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Piston Medical Air Compressor System

Operation Manual

Amcaremed Technology Co., Limited

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Contents

1. Introduction

This operation manual will provide installation, operation and basic maintenance instructions for medical air compressor system. This manual is applicable to our oil-free piston air compressor system. Before starting the piston air compressor, the user must read the following content.

Operators of this equipment should have relevant knowledge of air compressor systems and be able to identify and avoid potential threats associated with air compressors. Improper operation will cause injuries and serious accidents. Before installing and operating this equipment, users should understand the structure, operating procedures and hazards of the air compressor. If you have any questions about the operation, safety, maintenance of the air compressor, please contact us.

2. System Overview

Medical air compressor systems are designed to supply medical compressed air to medical gas pipeline systems in medical facilities.

Amcaremed medical air compressor system consists of main components such as electric control box, compressor, dryer, air tank, pipeline, pressure sensor, etc. The electric control box monitors the pressure in the air tank in real time through the pressure sensor, and controls the start and stop of the compressor through the logic program, so that the pressure in the air compressor system is always balanced within the preset range. The touch screen main screen will display the real-time system pressure value and the status of each compressor.

3. Safety guidance

Operators should read this manual carefully before installing, wiring, starting, operating, adjusting and maintaining the system.

Operators should use common sense safety precautions, good workmanship practices and follow any relevant local safety precautions.

This manual contains information that is very important to know and understand. For safety and to prevent equipment problems, pay special attention to the following information:

- Before starting any installation or maintenance procedure, all power to the equipment must be disconnected and a pre-power-on inspection must be performed.
- This is a high speed machine. Do not attempt to service any parts while the machine is operating.
- All electrical procedures must comply with all national, state and local codes and requirements.

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- All wiring should be connected by a certified electrician.
- The waste discharge and scrapping procedures of air compressor system should comply with local environmental protection regulations.
- The high temperature surface of the compressor may cause burns. Please wait until the pipe or compressor surface cools down before repairing or maintaining it.
- The wire size should be able to handle the peak value of all operating units and the full motor load. Please read the wire size for the full motor load and full system load on the electrical wiring diagram.
- Before removing, loosening, or servicing any covers, guards, accessories, connections, or other equipment, release all air from the affected components.
- If repairs or maintenance will affect available pressure levels, notify appropriate hospital personnel.

4. System Introduction

4.1 Configuration Instructions

Medical air compressor system meets CE requirements and has two oil-free piston air compressors. The system is suitable for three-phase four-wire power supply, 220V/380V, 50Hz/60Hz and other working environments. Other accessories include precision air intake filter, adsorption dryer/refrigeration dryer, stainless pipe pipeline, electric control box, carbon steel tank, etc.

4.2 Component Introduction

4.2.1 Compressor

Oil-free piston air compressor.

4.2.2 Air Inlet Filter

Dust filter: Imported 3 micron precision air inlet filter

Water separator filter: Imported 0.5 micron precision air inlet filter

Oil removal filter: Imported 0.1 micron precision air inlet filter

Bacteria filter: Imported 0.01 micron precision air inlet filter

4.2.3 Check valve

Imported copper check valve G1.

Each compressor is equipped with the check valve, which allows gas to pass in only one direction, preventing the gas from flowing in the opposite direction, effectively preventing the compressor from running in the opposite direction.

4.2.4 Valve

One piece manual ball valve G1.

The valve can be closed manually to disconnect the compressor and adsorption dryer for maintenance.

4.2.5 Air pressure sensor and air pressure gauge

The pressure gauge can display the pressure in the air tank in numerical form, so that the operator can know the measurement results in a simple digital form. At the same time, the air pressure sensor detects the air pressure value in the air tank and the pipeline. The operator only needs to enter the air pressure range value, and the compressor will automatically work within this range.

4.2.6 Compressor operation timer

Record the running time of each compressor to facilitate operators to perform maintenance work on the compressor.

4.2.7 High temperature bellows

Connect the compressor to the stainless steel pipeline to prevent the vibration generated by the compressor from being transmitted to the pipeline, balance the equipment, reduce the damage of vibration to the pipeline and accessories, and reduce the overall vibration of the system and the vibration caused by system resonance.

4.2.8 Air storage tank

Material: Carbon Steel

Air storage tank is designed to be cylindrical with a compact structure, which is easy to move and transport. It is equipped with an electronic drain valve, which the operator can set to automatically drain the condensed liquid in the tank.

4.2.9 Electric control box

(1) The low-voltage electrical components and controller PLC used in the electrical control box are all Siemens or Schneider brands. TCP/IP communication is used to connect the host computer touch screen with the PLC, to operate the system on the touch screen;

(2) It uses thin-film capacitance sensor with high measurement accuracy, good corrosion resistance, and the measurement results are not affected by the measured gas;

(3) Can achieve: ① Reliable protection of the compressor ②Automatically or manually control the start and stop of the compressor ③The pressure working range can be freely set.

(4) Manual control mode: Any compressor can be started and stopped by pressing a button without being affected by the pressure value.

(5) Automatic control mode: The air compressor system automatically operates within the pressure range set by the operator. When the system pressure is higher than the set value, the compressor stops working; when the system pressure is lower than the set pressure point, the compressors automatically start to operate in sequence. When the system pressure is higher than the set value of the protection pressure, one of the compressors is shut down according to the compressor running time calculation to reduce the compressor running time, save energy and reduce consumption, and realize polling start to balance the service life of each compressor.

(6) Sound and light alarm: When the air pressure reaches the set parameter value or the compressor reaches the maintenance time, a sound and light alarm will be issued to prompt that the system now needs maintenance or overhaul.

(7) The control system is equipped with protection devices such as overvoltage, overload, phase loss, and phase sequence detection. Each compressor circuit is equipped with protection components such as circuit breakers, low-voltage circuit breakers, and thermal relays.

5. Receiving inspection

Receipt of your medical compressed air system, inspect it immediately for any damage that may have occurred during shipping.

Repair or replace damaged items before use. The nameplate should be checked to verify that the model and voltage are correct.

WARNING: Use properly rated load-bearing lifting equipment and follow safe lifting procedures during all moves.

WARNING: Do not operate the device if it has been damaged during transportation, handling, or use. Damage may cause an unsafe condition and result in personal injury or loss.

6. Installation

6.1 Installation Location

1. The air compressor system must be installed in a clean, well-lit and well-ventilated area.

2. The area should be free from excessive dust, toxic or flammable gases and moisture.

3. Do not install the compressed air system where the ambient temperature is above 40° or the humidity is high.

4. Clearances must allow safe and effective inspection and maintenance.

5. For maintenance and ventilation of the system, it is recommended to leave 24 inches (60.96 cm) of clearance around the system and 36 inches (91.44 cm) of clearance in front of the control panel. Provide the system with vibration-damping pads to reduce noise caused by system vibration. The system should be leveled and placed on a concrete pad suitable for supporting the weight of the system.

6. If necessary, use metal shims or leveling pads to level the system. Do not use wood shims.

7. The system should be located as close to the point of use as possible to prevent excessive loss of working air pressure due to pressure drop.

6.2 Pipeline

1. When assembling the system pipes, make sure the pipes are arranged neatly without any strain or twist.

2. The outlet duct should be as short as possible and the restriction should be as small as possible.

6.3 Wiring

WARNING: Before performing any electrical work, be sure to disconnect all power to the system.

Before beginning any installation or maintenance work, refer to the electrical drawings supplied with the equipment.

Do not operate the system at a voltage other than that specified on the system panel.

All user wiring should comply with the National Electrical Code and any other applicable state or local codes.

CAUTION: All voltage is disconnected from the compressor module using a circuit breaker.

Closing the appropriate circuit breaker will disconnect control power, and closing the appropriate motor circuit breaker will disconnect compressor power.

The electrical service must be the same as specified on the nameplate, otherwise damage to the equipment may occur.

Before starting the electrical installation, check the control voltage, phase, and current ratings, and make sure the voltage provided by the hospital is the same.

Vibrations during shipping may cause electrical terminals, fuse inserts, and mechanical connections to loosen. Tighten all electrical connections before applying power to the control panel.

Only a qualified electrician should connect power to the control panel and any other connected circuits.

Ensure that the power supply of the emergency power generation system is consistent with the requirements of the compressed air system.

The three-phase power provided by the emergency generator must match the normal power supply to ensure that the motor always maintains the correct rotation direction.

7. Run

7.1 Preparation before startup

1. Before operating, make sure you have read and understood all safety warnings, labels and instructions.

2. Remove any shipping materials, brackets, etc.

3. Make sure all fuses and circuit breakers are of the correct type.

4. Verify that the power and ground wires are securely connected. Make sure the electrical control box door is closed and locked.

5. Make sure the inlet bellows is properly installed and all pipes are connected. Open the isolation valve, open the receiver valve, and close the receiver drain valve and bypass valve.

WARNING: Risk of injury. Make sure that no one touches any moving parts during the rotation check.

7.2 Startup and Operation

1. Follow all steps under "Preparation before startup" before attempting to operate the compressor.

2. Turn on the power.

3. Fully open the connecting valve.

4. Check the home page of the screen and the compressor status is automatic.

5. Check the alarm display status. If there is a phase sequence error alarm, the system cannot run. You need to disconnect the incoming power supply and swap the order of any two of the three live wires. After powering on again, open the alarm record. After clearing the alarm record, if there is no prompt of phase

sequence error or other fault prompts! (When the system pressure is low, the low-pressure alarm will be prompted, which only serves as a prompt and will not affect the operation of the system!)

6. After the above pre-startup preparations and tests are completed, press the green start button to start the system!

7. Use the system pressure gauge to check the air compression value. When the air pressure value remains unchanged and the stop conditions are met, the control system will automatically shut down the compressor.

8. Check for excessive vibration, unusual noise or leaks during operation.

8. Control system

8.1 Control system overview

Medical air compressor control systems are based on pressure sensors. Each pressure control system has a color touch screen that can adjust alarm set points during use; monitor system faults; monitor the air pressure value of the air compressor system and the operating status and operating time of each compressor. All compressors have a circuit breaker to control the compressor on and off.

8.2 Electric control cabinet interface

1. Display screen: displays the working status of the air compressor system and fault monitoring, and is used to change different settings of the air compressor system

2. Door circuit breaker: controls the power on/off of each compressor

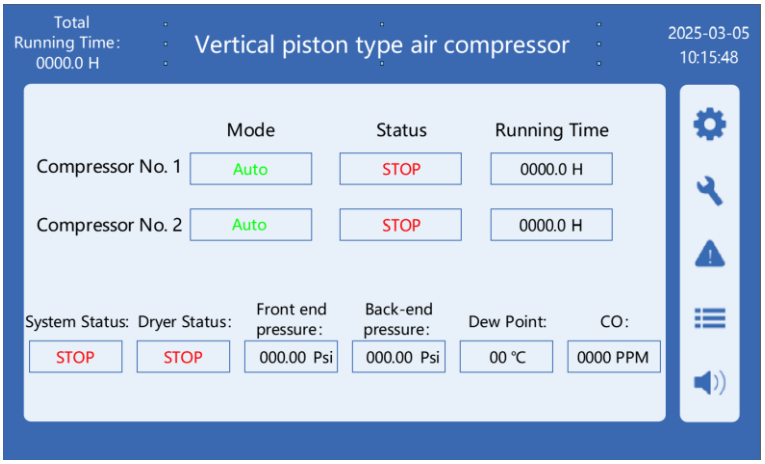
3. Power indicator light: displays the on/off status of the control power supply

4. Sound and light alarm: emits red light and sound when there is a fault in the air compressor system

5. Start/stop button switch: start and stop the compressor in automatic mode

6. Infrared sensor: The touch screen automatically lights up when a human body is detected approaching

8.3 Touch screen interface



Operation Mode

- If the air compressor system is in manual mode, the red font Manu is displayed. The start and stop of the compressor require entering the manual control page. Click the button to start and stop the compressor individually.
- If the air compressor system is in automatic mode, the green font Auto is displayed. Press the start button and the compressor will automatically start and stop according to the set air pressure start and stop set points.
- If the compressed air system is in a fault or warning state, click to enter the alarm record and view the information content.
- Regardless of the mode, if the compressor is running, the green font RUN will be displayed.
- Regardless of the mode, if the compressor is stopped, STOP will be displayed in red.

Compressor operating time display

each **compressor** is displayed in hours.

System Status

- If the system is operating normally, “Running” is displayed.
- If the system is stopped, “STOP” is displayed.

- If any compressor fails, or the tank is under pressure or over pressure, the display will read "Warning"
- If both compressors fail at the same time, or the pressure sensor fails, "Fault" is displayed.

System running time

The system's operating time is displayed in hours.

Air pressure value display

Current air pressure value can be displayed in MPa, Psi or Bar.

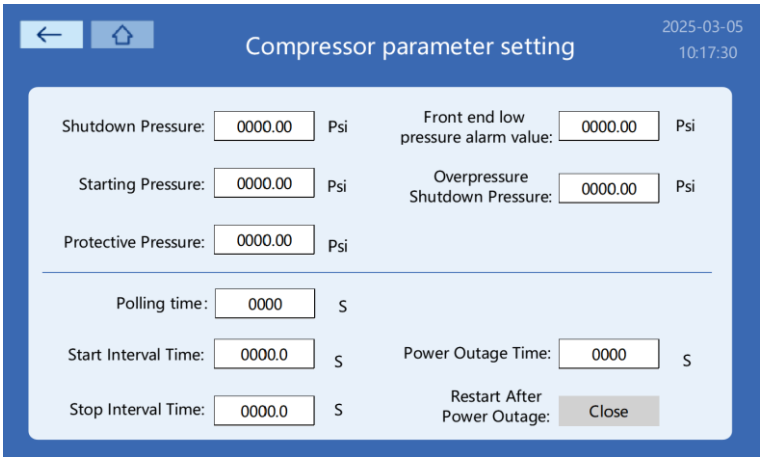
Sound and light alarm off

When an alarm occurs, the sound and light alarm will sound and flash. Click the icon  the sound and light alarm will be turned off within the set time.

Settings interface

You can click on the right side of the home screen  icon to enter the password interface. After successfully entering the password 123456 to enter the settings interface

Parameter setting interface (Compressor)



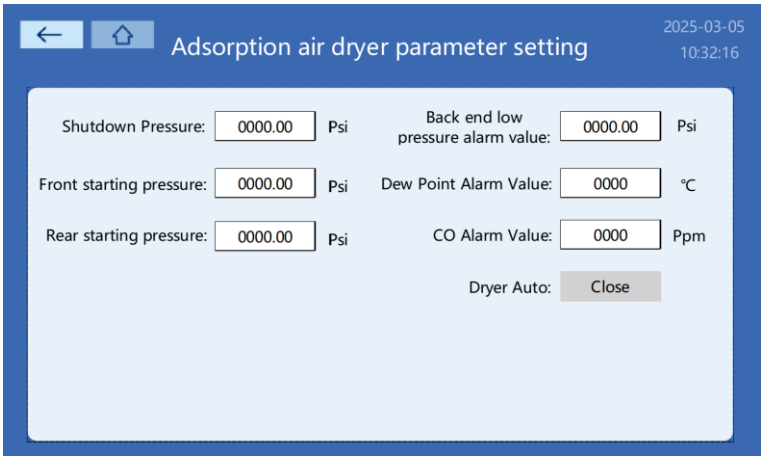
After entering the parameter setting interface, select compressor settings, and enter the above page:

- Shutdown Pressure: In automatic mode, high pressure stop point setting.
- Starting Pressure: In automatic mode, the low pressure starting point setting.
- Protective Pressure: In automatic mode, when the system pressure is greater than the protective pressure, the system will shut down one of the compressors in turn according to the operating time of each compressor, thereby achieving energy saving and efficiency improvement and increasing the service life of the compressor.
- Front end low pressure alarm value: When the front- end system pressure is lower than the low pressure alarm value setting, an alarm will be prompted.
- Overpressure Shutdown Pressure: When the system pressure exceeds the high pressure setting value, the device will alarm and stop the compressor. When the pressure is lower than the high pressure setting value, the compressor will resume operation.
- Start Interval Time: When automatically started, the compressors are started in sequence according to the start interval time setting value to avoid excessive current when the compressors are started at the same time, which may cause damage to the equipment.
- Stop Interval Time: When automatically stopped, the compressors are shut down in sequence according to the stop interval setting value to avoid excessive current when the compressors are shut down at the same time, which may cause damage to the equipment.
- Polling time: When the system enters the protection state, the compressor will be turned on and off alternately when the compressor reaches the polling time setting value .
- Power Outage Time: If the power-off restart function is enabled, the system will record the time after the power outage. When the power is turned on again, if the power-off time interval is

less than the set value, the system will maintain the running status before the last power outage (if it was running before the power outage, it will run after the power is turned on, and vice versa). If the power-off time interval is greater than the set value, the status before the last power outage will not be maintained.

- Restart After Power Outage: You can turn on or off the power outage restart function.

Parameter setting interface (Dryer)



After entering the parameter setting interface, select the dryer parameters, and enter the above page:

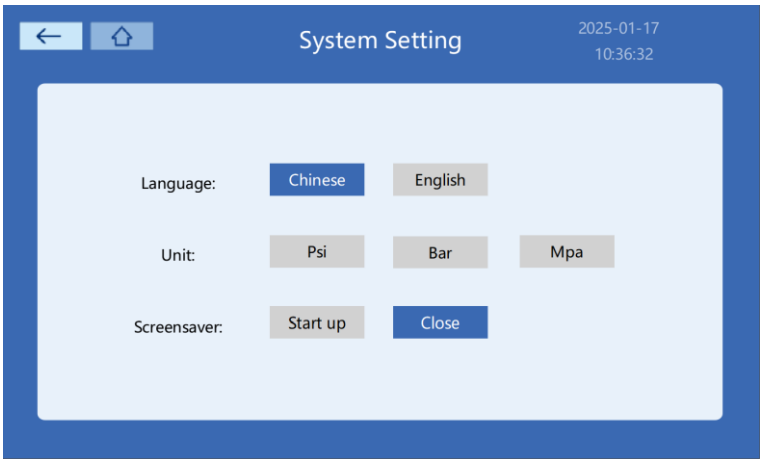
- Shutdown Pressure: In automatic mode, when the pressure at the rear end is greater than or equal to this set value, the dryer stops working and the electric valve is automatically closed.
- Front starting pressure: Front start pressure.
- Rear starting pressure: Rear end starting pressure.

(The pressure at the front end is greater than the set value and the pressure at the rear end is less than the set value, the dryer starts working and automatically opens the electric valve.)

- Back end low pressure alarm value: Back end low pressure alarm value setting. When the actual pressure at the back end is lower than the set value, an alarm will be prompted.
- Dew Point Alarm Value: When the dew point value of the test gas outlet is greater than the dew point setting value, an alarm will be issued.
- CO Alarm Value: Set the CO alarm value. When the CO value of the detected gas is greater than the CO set value, an alarm will be prompted.
- Dryer Auto: Automatic start and stop function of the dryer. If it is turned off, the dryer and electric valve will not start and stop automatically according to the set value.

System settings interface

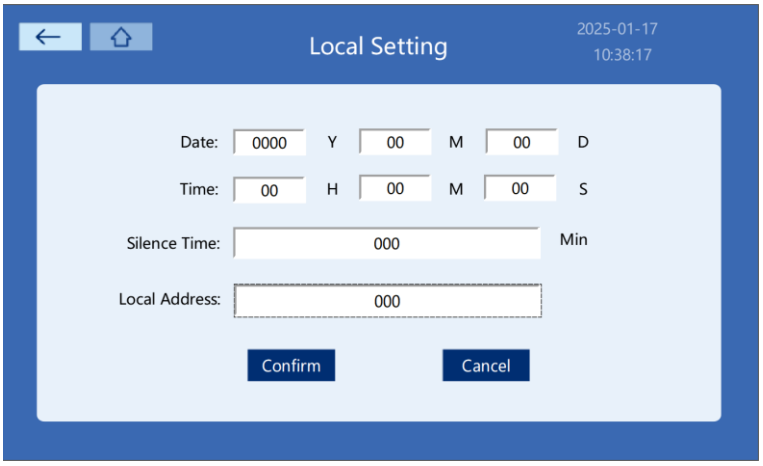
After entering the settings interface, select the System Setting, and enter the below page:



- Language: The system language can be selected between English and Chinese.
- Unit: The system unit can be selected from Psi, Bar, and MPa. When changing the unit, the relevant set value and real-time pressure value will be converted according to the ratio. Note: When the system is running, the unit switching function will not appear. If you need to change the unit, you need to shut down the system before changing it, because when switching units, the data will change, which may affect the system judgment if the system is running.
- Screensaver: The screen saver function can be turned on or off. When turned on, when the sensor under the screen does not detect an obstruction, the screen brightness will decrease after 5 seconds, thereby extending the screen life. When turned off, the screen will always maintain high brightness.

Local settings interface

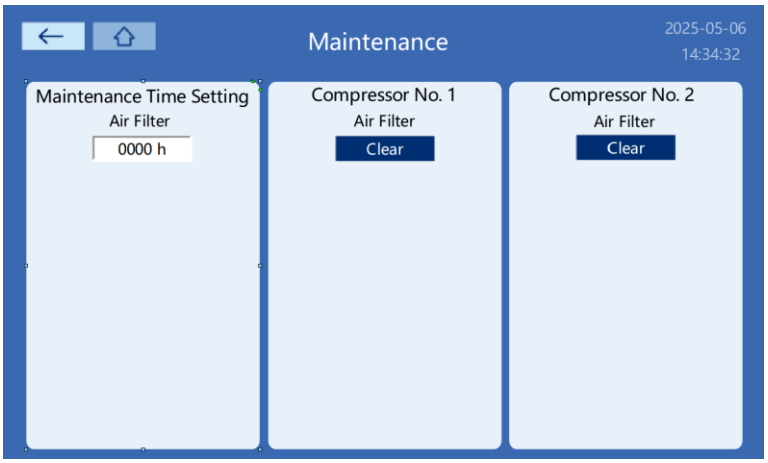
After entering the settings interface, select the Local Setting, and enter the below page:

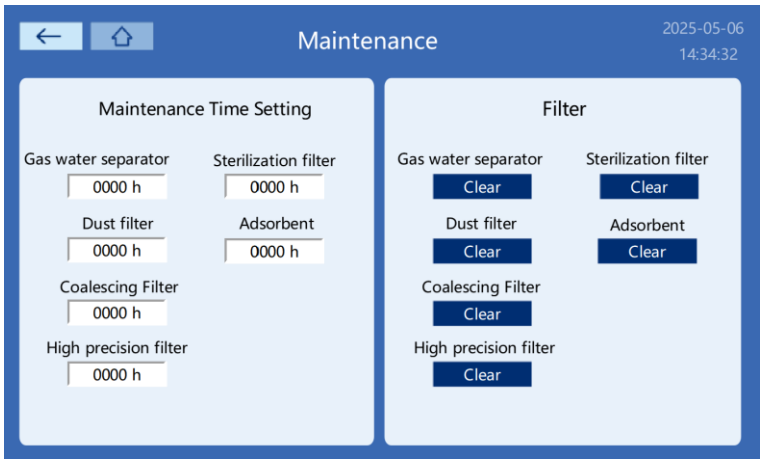


- Date/Time: After setting the local date and time, click Save!
- Silence Time: The time setting for silencing the buzzer can be set up to 50 minutes at most. Click Save!
- Local Address: Set the 485 slave address, the setting range is 0-255, click Save!

Maintenance setting interface

After entering the settings interface, select the Maintenance Setting, and click compressor/dryer maintenance settings to enter the corresponding page:

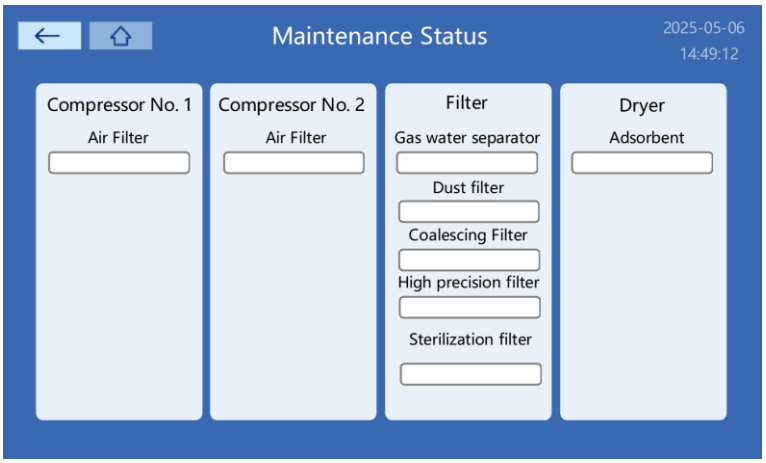




- Set the maintenance time for the compressor's air intake filter, gas-water separation filter, dust removal filter, coalescing filter, high-precision filter, sterilization filter, etc. The default setting at the factory is 8000H. If you want to change the maintenance time, just enter it directly in the input box.
- If the maintenance has been completed and the maintenance time needs to be recalculated, please click the " Reset " button and then confirm the operation to recalculate the maintenance time.

Maintenance view interface

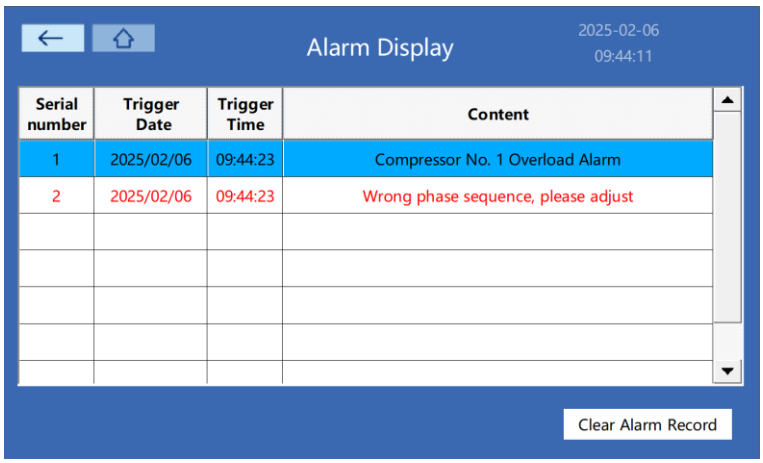
You can click on the right side of the home screen  icon to enter the maintenance view interface.



- The maintenance time of each compressor/dryer 's accessories is timed and displayed as a percentage. When it reaches 100%, the vacuum system will sound and light alarms, indicating that maintenance is required.
- After the maintenance time is reset, it will be 0% and start counting again.

Alarm record interface

Click on the right side of the home screen  icon to enter the alarm record interface.



- You can view the specific time when the alarm was generated and the specific description of the alarm.
- Click the “Clear Alarm Record” button in the lower right corner and enter the correct password (123456) to clear the existing alarm records.

Company information interface

You can click on the right side of the home screen icon to enter the company information interface.

8.4 Summary

The electric control cabinet is a control device that controls the manual and automatic start and stop of the two piston machines . Through the pressure sensor on the air tank , the working pressure can be displayed on the touch screen, and the start and stop pressure can also be changed to achieve a constant pressure range control requirement.

1. Timer: used for timing the operation of the piston machine and the power-on timing of the air compressor system. When the piston machine is running, the timer starts to count, and the minimum display unit is hours (H). When the running time of the piston machine reaches the set maintenance time, please perform maintenance; when the air compressor system electric control cabinet is powered on, the timer starts to count, and the minimum display unit is hours (H), showing the time the current air compressor system has been powered on.

2. Pressure sensor: used to display the current pressure value of the system. By setting the parameters in the air compressor system, the start and stop pressure setting values can be changed.

3. Manual control function: After the power is turned on, switch the piston machine selection switch in the air compressor system to the manual position to manually start and stop the compressor .

4. Automatic control function: After the power is turned on, switch the piston machine selection switch to the automatic position in the air compressor system , press the green start button, and the system starts to run automatically. The controller automatically starts according to the start setting value. When the air pressure reaches the set protection pressure value, one of the compressors is stopped according to the system calculation. If the continuous operation time of the compressor reaches the polling time setting value, the running compressor is turned off and another compressor is turned on. When the air

pressure reaches the set stop pressure value, the compressor stops running. This function can achieve energy saving and increase the service life of the compressor.

5. Power-off restart function: You can choose to turn on or off the power-off restart function. If it is turned on, the system will remember the state before the power outage. For example, if the system was running before the power outage, then after powering on, the system will monitor the power outage duration. If it is within the set time, the system will automatically run without manual startup. If the power outage duration exceeds the set value, it will not be able to start automatically. This function can provide convenience for some users with unstable power supply and frequent power outages.

9. System maintenance

Daily inspection:

1. Check the compressed air system for leaks.

2. Check whether the piston machine belt is loose.

3. Check whether the automatic drain starts and stops normally.

4. Check the automatic drain valve every day, rotate the copper sleeve upwards and observe the drainage volume. If the drainage volume is too small, it means it is blocked and needs to be removed and cleaned.

5. The automatic drain valve can be removed and cleaned with soapy water or degreasing detergent every month or every 500 hours of use, then rinsed with clean water and reinstalled. This method can also be used to clean the automatic drain valve if it is blocked due to excessive oil stains.

6. Observe the differential pressure pointer on the differential pressure gauge every day. If the differential pressure exceeds the red area, the filter element should be replaced in time.

10. Troubleshooting

Fault	Reason	Troubleshooting
Compressor not running	Electrical circuit disconnection	Replace wiring or circuit breaker
	Motor failure	Repair or replace
	Thermal overload protection	The motor is overloaded. Check the motor load and whether the motor is running abnormally. After eliminating the abnormality, press the reset button to clear the fault.
	Sensor failure	Repair or replace

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The pressure does not rise or rises slowly	Pressure gauge failure	Replace with new parts
	System Leaks	Check the connecting parts and piping system
	Suction and exhaust valves are damaged and leaking	Replace with new parts
	Filter silencer blocked	Clean or replace the filter
	Speed reduction	Elastic belt to make it tight enough
Compressor exhaust temperature is too high	Exhaust valve plate leaks or breaks	Check and eliminate or replace new parts
	Poor ventilation, too high intake temperature	Improve the ambient temperature to <40℃
	Poor cooling effect	Check whether the main engine pulley rotates in the correct direction
The compressor sounds abnormal	The air compressor unit is not installed stably	Check and eliminate
	Loose fasteners	Tighten
	Air compressor parts are seriously worn	Replace with new parts
	Bearing lacks grease or is worn	Add grease or replace in time
The dryer cannot start	Air switch burnt out	Ask electrical personnel to inspect or replace related electrical parts
	Protection relay action	
	The start button has poor contact	
	Controller damage	
Abnormal display of pressure gauge of the dryer 1. The pressure gauge of the adsorption group shows too low 2. The pointer of the pressure gauge of the regeneration group does not return to zero	Pressure gauge damaged	Replace the pressure gauge with a new one
	Solenoid valve is damaged or blocked	Clean the solenoid valve or replace it
	Tracheal rupture	Replacement of air tube
	Cylinder damage	Replacement of cylinder
	The outlet check valve spring does not reset	Replace the check valve spring
	The sealing components inside the valve are damaged	Replace the seal assembly

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	Regeneration air flow is too large	Adjust the regeneration air flow to the appropriate size
The outlet gas dryness does not meet the standard. 1. The outlet gas contains moisture. 2. The dew point value is too high.	Adsorbent and filter element not maintained as required	Timely maintenance of equipment consumables
	Insufficient regeneration of adsorbent moisture	Adjust regeneration air flow and pressure equalization time

11. Service and Warranty

1. This product is strictly inspected by the company's internal warehouse. If a transportation accident occurs or it is caused by our company's fault, our company can repair or replace it free of charge.

2. The warranty period is 2 years from the date of purchase.

3. The contents of this article are subject to change without prior notice.

12. Information

12.1 Manufacturer information

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12.2 After-sales service

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