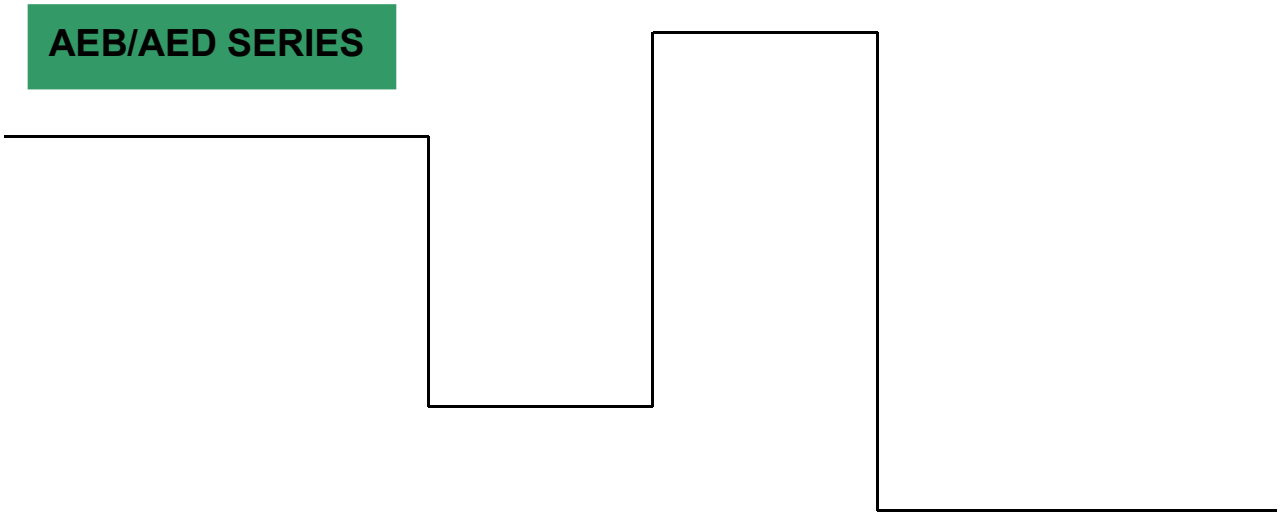
AEB/AED SERIES



Operation Manual

SCREW AIR COMPRESSOR

Preface

Thanks for your purchase of AEB/AED series oil injection screw air compressor. All of our compressors have been strictly tested before delivery, it is reliable and durable. However, In order to avoid some problems, it is very important to review this manual.

This manual covers most useful information for operation and maintenance, keep this manual with the compressor for ease of reference by authorized personnel at any time.

To offer our customers a better shape of service is always our first priority. If there is any thing, which you don’t understand, please feel free to contact us.

Contents

Warranty condition

1. Warranty condition

The warranty period is 18 months from the date of delivery or 12 months after running machine first.

2. Contents of warranty

In case a trouble occur during the warranty period, when it is determined that the trouble is caused clearly by defective design, manufacture and/or poor of work, we provide parts required free of charge.

3. Exceptions

Even during the warranty period of this machine, following cases are not covered:

（1） Trouble caused by the natural disasters or accidents beyond human control.

（2） Trouble caused by a defective material selected or supplied by others, or caused by a defect resulted from the design designated by others.

（3） Trouble caused by a repair or modification conducted by others.

（4） Trouble caused by not adhering to the operating procedures, periodical inspections, maintenance and storage, etc. described in the specification sheets and instruction manuals issued by us.

（5） Trouble caused by defective foundation, building and/or equipment other than this machine.

（6） Reduction of production, production compensation, and all other losses.

Safety regulation

1.. In general,

① Fully understand the contents described in the operation manual before starting or making inspection and maintenance of the machine. The administrator of this machine must not allow a person who does not understand the contents described in the operation manual.

② As for inspection and maintenance, refer to the experienced specialists. Those who have little experience must be closely supervised.

③ The unit must be grounded to prevent any possible electric shock.

④ The unit is designed to handle air only, do not use for compressing inflammable, poisonous or corrosive gas.

⑤ Operate the machine correctly and strictly observe the limitations described in this operation manual. Carry out periodic inspection and maintenance to ensure a trouble free operation.

⑥ If any abnormal noise、vibration、leaking is detected, shut down the machine immediately.

2. During operating,

① Do not use the compressed air for body cleaning.

② Never reach the rotating part during operation.

③ Always keep terminal boxes closed during operation to prevent electric shock.

④ When starting the equipment after the periodic repair work, ensure all settings of safety devices and timers are correct.

3. When work for inspection and maintenance,

① To avoid any unexpected starting or operation, turn the switches off both in the local panel and in the main control room to the STOP position. Turn OFF the main power supply and ensure the equipment is completely shut down.

② Be careful not to get burned. The parts of the equipment painted in silver are heated area during operation. Use heat insulated protectors when you touch the hot parts to make inspection and maintenance.

③ Use the right tools for maintenance and repair.

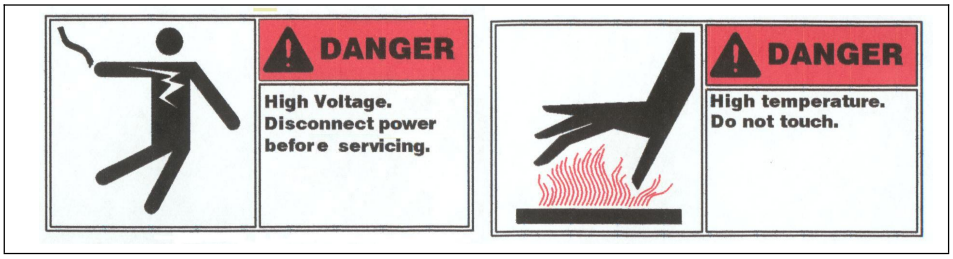
④ Do not leave tools in the compressor, the speed up gears and the piping.

⑤ Before inspection and maintenance, depressurization is necessary to prevent air from blowing off.

4. Alert labels

The following alert labels are attached to emphatically show you the important rules that you must observe to avoid possible injury and equipment failure.

Ensure warning labels attached on the unit


DANGER
High Voltage.
Disconnect power
before servicing.
DANGER
High temperature.
Do not touch.


WARNING
Take care of
leaking fluid.
Fluid may blow
off from an oil
supply plug,safety
valve or pipings.
WARNING
If the hand is
caught by a
rotating part such
as a pully,a fan
or a motor.serious
injury may occur.
WARNING
Never use the
compressed air
for the purpose
of assisting
respiration.
WARNING
Do not put hands
near it when
machine operating.

Chapter1. Receiving and Installation

1. Receiving

Check items just after the arrival of product

- Any difference from your order sheet
- Any damage during transportation
- Any missing accessories

If any of the above found, please keep all papers, photos if possible, records, and contact seller or us.

2. Installation of compressor

2.1. Site selection:

To ensure trouble free operation, high air quality as well as performance, ease of maintenance, a proper installation site is essential. An installation plan should be established.

Select a site that has:

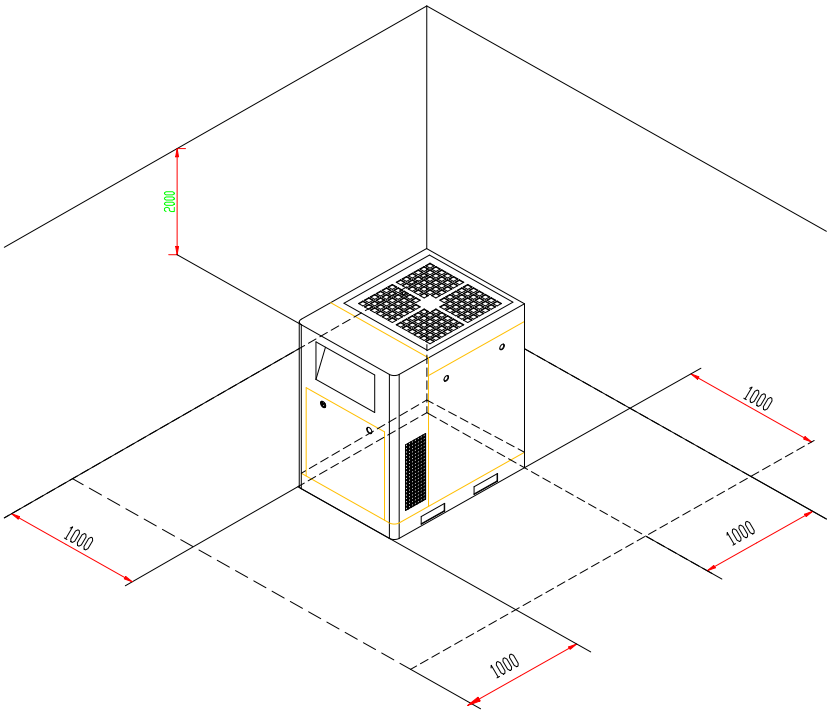
2.1.1 Wide and good visual location, which will get easy maintenance.

2.1.2 Low RH %, little dust, clean air and good ventilation

2.1.3 Ambient temperature should be kept below 104℉.

2.1.4 In case of a bad environment, too much dust, install pre-filter to maintain the life cycle of air compressor system component

2.1.5 Reserve maintenance space. 70cm distance required at least among air compressor and wall



2.2 Foundation

2.2.1 Foundation shall be built on solid ground. The foundation surface should be flat and leveled to avoid vibration.

2.2.2 Consideration the safety of building if the air compressor installed upstairs then oscillation-proof treatment must be well done to erase the vibration transmitting to

downstairs or creating resonance vibration。

The vibration generated by screw compressor is very small; so there's unnecessary to construct a foundation

3.Caution for piping

3.1 The pipeline should design to have 1-2 degree slope away from compressor to drain the condensation.

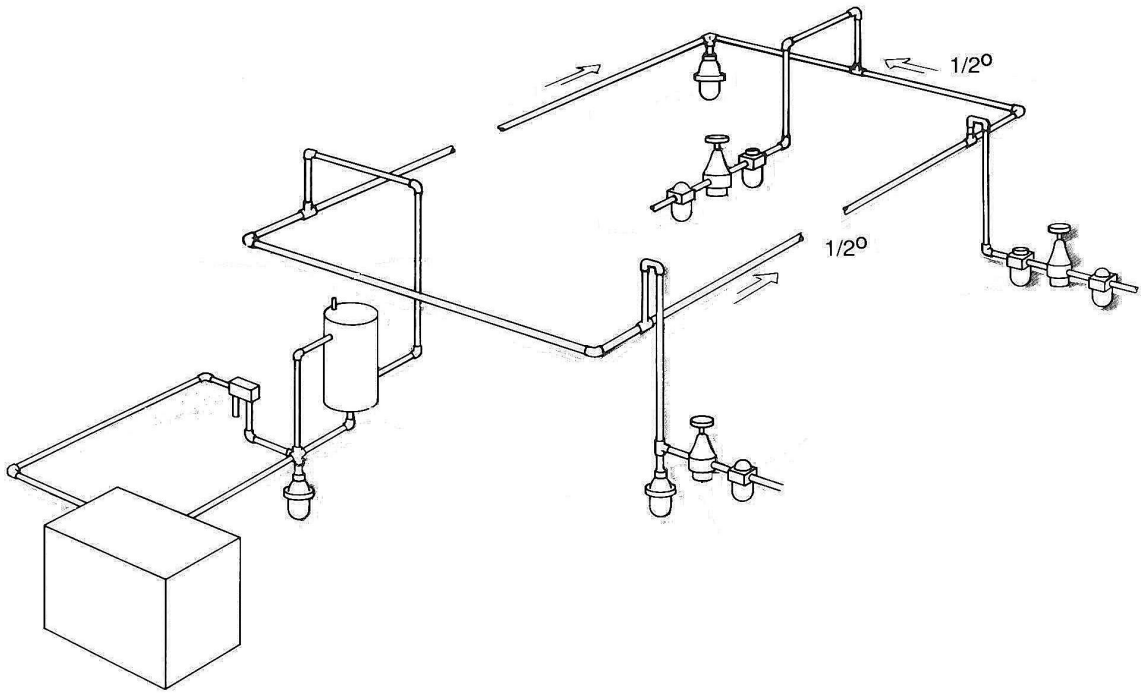
3.2 The pressure drop in constructed pipeline shall not exceed 5% of designed air compressor pressure. Therefore, it's better to select a suitable diameter larger than designed value while doing piping design。

3.3 Branch pipeline must be connected from top of main pipeline to avoid condensation。

3.4 Three-point combination (filter regulator and lubricator) should be installed for any tool which requires lubrication to enhance the life cycle.

3.5 Don't arbitrarily reduce the main pipe line size, otherwise, turbulent flow will occur at connection joint and cause pressure loss。

3.6 If air tank and drier, etc are installed, the ideal piping arrangement is: air compressor + air tank + drier, In this arrangement, the air tank traps a portion of condensate and decrease the air discharge temperature. Air that has low temperature and low moisture content enter into drier can reduce the load of drier and ensure air quality。



3.7 If the system demand is intermittent with high volume, we recommend adding an air tank as buffer to reduce the load cycle. It's helpful for air compressor。

3.8 To avoid pressure drop, the velocity of air in the piping shall not be designed not to exceed 15m/sec with the system air pressure is under 217.6psi,

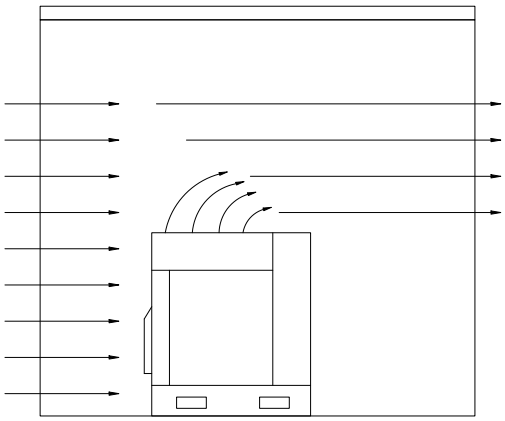
3.9 To avoid pressure drop, use as few as possible elbows and valves in the pipeline.

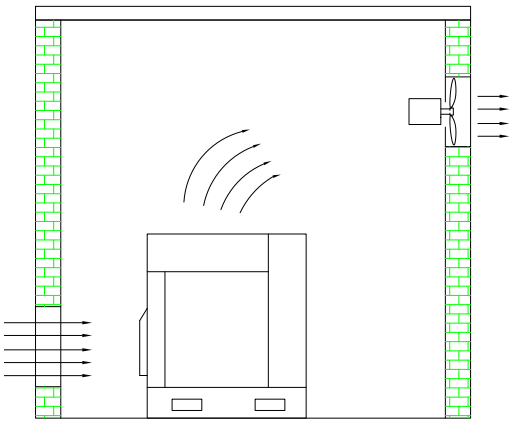
3.10 The ideal piping construction is to let main pipeline revolve around the whole plant to balance air pressure in any location.

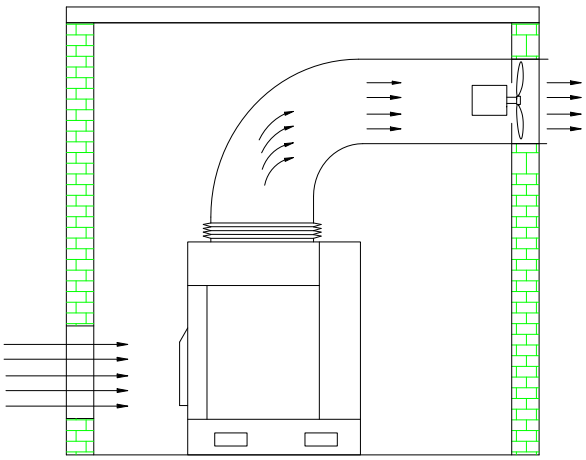
4. Cooling system

4.1 Ventilation

The air compressor is a heat generating facility, especially for air-cooled type, the ventilation is very important. It's necessary to install a forced feed ventilation facility. The ventilation rate should be larger than the heat dissipation rate of the compressor. The horsepower and diameter of the cooling fan in the compressor would be your excellent reference to maintain the indoor temperature below 40°C.







While using the duct, the static pressure of the fan should below 10mmAq. Therefore, the air delivery can reach the degree we have mentioned above. When installing the duct, reserve some space to equip with flexible canvas joint for maintenance. (Enough space provides us removing the upper board while cleaning the cooler.)

4.2 Cooling water

4.2.1 Soft water is preferred to be utilized as cooling water for water-cooled air compressor.

This can avoid Ca, Mg ions in water from scaling in the cooler caused by high temperature chemical reaction, and affect the heat transfer of cooler. If cooling tower circulation system is applied, then maintenance additives must be added periodically to keep a water quality.

4.2.2 The automatic make-up system of cooling water circulation system must be equipped; otherwise, cooling water will be insufficient after a certain period of operation and will let the air compressor trip out due to the high discharge temperature protection.

4.2.3 It’s the best way to utilize cooling water system of air compressor individually. Don't let it share with other systems to avert insufficient water flow, which will influent on cooling effect.

4.2.4 Cooling tower must meet the specified cooling water flow of air compressor; meanwhile, the selection of pump horsepower must be correct. Cooling tower placed site must dissipate heat easily and have good ventilation

4.2.5 Providing the cooling water pressure within 21.7-36.3psi.

4.2.6 The temperature difference between cooling water’s outlet and inlet is ranging at 42.8-50^{0}F.

5. Electric components

5.1 Refer to electrical guidebook or following chart, a correct cable diameter should be selected accordingly.

5.2 Air compressor should have an independent power system, especially not to connect it with other different power consumption systems in parallel. If in parallel application, it's possible to trip out the overload protection device due to a larger voltage reduction or phase imbalance。

5.3 Install the adequate NFB according to the horsepower of air compressor for the sake of safety and protection

5.4 It's necessary to confirm the correct voltage while doing power distribution of air compressor

5.5 The ground cable of motor or system must be installed and ground cable cannot be connected to air pipeline or cooling water piping

5.6 As a rule of thumb, the current balancing of three-phase AC motor shall not exceed 3% of rated current while the voltage balancing should not be over 5%

5.7 Air compressor must have a ground cable connected to ground to prevent electricity wastage, which may cause danger.

6. Electric motor operation and inspection

To measure the insulation resistance between cable and ground by 500V high resistance meter or similar instrument; make sure the measured data is above 1M ohms.

Chapter 2. General introduction of screw air compressor

1. Brief introduction of oil-injected screw air compressor

The oil-injected screw air compressor, with its incomparable advantages and excellent/reliable performances when compared with the piston compressor of the same horsepower, has become the new essential aspect for contemporary development of air compressors. The advantages are: low vibration, low noise, high efficiency, no damageable parts, perfect matching between the main rotor and the auxiliary rotor and also between the rotors and the unit case enabling reduction of the return-air leakage and increasing efficiency. Rotors in mesh without reciprocating movements of the cylinder have reduced the vibration/noise sources. Also, the unique way of lubrication has brought about many advantages as follows:

1.1 Self-generated differential pressure constantly presses the lubricant into the compression chamber and the bearings to simplify the complex mechanical structure.

1.2 The injected lubricant will form an oil film between the rotors enabling the main rotor to drive the auxiliary rotor directly. Thus, the high precision synchronizing gear is not necessary in this case.

1.3 The injected lubricant will increase the air-tightness of compression.

1.4 Since the lubricant absorbs a large amount of compression heat, in the event of high single-stage compression ratio of 16, the unit will remain below the temperature of carbon deposition and degradation of ordinary lubricant, and the different expansion coefficients will not cause any friction between the rotors and the case.

1.5 Lubricant will lower the noise caused by the high-frequency compression.

2. Mechanical structure of oil-injected screw air compressor

The oil-injected screw air compressor manufactured by us is a dual-axial displacement rotary compressor. The air inlet is located at the top of the case while the air discharge is at the bottom. Two high precision main rotor and auxiliary rotor are installed in parallel inside the case. The main rotor has five teeth while the auxiliary rotor has six. Tooth gives a helical shape with two in mesh. Both ends of the main/auxiliary rotors are supported in position by bearings.

3.The principleof oil-injected screw air compressor

3.1 Suction phase

The gas is drawn from the suction port into a groove space formed by the unmeshing of the two lobes. As the rotors rotate, the groove space increases in volume and when its volume becomes the maximal, the suction port is not open to the groove space any longer, which means the suction process ends up. The suction phase is shown in figure 2.2(a).

3.2 Closing and transmitting phase

As the rotors continue rotating, the groove space in the shape of “V” decreases in volume with the re-meshing of the two lobes and therefore leads to internal compression. as shown in figure 2.2(b)

3.3 Compression and oil-injection phase：

In the meantime, oil is injected into the compression chamber and mixed with the air in it. This phase lasts until the discharge port is open to the groove space as shown in figure

2.2(c).

3. 4 Discharge phase

When the discharge port is open to the groove space, the mixture of the compressed air and the oil is discharged. This process continues until the volume of the groove space becomes the minimal as shown in figure 2.2(d)

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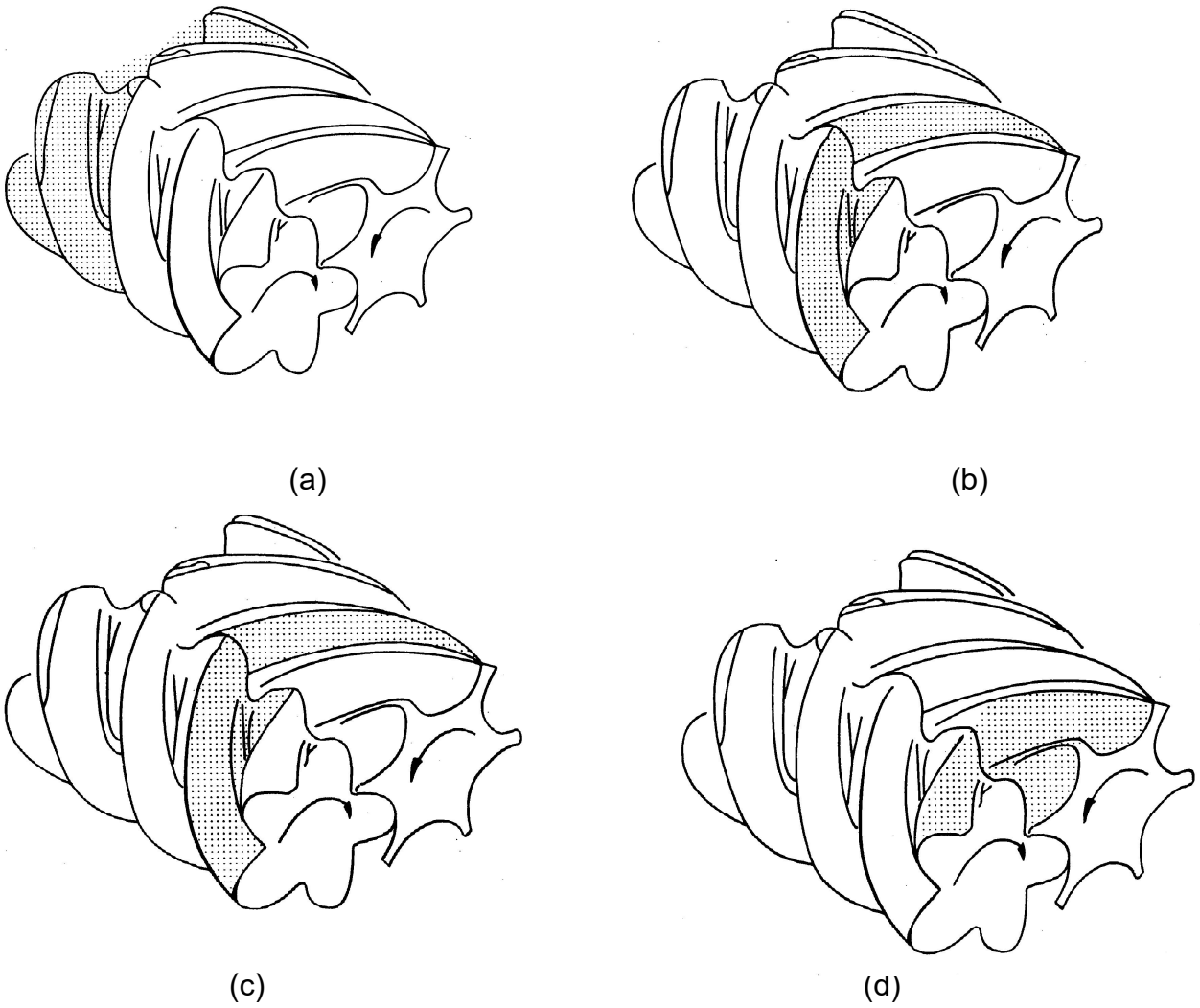
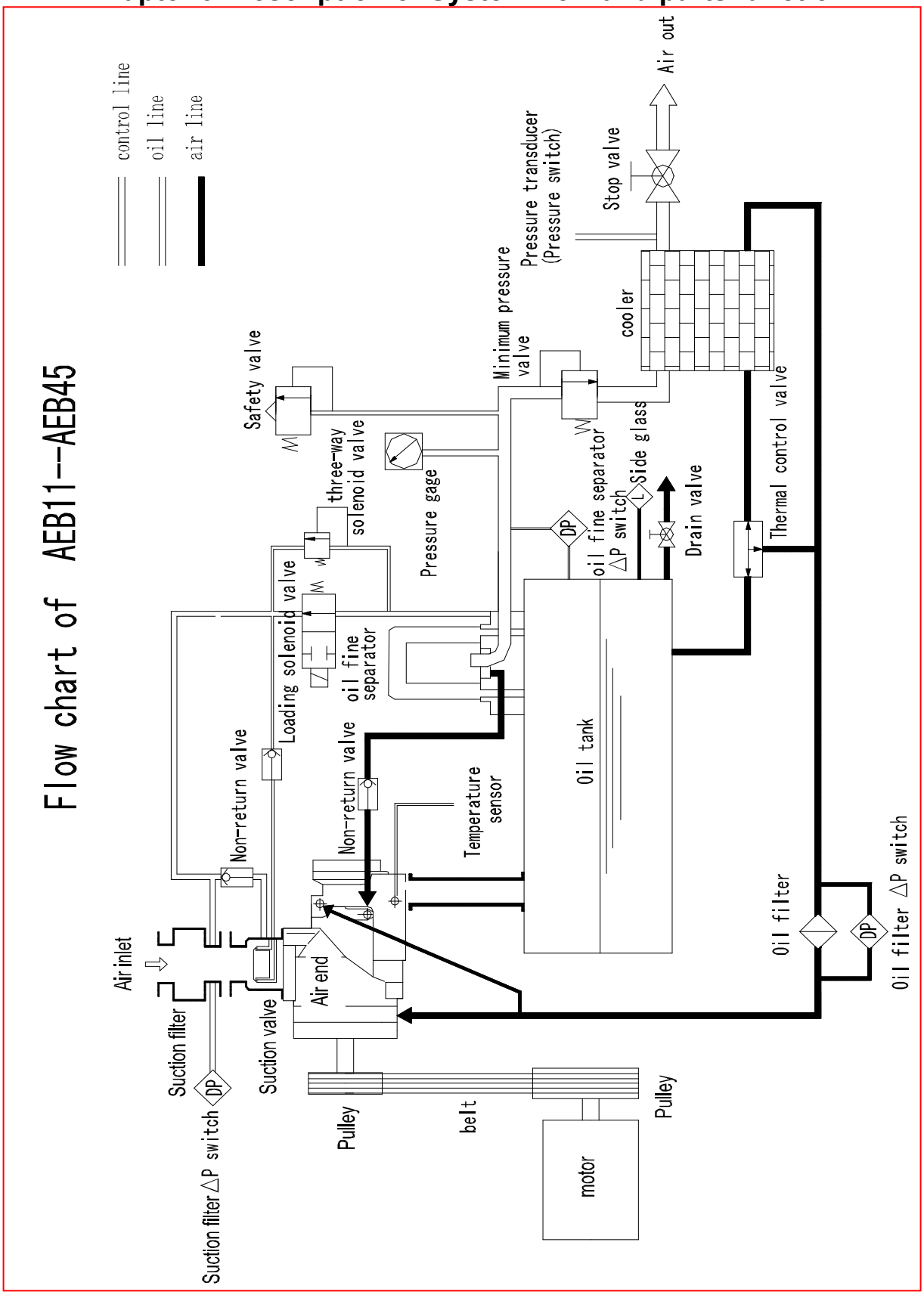
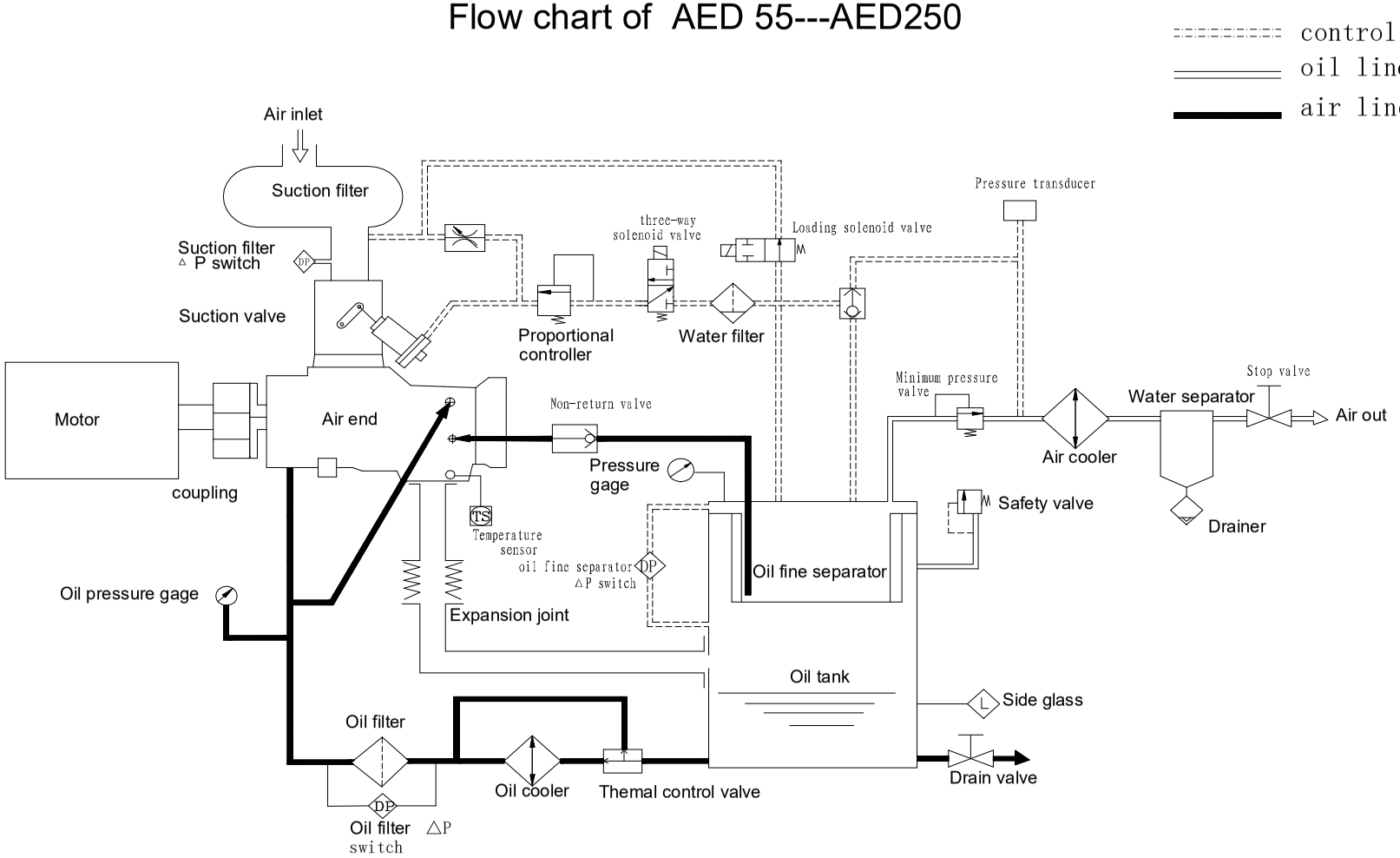


Figure 2.2


Flow chart of AEB11--AEB45
control line
oil line
air line
Air out
Stop valve
Pressure transducer
(Pressure switch)
Minimum pressure
valve
cooler
Safety valve
three-way
solenoid valve
Pressure gage
DP
oil fine separator
△P switch
Side glass
Drain valve
Thermal control valve
Loading solenoid valve
oil fine
separator
Non-return valve
Non-return valve
Temperature
sensor
Oil tank
Air inlet
Suction filter
DP
Suction filter △P switch
Suction valve
Air end
Pulley
belt
motor
Pulley
Oil filter
DP
Oil filter △P switch

Flow chart of AED 55---AED250



1. Air system flow

1.1 Air enters into compression chamber to be compressed and mixed with oil via suction valve after dust particles are filtered by air filter, the oil-mixed compressed air goes into oil tank, and then pass through oil fine separator, min-pressure valve, after cooler, stop valve, finally feed into system.

1.2. Description of parts function in primary air source passage.

1.2.1 Suction filter

The suction filter is a dry paper element filter to filter solid particles in the size of >10 m. A maintenance indicator is attached to it, and when the red lamp of the indicator illuminates, the filter paper should be cleaned, or replaced if the filter paper is too dirty.

1.2.2 Suction valve

The suction valve is an assembly of a butterfly valve and a one-way swing check valve with a balance weight and a gravity-casting aluminum valve seat. Inlet airflow is controlled through changing rotating angle of the butterfly plate, and the check valve is used for avoiding the back-flow of air and the oil at high pressure when the compressor is shut down.

The suction valve used in AED7.5and AED45 is a sliding valve at piston type, which controls no-load or overload by the piston moves up and down. Double way solenoid valve is used to make the piston of the suction valve move upward to shut off the valve, during its start-up、shut-down or no-load, as well as the throttle valve is used to keep the minimum pressure required by system recycling.

1.2.3 Expansion joint（under 75HP not available）

The expansion joint, which is installed on the pipeline between the unit discharge and the oil gas drum inlet, is used to compensate for the pipe deformation caused by thermal expansion or unit vibration.

1.2.4 Oil tank

An oil level indicator is installed on the tank's side and the oil level must be located between H and L. An oil drain valve is arranged at the bottom of the oil tank, and every time before start-up the valve should be open a little bit to remove the condensed water from the oil tank. A one-inch hole is on the top of the tank for oil adding. The area of oil tank is wide, and the flow rate of the compressed air is decreased. On the other hand, a special air guiding plate is adopted in the oil tank, which could separate the big oil drop from the whirlwind; this is the primary oil separation, generally, called "rough separation".

1.2.5 Safety valve

If the pressure switches improperly works so as to make the pressure inside the oil tank higher than nominal discharge pressure by 14.5psi, the safety valve will trip out to reduce the pressure below the set value.

1.2.6 Minimum pressure valve

It is located at the outlet of the oil fine separator and on the top of the oil tank. The opening pressure is preset at 65.3 ~ 72.5psi. The function of the minimum pressure valve is described as following.

1) To build up the pressure is necessary for oil circulation as soon as possible after start-up to ensure lubrication of the unit.

2） Reduce the airflow velocity to ensure separation effect, and protect the oil fine separator from being damaged by too large pressure difference because the valve won't act until the pressure reaches the set valve.

1.2.7 Air cooler

Please refer to the directions of cooler system。

2. Oil flow

2.1. Description of the injected oil flow

Owing to the high pressure, oil is forced to flow from the oil tank. Passing through the thermostatic valve, the oil cooler, and the oil filter, the oil flow is divided into two ways. One way leads to the compression chamber in which the oil cools and seals the compressed air, and another way leads to backward of the compressor in which the oil lubricates the bearings and the gears. Finally, two ways of oil flow join together again at the discharge port and are discharged with the compressed air.

The compressed air is mixed with the injected oil flows through the discharge pipe and enters the oil tank where most of the oil is separated from the air. The air together with the residual oil passes through the oil fine separator and the residual oil is filtered out. And then the clean air flows through the minimum pressure valve and is delivered to user's system.

2.2. Function of parts in lubricating oil line

2.2.1 Thermostatic valve

A thermostatic valve is arranged before the oil cooler to keep discharge temperature above dew point temperature. Oil temperature is low in the initial start-up period, so the oil should enter the compressor without passing through the oil cooler. The valve will open slowly when oil temperature rises above 152.6°F. If oil temperature exceeds 161.6 °F, the valve will open fully to allow all oil to flow through the oil cooler and then enter the compressor。

10HP~60HP unit, which has no heat-control led valve, controls the discharge temperature by starting/stopping the fan.

2.2.2 Oil cooler

Please refer to the directions of cooler system

2.2.3 Oil filter

The oil filter is a paper element filter. It functions as filtering out foreign materials in the oil, such as metal particles and oil cracked materials, etc. The filtration precision is within 10 ~ 15ppm, which provides perfect protection for the bearings and the rotors. The filter element should be replaced after 150 hours operation for a new package. When it should be replaced depends on its pressure difference indicator. If the pressure difference exceeds the preset value without replacing the filter element, it will lead to an insufficient oil flow rate and over high discharge temperature, which will cause shutdown of the unit or reduce the service life of the bearings.

2.2.4 Oil separator

The cartridge of oil fine separator is made of two layers fine fiberglass. The oil mist contained in the compressed air almost can be filtered after it passes through oil fine

separator. Oil particle size can be controlled below 0.lu and oil content lower than3 ppm. Under normal operation, oil fine separator can be used for about 4000 hrs. However, the oil quality and

contamination level of surrounded environment will give an impact to its life cycle. If unfortunately happen to a serious polluted environment, it should consider installing prefilter.

As for the selection of lube oil, we strongly suggest you using the recommended branded oil. It's absolutely not permissible to use fake oil or re - made oil.

Following methods can monitor oil fine separator:

1)The oil content in airline is increasing.

2)An oil fine separator pressure differential switch (8) between oil tank and oil fine separator is installed. The design differential pressure is 14.5psi. Once the differential pressure of oil fine separator exceeded the designed set point, it would illuminate pressure differential indicating light.

3 .Cooling Systems.

The cooling system is one of the very important parts of the air compressor. Air will release a large amount of heat after being compressed, and the heat must be carried through heat exchanging of the cooling system. The cooling system is divided into two types, the air-cooling and the water-cooling.

3.1 If it's air-cooling after cooler (Please refer to Figure 2.) It uses cooling fan (31) to suck cool air and let it go through cooler to cool compressed air. Normally the discharge temperature is below ambient temperature plus +59℉. Air-cooled compressor is much sensitive to ambient temperature, therefore; please take ventilation into account in site selection.

3.2 If it's water-cooled, it uses shell and tube type cooler to cool compressed air down. The discharge temperature is under 104℉ (cooling water inlet temperature must be lower than 95℉) Water cooled compressor is not as sensible as air cooled type and is more easier to control the discharge temperature. Special attention to the cooling water quantity is needed; if cooling water quantity is very bad then heat transfer will be very easy to clog.

4 .Controlling Systems

The controlling system, including the sensing components (used for sensing the operating status of the unit) and the actuating components (used for actuating the control action), enables the unit to run in full automation (there is no need to specially assign a person to watch over the system). See the system flow chart for details。Function of parts in controlling system

4.1 Suction valve（refer to the air flow）

4.2 Relieved solenoid valve

Relieved solenoid valve is a two-way N.O. solenoid valve. This valve will open when unit is shut down or at unloading status to relief internal pressure of tank. This action will be assure of that compressor can start up or idle running under no-load conditions.

4.3 Three-way solenoid valve：(limited only to ≥75HP unit)）

This is a two-position three-way normally-closed solenoid valve which closes in normal condition and opens when energized. It is energized or de-energized together with the solenoid blew down valve. If loading is needed, this valve opens when it is energized to let the system pressure move to the inlet valve servo-cylinder nozzle 1, so the inlet valve will be opened to enable the loading operation. On the other hand, if unloading is needed, this valve closes when de-energized to cut off the pressure supply

to the inlet valve servo-cylinder nozzle 1, so the inlet valve will be closed to enable the unloading operation (at this time the solenoid blowdown valve starts to work)。

4.4 Pressure control component

The pressure control component has two types, the pressure switch and the pressure sensor.

Unless special request, usually, The pressure sensor is used on all machine. The pressure sensor senses the air pressure and converts it to the electric current signal that is then sent to CPU. CPU converts the electric current signal to the digital signal that is then sent to the LCD for display of real time pressure value. CPU, then, makes a decision according to the pressure value before sending the control signal.

The pressure sensor senses the pressure behind the pressure remaining valve, i.e. the customer system pressure. If the customer system pressure increases to the upper limit set point, CPU will send a signal to make the solenoid valve de-energized so the unit will be unloading.

If the customer system pressure decreases to the lower limit set point, CPU will send a signal to make the solenoid valve energized so the unit will be loading.

Prior to the compressor being delivered to the customer, the upper/lower limits of the pressure sensor is set in line with the unit operating pressure required by the customer when ordering the compressor. The upper limit set point is the maximum operating pressure required by the customer while the lower limit set point is usually the maximum operating pressure - 17.4psi。

4.5 Temperature control component

The temperature control component is also divided into two types.

The temperature sensing probe is a thermocouple that senses the compressor discharge temperature and converts it to the electric current signal that will be then sent to the temperature switch. The purpose of the temperature switch is:

4.5.1 To convert the electric current signal sent from the temperature sensing probe to the digital signal for display.

4.5.2 To protect the temperature. To set the temperature protection value on the temperature switch. When the discharge temperature reaches the temperature switch protection set-point (212℉), the temperature switch will start to send a signal to CPU which will then send a signal to stop the unit.

Oil loss, fan failure or over high ambient temperature, etc. will lead to a high discharge temperature.

If the discharge temperature protection is enabled, the system starting circuit will be disconnected immediately. The system cannot be restarted until you press the emergency stop button to reset the function to disable the discharge temperature protection.

The temperature sensor senses the system temperature and converts it to the electric current signal that is then sent to CPU. CPU converts the electric current signal to the digital signal that is then sent to the LCD for display of real time discharge temperature value. CPU, then, makes a decision according to the temperature value before sending the control signal.

The system controls the fan start/stop according to the unit discharge

temperature. Refer to P42 description for details. Oil loss, fan failure or over high ambient temperature, etc. will lead to a high discharge temperature. If the discharge temperature reaches the protection set-point (212℉), CPU will send a signal to stop the unit.

If the discharge temperature protection is enabled, the system starting circuit will be disconnected immediately. The system cannot be restarted until you press the emergency stop button to reset the function to disable the discharged temperature protection.。

4.6 Capacity control valve

The purpose of the capacity control valve is to let the unit reduce its inlet air amount before the air use reaches its full load, and let the unit run in the regulated capacity to avoid relatively frequent unloading/loading for power saving.

The capacity control valve is divided into two types, the direct-proportional valve and the inverse-proportional valve.

The direct-proportional valve works as follows: if the incoming pressure is lower than the pressure set-point (the pressure set-point is 2.9psi lower than the upper limit of the unit pressure), the direct-proportional valve will not work and there will be no delivery pressure. If the incoming pressure exceeds its pressure set-point, the direct-proportional valve will open and the delivery pressure will move toward the inlet valve nozzle 1 to make the piston go upwards to reduce the inlet opening so the inlet air amount will be reduced. The higher the incoming pressure is, the higher the delivery pressure of the direct-proportional valve will become, and, as a result, the inlet valve will close further to reduce the larger amount of the inlet air.

Inverse-proportional valve is used in conjunction with the butterfly inlet valve on 55KW≥ unit. It works as follows: if the incoming pressure is lower than its pressure set-point, the inverse-proportional valve will not work and the delivery pressure will equal to the incoming pressure. If the incoming pressure exceeds its pressure set-point, the inverse-proportional valve will open to make the delivery pressure lower than the incoming pressure. Thus, the higher the incoming pressure is, the lower the delivery pressure will become.

The working pressure of the inverse-proportional valve is usually set 2.9psi lower than the upper limit of the unit pressure. When the pressure goes up to this working pressure, the inverse-proportional valve will decrease the delivery pressure to make the pressure at the inlet valve servo-cylinder nozzle 1 go down. As a result, the inlet valve will be closed in some degrees and the unit will start to control its capacity. If the pressure continues to go up, the inverse-proportional valve will have lower delivery pressure. As a result, the inlet valve will be closed further to make the unit have less amount of the discharge air.

The capacity control valve has been set by the manufacturer. Never try to adjust the valve.

4.7 Shuttle valve (limited only to 75HP unit)

The shuttle valve has two air sources, i.e. the inlet and the outlet. The shuttle valve allows the higher air source to be passed while the lower one is blocked.

Its purpose is to supply a relatively high control air pressure to the inlet valve

servo-cylinder in different operating conditions. Therefore, the inlet valve could be opened quickly when the unloading status is turning to the loading status.

4.8 Check valve

The check valve is installed between the oil-return pipe and the unit body. The check valve allows the oil filtered from the oil fine separator to flow only in one-way into the unit in order to prevent the oil in the unit from returning to the oil fine separator before the system pressure drops to “0” after the compressor shutdown (this oil which returns to the oil fine separator will greatly increase the oil consumption by the unit).

For a unit with the piston inlet valve , two check valves are used on the anti-vacuum pipe to prevent the oil return.

4.9 Differential pressure switch：

The unit has three filter components, i.e. the air filter, the oil filter and the oil fine separator. These components, when blocked, will have adverse effects on the unit operation. Thus, the differential pressure switch is installed on each of the three components. When one of these components gets blocked and the differential pressure before/after being blocked reaches the differential pressure switch.

set-point, the differential pressure switch will start to work by putting the signal into CPU to make the corresponding indicator lamp on the control panel light up showing that the relevant component has been blocked. If this occurs, replace the component as soon as possible. Never take any chances with the blocked component for further use. Otherwise, other failures or damages to the unit are very probable to ensue. Thus, the loss may outweigh the gain.

The differential pressure values as the differential pressure switch starts to send the signal:

Air filter -0.8psi
Oil filter 26.1psi
Oil fine separator 14.5psi

10HP～60HP unit has no differential pressure switch. The control system has already set the useful life of the filter materials. When it reaches the set time, replace the filter materials。

5. Electric controls

5.1 Startup panel:

The startup panel consists of various electric components as follows:

5.1.1 Contactor:

10HP～60HP unit is a direct-start type. The startup panel has two contactors, i.e. M (for control of the main motor operation) and F (for control of the fan operation). When the main motor starts, M will pull in with the main motor in △ type for direct startup.

≥20HP unit is a Y-△ start type. The startup panel has four contactors, i.e. M, D, S, and F, in which F controls the fan operation while the others control the main motor operation. When the main motor starts, M and S will pull in with the main motor in Y type for decreasing the startup current. Several seconds later, it will automatically switch to M and D pull-in with the main motor in △ type. An electric self-locking design is installed between Contactor D and S to avoid simultaneous pull-in.

All the contactors receive a command from CPU.

5.1.2 Overload protector:

The unit has two motors, i.e. the air compressor driving main motor and the fan motor. An overload protector is installed on the circuit for each of the two motors. It is a current protector. When the motor current exceeds the protector set-point and this state lasts for some periods, the protector will cut off the main power automatically so the compressor will be stopped. At this time, it is necessary to find out the cause for the current overload for immediate troubleshooting. Once the protector is activated, the unit cannot be restarted until the protector is reset. Press the reset button on the protector to reset its function.

The protector set-point is usually setted the rated current of the motor.

5.1.3 Transformer

The startup panel has one transformers ,it is the main transformer that provides power supply for the whole electric control system.

5.1.4 Relay circuit board

The relay circuit board is used to rely on the switch-signal. The weaker control signal from CPU (e.g. signal for the solenoid blowdown valve energization/de-energization or the contactor pull-in, etc.) will be converted, through the relay, to the big electric current signal for driving the solenoid valve and the contactor. The signal from the differential pressure switch or the overload protector may also be converted before being sent to CPU. Besides, the phase reversal relay is integrated into this circuit board.

5.1.5 CPU

CPU refers to the control center of the whole unit. Signals from various sensing components are sent to CPU which, in turn, issues corresponding commands to control the unit operation while showing all kinds of operating parameters and failure information on the LCD.

Refer to Chapter 4 for the details of CPU control function.

6. Transmission system

6.1 YED unit uses the belt type transmission system. The motor belt pulley and the unit belt pulley, with high-strength belts on them, are mounted respectively on the motor shaft and the unit shaft. The unit rotating speed could be varied by changing the diameters of the two belt pulleys.

6.1.1 Belt check: Check the belt after the first 30 hours operation of the new compressor, and adjust the belt if it gets too loose. Afterwards, check or adjust the belt every 1500~2000 hours.

Use a tensiometer to apply a 3 kg load to the belt and measure its deflection. Adjust the belt tension if the deflection exceeds the reference value. The deflection of this unit is 6±0.3mm.

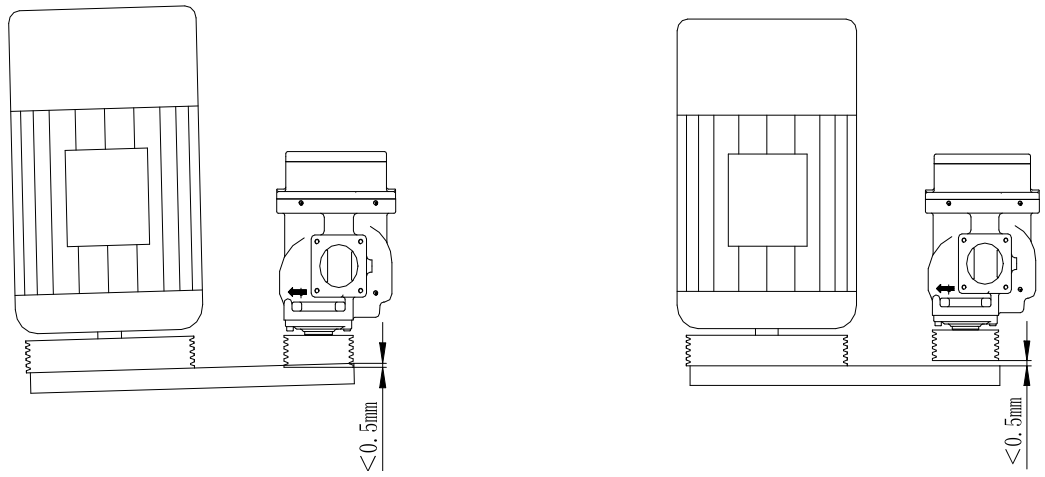
When adjusting the belt tension, first slightly loosen the four fixing screws on the motor seat, then use the adjusting screw at the side to move the motor, and next, use the tensiometer to measure the belt tension and tighten the fixing screws of the motor。

After adjusting the belt tension and replacing the main motor or the compressor body, readjust the position of the motor to maintain the planeness error of the two belt pulleys within 0.5 mm. Too much planeness error may result in belt wear and shortened life. See Figure 8.

Checking method: Place one end of a rigid ruler (about 1 m length) against the external end face of the motor belt pulley, and then check the distance from the other end of the ruler to the unit belt pulley, i.e. the planeness error. If there is too much planeness error of the belt pulley, contact us or our distributors for leveling。

6.1.2 Change all belts. Changing only one of the belts may cause unbalanced tension.

6.1.3 During adjusting or replacing, don't spatter the lubricant on the belt or the belt pulleys for avoidance of the belt trackslip.



Unparallel error of two belt pulleys　　Parallel error of two belt pulleys

Figure 8

6.2 ≥AED55 unit uses the coupling transmission system that consists of the center bracket, coupling, elastomer and transmission gear, etc.

6.2.1 Center bracket:

The unit body and the motor are connected through the center bracket to become a module. The flange at the front end of the motor and the locating hole & precisely-machined center bracket on the unit case ensure the accurate centering of the motor shaft and the unit protrusion shaft.

6.2.2 Coupling and elastomer

The motor shaft and the unit shaft are driven through a pair of couplings. There is a plum blossom elastomer between the two couplings. The couplings and the elastomer could be used for a long time without any maintenance to them.

6.2.3 Transmission gear

The front half part of the unit is a gear box in which there is a pair of transmission gears. The driving gear is mounted on the unit protrusion shaft while the driven gear is on the main rotor. The torque input from the motor shaft transmits through this pair of gears to the main rotor which then drives the auxiliary rotor to realize the air compression process. Some other units have no transmission gears, thus the motor shaft directly drives the main rotor through the coupling.

7. Other auxiliary devices

7.1 Anti-vibration device:

The screw compressor itself has a very small vibration, but little only. For example, during start and Y-△shift, the vibration relatively increases. Therefore, the anti-vibration device is installed in the

unit to prevent this vibration from transmitting to the base. The motor and the unit are respectively supported by two shock pads.

Note: The vibration isolator or the motor/unit should be fastened by bolts during transport. These bolts have already been fastened by the manufacturer. Loosen these bolts before starting the new compressor for the first time.

7.2 Front-mounted filter:

A front-mounted filter is installed at the air inlet of the unit to prevent too much dirt from entering into the unit isolation cover. The front-mounted filter should often be removed for cleaning to prevent the filter from being blocked; otherwise, it will cause high temperature of the unit and reduction of the discharge air. More frequent cleaning is necessary for the air-cooled unit in a high dust condition.

8. Lubricant system

Lubricant plays a key role in the normal and reliable operation of the screw compressor. A brief introduction of the lubricant role has been described in Chapter 2. The following is a further and detailed description about the lubricant function.

8.1 Lubrication: Lubricant forms an oil film between the rotors in mesh, thus there hardly is any wear between the rotating rotors. Lubricant also lubricates the bearings at both ends of the rotor, as well as the transmission gear in the gear drive unit.

8.2 Cooling: The air, after being compressed, generates a great amount of heat which is absorbed and carried by the lubricant injected into the compressor, so that the compressor won't have a dangerously high temperature. What's more important is that the relatively low discharge temperature makes the compression status nearer to the ideal isothermal compression, enables higher efficiency and saves more power for the compressor.

8.3 Sealing: Though the screw rotor is made by high-precision grinding, there still are tiny gaps during meshing, which may cause air leaks. The oil film between the rotors considerably decreases these gaps to reduce the air leaks for higher efficiency.

8.4 Noise reduction. The screw compressor, due to its structural characteristics, generates high-frequency noise when it compresses air. The lubricant is able to improve its compression status and eliminate the rotor friction to reduce the operating noise.

Since the lubricant plays such an important role in the screw compressor, high-quality lubricant is required correspondingly. For example, the lubricant should have such qualities as good anti-oxidation, anti-emulsifying property, anti-foaming property, anti-aging property, anti-corrosion property and anti-wear property, etc. If the poor-quality lubricant is used, the lubricant is soon degraded and deteriorated with drastic increase of viscosity, so the lubricant will lose its lubricating property to speed up the wear of the moving parts and greatly increase the acid number. As a result, major components like the rotor and the bearing will get corroded and greatly reduce the unit useful life, and even lead to the rotor getting stuck! Mixing of two or more lubricants will also deteriorate the quality of the oil, or the incompatibility of each additive will cause the lubricant to be condensed into gluey substance!

Warning: Feeding the lubricant manufactured by other companies will automatically void all the responsibilities of GOLDKING INTERNATIONAL company.

YEB/YED series Screw Air Compressor-specific oil, made according to the highest quality

standard, uses high-quality, refined base oil and special high-grade additive. This lubricant oil has undergone repeated long tests for approval to ensure the satisfaction of each performance requirement.

In normal condition, the oil performance decreases slowly as time passes. Once it reaches the useful life, the performance will decrease drastically. In general, 3000 hours is the recommended oil replacement period. The customer's environment and condition, however, differ in thousands of ways, so the oil replacement period will vary as well. Many factors affecting on the oil replacement period include load, temperature, humidity and environment, etc. The following conditions will considerably reduce the life of the lubricant.

① Poor ventilation that greatly increases the ambient temperature, or delayed maintenance that makes the compressor run at high temperature for long time;
② Highly humid environment or rainy season;
③ High dust environment.

Extending the useful life of the lubricant as long as possible is quite worthy, so try to avoid the above factors. If the above factors exist, it is recommended to reduce the oil replacement period correspondingly. Even if the environment is quite good without any of the above factors present, the oil replacement period should not exceed 3000 hours. When it reaches 3000 hours, the quality of the lubricant has already been decreased in some degree and the compressor is not running in its optimum condition. Continuing to use the lubricant will speed up the deterioration of the quality of the lubricant and gradually increase the possibility of the compressor being damaged. If deterioration of the lubricant quality leads to the carbon deposition, not only the lubricating performance has been decreased drastically (which will cause the aggravated wear of the rotor and the bearing), but the flash point has gone down considerably (which will probably put the lubricant into self-combustion at high temperature resulting in extremely dangerous consequences)!

The customer must remember: it is extremely dangerous to just add lubricant constantly or just replace half of the lubricant each time! The newly added lubricant will not recover the original performance of the non-replaced lubricant. If you continue to use this non-replaced lubricant, you may encounter the above-mentioned damages and dangers! Thus, replace the entire lubricant at a designated period.

9. Motor

Refer to the motor manual (which comes with the unit) for use and maintenance of the main motor.

Chapter4. Screw Air Compressor Controller

System characteristics:

1.The picture is beautiful and the operation information is displayed comprehensively. If it is a frequency converter, all parameters can be set on the touch screen.

Temperature detection and control protection.

2.Pressure detection and control protection.

3.Integrating PID operation and control, the frequency of frequency converter is controlled according to the supply pressure, and constant pressure gas supply is realized with constant pressure precision of 0.02Mpa.

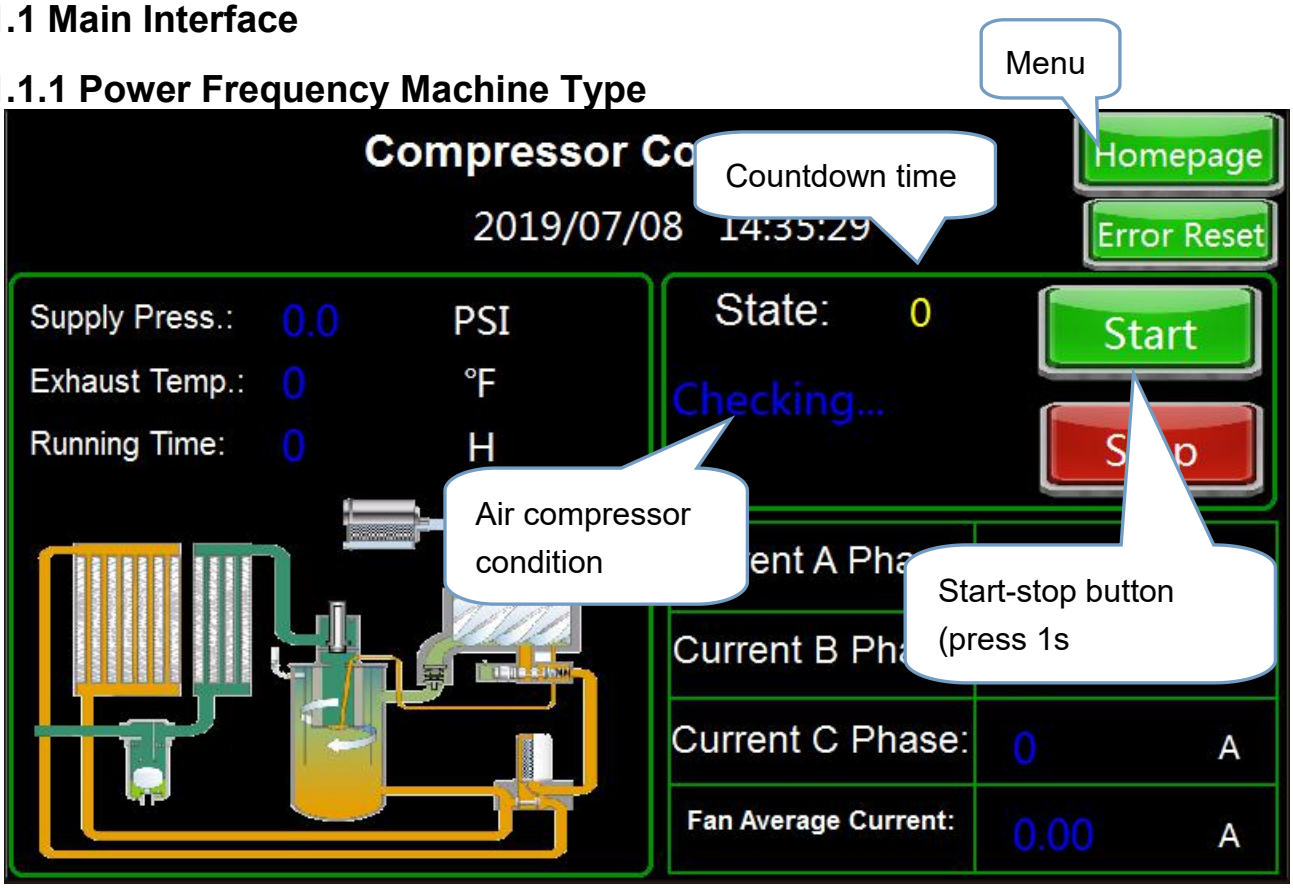
4.Low-frequency band load capacity, wide voltage range 323V-480V, good stability.

5.Controller capacity 16K step, secondary development, good scalability, such as the realization of customer's unique needs, joint control function, remote monitoring function of the Internet of Things, etc.

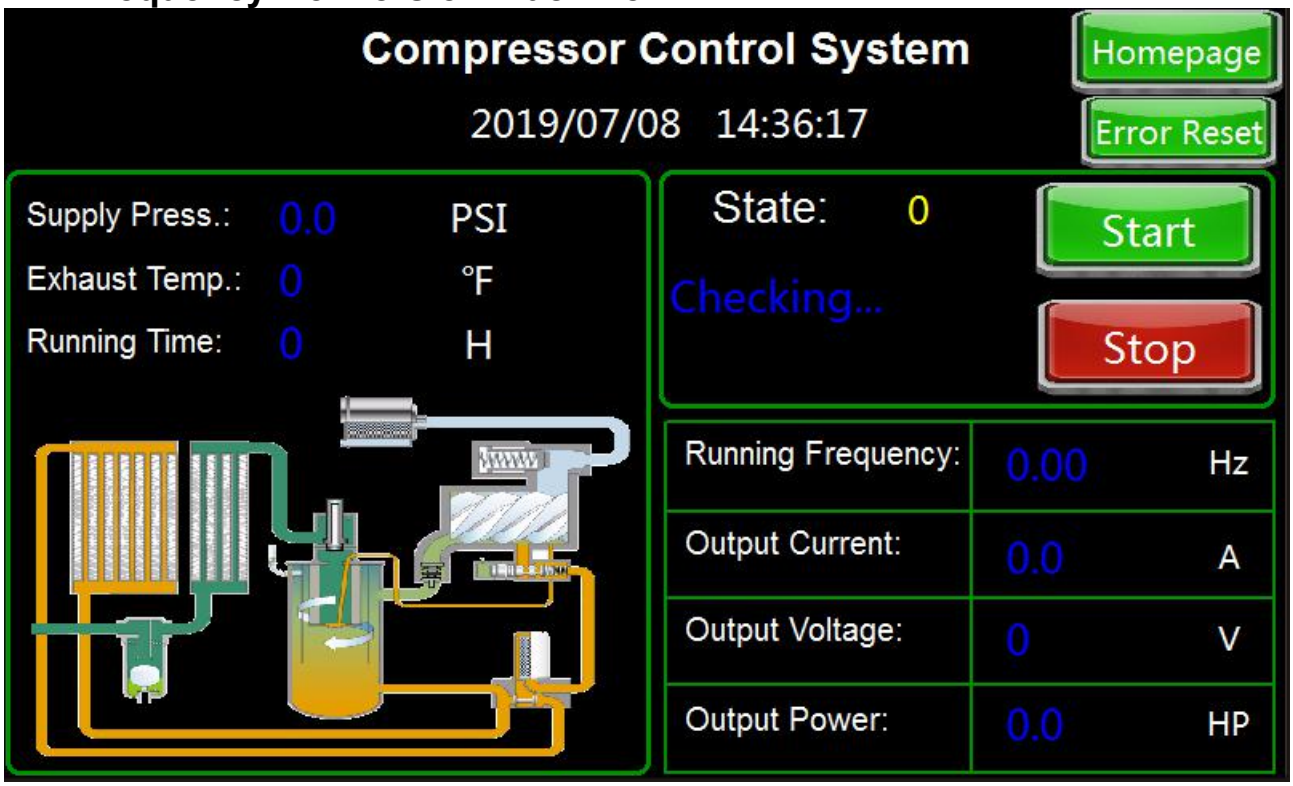
1.Picture Introduction

1.1 Main Interface

1.1.1 Power Frequency Machine Type



1.1.2 Frequency Conversion Machine



In the main screen, it can control the start and stop of the device and display the important parameters of the current operation.

Status introduction:

1.**Power-on self-test:** When the equipment is on-line, it will be displayed when there is a fault in power-on or when the communication connection with PLC is disconnected.

2.Stop: When the equipment does not appear abnormal self-check, alarm status, and has not been started, restart delay, equipment status, when the equipment is in the state of shutdown to start the equipment, start the device button to be effective;

3.Frequency conversion startup: When the controller is set to frequency conversion mode, it enters this state after pressing the startup button.

4.Star startup: When the controller is set to power frequency mode, press the startup button and enter the startup state.

5. Angular startup: Star startup delays and enters angular startup.

6.Loading delay: When the frequency converter accelerates according to the acceleration time or starts at the same angle, it enters the state of loading delay.

7.Operation: When the equipment has been started and after loading delay, it will enter the normal operation state.

8.Stop preparation: When the equipment receives stop signal, the process to complete stop is in the state of stop preparation.

9.In the reboot delay: when the equipment stops, the reboot delay is required before the machine can be restarted.

10.Check for faults: When faults occur, the corresponding faults need to be eliminated

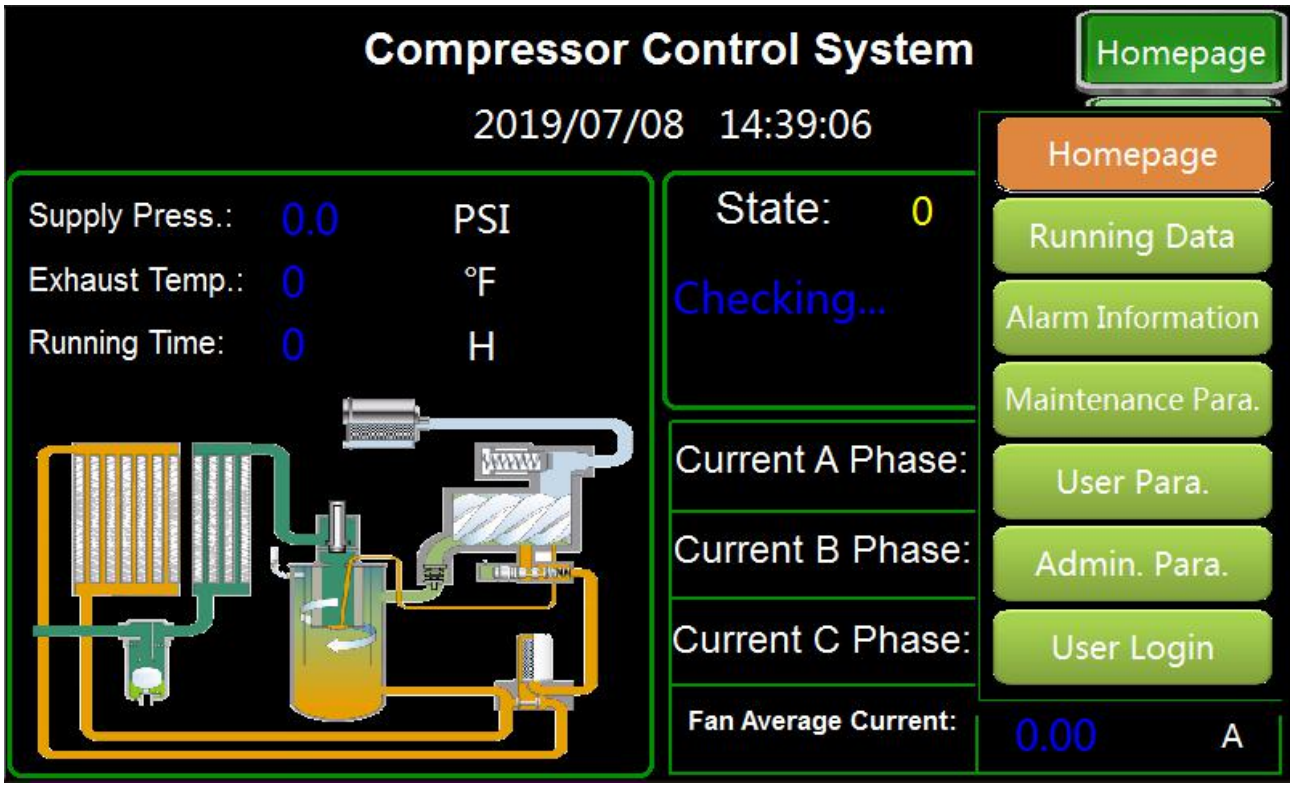
before the fault alarm can be eliminated.

11.Reset for emergency shutdown: When pressing emergency shutdown, reset is needed before starting.

12.Space-time delay: when the air compressor is in the state of unloading, start timing to prepare for standby, when reloading, the timing stops;

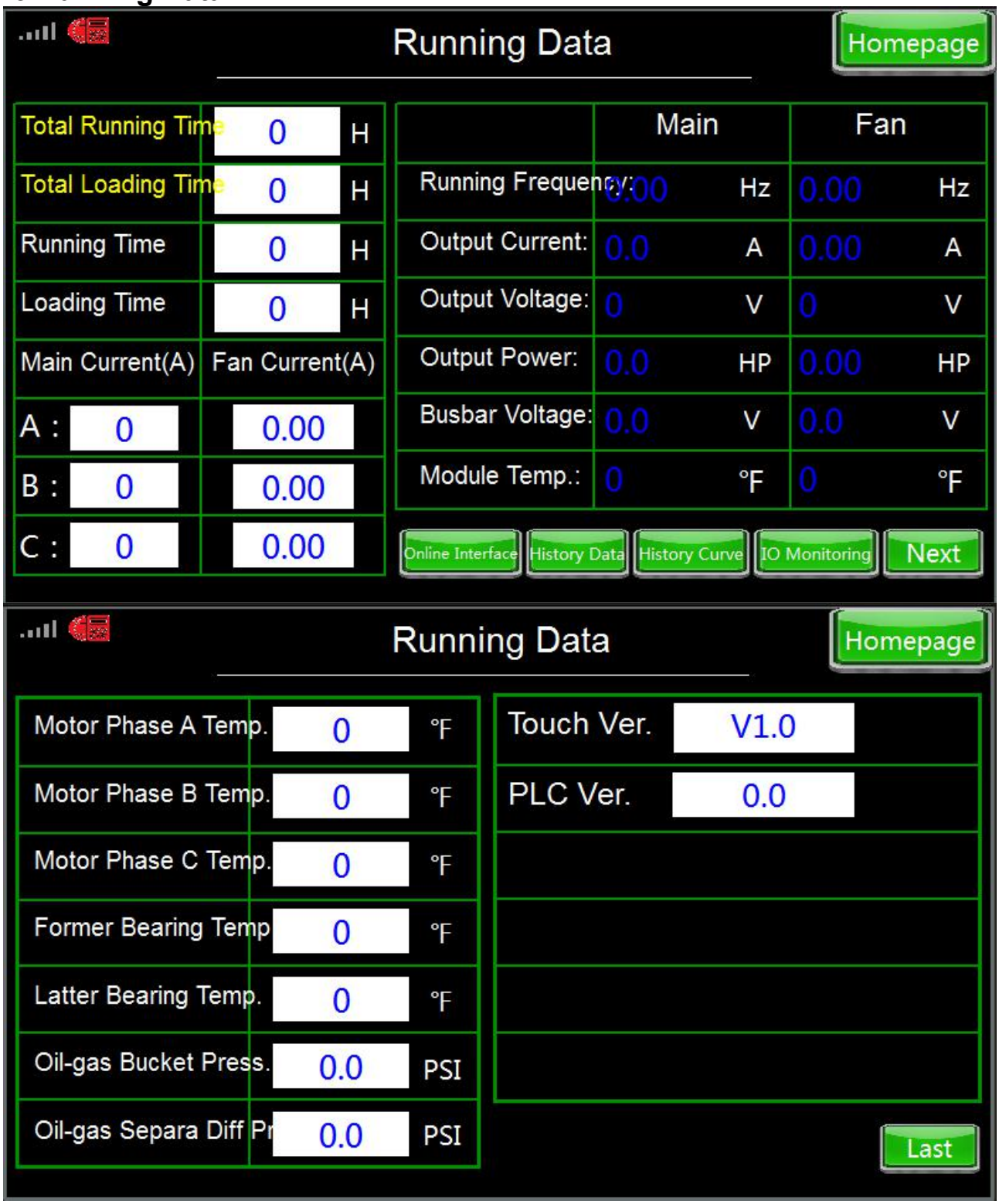
13.In the idle shutdown: when the idle running time of the main equipment reaches the set dormancy time, the equipment enters the standby state, and when the pressure is lower than the loading pressure, it will automatically wake up and start.

1.2 Menu Interface



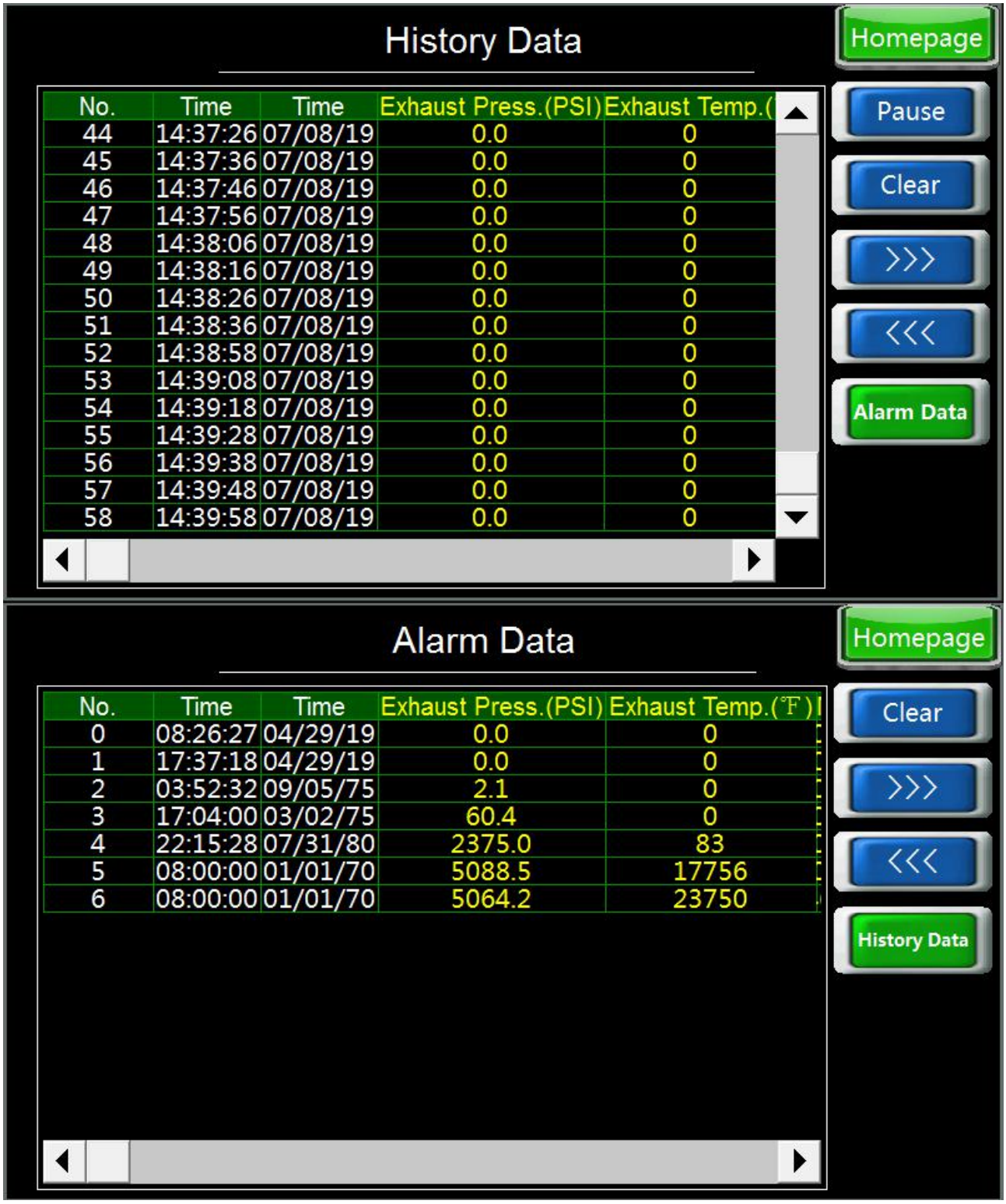
By clicking on the buttons in the menu page, you can switch to the corresponding interface. Some interfaces need to login to obtain the corresponding rights before you can enter.

1.3 Running Data



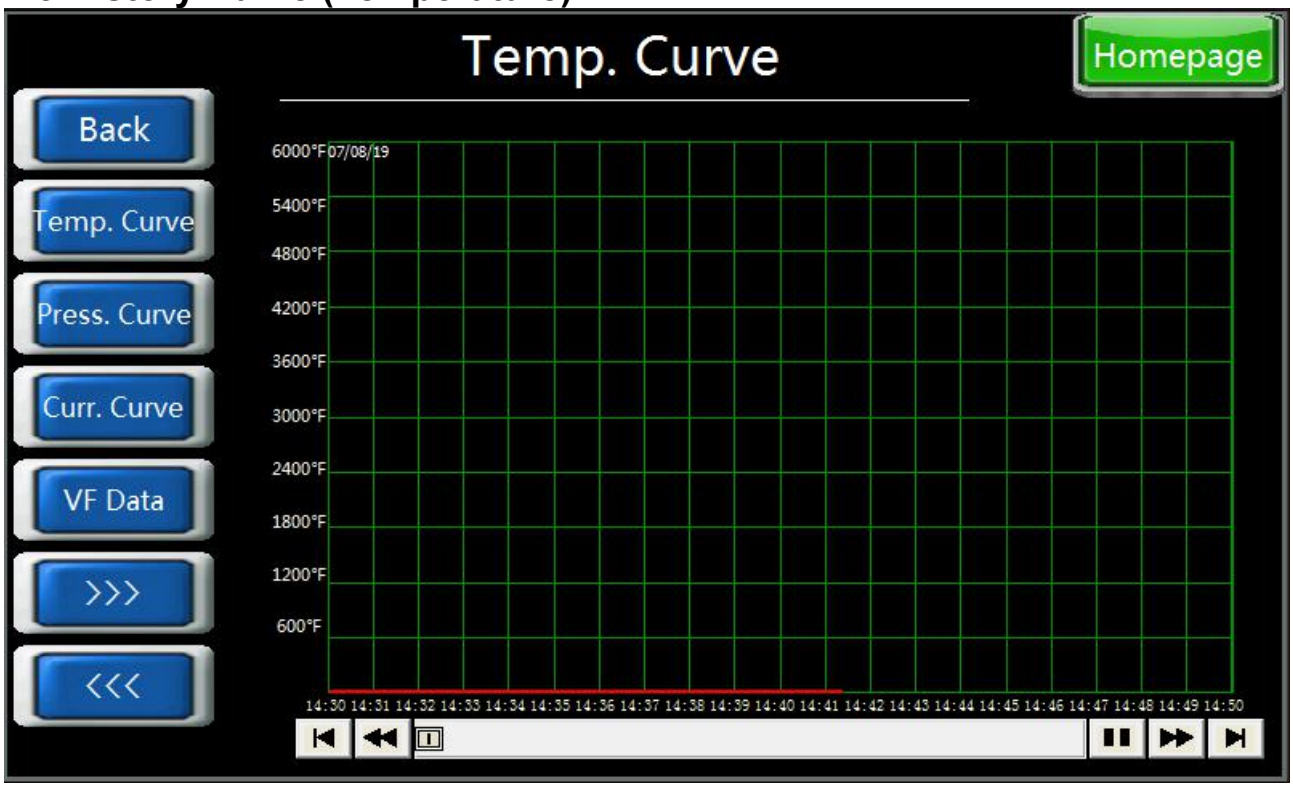
The specific running data of air compressor and the program version of touch screen and PLC can be viewed in this interface, and the corresponding buttons can be switched to the historical data, historical trend and IO monitoring interface.

1.4 Historical Data



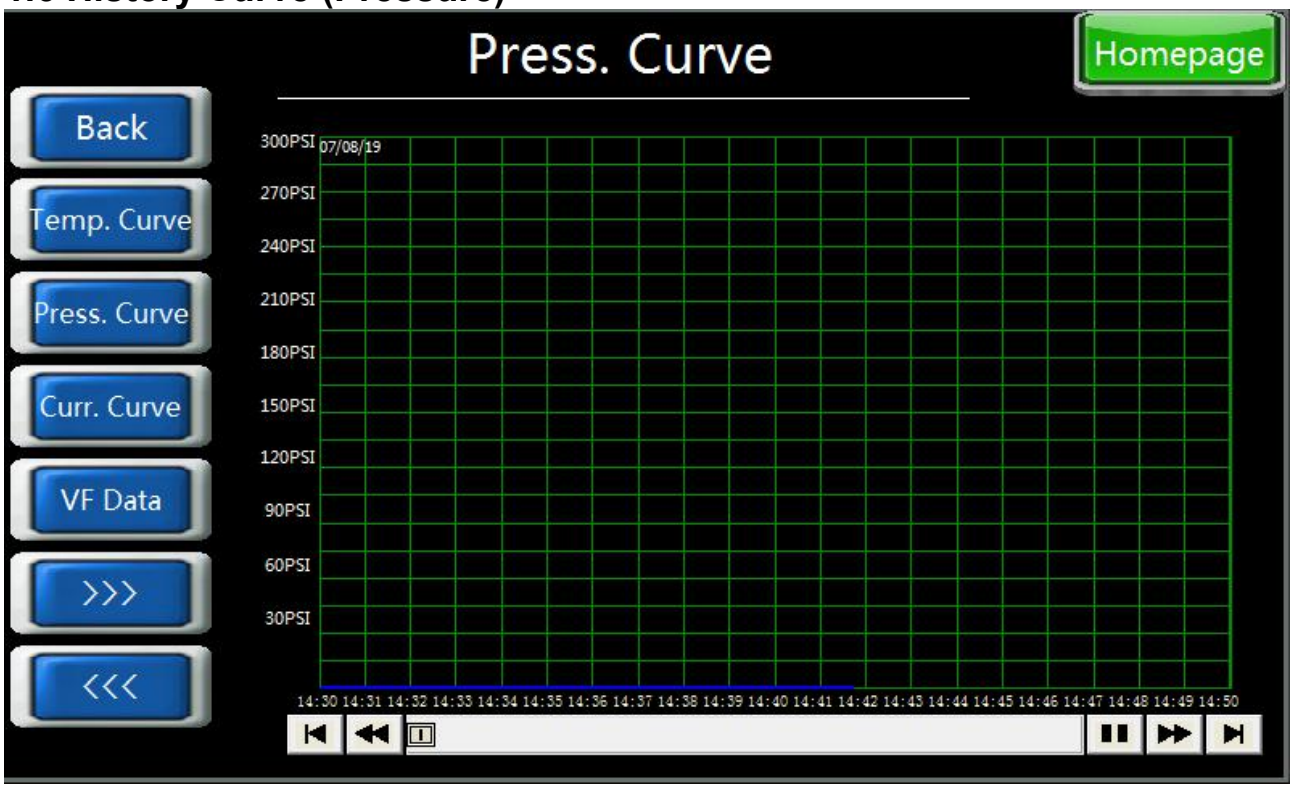
The historical operation data and fault data of air compressor can be viewed in this interface. The historical operation data is recorded once every 10 seconds and the historical fault data is recorded once when the air compressor fails. Customers can determine the cause of the failure through data records

1.5 History Curve (Temperature)



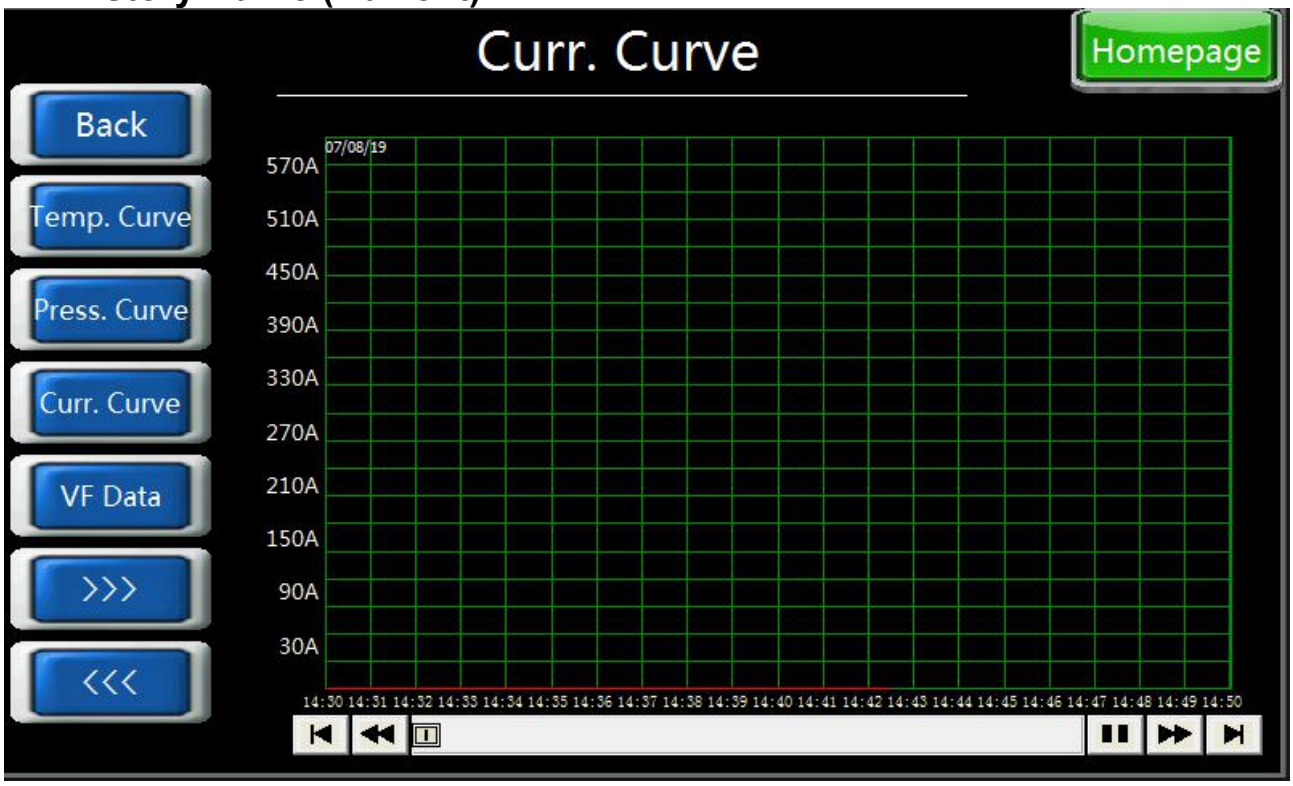
The trend of exhaust temperature over a period of time can be seen.

1.6 History Curve (Pressure)



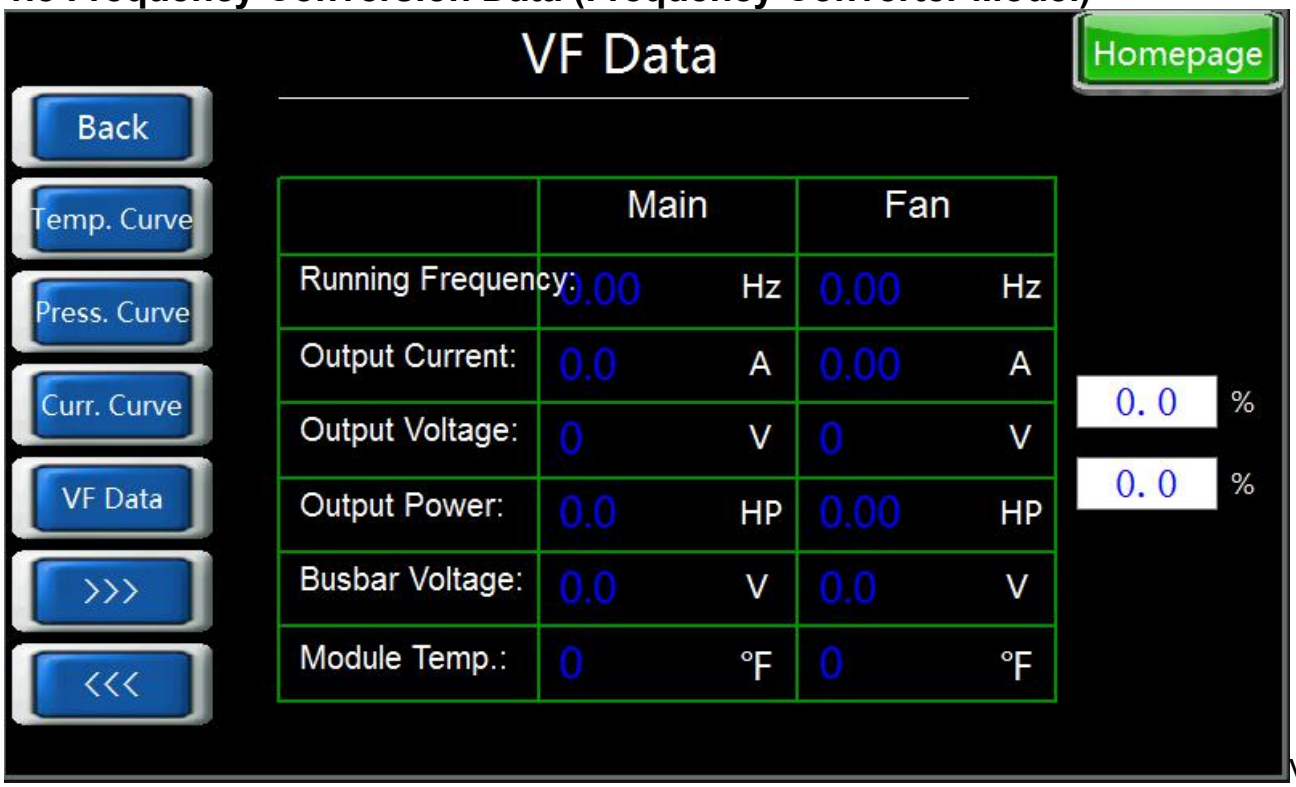
The trend of exhaust pressure over a period of time can be seen.

1.7 History Curve (Current)



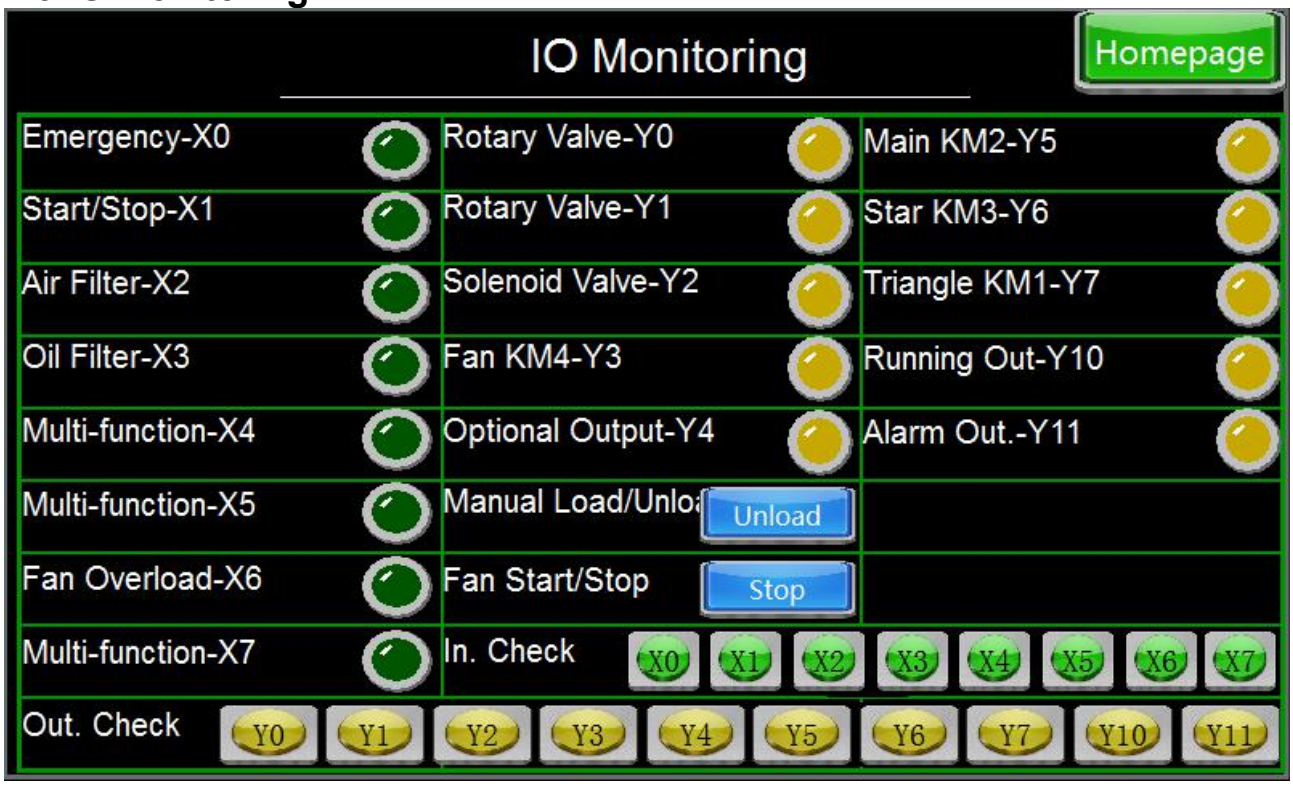
The trend of main motor current over a period of time can be seen.

1.8 Frequency Conversion Data (Frequency Converter Model)



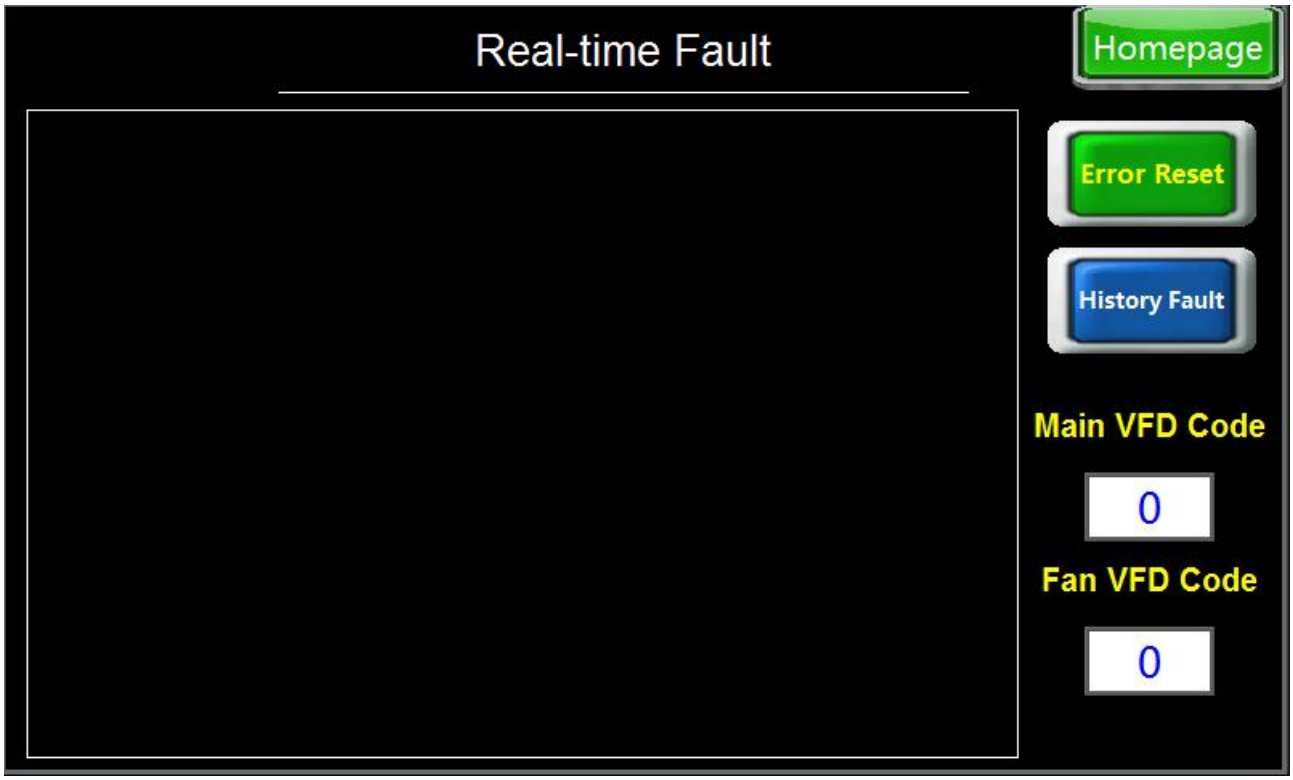
View the operation data of the main converter and fan converter.

1.9 IO Monitoring



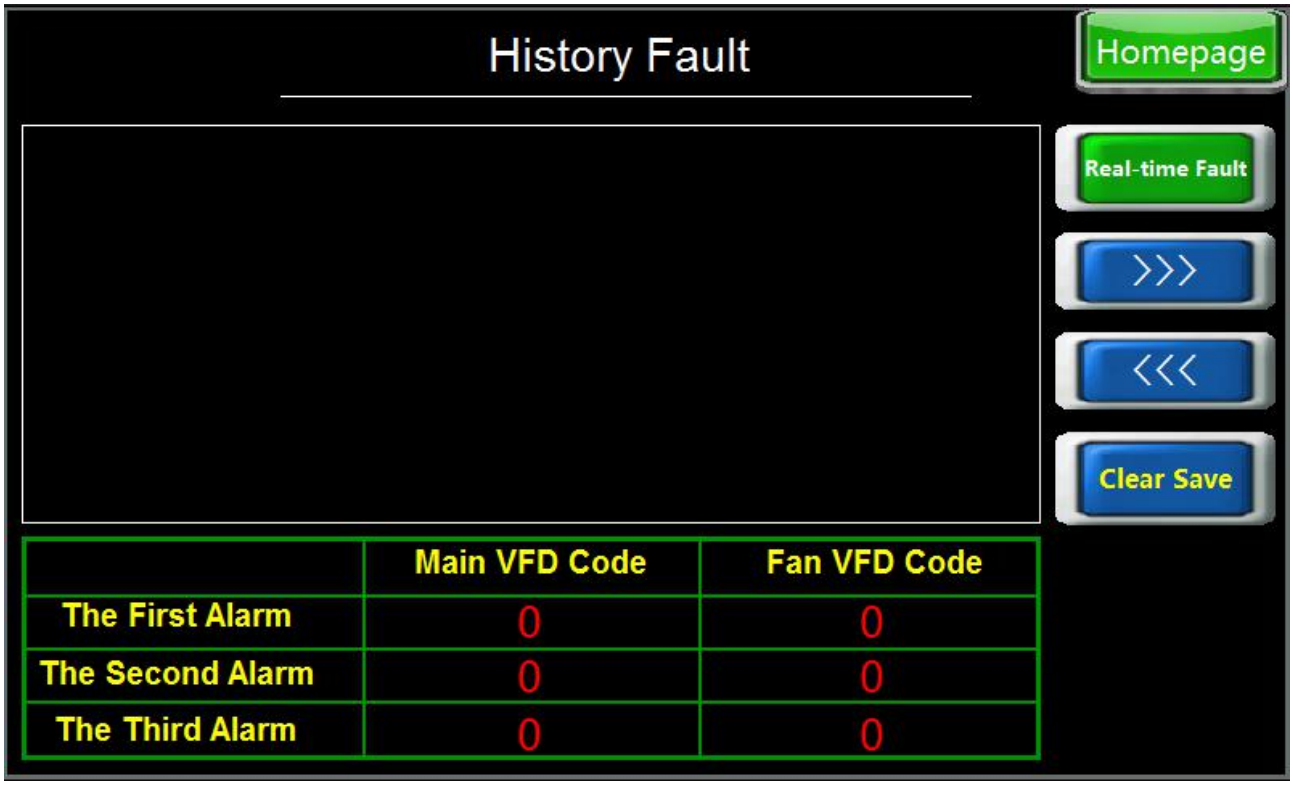
Monitoring IO Point of PLC.

1.10 Real-time



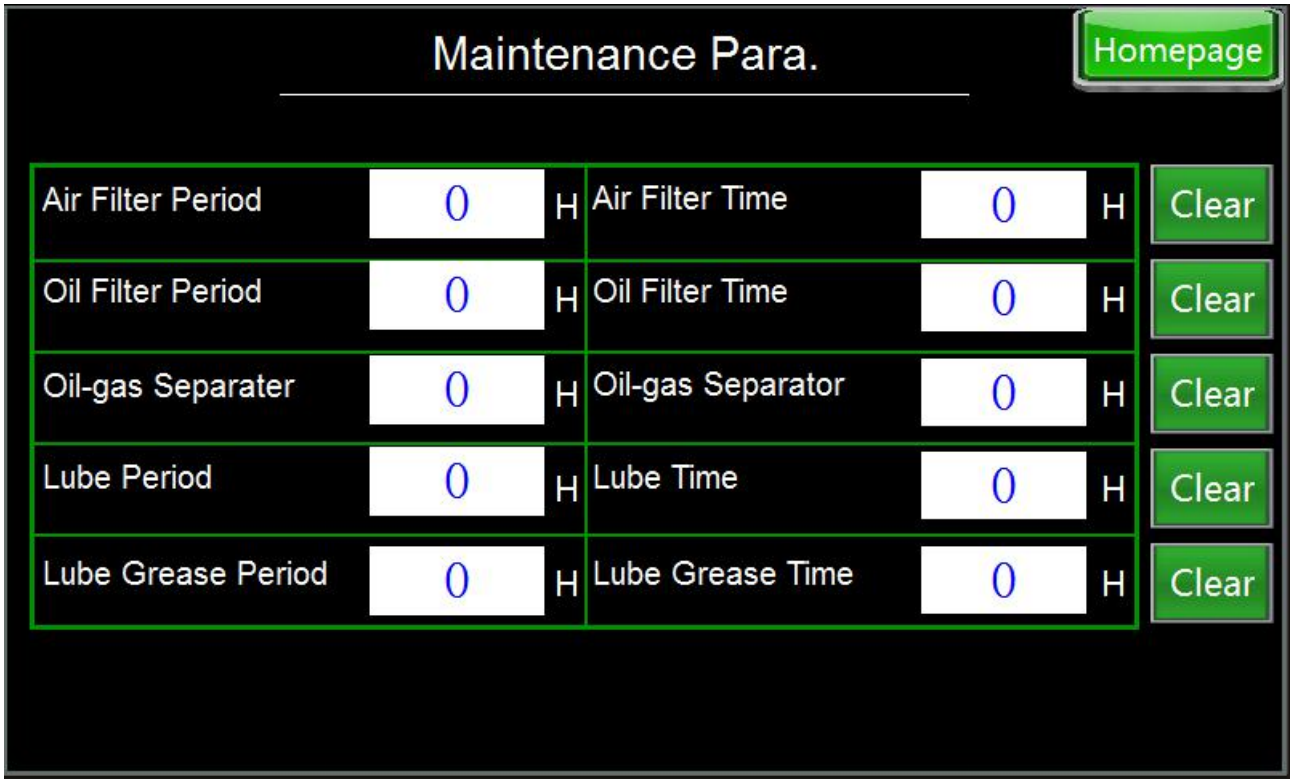
Viewable Real-time Fault Data and Converter Fault Code.

1.11 History Fault



Viewable Historical Fault Data and Converter Fault Code

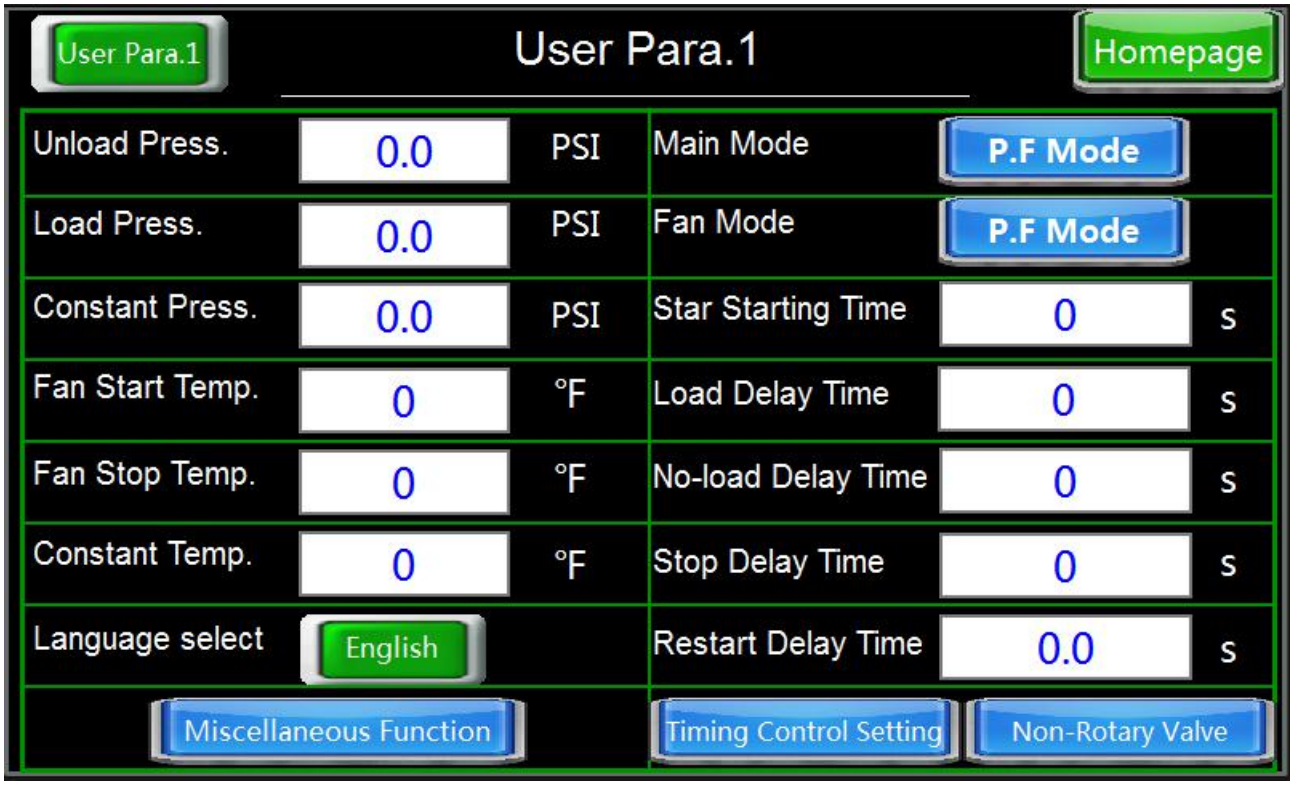
1.12 Maintenance Parameters



Description of parameter terms

Parameter	Initial value	Function
Air filter period	2000	Air filter used time is more than the value of the set value here, warning tips ;
Oil filter period	2000	Oil filter used time is more than the value of the set value here, warning tips ;
Oil separator period	4000	Oil separator used time is more than the value of the set value here, warning tips ;
Oil using period	2000	Oil used time is more than the value of the set value here, warning tips ;
Grease using period	2000	Grease used time is more than the value of the set value here, warning tips ;
Air filter used time	0	Air filter time of used, the replacement of the new air filter, cleared here.
Oil filter used time	0	Oil filter time of used, the replacement of the new oil filter, cleared here.
Oil separator used time	0	Oil separator time of used, the replacement of the new oil separator, cleared here.
Oil used time	0	Oil time of used, the replacement of the new oil, cleared here.
Grease used time	0	Grease of used, the replacement of the new grease, cleared here.

1.13 User Parameters 1

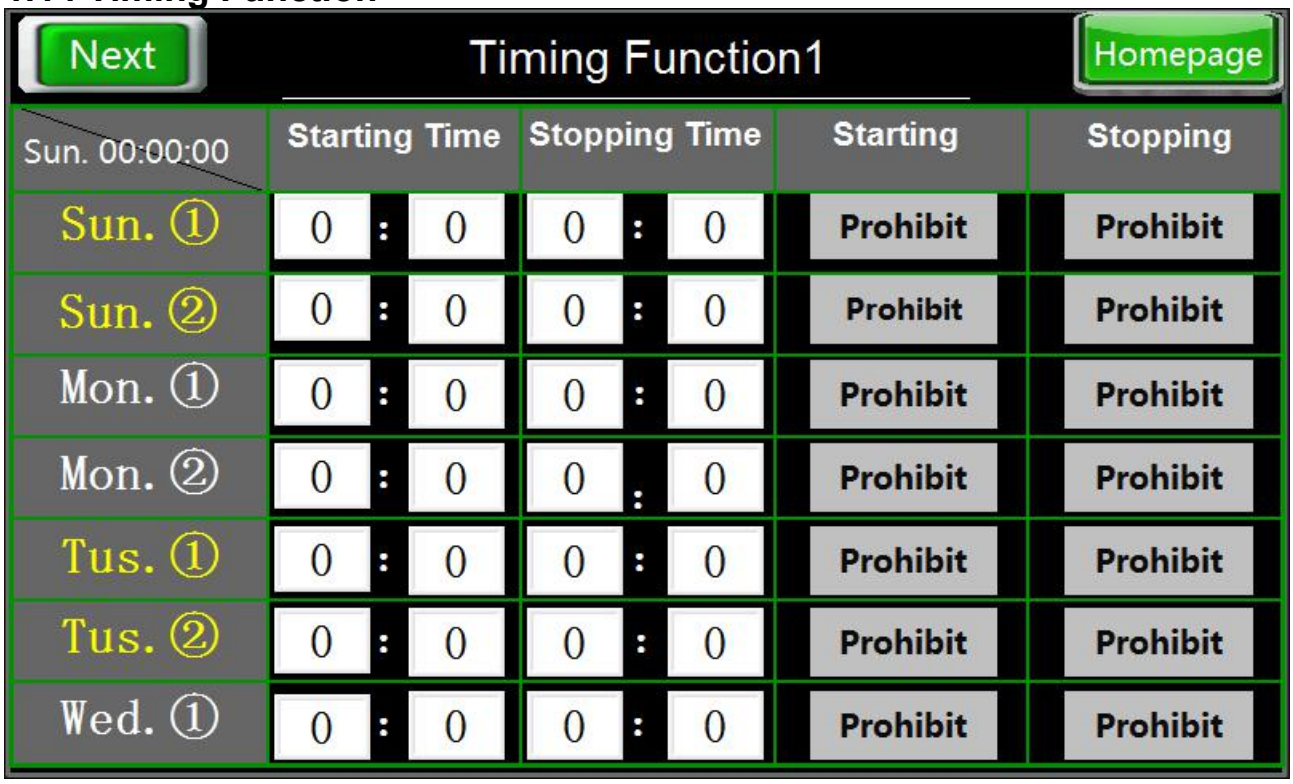


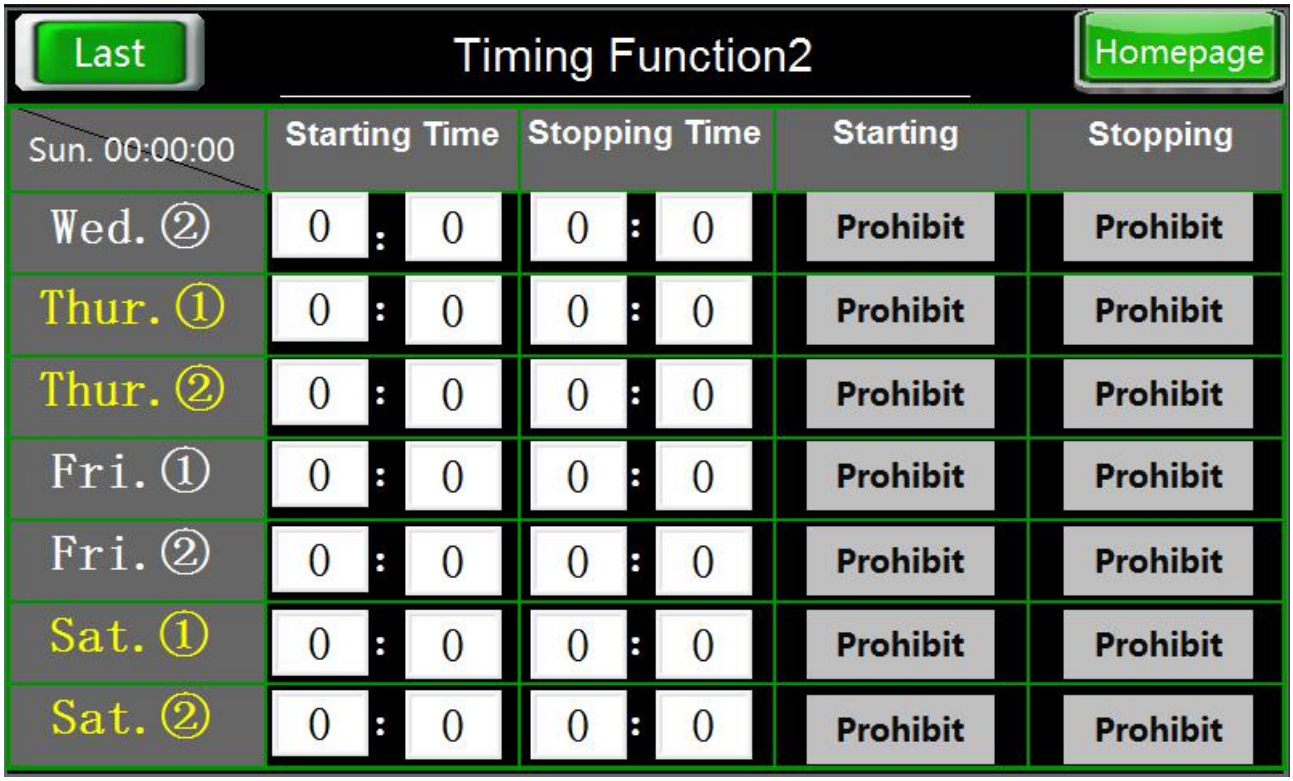
Description of parameter terms

Parameter	Initial value	Function
Unload pressure	116.0PSI	When the pressure is greater than the value of the setting value, the controller controls the air compressor unloading..
Load pressure	94.2PSI	When the air compressor operates in the unloaded state, detected here pressure is lower than the set value, air compressor load operation, if the compressor in a standby state, the pressure is lower than the set value detected here, wake up the host. The setting range is less than or equal to a constant pressure
Constant pressure	1087PSI	According to the pressure setting value, when the VF mode or a rotary valve controller, this value is effective, to achieve constant pressure supply. The setting range should be greater than or equal to the loading pressure, less than or equal to the unloading pressure
Fan start temperature	2873℉	When the exhaust temperature is higher than the value here, the fan start to run.
Fan stop temperature	2535℉	When the exhaust temperature is lower than the value here,the fan stop running.
Run mode	P.F Mode	When the machine stops, the machine can be set to run the run mode, power frequency / frequency mode, in order to set up the machine down
Fan mode	P.F Mode	When the machine stops, the fan can be set to run the run mode, power frequency / frequency mode, in order to set up the fan down
Star starting time	8s	When the power frequency is running, the duration of star start..
Load delay time	10s	After the start of the triangle, the time delay load

No-load delay time	900s	When the air compressor enters into a standby state to determine the time, frequency model is set 300s, power frequency is set 900s.
Stop delay time	15S	After receiving the stop signal, after this time, completely shut down.
Relay delay time	100S	To prevent frequent starting and stopping the air compressor, after shutdown, after a shutdown time to open air compressor again.
Touch date	****-**-**	Set touch date
Touch time	**:**:**:	Set touch time
Timing control setting		Enter the timer settings interface

1.14 Timing Function

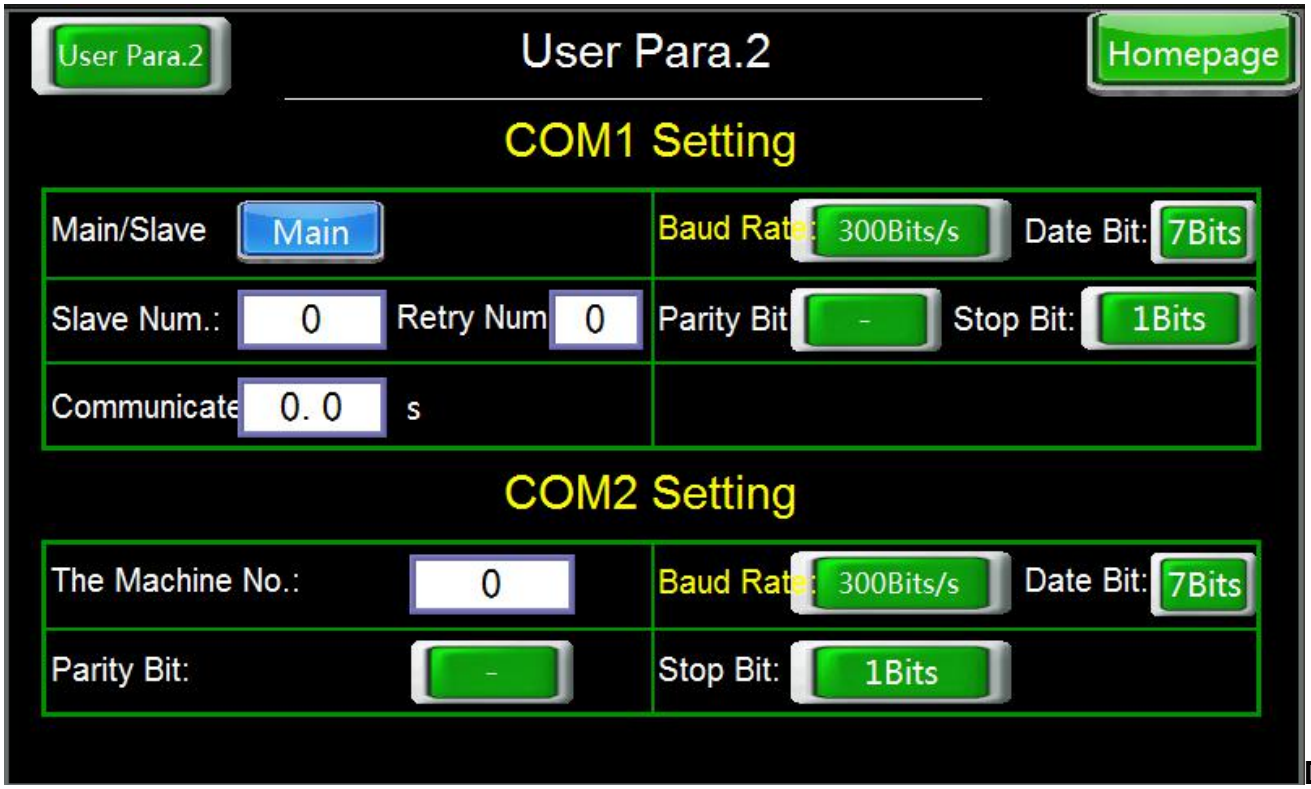




This interface is the function of timing switch. After logging in the user's rights, the user can enter this interface in the user's parameter interface. Customers can input the start-up time and shutdown time in the corresponding time according to their needs, and then set the start-up action and shutdown action as allowable to turn on the timing switch function, which can be set up at most in the same day. Two different switch time points.

Note: This function is not enabled by default. If customers do not need this function, please turn it off in time to prevent unnecessary consequences caused by machine misoperation.

1.15 User Parameters 2



D

escription of parameter terms

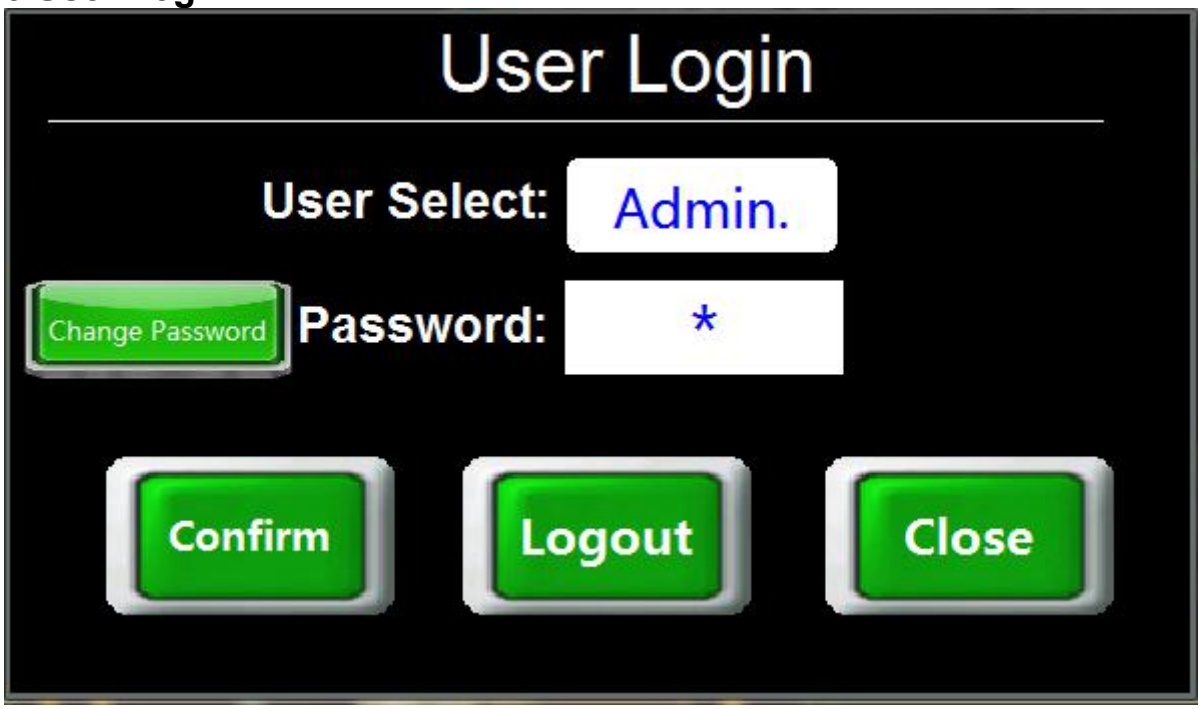
Parameter	Initial value	Function
Main/slave	main	Set the type of the machine when the machine is connected to centralized control.
Slave Num.(Main setting)	1~8	Set the number of connections in network
Communicate timeout.(Main setting)	0.3s	Set communication timeout
Machine NO.(0:main)	0~8	Set machine communication number
Retry num.(Main setting)	3	Set the number of primary master to access the failure of communication from the machine
The Machine NO.	1	When the host through the COM1/COM2 interface to access the machine data set communication number
baud rate	9600	When the computer through the COM1/COM2 interface to access the machine data set when the communication baud rate
Data bits	8	When the host through the COM1/COM2 interface to access the machine data set the number of communication data
Check bits	-	When the host computer data through the COM1/COM2 interface to access the communication check bit type
Stop bits	1	When the host through the COM1/COM2 interface to access the machine data set to stop the number of communication

The controller reserves two 485 communication interfaces between COM1 and COM2 to communicate with the host computer. Customers can realize the functions of joint monitoring and remote monitoring through these two 485 communication interfaces according to their needs.

COM1 485 communication port defaults to master station (optional), communication format is 9600 Bit/s baud rate, 8 bit data, no check bit, one stop bit;

COM2 485 communication port defaults to slave station (not set up), communication format is 9600 Bit/s baud rate, 8 bit data, no check bit, one stop bit.

1.16 User Login



1.17 Change Password

Select the appropriate permissions, enter the password, after login successfully can modify the corresponding permissions parameters, modify the password needs to the permissions, after login can to show the change password box.

User type	Password	User rights
User	8888	View maintenance parameters, view the user parameters, modify the load、 unload pressure and constant pressure
Agency	****	View and modify maintenance parameters, view and modify all parameters within the user parameters
Administrator	****	View and modify all parameters

2.Modbus-RTU Communication Address List

Name	PLC MODBUS Address	Accuracy	Unit	Read/Write	Remarks
Supply Press.	400101	1	PSI	R	
Exhaust Temp.	400102	0.1	℉	R	

Running Time	400103	1	H	R	
Loading Time	400104	1	H	R	
Motor Current A Phase	400105	1	A	R	
Motor Current B Phase	400106	1	A	R	
Motor Current C Phase	400107	1	A	R	
Running Status	400108			R	See Running Status Table
Failure Status	400109			R	See Fault Status Table
Control Status	400110			W	See Control State Table
Air Filtration Used Time	400111	1	H	R	
Oil Filtration Used Time	400112	1	H	R	
Oil used time	400113	1	H	R	
Lubricating oil used time	400114	1	H	R	
Lubricating grease Used time	400115	1	H	R	
Motor Phase A Temp.	400116	0.1	℉	R	
Motor Phase B Temp.	400117	0.1	℉	R	
Motor Phase C Temp.	400118	0.1	℉	R	
Former Bearing Temp.	400119	0.1	℉	R	
Latter Bearing Temp.	400120	0.1	℉	R	
Fan Current A Phase	400121	0.01	A	R	
Fan Current B Phase	400122	0.01	A	R	

Fan Current C Phase	400123	0.01	A	R	
Barrel Pressure	400124	1	PSI	R	
Injection Pressure	400125	1	PSI	R	
Water Pressure	400126	1	PSI	R	
Injection Temp.	400127	0.1	℉	R	
Spare	400128			R	
Oil partial pressure difference	400129	1	PSI	R	
Frequency of Fan Frequency Converter	400130	0.01	Hz	R	
Output Voltage of Fan Frequency Converter	400131	1	V	R	
Output Current of Fan Frequency Converter	400132	0.01	A	R	
Output Power of Fan Frequency Converter	400133	0.1	HP	R	
Bus Voltage of Fan Frequency Converter	400134	0.1	V	R	
Operating Frequency of Host Converter	400135	0.01	Hz	R	

Output Voltage of Main Converter	400136	1	V	R	
Output Current of Main Converter	400137	0.1/0.01	A	R	Current less than 55 KW is double decimal point multiple
Output Power of Main Converter	400138	0.1	HP	R	
Bus Voltage of Main Converter	400139	0.1	V	R	
Name	**PLC MODBUS Address**	**Accuracy**	**Unit**	**Read/Write**	**Remarks**
Supply Press.	400101	0.1	PSI	R	
Exhaust Temp.	400102	1	℉	R	
Running Time	400103	1	H	R	
Loading Time	400104	1	H	R	
Motor Current A Phase	400105	1	A	R	
Motor Current B Phase	400106	1	A	R	
Motor Current C Phase	400107	1	A	R	
Running Status	400108			R	See Running Status Table
Failure Status	400109			R	See Fault Status Table
Control Status	400110			W	See Control State Table
Air Filtration Used Time	400111	1	H	R	
Oil Filtration Used Time	400112	1	H	R	
Oil used time	400113	1	H	R	

Lubricating oil used time	400114	1	H	R	
Lubricating grease Used time	400115	1	H	R	
Motor Phase A Temp.	400116	1	℉	R	
Motor Phase B Temp.	400117	1	℉	R	
Motor Phase C Temp.	400118	1	℉	R	
Former Bearing Temp.	400119	1	℉	R	
Latter Bearing Temp.	400120	1	℉	R	
Fan Current A Phase	400121	0.01	A	R	
Fan Current B Phase	400122	0.01	A	R	
Fan Current C Phase	400123	0.01	A	R	
Barrel Pressure	400124	0.1	PSI	R	
Injection Pressure	400125	0.1	PSI	R	
Water Pressure	400126	0.1	PSI	R	
Injection Temp.	400127	1	℉	R	
Spare	400128			R	
Oil partial pressure difference	400129	0.1	PSI	R	
Frequency of Fan Frequency Converter	400130	0.01	Hz	R	
Output Voltage	400131	1	V	R	

of Fan Frequency Converter					
Output Current of Fan Frequency Converter	400132	0.01	A	R	
Output Power of Fan Frequency Converter	400133	0.1	HP	R	
Bus Voltage of Fan Frequency Converter	400134	0.1	V	R	
Operating Frequency of Host Converter	400135	0.01	Hz	R	
Output Voltage of Main Converter	400136	1	V	R	
Output Current of Main Converter	400137	0.1/0.01	A	R	Current less than 55 KW is double decimal point multiple
Output Power of Main Converter	400138	0.1	HP	R	
Bus Voltage of Main Converter	400139	0.1	V	R	

Running Status Table

Place number	Mean	Place number	Mean
0bit	Loading	8bit	Oil Filtration Blockage
1bit	Running	9bit	Fan overflow

2bit		10bit	
3bit	Exhaust high temperature	11bit	
4bit	Phase Sequence Error	12bit	
5bit	Overcurrent of main motor	13bit	
6bit	Air Filtration Blockage	14bit	Excessive exhaust pressure
7bit		15bit	Airtime shutdown

Fault Status Table

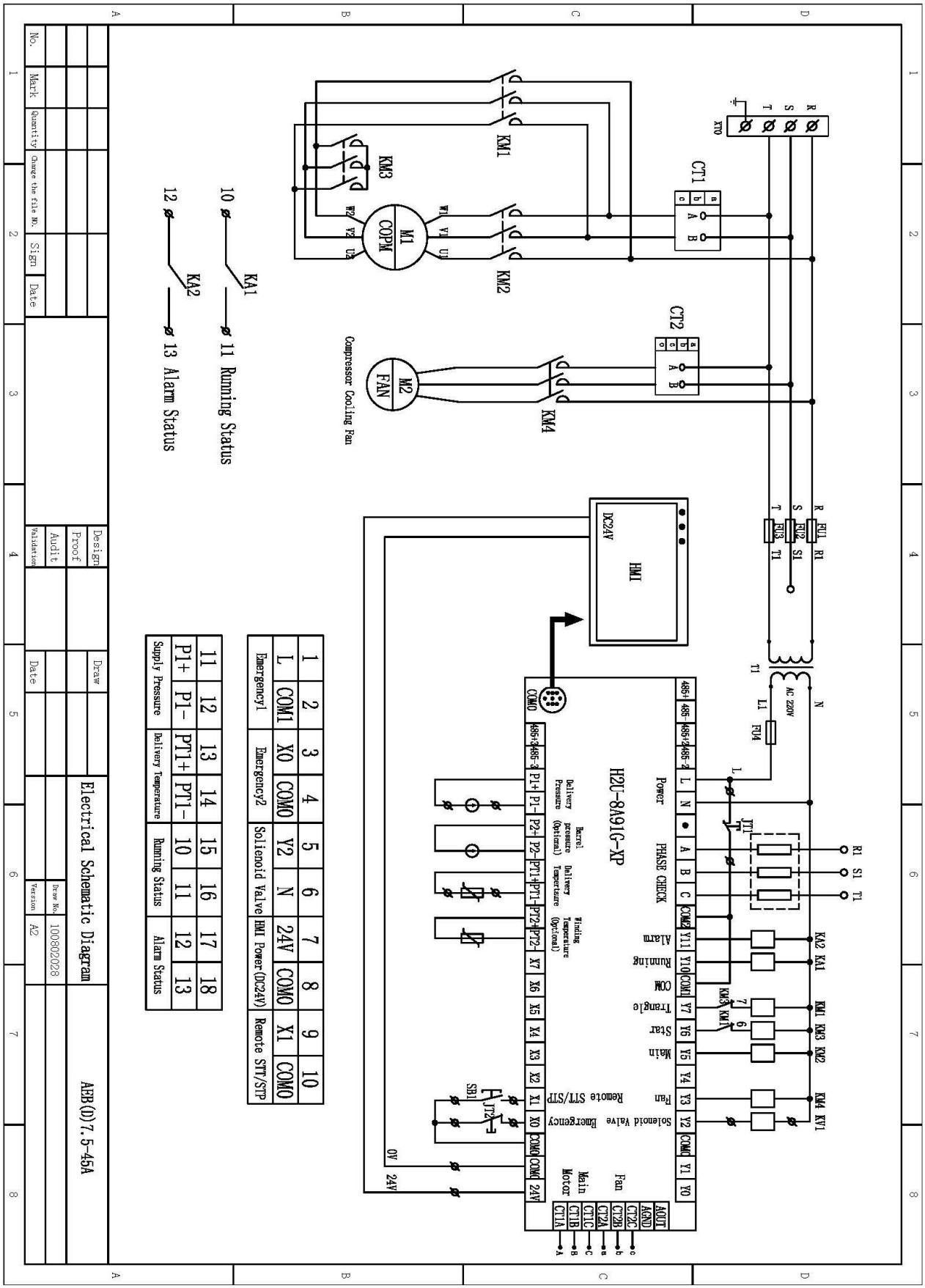
Place number	Mean	Place number	Mean
0bit	Serious malfunction	8bit	High Exhaust Temperature Warning
1bit	Light fault	9bit	
2bit		10bit	
3bit	Lubricating grease overtime	11bit	
4bit	Lubricating oil overtime	12bit	
5bit	Air filter overtime	13bit	Water shortage
6bit	Oil separator overtime	14bit	Failure of Exhaust Temperature Sensor
7bit	Oil filter overtime	15bit	Failure of supply pressure sensor

Control State Table

Value	Mean
1	Start
2	Stop
4	Unload

8	Load
9	Emergency

Electrical Schematic Diagram



Chapter 5. Operation

1.Trial run、start-up and shut-down

1.1 Users can refer to the following procedures when the air compressor starts up for the first time or the unit has just been repaired.

1.2 Connect the power supply cord and ground-wire, check the voltage and three-phase power supply.

1.3 Inspect whether oil levels in oil tank is between “H” and “L”

1.4 Check whether bolts、tools、signs、rags or dirt have been left, which are used in regulation and repairs, and be certain of nothing irrelevant in the unit tank when compressor starts up

1.5 Lubricating oil of 0.5 liter should be added into suction valve before start-up. Rotate the compressor several circle by hand to be sure that no mechanical interference in compressor and to avoid compressor burns down for lack of oil. Especially to pay attention to avoidance of anything dropping in the compressor, that would damage the compressor.

1.6 Check the discharge lines to be sure that the discharge valve is open, to avoid rapidly pressure rising which could cause damage.

1.7 Push “ON” and then push “EMERGENCY STOP” immediately. Check the compressor’s rotation direction which should agree with the arrow drawing at the surface end, the extended end of shaft compressor, if the direction isn’t consistent with each other, exchange any two cords of three-phase power supply cords please.

1.8 Push “ON” again and compressor starts to run

1.9 Check the indicating lamps and warning lamps. Check correctly setting of the flow rate control valve and pressure switch.

1.10 If abnormal noise、 vibration or oil leakage is found, push “EMERGENCY STOP” immediately to shut down compressor

1.11 Check the discharge temperature by discharge temperature meter to be certain that the temperature is between 167^0F and 203^0F

1.12 Push “OFF” when compressor shuts down, releases valve discharges automatically and immediately, electric motor stops after time delays 10~15 seconds. This design is against that compressor shuts down immediately and directly under “overload” condition.

2.Check before start-up

It is necessary to make a check exactly for avoidance of fatal damages to compressor and the improvement of the compressor performance.

2.1 Open the manual discharge valve on oil tank and water separator, so that the condensed water which comes into being during compressor shuts down can be drained out, otherwise, it will shorten service life of lubricating oil and cause bearings burn down easily.

2.1 Check whether oil levels are between H and L, and lubricating oil isn’t permitted to be excessive as well as deficient, supply lubricating oil, if deficient.

2.2 Watching oil levels should be done after compressor shuts down ten minutes; oil levels in a compressor run may be lower compared with which in a shutdown.

3.Cautions in a compressor run

3.1 If there are abnormal noises or vibration, please shut down compressor immediately.

3.2 Pressure is remained in pipeline and containers, don't open pipelines or loosen bolts and stoppers, don't open the unknown valves.

3.3 If no oil is found in oil level gage and low oil level lamp illuminates in a compressor long-term run, shut down compressor immediately, and watch oil levels after ten minutes, supply oil when no pressure is in system, if deficient

3.4 It is necessary to drain out the condensed water comes into being in rear cooler and whirlwind separator timely everyday, or set an automatic discharge valve there, otherwise, water will be taken into system.

3.5 Check meters every two hours to record the value of voltage、electric current、air pressure、discharge temperature and oil levels for reference in repairs in days to come.

4.Management for unused long-term

When compressor is unused for long-term, please manage it carefully in following methods, particularly in wet seasons and regions.

4.1 Unused for three weeks but less than two months

4.1.1 Wrap electric devices such as motor control panel with a sheet of plastic and oilpaper against moisture.

4.1.2 Drain water out in oil cooler and rear cooler.

4.1.3 It benefits compressor using in the future to make a trouble shooting in advance, if possible.

4.1.4 Drain water out, which is in oil tank、oil cooler and rear cooler, in several days.

4.2 Unused for two months or more

Management as follows recommended besides proceeding procedures.

4.2.1 Close all of opening ends to against moisture and dust.

4.2.2 Wrap safety valve、control panel and so on with a sheet of oilpaper against rust-eaten.

4.2.3 Replace lubricating oil with new before using, and run compressor thirty minutes, drain out condensed water in oil tank and oil cooler in two or three days.

4.2.4 Drain out cooling water completely.

4.2.5 Store in a clean、dry location, if possible.

4.3 Restarting up procedures

4.3.1 Untie the plastic or oilpaper wrapped the unit.

4.3.2 Test insulation of motor and be certain that the resistance is over 1MΩ.

4.3.3 Other procedures refer to trial run.

Chapter 6. Maintenance and parts change

Careful maintenance/service to the compressor is worthy of doing, which will keep the compressor in good shape all the time for its optimum efficiency and will also eliminate, just in time, any potential causes for the compressor failure in order to extend the useful life of each part and component. It's extremely dangerous to think that the compressor, if no failure occurs, can do without maintenance and service. This thought only increases the possibility of a failure occurring to the unit. What's more, if repair is done only when a failure has occurred, you will have to suffer the losses caused due to repair cost as well as the compressor shutdown. Follow the instructions in this manual when performing proper and timely service and maintenance to the unit. When servicing, ensure that the right parts of the manufacturer are used. These parts, which will affect the performance and life of the unit, are very important. We are not responsible for any failure or damage caused by not using the right parts of the manufacturer or the oil designated by us. For any questions, please contact the service company.

1. Cleaning and replacing consumables

1.1.Air filter

After 1000-hour running or when the ΔP indicator light displays, remove and clean the air filter with a new one and every 2000 hours thereafter but shorter time at dusty surroundings。

Disassembling and cleaning:

1.1.1 Loosen the lock nut on the cover of the air filter and remove the cover.

1.1.2 Loosen the lock nut of the filter core and remove the core.

1.1.3 Use the low-pressure compressed air (< 43.5psi dry compressed air = to blow the filter core from inside to outside. Blow every part along the entire filter core.

1.1.4 Replace the filter core

1.2. Pre filter

Remove and clean it every 1-2 week, increase the frequency for dusty surroundings。

1.3. Oil-filter

Replace with a new one after the first 1000 hours running and 2000 hours running thereafter。Dirty lubricant due to the poor environment will cause the filter to be blocked before its useful life of 2000 hours. In this case, the indicator lamp for the oil filter blockage will light up on the control panel with the LCD showing that the oil filter is blocked. The oil filter should then be replaced immediately.

Replacement:

1.3.1 Remove the oil filter core from the oil filter case. Use the chain wrench or the strap wrench.

1.3.2 Clean the oil filter case.

1.3.3 Apply a thin layer of lubricant to the O-ring of the new filter core.

1.3.4 Mount the new filter core. Manually rotate the core to make the O-ring in close contact with the case, then use the chain wrench or the strap wrench to tighten further 1/-4 ~ 1/3 turn.

Note: When using the chain wrench or the strap wrench, take care not to crush the filter core case.

1.4. Oil fine separators

When the oil fine separator ΔP indicator light displays, or the oil pressure is higher than air pressure, check it and replace with a new one and 3000 ~ 4000 hours running thereafter but shorter time at dusty surroundings。

The external-mount oil fine separator is disassembled the same way as the oil filter core is. When replacing the oil fine separator, try to prevent the impurities from falling into the oil drum for avoidance of the improper operation of the air compressor.

For replacement of the internal-mount oil fine separator, follow the procedures below:

1.4.1 After stopping the air compressor, close the air outlet and open the drain valve to ensure that the system has no pressure at all.

1.4.2 Disconnect the pipe above the oil gas drum, and at the same time remove the pipe between the pressure remaining valve outlet and the aftercooler.

1.4.3 Remove the oil-return pipe.

1.4.4 Loosen the fixing bolts on the upper cover of the oil gas drum, then remove the upper cover.

1.4.5 Remove the oil fine separator to check the O-ring, then replace the new oil fine separator.

1.4.6 Assemble the oil gas drum in reverse order it was disassembled.

1.5. Lubrication oil (oil Model: shell corena S3 R46)

Change the oil after the first 1000-hour running and 3000 hours thereafter (the discharge temperature is at 176~194℉), but shorter time at dusty surroundings or with high discharge temperature。

Procedures for oil replacement:：

1.5.1 Drain the lubricant of the system completely.

1）Stop the unit completely and make sure that there is no pressure in the oil gas drum.

2）Disconnect the main circuit and then tag out the power switch and the compressor control panel to prevent other personnel from starting the unit.

3）Wipe dirt off the oil fill port cap.

4）Screw the oil fill port cap open.

5） Open the oil drain ball valves on the oil gas drum, the cooler and the discharge pipe of the unit. Hot oil is easier to drain. Therefore, drain the oil right after the unit stops.

6）Remove the oil filter, pour out the oil in it, then replace the oil filter.

1.5.2 Clean the system.

1）Close each oil drain ball valve.

2）Feed 50% new oil through the oil fill port. (This unit has a normal oil filling amount of about 30 liters.)

3）Close the oil fill port cap.

4）Start the unit and let it run for 20~30 minutes, then stop the unit.

5）Repeat Procedure 1 to drain the oil of the system completely.

1.5.3 Feed the normal amount of oil and close the oil fill port cap, then the unit will run normally.

Need for cleaning: Though it is required to drain the oil as much as possible out of every corner of the system, a small amount of oil still remains in some tubes and joints. This residual oil in the system will go bad very soon and will affect the new oil by making the new oil go bad as well, finally leading to an unpredictable result. Cleaning job will flush this residual oil and

some other fine impurities away as much as possible to make sure of the cleanliness of the newly-fed oil.

It is strongly recommended to make a detailed note of the time/amount of the consumable replacement and the lubricant charge. This information is very helpful for our service technicians to analyze the operating status of your compressor before offering you useful suggestions about the way of operating your compressor more reliably and economically. This information may also be used as a reference for analysis of causes for a failure that has occurred to the unit.

2. Maintenance schedule

2.1. Daily inspection or every time before start-up (as the previous section)
2.2. After running 500 hours
2.2.1 First time for a new machine to replace with oil filter cartridge.
2.2.2 Remove the air filter cartridge and pre-filter net and clean them by using low-pressure compressed air to blow outwardly.
2.3. After running 1,000 hours:
2.3.1 Check the movement of suction valve, connecting rod and movable parts, and add oil.
2.3.2 Clean the air filter cartridge.
2.3.3 Inspect or replace with oil filter cartridge, change oil first time for a new machine.
2.3.4 Clean coolers for air-cooled type.
2.4. 2,000 hours or six months running
2.4.1 Inspect every piping of the compressor.
2.4.2 Check the oil gauge or remove to clean it.
2.5. 3,000 hours or one year running
2.5.1 Clean the suction valve, replace with O-ring and add lubrication oil.
2.5.2 Check 2-way solenoid valve.
2.5.3 Check drain valve.
2.5.4 Check if oil fine separator is clogged.
2.5.5 Check retaining pressure valve.
2.5.6 Clean the radiator and replace with O-ring.
2.5.7 Replace with air filter cartridge and oil filter cartridge.
2.5.8 Add grease to the motor.
2.5.9 Inspect starter movement.
2.5.10 Inspect every pressure differential protective switch.
2.5.11 Change the lubrication oil (6,000 hours) with recommended oil--FS-600 (its revolving discharge temperature is lower than 194℉)
2.6. Each 20,000 hours or four years running:
2.6.1 Inspect or replace with oil seal and stage bearings, and then adjust the clearance between rotor and bearing housing.
2.6.2 Measure the motor insulation above 1M ohms.

Chapter7. Trouble shooting

“If a failure occurs to the compressor, immediately contact the designated distributor or our after-sales service department who will send personnel for inspection and repair. Never disassemble parts and components by yourself. The following troubleshooting table is for reference only.

After each failure and repair, make a detailed note of the status, cause and solution to the failure, or keep the repair service sheet the personnel have filled out. ”

Item	Trouble	Symptoms	Remedies
I	The compressor cannot start-up. (electrical failure light displays)	1. Fuse burnt. 2. Protection relay energized. 3. Start relay failure. 4. Bad contact of start push-button. 5. Low voltage. 6. Motor failure. 7. Stage failure. 8. Protection relay energized.	1. Contact qualified electric technician to check and replace. 2. Contact qualified electric technician to check and replace. 3. Contact qualified electric technician to check and replace. 4. Contact qualified electric technician to check and replace. 5. Contact qualified electric technician to check and replace. 6. Contact qualified electric technician to check and replace. 7. Manually rotate the stage. If it can’t be rotated, contact service department of F.S. 8. Inspect power wiring, every terminal and relay preset, reset it after resolving it.
II	High loading current compressor shuts down automatically. (electrical failure light displays)	1. Low voltage. 2. Discharge pressure too high. 3. Incorrect lubrication oil specification. 4. Oil fine separator clogged, high lubrication oil pressure. 5. Compressor stage failure.	1. Contact qualified electric technician to check and replace. 2. Check pressure gauge, adjust pressure switch if over the pressure preset. 3. Check oil code, replace with oil, please refer to section 5-1. 4. Replace the oil fine separator. 5. Manually rotate stage, if it can’t be rotated, contact service department of F.S.

III	Loading current is below normal value.	1. Air consumption too much, pressure is below the preset point. 2. Air filter clogged. 3. Suction valve fault. 4. Capacity control valve improperly adjusted.	1. Check air consumption, or add more compressors if necessary. 2. Clean or replace. 3. Remove, clean and add oil. 4. Reset.
Ⅳ	Discharge temperature is lower than normal value. (below 158℉)	1. Large amount of cooling water. 2. Low ambient temperature. 3. Long unloading time. 4. Incorrect discharge temperature gauge. 5. Thermostatic valve failure.	1. Adjust the valve of the cooling water. Air radiator can decrease the dissipating area. 2. Adjust the valve of the cooling water. Air radiator can decrease the dissipating area. 3. Increase air consumption. 4. Replace the discharge temperature gauge. 5. Replace the thermostatic valve.
Ⅴ	High discharge temperature air compressor shuts down automatically, high discharge temperature indicator light displays. (over the preset value of 338℉)	1. Insufficient lubrication oil. 2. Insufficient cooling water. 3. High cooling water. temperature. 4. High ambient temperature. 5. Oil cooler clogged. 6. Incorrect lubrication oil specification. 7. Thermostatic valve failure. 8. Radiator dirty. 9. Oil filter clogged. 10. Cooling fan failure.	1. Check oil level, if below L, stop the compressor and add oil to the level between L and H. 2. Check the pressure differential of the inlet/ outlet pipes. 3. Check the temperature of inlet water. 4. Increase exhausting air volume, decrease room temperature. 5. Check the pressure differential of the inlet pipes, the normal ΔP is 41℉. If it's below this value, maybe the oil cooler is clogged, remove and clean it with medicine. 6. Check the oil code, replace the oil. 7. Check if the oil is cooled when through the oil radiator, if not, replace the thermostatic valve. 8. Clean the radiator with low pressure oil. 9. Replace the oil filter. 10. Check or replace the cooling fan.

Ⅵ	Oil content in the air is too high. Lubrication oil refueled period is shortened. Filter belches smoke during unloading.	1. Oil level too high. 2. Oil return line orifice clogged. 3. Low discharge pressure. 4. Oil fine separator broken. 5. Spring failure in the min pressure valve.	1. Check the oil level, discharge to the level between H & L. 2. Remove and clean it. 3. Increase discharge pressure. (adjust the pressure switch to the preset value) 4. Replace with a new one. 5. Replace the spring.
Ⅶ	The compressor can't operate on full load.	1. Pressure switch fault. 2. 2-way solenoid valve fault. 3. Time-delay relay fault. 4. Suction valve fault. 5. Min pressure valve failure. 6. Leaks from control pipes	1. Replace with a new one. 2. Replace with a new one. 3. Contact qualified electric technician to check and replace. 4. Remove and clean it, add oil. 5. Remove and check if the valve seat and check valve piece worn out, if so, replace with new ones. 6. Check leaks position and lock.
Ⅷ	The compressor can't unload, the gauge pressure is kept at working pressure or continues going up. Safety valve energizes.	1. Pressure switch failure. 2. Suction valve fault. 3. Solenoid valve failure, coil burnt out. 4. Relief orifice too small.	1. Repair, replace if necessary. 2. Remove and clean it, add oil. 3. Repair, replace if necessary. 4. Repair and replace with a new one.
Ⅸ	Discharged air volume is lower than normal value.	1. Suction filter clogged. 2. Suction valve fault. 3. Min pressure valve fault. 4. Oil fine separator clogged.	1. Clean or replace. 2. Remove and clean it, add oil. 3. Remove and check if the valve seat and check valve piece worn out, if so, replace with new ones, so does the spring. 4. Repair, replace with a new one.
Ⅹ	High frequency of unloading/ loading	1. Pipe leakage. 2. Pressure differential of the pressure switch	1. Check leakage position and fasten it tightly. 2. Reset. (normal pressure differential is 29psi)

		too small. 3. Air consumption is unstable.	3. Increase the capacity of air tank.
XI	Oil mist is belching from air filter during shut-down	1. Suction check valve fault. 2. Loading stop. 3. Electrical wiring fault. 4. Min pressure valve leak. 5. Drain valve fails to drain.	1. repair, replace if necessary. 2. Check if the suction valve gets stuck, if so, remove and clean it and add oil. 3. Contact qualified electric technician to check and replace. 4. Repair or replace if necessary. 5. Check the drain valve, or replace if necessary.

Log sheet

Month / Time / Items										
The intervening level of air/oil receiver										
Air cleaner ΔP indicator										
Oil filter ΔP indicator										
Oil fine separator ΔP indicator										
Working current (A)										
Working voltage (V)										
Discharge pressure (psi)										
Lubrication oil pressure (psi)										
Running hour (hour)										
Signer										
Note										

Note:

a. Items 1-4: Using the signal √ or X to stands for normal and abnormal.

b. Use numbers to record Items 5-10.