JIANGSU MINNUO GROUP Co.,LTD

Oil-injection Screw Air Compressor

Handbook

(Installation, Maintenance and Operation)

Preface

This manual covers the working principle and main structure of our screw compressor. In order to let the users make the best use of our products, we try to provide operators with the information of function, operation, and maintenance of the compressor.

Before the first installation and startup of the compressor, please carefully read the manual, so as to acquire the knowledge on operation and maintenance items have not been listed in this manual, please feel free to contact our service department, who are ready to help you at any time.

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Chapter 1 Chief introduction

Chief introduction of screw compressor

Oil-injected screw compressor has feature of high reliable, less consumption parts, good balance, less vibration, low noisy and high efficiency. During compress process, it injects lubricant into room and bearing depending on pressure gap.

The lubricant will form film between rotors, the positive rotor will drive negative rotor directly and make seal.

Lubricant can lower noisy made by high frequency compressing.

Lubricant can absorb mass compressing heat.

I) The structure of screw compressor

(1) Basic structure

Oil-injected screw compressor is double-bearing, cubage, turning compressor. Its inlet is above and outlet is low part. A pair of precise positive and negative rotors, horizontally, parallel in house. The positive has 5 teeth and negative has 6 teeth. The diameter of positive is bigger than negative. The teeth are spiral and surround outside of rotors. Both teeth gnaw each other.

(2) Gnaw each other

The motor drives the positive rotor through both coupling and increase-speed gear. The positive rotor drives the negative and

run together owing to gnaw each other. The cooling lubricant injects to gnaw part between rotors from low part of compressor house and mixes air and brings compressed heat and forms film which prevents rotors from contacting directly and seals space between rotors and house. The lubricant also decreases noisy made by high speed compressing. The weight of lubricant is about 5-10 times of air weight.

II) Principle of screw compressor

(1) Inlet process

We design enough inlet air and modulate air by inlet valve. When rotors run and its alveolus reach open mouth which is vacuum, so the air is sucked and full of alveolus. And rotors run continuously, the alveolus is getting to gnaw each other and seals air between alveolus.

(2) Compress and oil-inject process

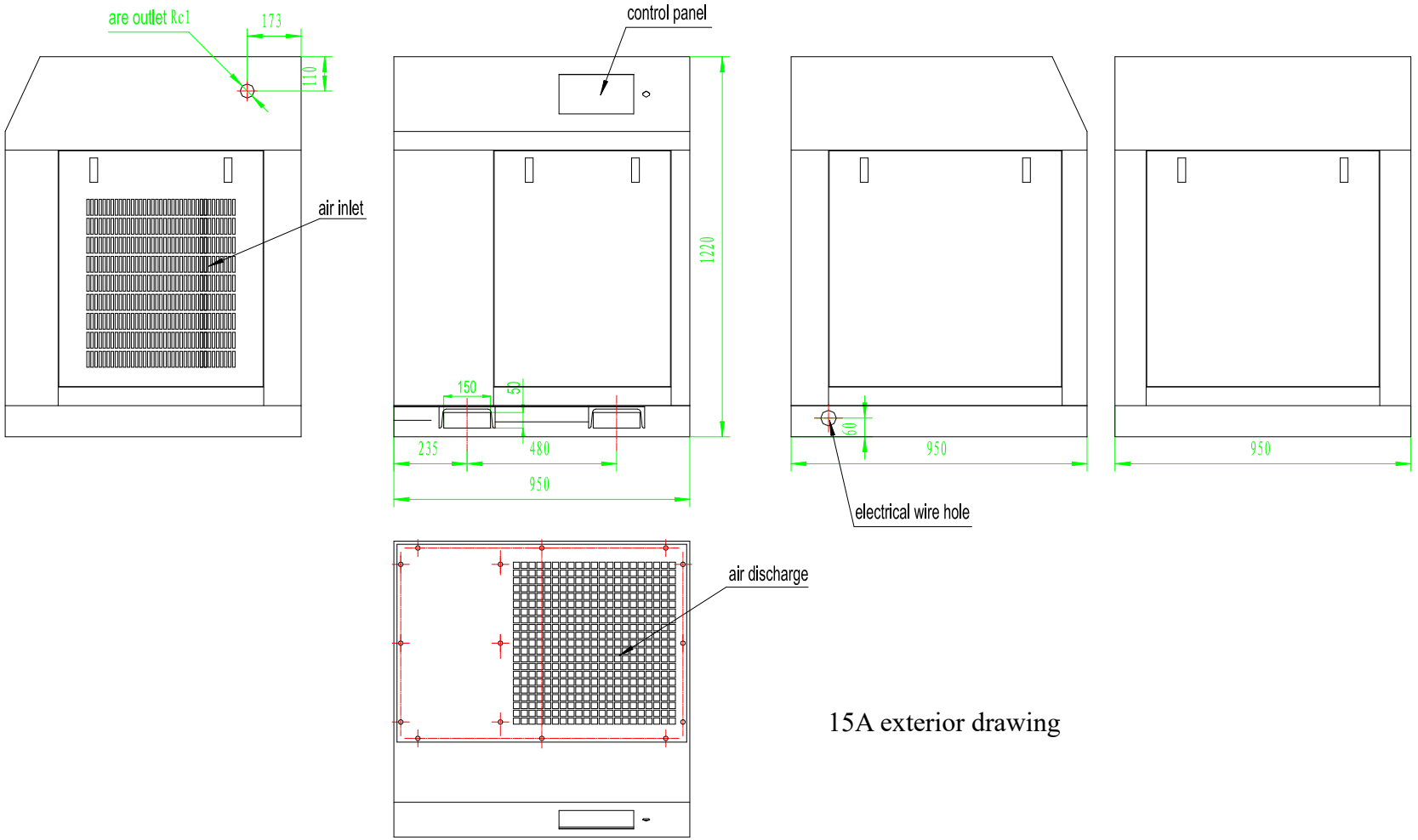
The alveolus space is getting small with the rotors' running, the air in it is getting to be compressed and the pressure is getting high. At the same time, the lubricant injects in compressed room and mixes with air.

(3) Exhaust air process

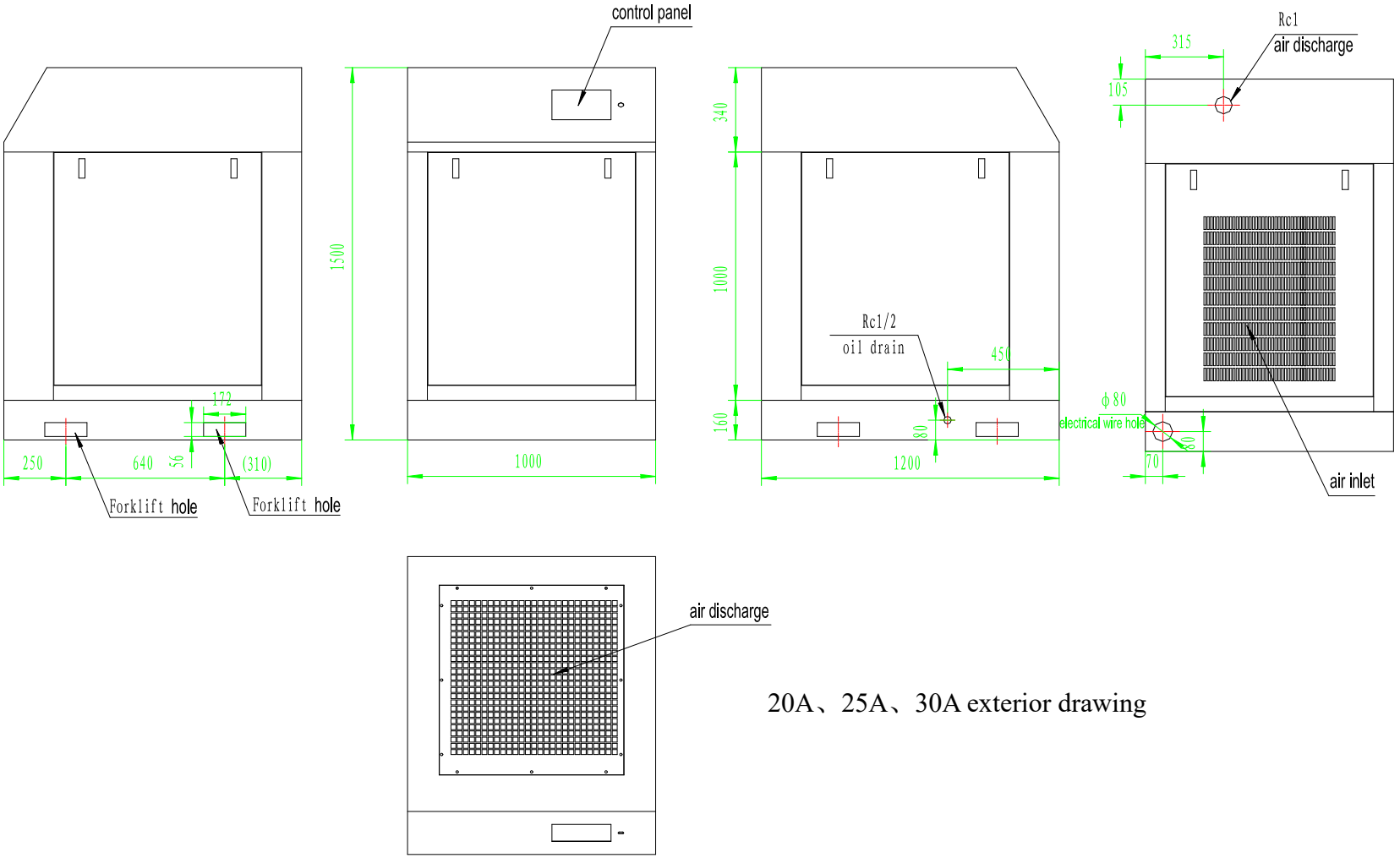
When the gnaw of rotors communicate with outlet, the pressure

reaches the highest, the mix air of compressed air and lubricant is exhausted up to the alveolus totally leaving outlet and alveolus volume becomes zero, and the exhaust ends. The compressor starts a new process of inlet, compress and outlet again.

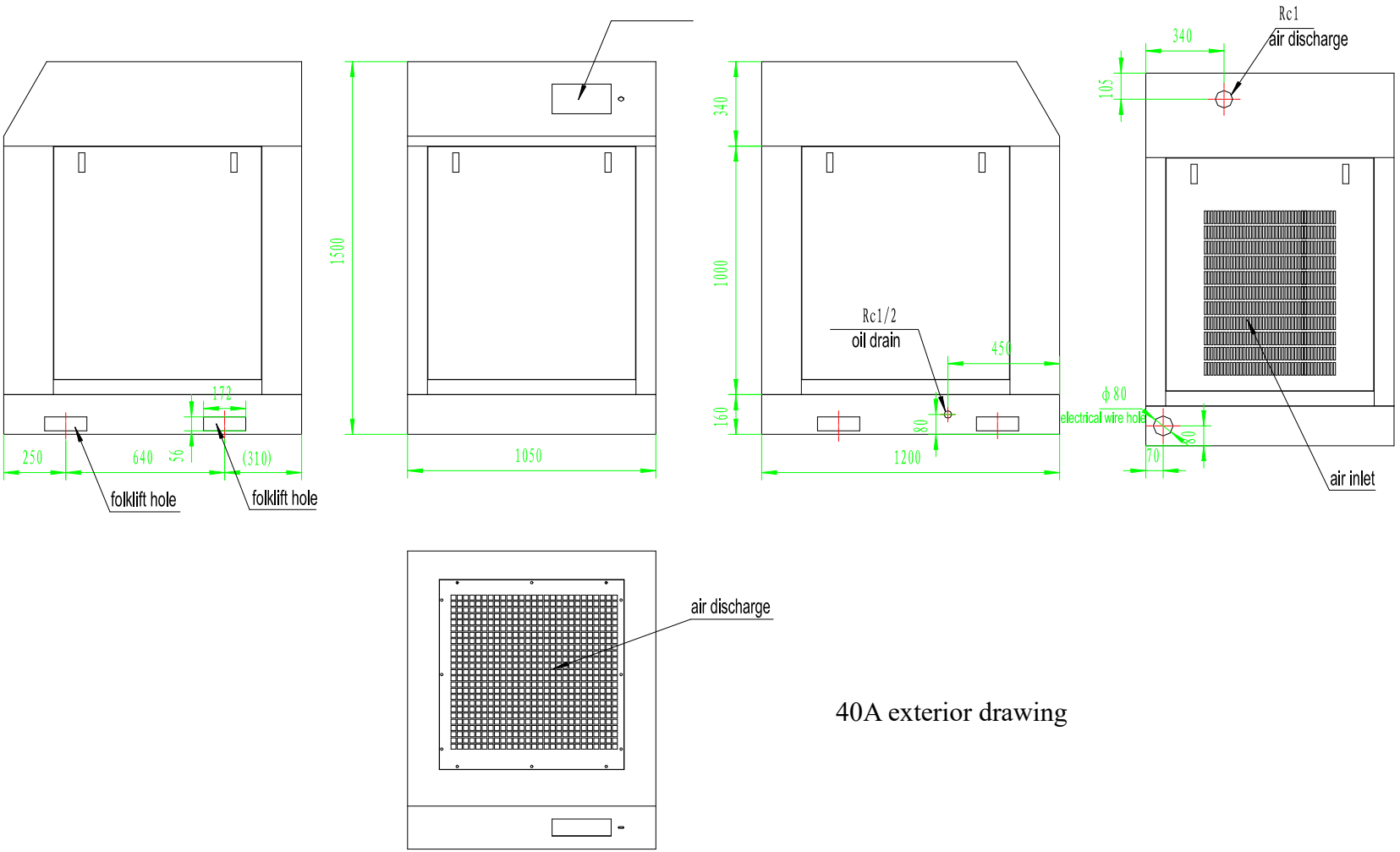
Chapter 2: Exterior drawing



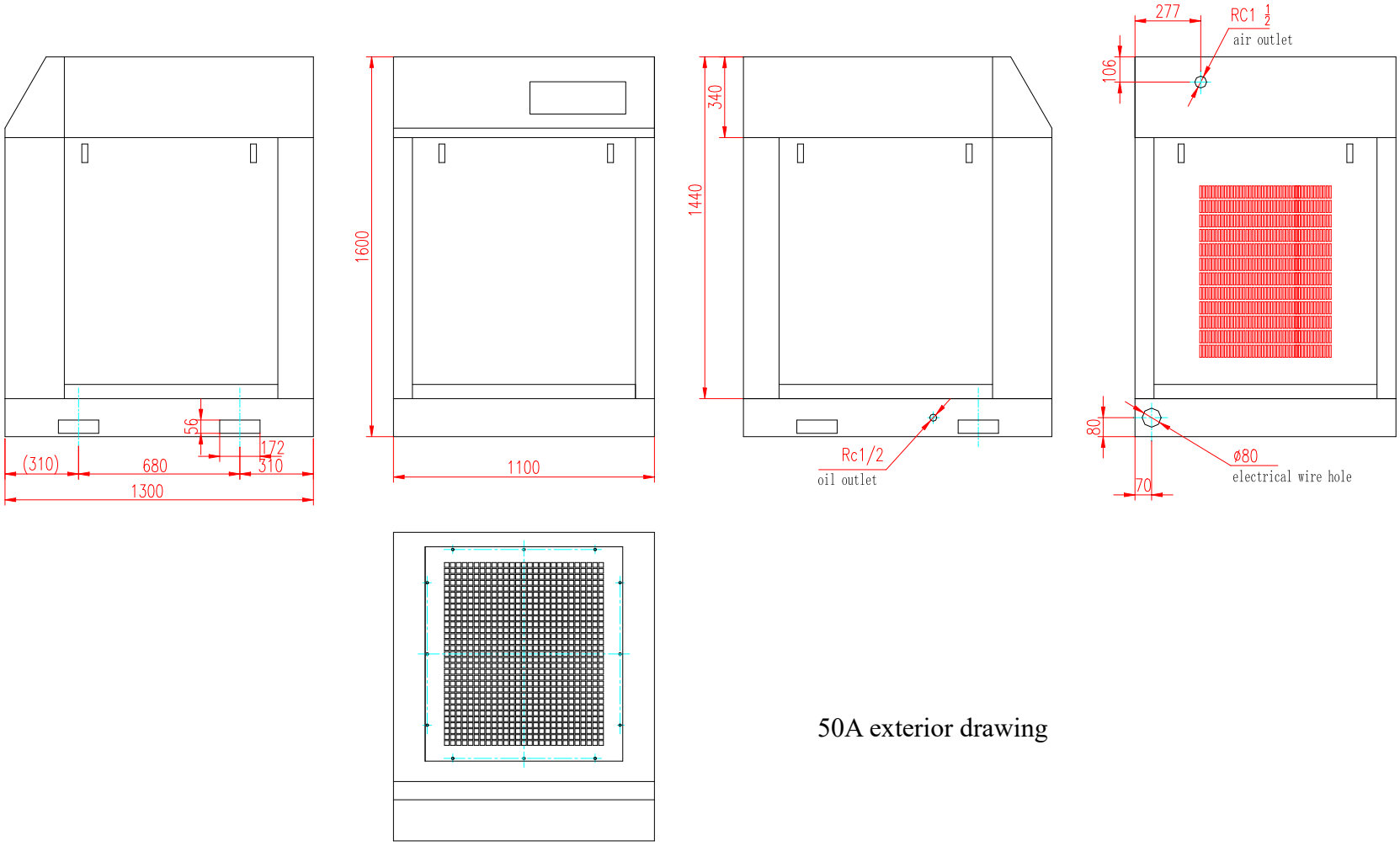
15A exterior drawing



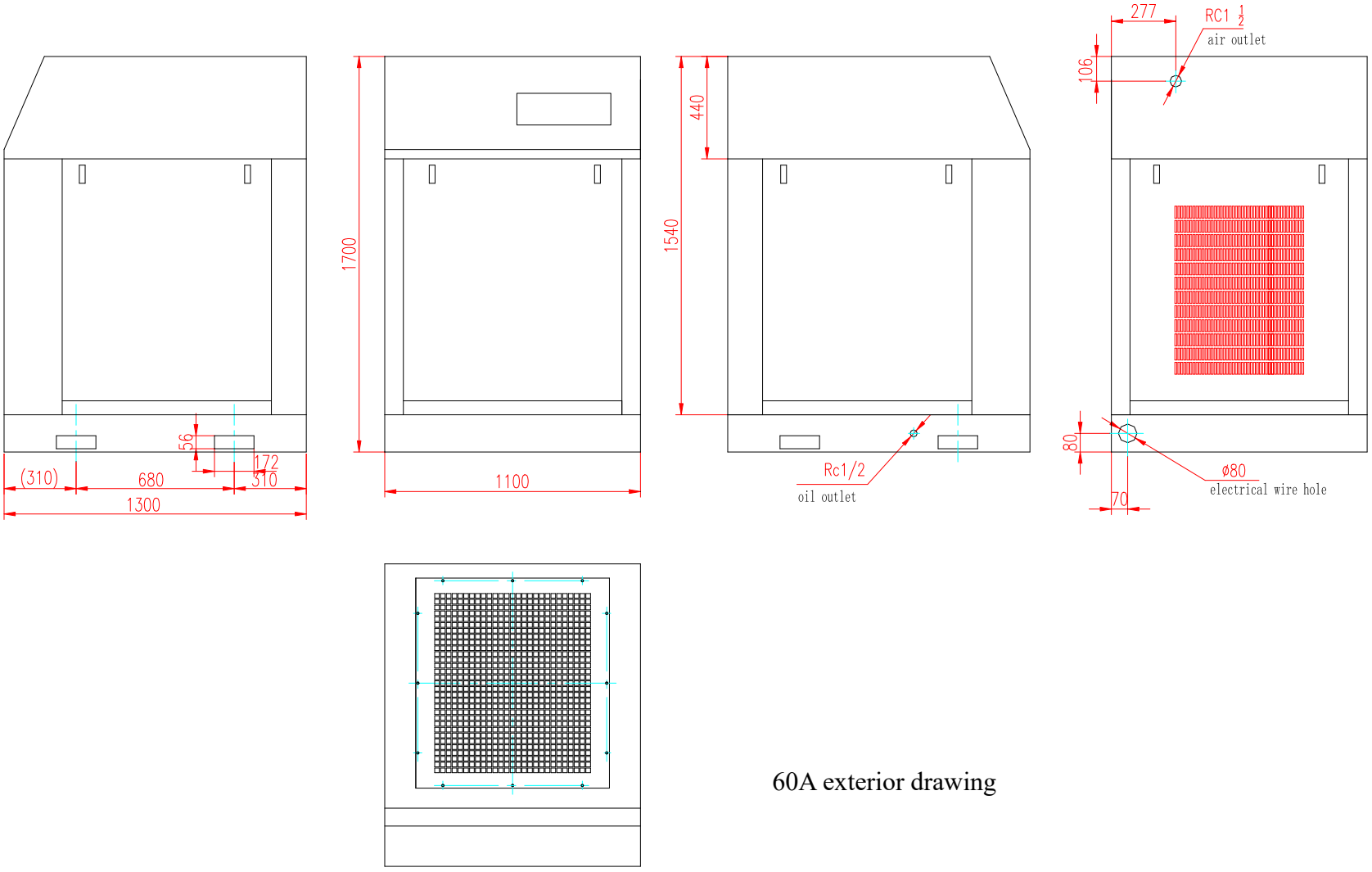
20A、25A、30A exterior drawing



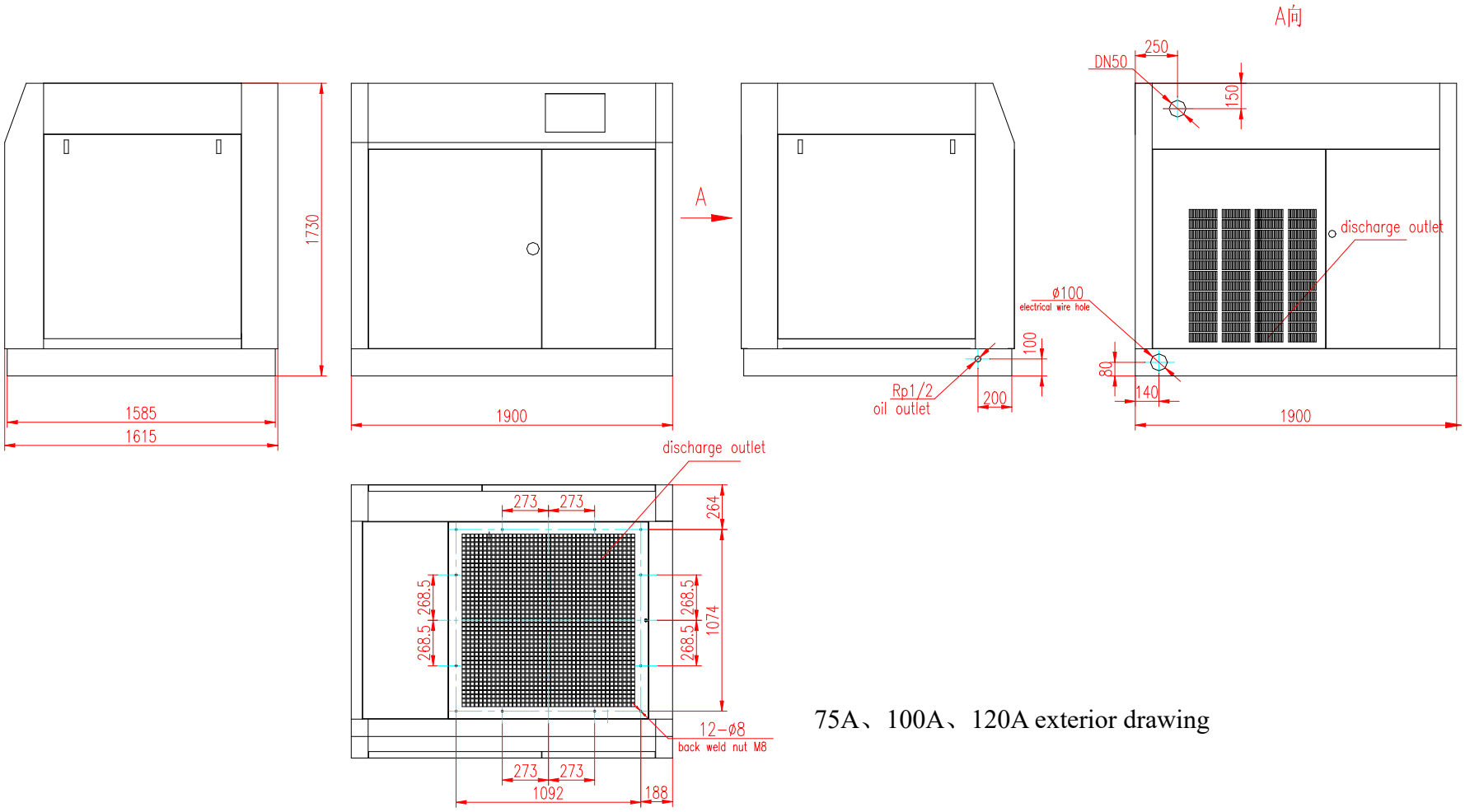
40A exterior drawing



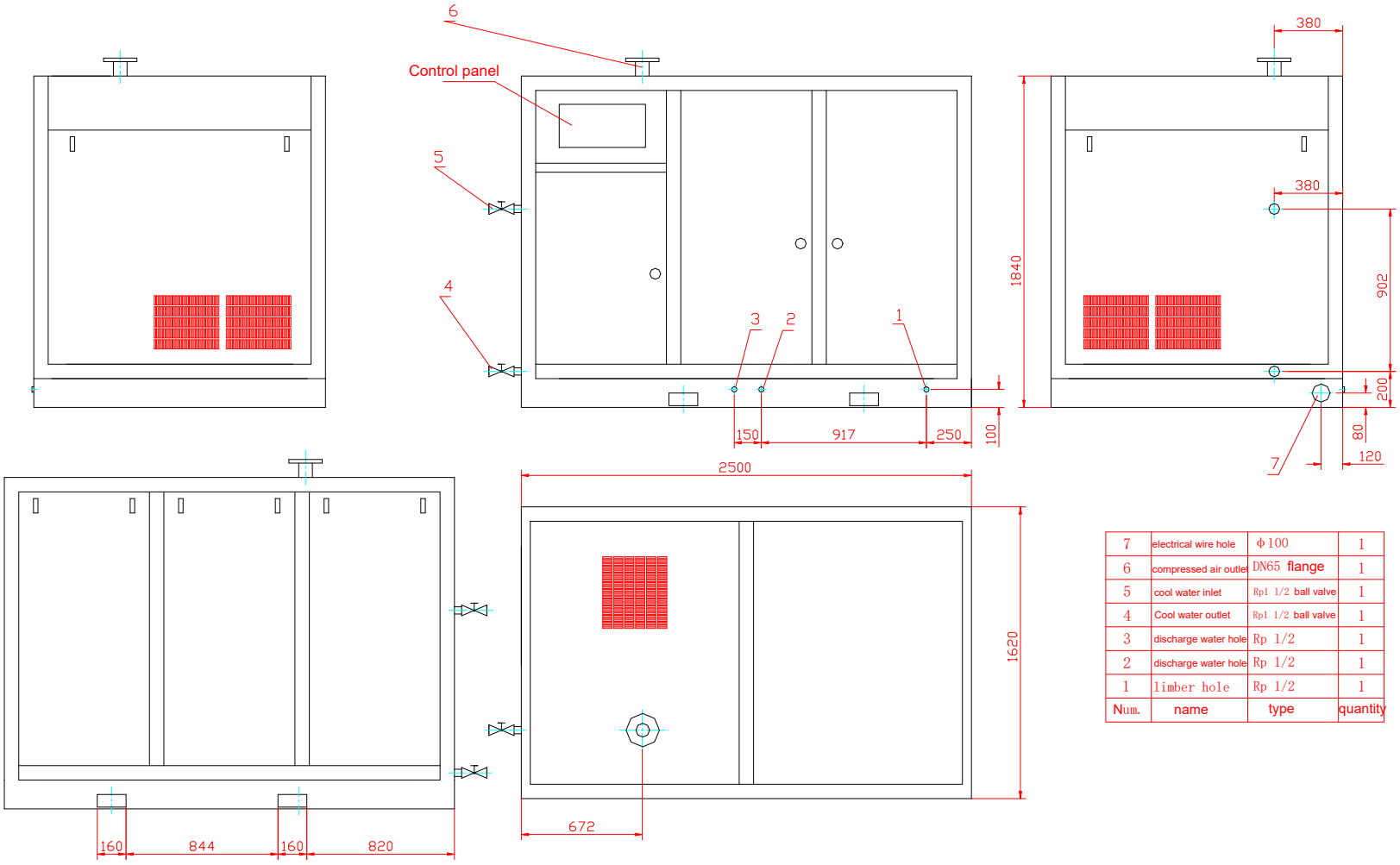
50A exterior drawing



60A exterior drawing

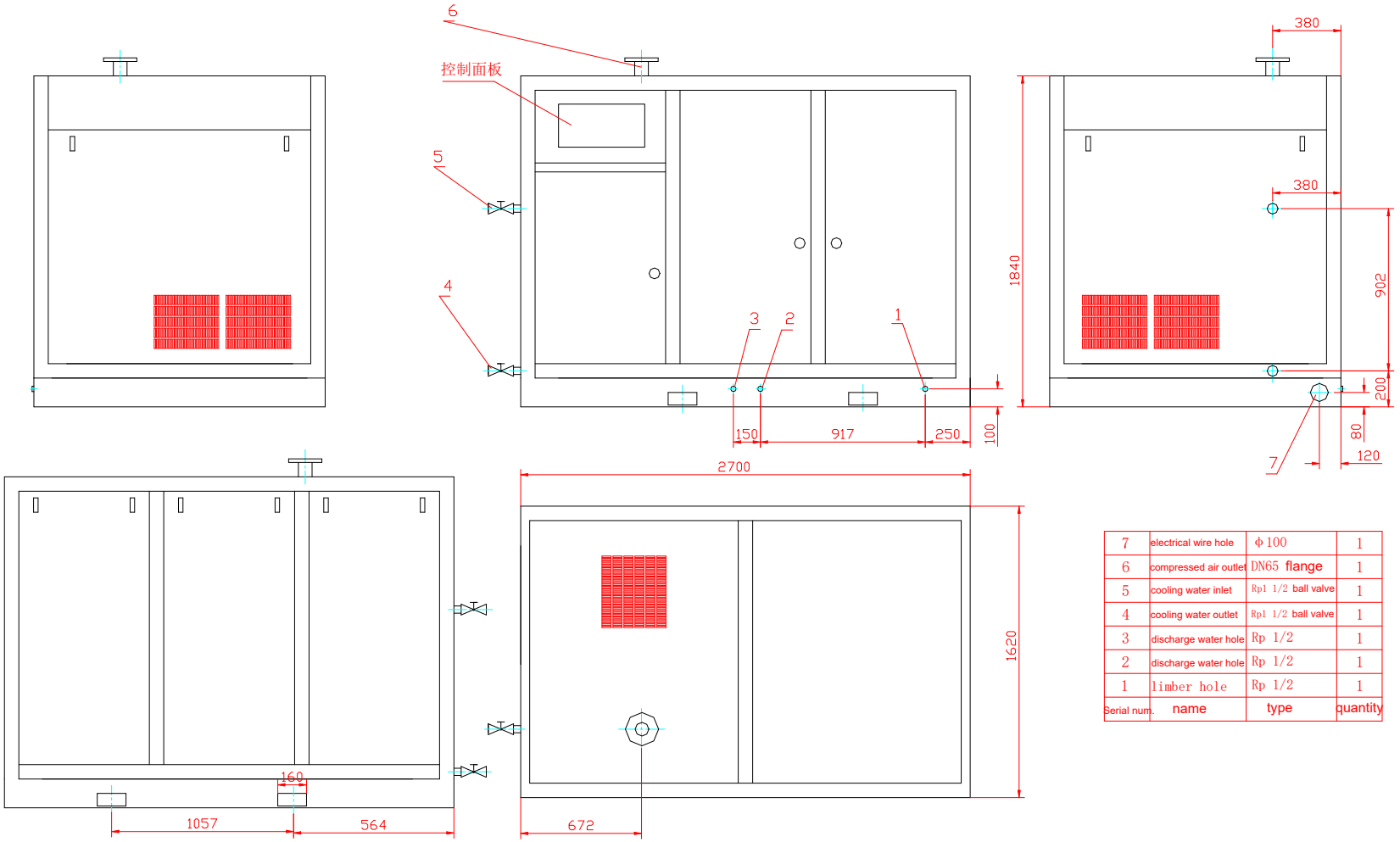


75A、100A、120A exterior drawing



7	electrical wire hole	Φ100	1
6	compressed air outlet	DN65 flange	1
5	cool water inlet	Rp1 1/2 ball valve	1
4	Cool water outlet	Rp1 1/2 ball valve	1
3	discharge water hole	Rp 1/2	1
2	discharge water hole	Rp 1/2	1
1	limber hole	Rp 1/2	1
Num.	name	type	quantity

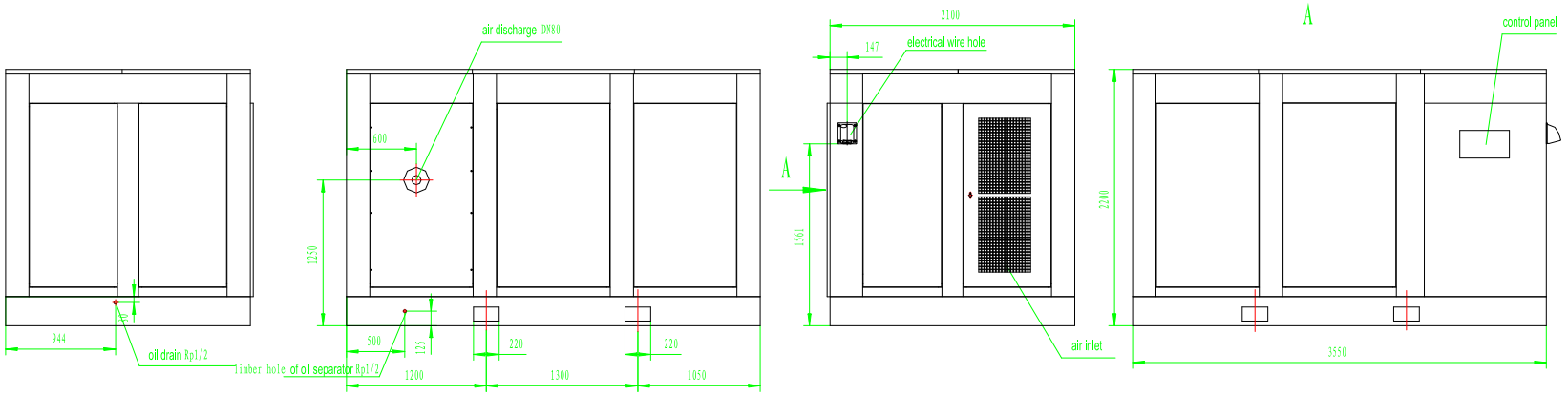
150W、175W exterior drawing

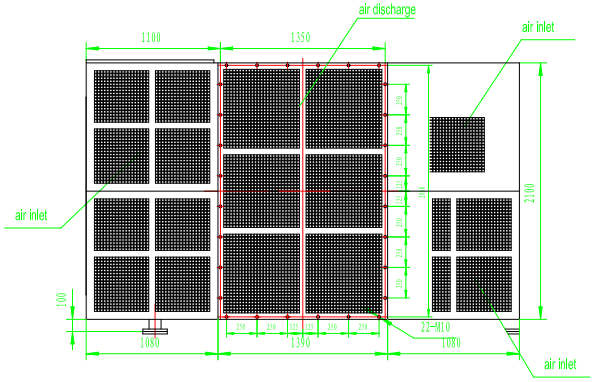


Serial num.	name	type	quantity
7	electrical wire hole	Φ100	1
6	compressed air outlet	DN65 flange	1
5	cooling water inlet	Rp1 1/2 ball valve	1
4	cooling water outlet	Rp1 1/2 ball valve	1
3	discharge water hole	Rp 1/2	1
2	discharge water hole	Rp 1/2	1
1	limber hole	Rp 1/2	1

back view

200W、250W exterior drawing





300A、350A exterior drawing

Chapter 3: Installation

1. Installation

The compressor should be put level and stick the ground closed. The ground should be flat to avoid vibration and noise.

2. Ventilation

In order to make the working temperature of the compressor Remain stable, to ensure the air can be drew in and out the compressor unobstructed. So some space should be reserved for the suction entrance and discharge pipe.

The environment temperature should under the 45℃. The environment temperature more high, the air disposed volume less.

3. Air pipe installation

There is a stop valve on the inlet pipe of the compressor. The pipeline needs to have 1-2° slope to help the condensation water in the pipeline discharged.

If the system needs a large of compressed air in a short time, you'd better have a gas tank as a buffer. This can help the compressor and can be used more long.

4. the cold water's volume of the water screw compressor

No.	Model	Water volume (L/min)	Note
1	75W	55	
2	100W	75	
3	120W	90	
4	150W	110	
5	175W	132	

Chapter 4: Working process and parts function

1. General

The compressor is a cubic whole closed system. It contains the compressor, driving system, inlet and outlet system, cooled and lubricable system, control system and electric system. All the parts are installed on the high strength base.

2. Driving system

Motor drives the compressor through the belt pulley.

The cooling fans operated by individual motor.

3. Enter and exhaust the system

1) After the air through the air filter, the dust has been removed. Then the air flows into the main room of the air end through the suction valve, compressed the air and mixed with the lubrication.

The mixed air after compressing enters the oil gas tank to separated for the first time, The Mixed air separate for the first time, separated by the high precision oil gas separator, then the air pass the minimum pressure valve, through the cooler. The air go into the using pipe by the outlet valve at last.

2) the function of main fittings

2.1) air filter

The air filter is a dry type heavily loaded paper filter. Usually user

should take down the filter and blowdowned the dust from inwards to outside every 1000 hours.

2.2) suction valve

Piston type suction valve principle: Utilize the piston’s enter and retreat to control the load. When the solenoid valve is opened, the venting valve is closed and the control valve is opened by the servo cylinder. The compressor is on full load. When the solenoid valve is closed, the control disc is closed by the servo cylinder. The oil separator is lowered via the venting valve.

Butterfly type suction valve principle: when the compressor started, the disc of the suction valve closed. When the air enters into the cylinder, the butterfly opened and the compressor is on load. The reverse running will be accordingly.

2.3) air end

Our screw compressor use German air end, is a two precise rotors type compressor. The male rotor has five screwy teeth, while the female rotor has six screwy teeth. The teeth joggle with each other. The rotors are supported by the bearings on the ends. The air suction end has a roller bearing. The discharge end has two cone-shaped roller bearings.

2.4) oil gas tank

The oil gas tank is an oil storage device of the lubricating oil and

a device of first separation of the oil and gas. When the compressed air enter the oil gas tank, by striking, whirlwind separates, reduces the flow speed, etc to separate the bigger oil.

2.5) safety valve

After the pressure transducer does not work, the valve opens when the increasing pressure in the valve exceeds the adjusted opening pressure 20%. Then the pressure dropped to the adjusted pressure to protect the whole system. Valve supply is set to the opening pressure, please do not change the adjusted pressure.

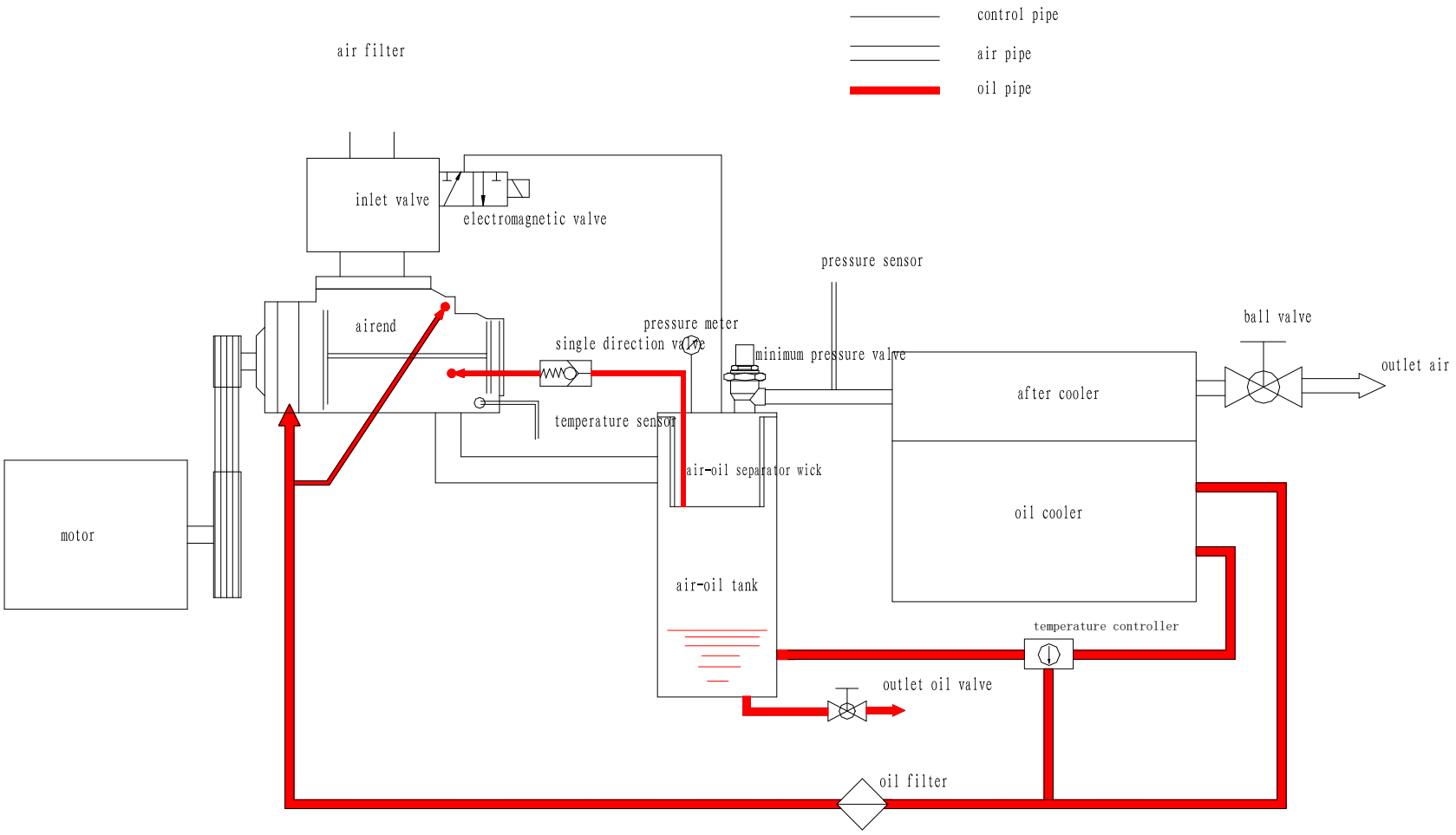
2.6) precise oil-gas filter

Depth type oil gas filter, is made of multi-layer micron lever glass fibre. The compressed air goes through the filter most oil has been separated and the oil content below 3ppm.

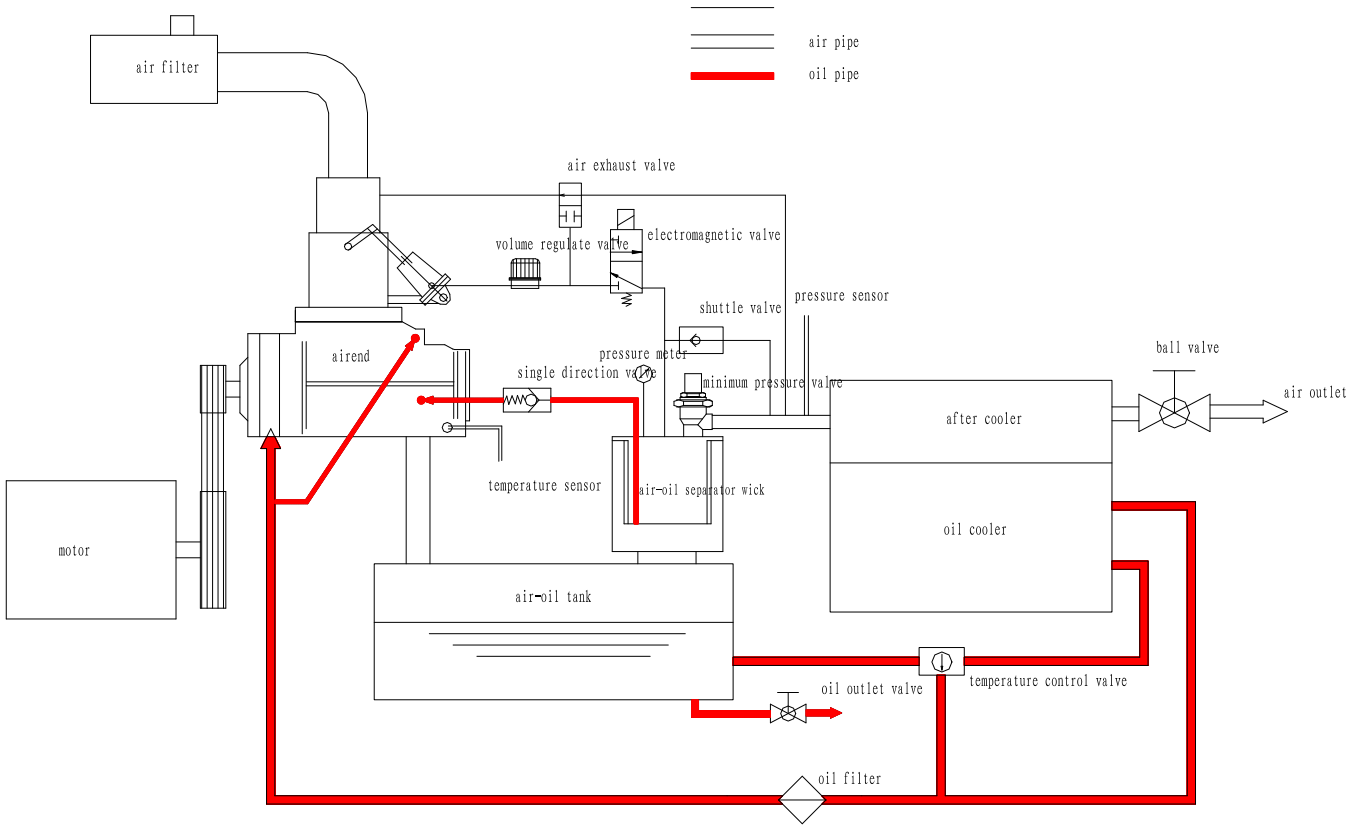
2.7) minimum pressure valve

The minimum pressure valve is installed either at the outlet of the separator or in the discharge line after the separator, the adjusted pressure are set at 4.5bar. To uphold the minimum oil pressure required for cooling and lubrication during start-up, off-load and when user ports are filly open.

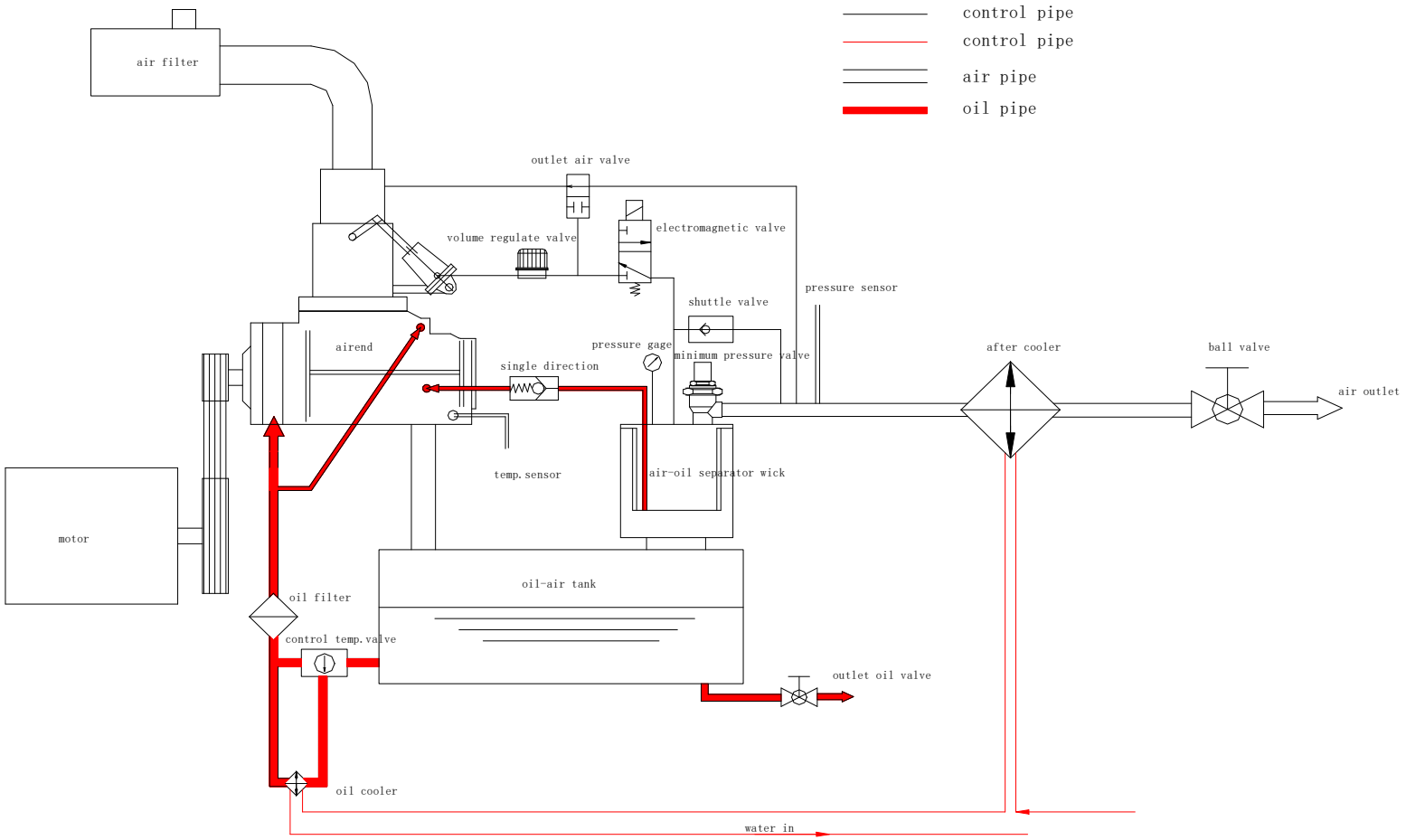
3. System drawing



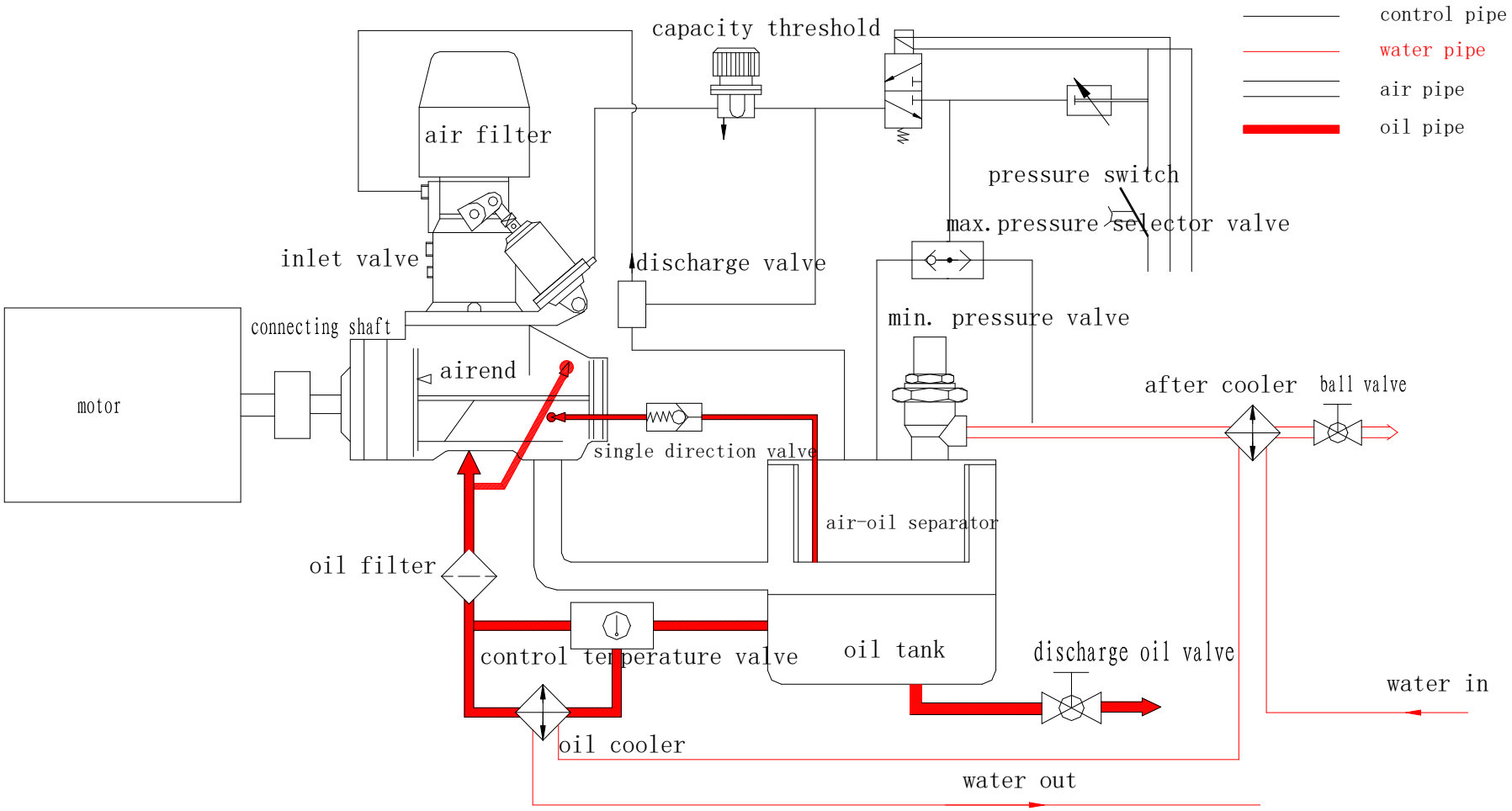
System drawing of screw compressor 15A～75A



Screw compressor system drawing 75A～350A



100W、120W system drawing



150W～350W system drawing

4. Cooling lubricate system

1) system process

The cylinder body and cylinder cover water-cooled air compressor have the cooled water jacket. The cooler in series with the 1、2 class cylinder, supply water. Every stage cylinder contact in series too. The middle cooler is connected on first class gas vent and the second outlet flange.

2) main fittings function

2.1) lubrication

Use the all-weather screw compressor special-purpose lubricating oil, the flash point is 257℃, incline , the Pour point is- 42℃. The oil can be used in the worst weather and temperature environments (-5℃~50℃).

2.2) oil cooler

Oil cooler is an aluminium cooler. The cooled air sunk by the cooled fan and the oil will be cooled by the cooler.

2.3) oil filter

The oil filter completely removes impurities of circulating, lengthens life of the compressor.

2.4) cooled fan

Cooled fan driven by the single electrical motor, the cold air is sucked by the a outside, through cool lubricating oil behind the

grades of compressed air , hot air discharge to the outside.

5 control system and electric circuit

1) control system

1.1) start the motor (Pressure down or star type start)

Suction valve close, venting valve open, the suction side become high vacuum in the while. The lubrication which the compressed room and bearings need applied by the press difference.

1.2) start the motor (whole pressure or star type start)

When the compressor is under whole pressure work, the venting valve closed, the pressure of the tank become high, the suction valve open. And the pressure rises rapidly, when the pressure rises at 4.5bar, the pressure maintains valve open, the air discharged.

1.3) non-load/full load operation

When the discharge pressure rises at the rated pressure, the control system will cut off the power, the venting valve open, the suction valve closed, the air in the tank will be discharged to the outside. The compressor is non-load work, the lubrication applied by the press difference.

1.4) stop

Press the “OFF” button, the venting valve open, the suction

valve closed, the air in the oil-gas tank discharged into the outside. After a while, the motor stopped.

1.5) emergency stop

When the discharge temperature is higher than the max discharge temperature or the motor over load, the power will be cut off and the motor will stop at once, the venting valve open, the suction valve close at the same time. Only under the unusual situation take placing, can use the emergency shutdown button.

2) Electric circuit

The electric circuit of air compressor has two systems: one is computer controller (consult the computer controller handbook); the other is start disc: the install place and control drawing please consult the follow drawing:

Chapter 5: operated and use

1. Safety regulations:

TO avoid hurting person or breaking the machine, The customer should make the detailed safety operation regulation, the following several points are suitable for consulting:

1) The operator must be trained and authorized staff only, must have read and understood the operating manual.
2) The unit install, operated and use must meet the national regulation.
3) Do not carry out any improper repair or modification work on the compressor. In case of problem contact the JF after-sales service.
4) Find any unusual situation, should shut down immediately, then cut off the power.
5) Should not exist flammably, explosively, poisonously and having caustic gas in the surrounding environment.
6) Before repair or regulate the machine must stop the compressor and cut off the power.

2. Check the rotation direction of the compressor

Instantaneously open the motor to learn the rotation direction of the motor, which should be as shown on the compressor. If not, please turn off the power, and change the position of any two of

the lines in switch box.

3. Start the machine

Should follow the following steps while starting the machine:

1) Confirm finishing all the preparations and checking works in the installation chapter
2) Check the power and the electric tough contact good or not
3) Check the pipeline is leak or not
4) Check the oil level in the oil-gas tank whether between the low level or high level.
5) When Stopping the compressor for a long time(over two months) ,To avoid the compressor burn out because of less oil should inject 1L lubrication from the suction valve into the compressor and turn the compressor several rounds by the hand. Please pay more attention to do not drop other things into the compressor to avoid damage the compressor.
6) Push the start button

4. normal operation

After start the compressor, please watch the working parameter.

5. Shut down the compressor

Push the stop button, after 10~30 seconds the compressor will stop.

6. Attentions in operation

1) If there is abnormal noise or vibration during operation, please stop the compressor right now.
2) During operation, there are pressure in pipes and containers, so please do not open the pipes, plugs, and valves.
3) In case of long time operation, if you find the oil level is under designated position, immediately stop the compressor. Watch the oil level 10 minutes later. If the lubricating oil is really not sufficient, please add after confirming there is no pressure in the system any more.
4) Water will coagulate in the second cooler and water separator, please drain it everyday.

Chapter 6 Maintenance

I. Brief Introduction

The largest advantage of this compressor unit is that it needs only a little maintenance work. The clearness of air, the quality of lubricating oil, and the lubrication of air end are the three major factors that affect the operation of the compressor. The maintenance work includes:

1.Changing in time the easy –to-wear spare parts, such as air filter, oil filter, air-oil separator, etc.

2.Checking, lubricating, and cleaning the compressor unit regularly

3.Maintaining well the machine if not use for a long time

II. The standard of lubricating oil and maintenance

1.The standard and recommended oil

Lubricating oil is of virtual importance to the oil-injected screw compressor. If missed, the compressor may be greatly damaged. The lubricating oil for screw compressor has three functions: lubricating the contact surface of the bearing and rotor, sealing the space between rotors, and cooling the compressor. As a matter of fact, most of the oil is used for cooling, while only a little is for lubricating and sealing. In order to fulfill the above-mentioned function, we designated the JF special oil for screw compressor.

2. Replacing lubricating oil

1) Factory's influence replacing time

A. Poor ventilation, high environment temperature

B. High humidity

C. Dusty environment

D. Mix of different oil

2) Normal replacing time

New compressor should replace oil after the first operation for 500 hours. After that, the replacing period is every accumulative 4000 hours. But even if the operation hour is less than 4000 in a year, the oil should be replaced after a year.

3) Advice

Please do not use the lubricating oil longer than its life span. Other wise, the quality of the oil will fall, the oil cannot lubricate, the temperature will be high enough to cause breakdown. What's more, the oil might self-ignite and burn the compressor.

3. The procedure for replacing oil

1) Operate the compressor to raise the oil temperature, then push "off" to stop.

2) Open the valve for discharging oil. The oil emits fast under pressure, but it is easy to splash. It is advisable to slowly open the valve.

3) When the oil is released out, close the valve. Open the admission entrance and add oil. Please release all the oil inside, including the oil in the pipes, coolers, and the air-oil barrel.

4) Add in new oil

Note: The pressure switch has been initialized before the compressor leaves the factory, please do not adjust randomly.

III) Replacing main separator element

Replacing time: every accumulative 4000 hours or the maximum pressure difference reaches 1bar. If the difference is 0, the separator element has malfunction, or the flow is in short circuit. Please replace immediately.

Replacing procedure:

First confirm the compressor stops, the cut-off valve(27) in the air-providing pipe closes, the main power shuts, and the pressure in air-oil tank discharges completely:

1) Dismantle the oil-return pipe from the compressor.

2) Loose the joint of the oil-return pipe at the top of air-oil tank, draw out the groupware of oil-return pipe.

3) Dismantle the pipe on the air-oil tank.

4) Remove the bolt and the top cover.

5) Draw the separator element out of the tank.

6) Clean the top cover, space, and sealing.

7) Check carefully the tank to ensure there is not tiny stuff inside. Then check the new sealing parts to see whether they are broken, and whether the special staple is fully exposed. The element and the tank should be concentric.

8) Put the cover in right place, wrest the bolt in a crossway. Otherwise leak may occur.

9) Insert the oil-return pipe into the tank, until the pipe reaches the bottom of element. Fasten the pipe joint firmly.

10) Install the pipe into where it was.

11) Startup the compressor to see whether there is oil leak before normal operation.

IV). Replacing oil filter

Replacing time: the first accumulative 500 running hours, every accumulative 4000 running hours later. Or when the lamp for oil filter lights, or when oil is replaced.

Replacing procedure: Ascertain the pressure inside the pressure is discharged, the main power is cut-off. Put a suitable container below, remove the old oil filter, and install a new one.

V). Replacing air filter

Replacing time: When the lamp for air filter lights. Or according to the working condition and the environment.

Suggestion: Frequent replacing air filter can prolong the life span of air end and lubricating oil.

Replacing procedure:

1) Stop the compressor.

2) Loose the nut at the top of air filter, remove the top cover.

3) Remove the old air filter, do not let dust fall into suction valve.

4) Clean the shell for air filter completely.

5) Install a new air filter, see whether it is in right place.

6) Load the top cover. Change the sealing if necessary.

7) Tighten the nut at the top.

8) Start-up the compressor.

VI) Checking the compressor unit

1. Everyday:

A: Check the oil level of compressor, add oil if necessary.

B: Confirm the digits shown on meter board are within the specified scope.

C: check the pressure difference of the air-oil separator.

D: Check the working condition of every operation switch

E: check the whole compressor unit for abnormal sound and leak.

2. Every month:

A: Sample the oil to see whether it deteriorates

B: Clean the surface of the compressor unit

C: Check temperature switch for discharge.

3. Every three months:

A: Clean the surface of cooler, fan vane, and dust around the compressor unit.

B: Clean the discharge muffler.

C: Add oil into the motor bearing.

D: check all the soft pipes, change if they are broken or aging.

E: Check electrical parts, clean the electric control box.

While cleaning the compressor and spare parts, please do not use corrosive solvent.

The maintenance for the motor can see the printed materials for motor.

In case of poor working environment, please shorten the maintenance period.

Chapter 7 Trouble shooting

Please check follows at first:

(1) Wire loose?

(2) Pipe damaged?

(3) Components damaged because of over-hot or short-circuit, it has changed color and burnt smell.

Trouble	Possible cause	Solve method
Can't start	(1)fuse burnt (2)protected relay cut (3)start button unconnected (4) over-low pressure (5) motor trouble (6)airend trouble	(1) check, replace (2) check, replace (3) check, replace (4) check, replace (5) check, replace (6) start by hand, if fail, replace it.
Over-high temperature of outlet air (stop running when overpass 105° C)	(1) over-high ambient temperature (2) temperature valve is out of work (3) less lubricant (4) blade of oil controller is dirty (5) oil filter is blocked	(1) improve ventilation (2) check/replace valve (3) check/adjust oil level (4) clean blade (5) replace oil filter

	(6) cooling fan has trouble (7) thermal resistance is invalid	(6)replace fan (7)check/replace resistance
Low pressure of outlet air	(1) air uses overpass supply (2) air filter is blocked (3) air valve can't be fully opened (4) air-oil separator wick is blocked	(1) check if pipe leaks (2)clean and replace filter wick (3)check inlet valve (4)check pressure-meter fore-and-aft air-oil separator and replace it if need.
Can't unload, when unload, pressure still keeps working pressure or rising	(1) inlet valve can't run well (2) pressure sensor invalid (3) exhaust valve invalid	(1) check inlet valve (2) check and replace (3)check and replace
Frequent load	(1) pipe leakage	(1) check pipe

and unload	(2) the gap between load and unload is set too small (3) unstable air consumption	(2) set again (3) increase air tank volume
Too high Oiliness in air, too much oil consumption	(1) over-high oil level (2) oil filter or regulate hole is blocked (3) air-oil separator wick or washer is broken (4) lubricant pipe is leakage (5) over-low outlet pressure (6) more lubricant bubble	(1) check oil level and adjust (2) Clean filter wick and regulate hole, replace them if need. (3) Check wick, replace it if it is broken (4) Check pipe (5) Elevate outlet pressure (6) Replace lubricant

Chapter 8 Preservation requirement

The compressor and appendix should be preserved in dry, ventilated room and should be dealt with rust-proof and mildew-proof during preservation period.

The compressor should be checked and maintained periodically if it has not run for a long time (longer than 2 months). You must operate according to the stipulation of our handbook if it is started again.