoid the start/stop frequently except on special occasions such as debugging/using conditions, especially starting in high pressure. The interval of the start and stop should be 5 minutes.

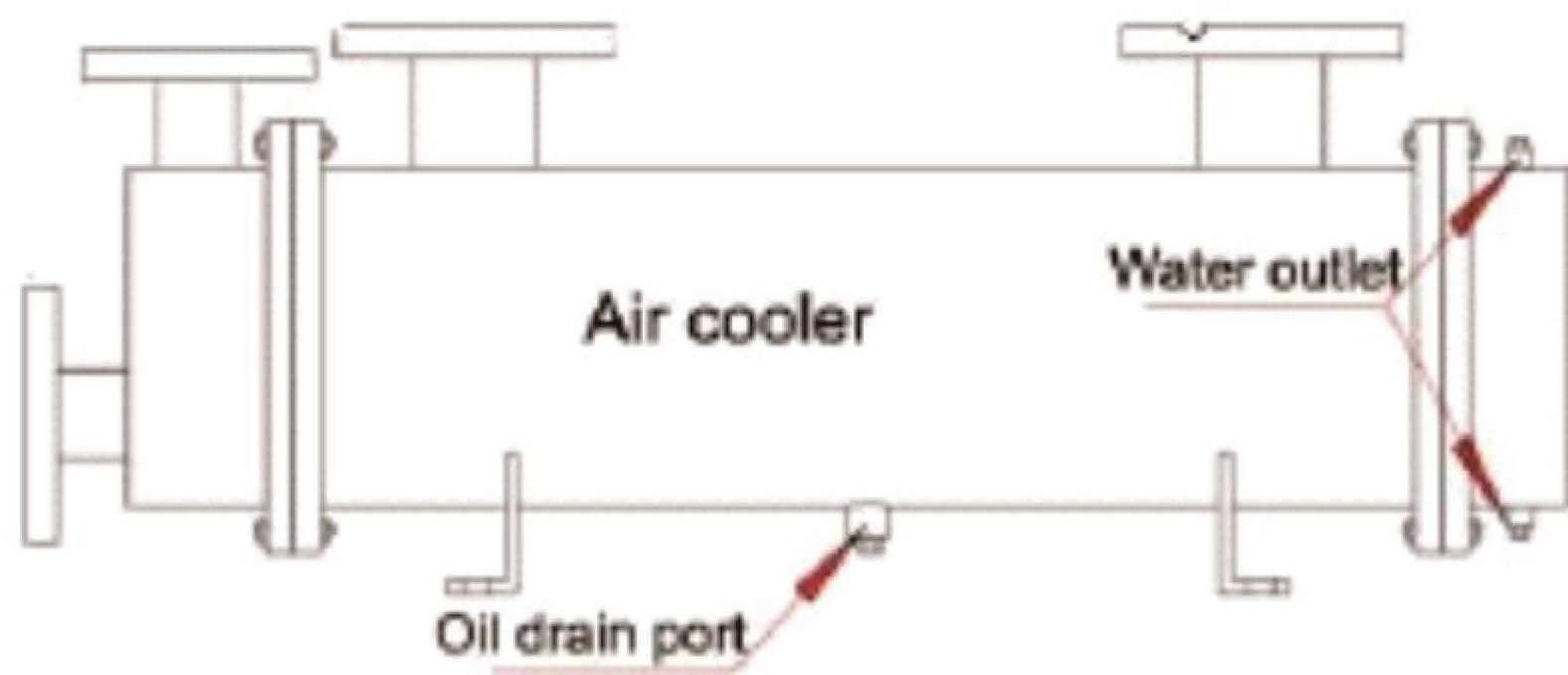
### IV. Stop

Press the OFF button on the PLC controller panel if it is necessary to stop the compressor, the compressor should be stopped according to the rated procedures (Red emergence button can be used only in the emergence condition!). The blow down valve in the air intake valve and solenoid valve on oil-air separator will discharge the compressed air after stopping the compressor; disconnect from the power source after releasing all the compressed air. Close the cooling water valve in water-cooled unit.

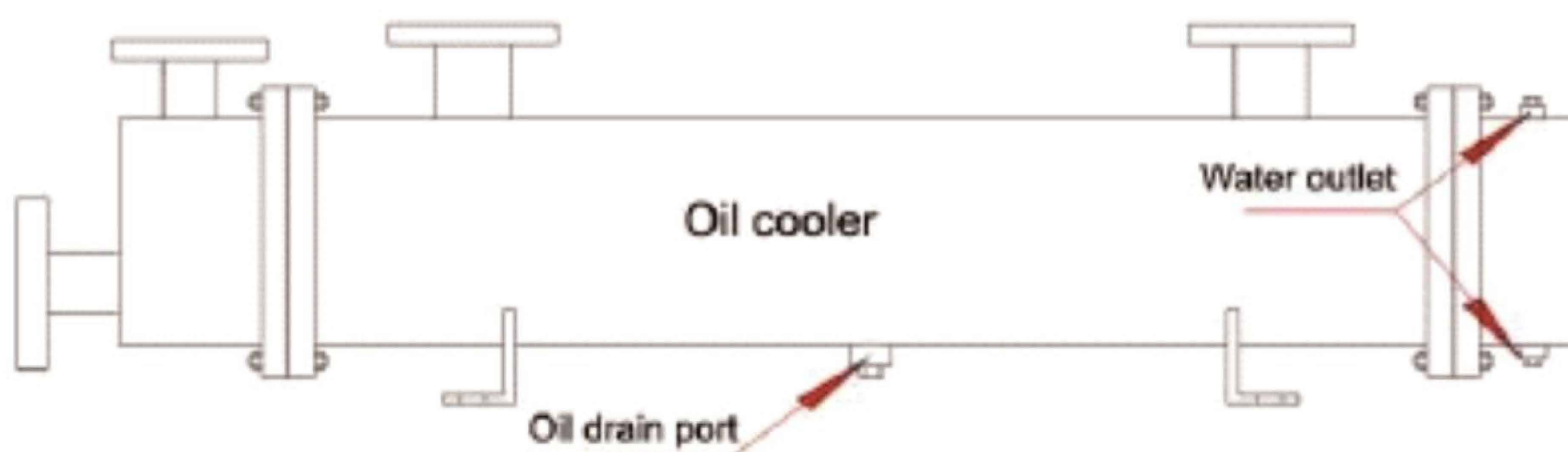


Attention:

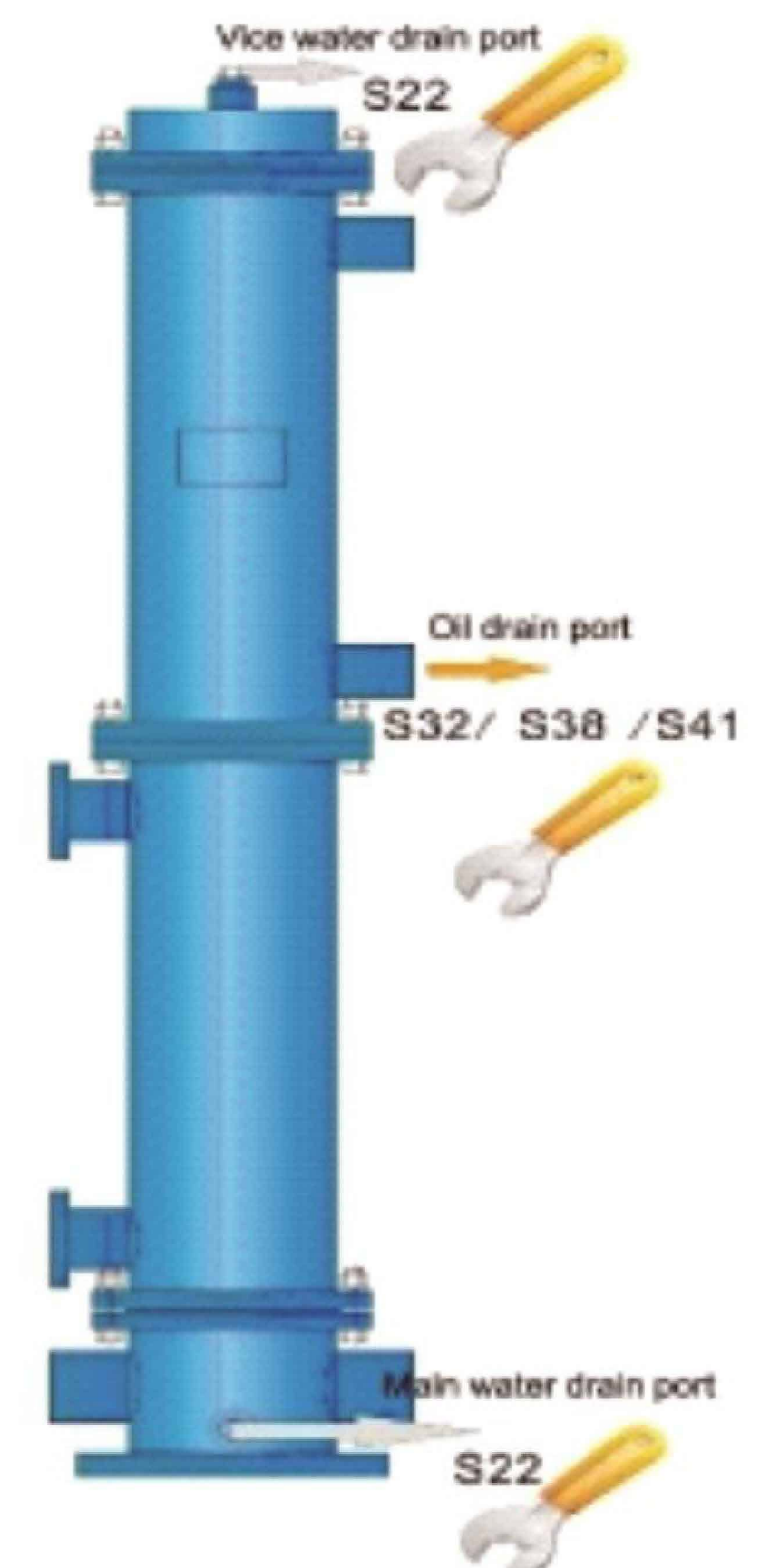
1. Disconnect from the power source 4-5 minutes only after stopping the compressor. Then the compressed air in the compressor could be discharged completely through the solenoid valve and the compressor will be in a unload state.
2. In winter, if the temperature is below  $0^{\circ}\text{C}$ , the water inlet valve of the water-cooled unit should be closed after stopping the compressor (see the following chart) in case of the broken of cooler caused by freezing.
3. As for water-cooled unit with the power 55-80kW, the coolers are vertical-type (Chart 21), the others are horizontal-type (Chart 22), drain the water drain according to following drawing.



Water-cooled cooler drawing



(Chart 22 Horizontal-type separated water-cooled cooler)



(Chart 21 Vertical-type combined water-cooled cooler)

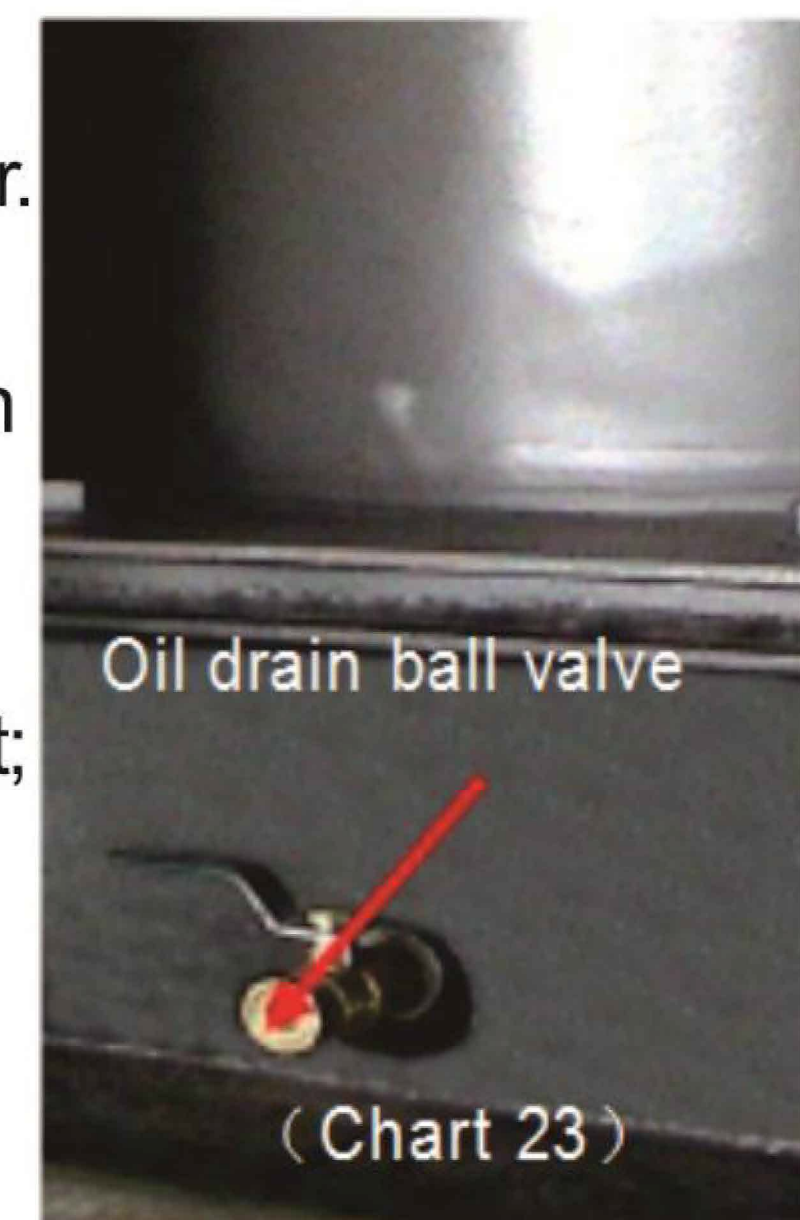
# Maintenance

## I. Drain condensed water (at the bottom of the oil-air separator)

The water in the air may be condensed in the oil-air separator tank, especially in moist weather. There is a lot of condensed water if the exhaust temperature is lower than the dew point of the air or the compressor is stopped of cooling. Too much water in the oil may lead to the emulsion of the lubricant, and affect the machines' normal operation. Such as:

- Bad lubricant effect of the air end;
- Oil/air separation effect gets worse, bigger differential pressure of the oil-air separator element;
- Erosion of the components..

Therefore, please set condensed water discharging timetable according to the temperature conditions.



## II. Methods of draining the condensed water:

Before draining the condensed water, stop the compressor and release the pressure in the compressor. In addition, the temperature of the compressor should be proper and the condensed water should be fully deposited. The best time to drain the condensed water is before starting the compressor in the morning.

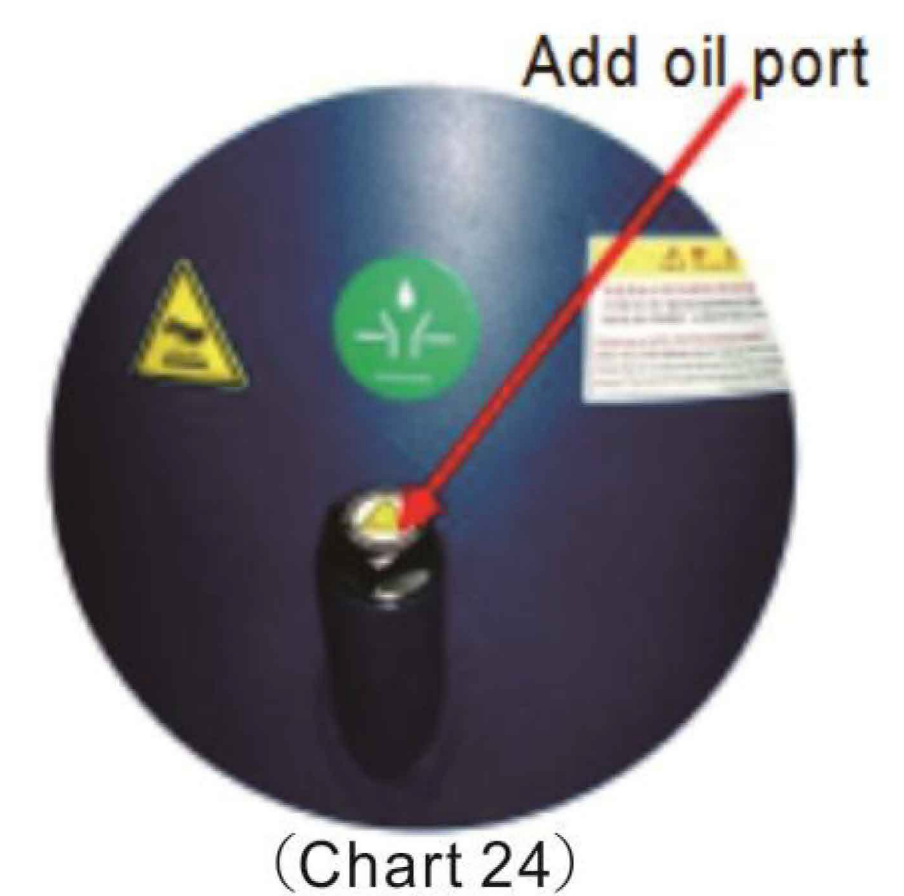
1. Twist out of the front screw plug of the ball valve (Chart 23);
2. Open the ball valve slowly till there is oil drain out, then close the ball valve;
3. Twist the front screw plug.

## III. Methods of draining the condensed water:

Replace the lubricant after stopping the compressor, and make sure that the compressed air in the compressor is released completely.

Following the steps for replacing the lubricant:

1. Run the compressor, makes the exhaust temperature up to 60-80 °C and the lubricant has been full preheated. Then stop the compressor and release the pressure in the compressor;
2. Get ready for the container for the oil, twist out of the screw plug of the oil drain ball valve;
3. Open the ball valve slowly to drain the oil (Chart 23);
4. As for the water-cooled units, twist out of the screw plug at the bottom of the cooler, in order to drain all the oil;
5. Close the ball valve, twist the screw plug;
6. Deal with the waste oil properly.



Following the steps for adding the lubricant:

1. Open the oiling port on the oil-air separator (Chart 24), add the lubricant to the oil-air separator tank;
2. As for the water-cooled units, remember to twist the screw plug at the bottom of the oil cooler;
3. Twist the screw plug and examine the oil level after starting the compressor, the oil mark should be kept in the middle of the green mark;
4. Make the record of the replacement.

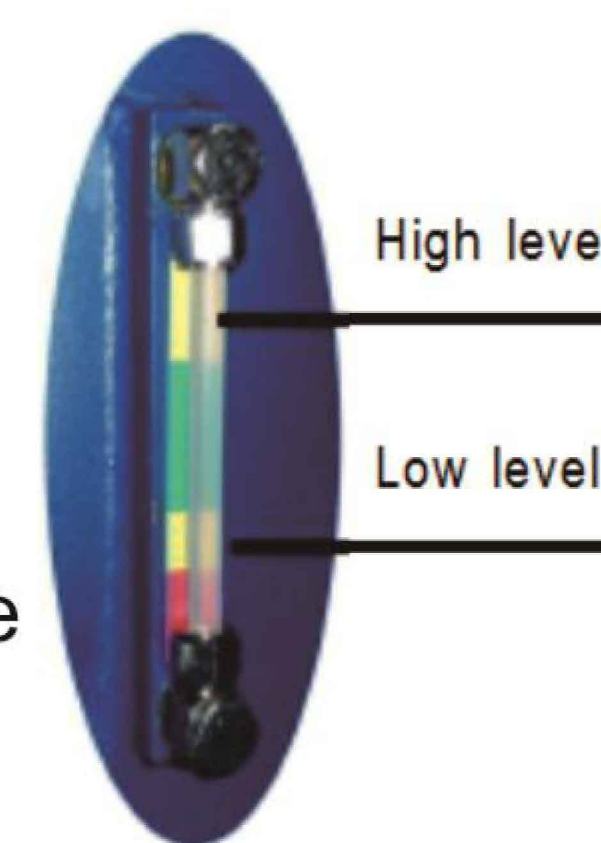
## Lubricant quantity of all kinds of models

Motor power	Lubricant consumption	No.	Motor power	Lubricant consumption	No.
5.5-18 kW	10-12 L	03012-1046	90 kW	55-60 L	03012-1046
22-30 kW	20-25 L	03012-1046	110-180 kW	80-90 L	03012-1046
37-45 kW	35-40 L	03012-1046	200-315 kW	130-140 L	35012-1046
55-75 kW	55-50 L	03012-1046	355-450 kW	200-220 L	35012-1046

#### IV. Add the lubricant

At the running state, the oil level should be kept between the min. and max. oil level(Chart 25). The separating effect may be affected if there is a lot of lubricant. The cooling performance may be affected if there is little lubricant. In the oil replace period, add the lubricant if the oil level is lower than the min. oil level. The operating steps are as follows:

1. Stop the compressor and make sure that the pressure is released completely, disconnect from the power source.
2. Open the oiling port on the oil-air separator tank; add lubricant in the tank.



(Chart 25)

#### V. Lubricant (Means cooling oil)

You must use the lubricant and replace the lubricant according to the requirements strictly. The lubricant with poor quality may cause the following sequences:

- Carbon deposition or oil emulsification, oil pipeline be blocked, the valves out of services, system breakdown and burn down of the airend.
- Bad separating effect, shorten the useful life of the oil filter and the oil-air separator element.
- Shorten the useful life of the running components.

So, please use the specified lubricant for the screw compressor. Add or replace the lubricant of the same factory and same No., The lubricant of different No. and different factory can't be mixed.

- Must be the specified lubricant for the screw compressor.

Replace period of lubricant:

The replace period of the lubricant is decided by the atmosphere, temperature, dustiness and the acid and alkali gas in the air. The replace period should be prolonged or shortened according to lubricant No. and the actually atmosphere. The compressor which has not been used also should replace the lubricant every 2 years.

#### Lubricant no. and the Replace period for reference

Lubricant No.	03012-1046(Semi-Synthetic lubricant)	35012-1046(synthetic lubricant)
Replacement Period	Replace it every 3000 hours	Replace it every 8000 hours

Please use our specified environmental protection lubricant special for the screw compressor (Chart 26) or the lubricant authorized by us.



(Chart 26)

⚠

Attention: Some companies which replace special lubricant for screw compressor with the normal lubricant. This may cause badly sequence. So, please purchase it carefully!

Specified original environmental protection cooling lubricant

## VI. Replace the oil filter

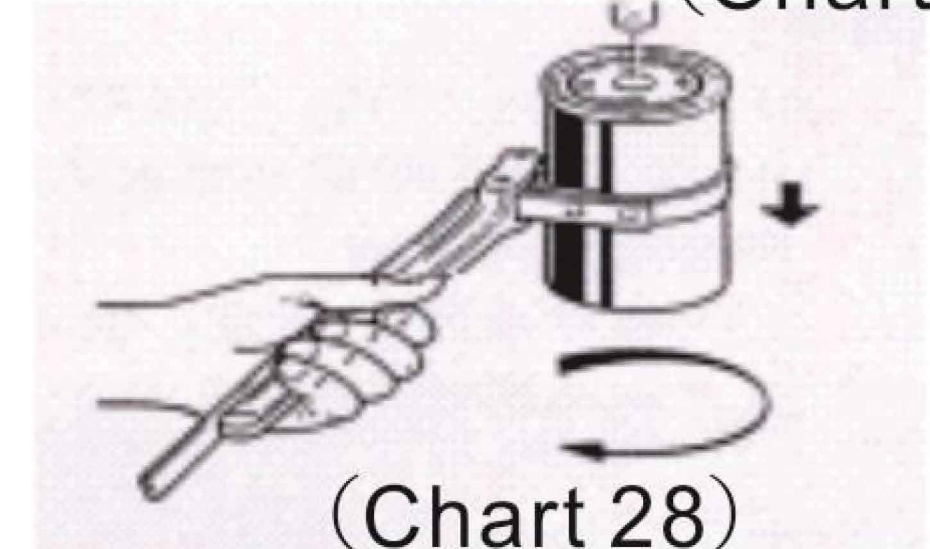
The oil-filter equipped on one side of the airend (Chart 27). Replace it every 300-500 hours after the first running, replace every 2000 hours later Or replace it when the differential pressure indicator alarm (the differential pressure is more than 0.13Mpa).

Operating steps:

1. Stop the compressor and make sure that the pressure is released completely, disconnect from the power source.
2. Pull out of the oil filter in counterclockwise; take care of the remained oil.
3. Check the new oil filter and the integrity of the sealing circle.
4. Fasten the oil filter in clockwise manually.
5. Check whether the oil filter is in a normal state or not.
6. Keep the replacement records.



(Chart 27)



(Chart 28)

## VII. Replace the oil-air separator element

The performance of the oil-air separator element is the main factor that affects the oil content of the compressed air.

The oil-air separator element is equipped in the oil-air separator tank (Chart 29), or replace it when the differential pressure indicator alarm (differential pressure is  $> 0.1\text{Mpa}$ ); or replace it once a year even if the total running hours are less than 3000 hours a year.

When the quality of the compressed air or the quality of the lubricant is not good enough, the oil-air separator will be blocked easily and the differential pressure indicator will alarm ahead of time.

Operating steps:

1. Stop the compressor and make sure that the pressure is released completely, disconnect from the power source;
2. Dismantle the connecting pipelines of the min. pressure valve;
3. Dismantle oil-extracting pipeline and others control pipelines;
4. Dismantle the cover of the oil-air separator;
5. Pull out of the oil-air separator element;
6. Replace a new oil-air separator element;
7. Keep the replacement records.

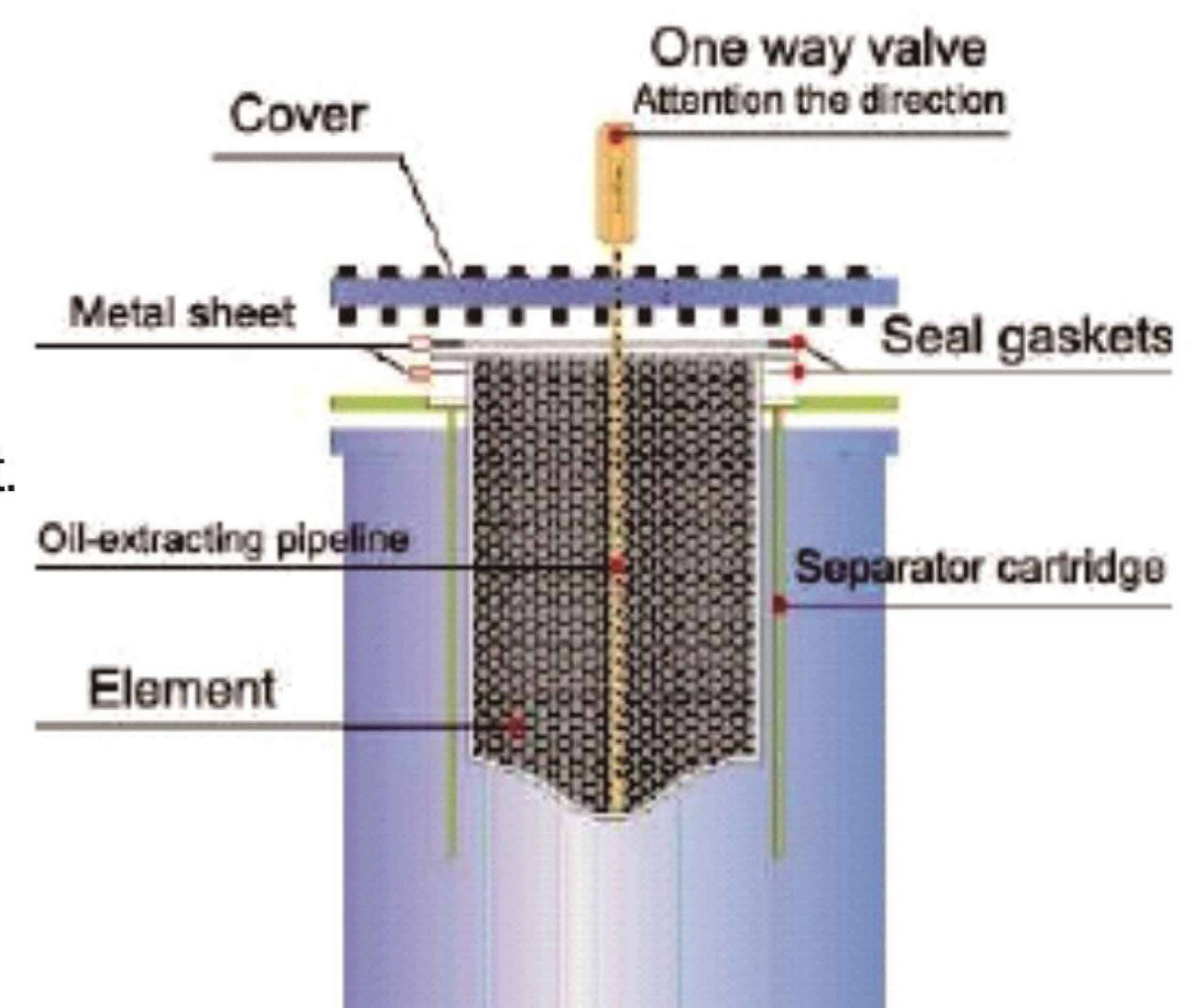


(Chart 29)



### Special attention for changing the oil-air separator element (Chart 30)

1. Make sure that the oil-extracting pipeline is inserted into the bottom of the oil-air separator element to ensure that the waste oil is drained completely.
2. Pay special attention to the two seal gaskets; make sure that they are equipped with the metallic needle or metal copper fin. Please add them if not. Make sure the cover, oil-air separator element and the oil-air separator are connected with them. The function of the sheet metal is to ensure that the oil-air separator element is connected to atmosphere and prevent the oil-air separator element from collecting static which should lead to oil air explosion.



(Chart 30)

## VIII. Replace the air filter (Chart 31)

The useful life of the air filter is decided by the atmosphere humidity, dustiness in the air. Generally speaking, you should replace it every 2000-3000 hours or replace it when the differential pressure indicator alarms (differential pressure is  $> 0.005\text{Mpa}$ ). And be sure to clean the surface of the element during the period. When the quality of the atmosphere is not good enough, the air filter will be blocked easily and the differential pressure indicator will alarm ahead of time.



When maintaining or replacing the air filter, please make sure that no matters are left in the air end and cover the inlet hole of the air end. Rotary the air end several times according to the mark direction, start the compressor if there is not any trouble.

Maintenance steps of the air filter:

1. Stop the compressor and make sure the pressure is released completely and disconnect from the power source;
2. Screw off the butterfly nut, take down the cover;
3. Screw off compression nut, take out of air filter element;
4. Clean the filter element or replace a new one.

Clean method:

- a) Knock method: Knock the upper and downer of the element gently in case break the filter element; this can remove the dust impurities on the surface of the element.
  - b) Blow up the impurities by the compressed air, but the pressure of the compressed air should be less than  $0.4\text{Mpa}$ .
5. Clean the impurities in the body.
  6. Equip according to the counter order. Attention: Check the end face and the head face of the element for leak test.
  7. Keep the replacement records.



## IX. Check/Adjust the automatic belt tensioning device

As for the belt drive model, please check the degree of tightness every 2000 hours. If the belt is too loose, please adjust the nut ① (Chart 21) till the belt tightens and the spring can run. For protecting the useful life of the belt, avoid the rejection of the belt caused by the oil pollution of the oil lubricant.



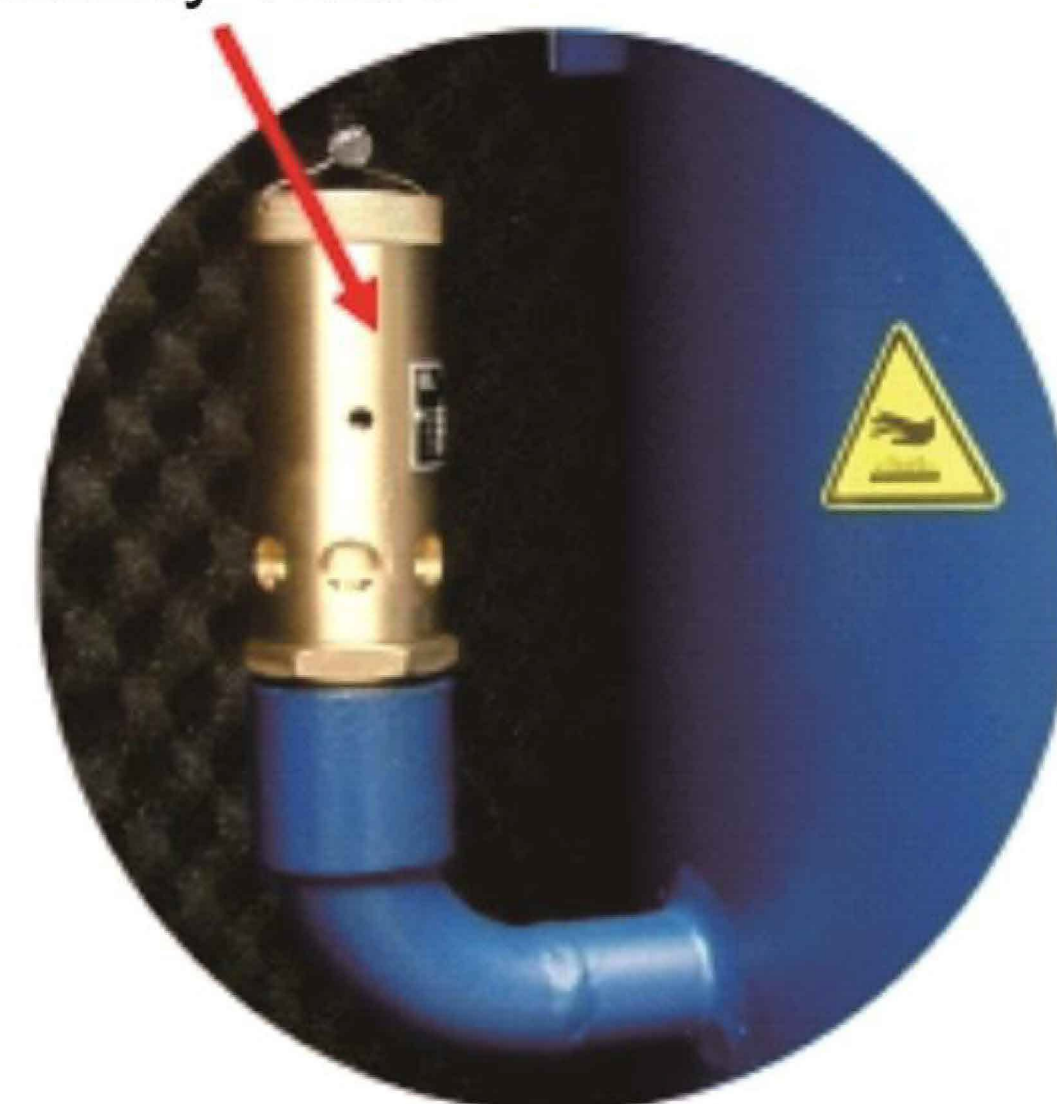
## X. Maintenance of safety valve

The safety valve is equipped on the oil-air separator tank (Chart 33), check once a year or according to the local labor department's stipulation.

Operating steps:

1. Stop the compressor and make sure that the pressure is released completely, disconnect from the power source;
2. Screw off the safety valve;
3. Examine the sensitivity by the special testing equipment. Dismantle the seal, if necessary. Screw off locking nut. Then you can adjust the opening pressure; turn up the opening pressure in clockwise, vice versa.
4. Send the adjusted safety valve to the local labor safety department for examination, seal it when pass the examination. Then you can equip it again.

Safety valve



(Chart 33)

### Safety valve opening pressure for reference:

Compressor working pressure Mpa	0.7	0.8	1.0	1.3
Safety valve opening pressure Mpa	0.8	0.9	1.1	1.4



Attention: The safety valve opening pressure should be less than the design pressure of the oil tank. Customer had better not adjust the safety valve privately. If necessary, make sure that it passes the examination of the local labor safety department, or we won't take responsibility for all the sequences.

## XI. Maintenance of cooler

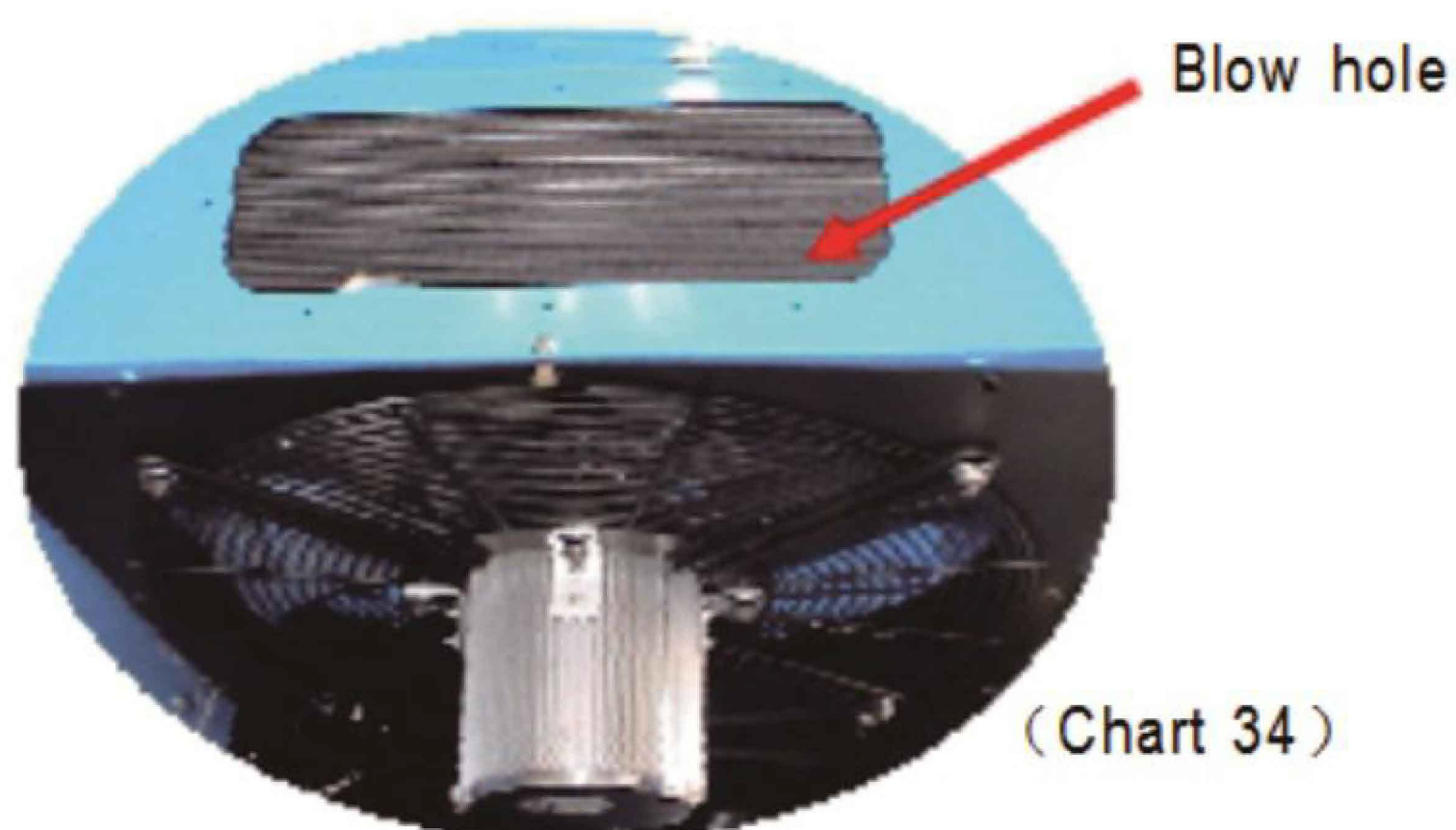
Clean the cooler in schedule according to using condition, make sure that the compressor work in the normal temperature. This can guarantee long useful life of the cooler. The exhaust temperature of the compressor will rise up if the cooler is blocked.

Therefore, clean the cooler regularly can guarantee the compressor working temperature less than  $95^{\circ}\text{C}$ . This will be good to the function and useful life of the compressor.

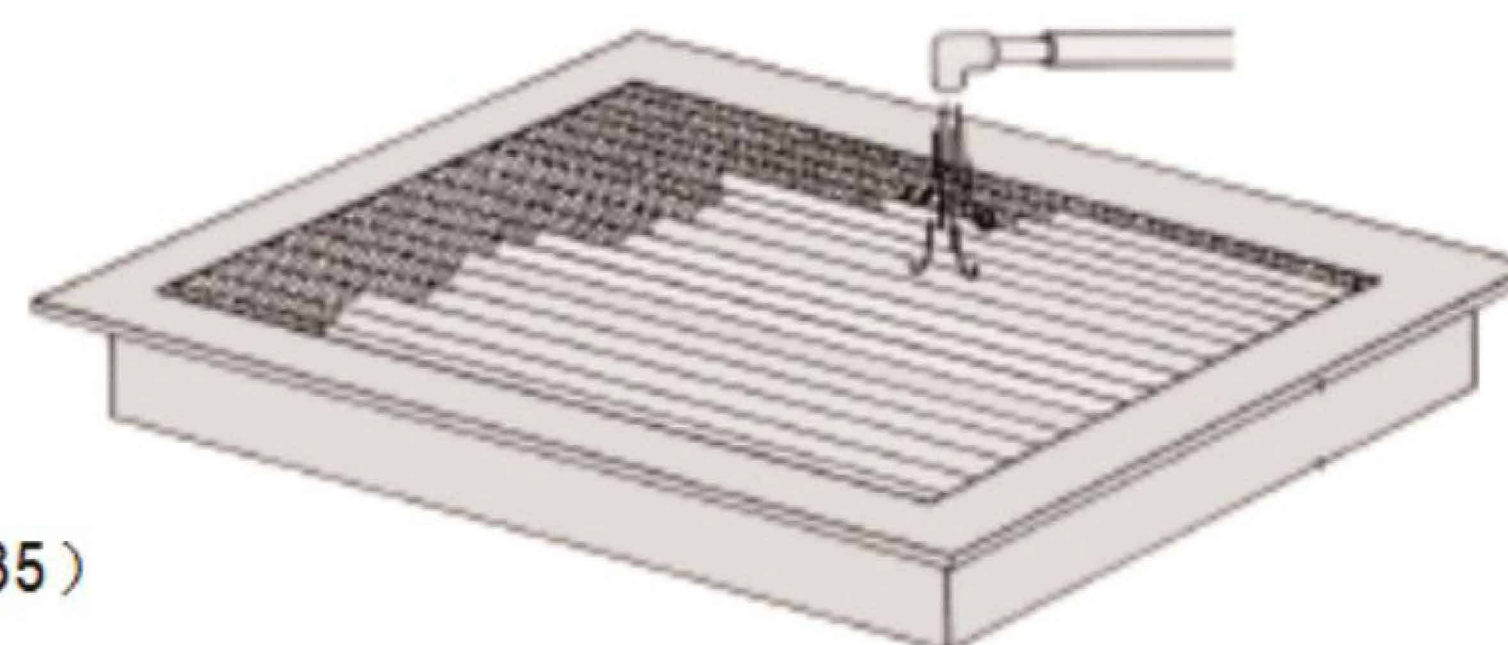
You can remove dirties by using the cleaning liquid. The clean working will be quite boring if the scales are too thick. You may have to dismantle the cooler to clean it.

1. Clean the air-cooled cooler (Chart 34、35)

Clean the surface of the radiator every 2000 hours. Open the blow hole on the side of the fan (Chart 34). Blow the dust on the surface of the cooler by the blows dust air-gun till the dust has been removed clearly, dismantle the cooler, pure the oil into the cooler and seal the inlets/outlets in case of the entering of the impurities. Then blow up the dust by the compressed air or rush it by water (Chart 35), blow the water up on the surface, equip it again.



(Chart 34)



(Chart 35)



**Attention!** Don't remove the dirty by the iron brushes or other hard things in case of damaging the cooler.  
**Attention:** The material of the air-cooled cooler is Aluminum alloy, as for the water-cooled cooler is copper. Be sure not to use the cleaning liquid which may react with the cooler.

2. Clean the water-cooled cooler.

The water-cooled cooler adopts the high-efficiency plate-fin cooler; Most of the heat will be transferred by the lubricant and be taken out by the convection of the water. Generally speaking, clean the water-cooled cooler every 3500 hours for the water-cooled unit.

Operating steps:

1. Stop the compressor and make sure that the pressure is released completely and disconnect from the power source;
2. Disassemble the cooling water inlet/outlet water pipes;
3. Pours into the clean solution and wash out with pumps (wash in the counter direction will get a better effect).
4. Equip the inlet/outlet water pipes again;

The clean effect couldn't be good if there are a lot of scales, you can disassemble the oil cooler separately, open the covers, and remove the dirty by the steel wire or other tools.

## **XII. Add lubricant to bearings (refer to the Motor user's manual)**

Be sure that the motor bearings have been well lubricated during the running period. Replace or add the No.3 general lithium bases grease every 5000 hours. Replace the grease if the bearings are too hot or grease degeneration, the add grease take up 2/3 place of the bearing house. The oiling ports of the motor are on the covers, add the grease by the oil gung.

## **XIII. Waste disposal**

Disposal the used lubricant, oil filter, air filter and oil-air separator element should according to the related local laws and regulations.

## **XIV. Maintenance attention**

1. Before maintaining the compressor, disconnect from the power source, release the compressed air in the compressor and make a notice board "Don't connect the power source."
2. Please use original components from our company; otherwise we will not take responsibility for them. maintenance personnel if there is anything wrong.
3. The airend is a precise component; you must send it to us for maintenance or turn to help from our designated.

## **XV. Sealing**

1. Drain all the lubricant out and replace the new lubricant of same brand when you want to keep the
2. Lay the compressor in a dry and closed place. Maintenance should be reinforced especially in the hot or humidity place.
3. The oil sealing period is 12 months (from the date of out of factory), please oil seal it after.

Checking Items	Working Content	Maintenance Cycle						Remarks
		Day	Week	Month	Half Year	A Year	Two Years	
Fastener	Check the bolts and transmission components	☆						The bolts and transmission components can't fall off or loosen.
Coupling	Check the coupling	☆						Concentricity is normal with no damage
Strainer of oil return pipe				★				No sundries
Condition of oil return in transparent return pipe	Make sure the oil return is normal	☆						Oil return is fluent
Unloading valve	Make sure the machine is stopped and deflating	☆						Normal stop, unloading and deflating
Lubricating oil <input type="checkbox"/>	Check the level and quality of oil	☆						The oil level should be within the alerting line, without oxidation discoloration
Air (oil) exhausting temperature	Make sure the venting temperature	☆						The normal temperature is between 70°C and 105°C
Voltage and current	Check the voltage and current	☆						Within 1.2 times of that of the rated current
Air Filter <input type="checkbox"/>	Cleaning		☆					Replace the filter element only.
Drainage in gas and oil barrel	Water drainage		☆					Discharge from the oil discharge valve
Dustproof gauze	cleaning and maintenance			☆				Take out and clean
Pipeline system	Check the situation of oil leakage and air leakage	☆						No phenomenon of oil leakage
Circuit system	Line terminal or displaying information	☆						No phenomena of information alarming or wire decrustation
Oil strainer <input type="checkbox"/>	checking and cleaning			☆				Replace the filter element only
Filter element of oil-gas separator	Cleaning and replacement			★				Replace the filter element only

Checking Items	Working content	Maintenance cycle						Remarks
		Day	Week	Month	Half Year	A Year	Two Years	
Mechanical seal for the host machine	Checking the leakage	☆						The quantity of oil leakage is less than 1.5g/h
Motor insulation	Checking the insulation resistance					★		More than 2MΩ when the voltage is 500V
Relief valve	Checking the sensitivity of the action				☆			In condition of rated pressure, it can discharge when the discharging ring of the relief valve is pulled with a force less than 1 kg and the sundries are cleared off.
Pressures of automatic stop and automatic start up	Checking the sensitivity of the action	☆						Stop pressure and start-up pressure are in normal condition .
Cooler	Maintenance and cleaning	☆						Clean the surface dirt in the way of blowing
Indicator of the oil level indicator	Checking the clarity	☆						Replace it when the oil level is fuzzy .
Belt and pulley	Checking the firmness or replacement	☆						Extrude the center of the belt with the thumb to make sure it is 10 to 15 mm and with no damage.

**NOTES:** “★” refers to parts that are maintained by users, “★” refers to parts that are entrusted to service center . “□ ” refers to parts that must be replaced after the new machine running continuously for 500 hours, then replace them after 3000 hours’ work. The maintenance parts are those whose working time are less than 6000 hours .

**PROCESSING METHOD OF LONG TERM SHUTDOWN EQUIPMENT SHOULD BE SEALED IF IT IS SHUTDOWN FOR A LONG PERIOD OF TIME**

- a) Clean the equipment and spread some anti-rust oil on the parts which are easy to rust.
- b) Electric equipment such as: motor control panel, all valves, tables, indicators, etc. shall be wrapped up with plastic paper or oil paper.
- c) The water in the oil cooler (gas and oil barrel), gas cooler and air storage tank shall be all discharged.
- d) Covering all the equipment with plastic paper or some other similar materials.
- e) Transportation fixed screw should be locked if the transfer storage space is changed,

**To restart the sealed air compressor, the motor insulation resistance should be measured first (No less than 1 MΩ).If the air compressor has been sealed for more than a year the lubricant should be replaced.**

# Faults and Troubleshooting

PROBLEM	CAUSES	MEASUREMENT TO MAKE
Motor starting up failure	No input voltage or the voltage is in abnormal condition .	Check the power supply circuit
	Phase failure (The motor gives out "buzz-buzz" sound)	Check the power line terminal, electric controller and on-line terminals
	Connection error in power phase position	Adjust the phase-sequence and repair or replace the main controller
	Blown fuse	Check and make sure there is no error in circuit and replace the fuse
	Burning of AC contactor or failure	Repair or replace
	Failure of pressure switch (Pressure sensor)	Repair or replace
	Motor burning out and bearing failure	Repair or replace
	Clamping stagnation in dynamic tray in handpiece or block up caused by bearing failure	Repair or replace
	Temperature sensor operation protection	Find out the causes and eliminate the breakdown
	Current protector operation protection	Find out the causes and eliminate the breakdown
Frequent starting up	Failure in starting up the time delay unit	Check and reset the time delay unit and main controller or replace it
	Serious leakage in pipeline	Check the leaking parts and eliminate the breakdown
Exhaust (oil) temperature is too high	Volume of air storage tank is not large enough	Add air storage tanks or replace larger air storage tanks
	Environmental temperature is too high	Increase the air volume in the unit room
	The cooler is dirty and with bad heat dissipation	Clean the cooler
	Blocking in oil pipeline	Check and get the pipe through
	Failure of temperature sensor	Repair and replace
	The lubricating oil is not enough	Add lubricating oil
	Failure in cooling fan	Repair or replace
	Failure in pressure switch, force sensor and main controller	Repair adjust and replace
	Too much air consumption	Repair the pipeline, buy more air compressors and control the air volume
	Serious leakage in pipeline	Repair and replace if necessary
Too low exhaust pressure	Blocking in air filter	Clean and replace the filter element
	Breakdown in air inlet valve	Repair or replace
	Blocking in oil-gas separator	Repair or replace
	Leakage in unloading solenoid valve	Repair or replace
	Slipping in V shape rotational belt	Repair, adjust and replace

PROBLEM	CAUSES	MEASUREMENT TO MAKE
Great consumption of lubricating oil	Blocking in oil return pipe	Disentangle or replace
	Warranty period of oil-gas separator is due	Clean or replace
	Too high lubricating oil level	Decrease the oil level
	Breakdown in minimum pressure valve	Repair or replace
	No use of special lubricating oil	Exchange the special lubricating oil
Abnormal noise and vibration	Fasteners become flexible. Host bearing wear or damage in motor	Repair or replace
	Conveyor wear	Replace the belt
	Wear or looseness in the coupling	Check,fasten or replace
	Foreign matters enter rotating parts such as handpiece, motor or fan	Repair or replace
	Early deterioration in lubricating oil	Failure in empty the used lubricating oil
Oil leakage in air filter when it is shutdown	No use of special lubricating oil	Exchange special lubricating oil
Great current or trip caused by slow rotation of the motor	Too high exhausting temperature	Increase air volume and decrease the environmental temperature or repair the temperature control valve and cooling system
	Breakdown in air inlet valve	Repair or replace
	Gas return in minimum pressure valve	Repair or replace
	Unloading solenoid valve fails to deflate	Repair or replace
	Breakdown in handpiece, motor and the bearing	Repair or replace
	V shape rotation belt is too tight	Repair and adjust the handpiece
	Low input voltage(The wire is too long and the diameter is too small)	Adjust the wire
	Poor contact in circuit	Repair or replace
	Too great differential pressure in pipeline (Blocking in filter element)	Repair or replace
	Serious imbalance in three-phase voltage	Check and eliminate the breakdown
Failure of rotating cooling fan	Poor contact or current capacity of the breaker is not large enough	Repair or replace
	No use of special lubricating oil	Exchange for special lubricating oil
	Too high temperature, great current and operation of overload protector	Repair or replace
	Phase failure	Check the circuit and AC contactor
	Breakdown in temperature controller and main controller	Repair or replace
	Inconformity in three-phase resistance value ( Motor burnt out)	Repair or replace
	Breakdown in fan bearing	Repair or replace