

Oil-injected Screw Air Compressor

Installation, Maintenance, Operation Manual

Foreword

First of all, thank you for your trust in the AirHorse series screw air compressors produced by Guangzhou AirHorse Compressor Co., Ltd.

This manual introduces the working principle and main structure of our company's screw compressor, and provides customers with knowledge about the functions, operation, and maintenance of key compressor components as detailed as possible, allowing customers to use the equipment more effectively.

The screw compressors manufactured by our company have undergone strict quality control and testing before leaving the factory. However, to ensure the safe and reliable operation of the machine and maintain its durability, please read this manual carefully before installation, trial run, and use. Fully master the operating skills of this compressor to keep it in good running condition. If you have any questions about the content of this manual, or if you need more detailed information, you can contact our service units. We will help solve all difficulties. The company will provide better help and support for your business with advanced technology, high-quality products, good after-sales service, and suitable product prices!

Safety Precautions

- 1、Compressed air and alternating current are both dangerous. Maintenance or servicing on the unit can only be performed after ensuring the compressor power supply has been disconnected and all compressed air in the entire compressor system has been vented.



Safety Note: When starting up for the first time or after the power cord has been changed, it is essential to check if the unit's rotation direction is correct. The method is to power the compressor for a very short time (jog for about 1 second) to check the compressor's rotation direction. It must be ensured that the air compressor's rotation direction is correct, otherwise just a few seconds could cause damage or seizure of the screw air compressor unit!

- 2、Before starting the unit, ensure all fittings and accessories are tightened.
- 3、Do not loosen or remove any pipeline attachments, fittings, or components while the unit is running. The system inside the unit is filled with high-pressure, high-temperature liquid or gas, which can cause serious personal injury.
- 4、The power supply line leading to the compressor must have an appropriately sized air circuit breaker and fuses installed according to the compressor's power rating. To ensure the reliability of electrical equipment operation, please be sure to connect a suitable ground wire according to relevant safety regulations and leave necessary maintenance space around the compressor equipment.
- 5、The compressor must not operate above the discharge pressure specified on the nameplate,

otherwise the motor will be overloaded, resulting in automatic overload protection shutdown of both the motor and compressor.

6、 Only use safe solvents to clean the compressor and auxiliary equipment.

7、 The safety valve is installed on the base of the oil-gas separator or on the oil-gas tank. Once the gas pressure inside the compressor's internal system exceeds its rated opening pressure, it will be automatically released through this valve. At the same time, be sure to check the reason for the overpressure condition in the compressor's internal system. The unit can only be restarted after the fault has been eliminated.

8、 Before performing any mechanical maintenance on the compressor, the following preparations must be made:

1 Stop the unit.

2 Manually turn off the power switch, ensuring the compressor is completely powered off.

3 Ensure the compressed air in the unit's internal system has been vented.

9、 Before starting and operating the compressor, you must read and understand this Installation, Maintenance, and Operation Manual.

Inverter Precautions

1. Do not touch the heat sink fins and inverter when they are hot. Otherwise, you may get burned.
2. Do not arbitrarily change the inverter's factory-set parameters. Improper changes may damage the inverter.
3. Do not touch the inverter's wiring terminals; they carry high voltage. Touching them may cause electric shock.
4. Before inspection or maintenance, the main power circuit must be cut off, and you must ensure the charge indicator light is off. It is dangerous to perform any work while residual voltage remains in the inverter's capacitors.
5. Only qualified personnel are allowed to perform inspection, repair, or part replacement. Remove all metal objects (such as watches, bracelets, etc.) beforehand, and use tools with insulation functions to prevent electric shock.
6. The inverter is equipped with a DC reactor as standard. When a radio or other electronic device is installed nearby, please install a filter on the input power side.
7. Failure to follow these rules may cause electric shock.

Our company reserves the right to modify and improve products and is not responsible or obligated to make corresponding modifications and improvements to products already shipped.

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Chapter 1: General Rules and Specifications for Screw Air Compressors

I. Introduction to Micro-Oil Screw Air Compressors

Micro-oil screw compressors are characterized by reliable operation, few vulnerable parts, low vibration, low noise, and high efficiency.

During the compression process, the compressor continuously injects lubricating oil into the compression chamber and bearings by means of the pressure difference it generates itself. The lubricating oil mainly has three functions:

- 1、Lubrication: The oil can form an oil film between the rotors, preventing direct contact between the rotors and reducing friction.
 - 2、Sealing: The oil film generated by the lubricating oil can seal the compressed air, improving the volumetric efficiency of the compressor.
 - 3、Cooling: Since the lubricating oil absorbs a large amount of compression heat, the compression process approaches isothermal compression, reducing the specific power of the compressor.
- Additionally, lubricating oil can also reduce the noise generated by high-frequency compression.

II. Structure of Micro-Oil Screw Air Compressor Body

1、Basic Structure

The micro-oil screw compressor adopted by our company is a two-shaft positive displacement rotary compressor. The air inlet is opened at the top of the casing, and the exhaust port is opened at the bottom. A pair of high-precision main (male) and auxiliary (female) rotors are installed horizontally and parallel inside the casing. The main (male) rotor has five helical lobes, and the auxiliary (female) rotor has six helical lobes. The main rotor has a larger diameter, and the auxiliary rotor has a smaller diameter. The lobe profile is spiral, and the two lobe profiles mesh with each other. Both ends of the main and auxiliary rotors are supported by bearings. The intake end has one roller bearing each, and the exhaust end has two symmetrically installed tapered roller bearings each. The body drive methods are divided into two types: belt drive and direct drive. The direct drive type couples the motor or other power source with the host unit via a coupling. The belt drive type does not have speed-increasing gears but uses two pulleys manufactured according to the speed ratio to transmit power via a belt.

2、Meshing

The motor drives the main rotor via a coupling, speed-increasing gears, or a belt. Since the two rotors mesh with each other, the main rotor directly drives the auxiliary rotor to rotate together. Cooling lubricating oil is injected directly from the lower part of the compressor casing via nozzles into the meshing part between the rotors, mixes with the air, carries away the heat generated by compression,

achieves the cooling effect, and simultaneously forms an oil film, preventing direct metal-to-metal contact between the rotors and sealing the gaps between the rotors and between the rotors and the casing. The injected lubricating oil can also reduce the noise caused by high-speed compression. Depending on the discharge pressure, the weight of injected oil is about 5-10 times the weight of air.

III. Compression Principle of Screw Compressors

1、 Intake Process:

The intake side suction port of the screw type must be designed so that the compression chamber can fully intake air. The screw compressor does not have intake and exhaust valve groups. Intake is only regulated by the opening and closing of an intake regulating valve. When the rotor rotates, the lobe groove space of the main and auxiliary rotors is at its maximum when it turns to the opening of the intake end wall. At this time, the rotor's lobe groove space is connected to the free air at the intake port. Because the air in the lobe groove is completely discharged during exhaust, the lobe groove is in a vacuum state after exhaust is completed. When it turns to the intake port, outside air is immediately sucked in, and the air flowing axially between the main and auxiliary rotor lobes is enclosed. This is also called the **[Intake Process]**.

2、 Sealing and Transport Process:

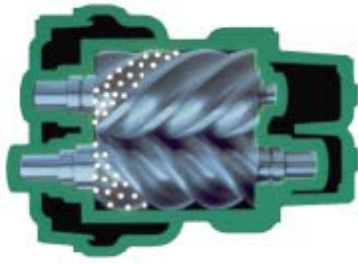
When the main and auxiliary rotors finish intake, the peaks of the main and auxiliary rotor lobes seal with the casing. At this time, the air is sealed within the lobe grooves and does not flow out, which is the **[Sealing Process]**. The two rotors continue to rotate, and the meshing surface of the lobe peaks and grooves at the intake end gradually moves towards the exhaust end. This is the **[Transport Process]**.

3、 Compression and Oil Injection Process:

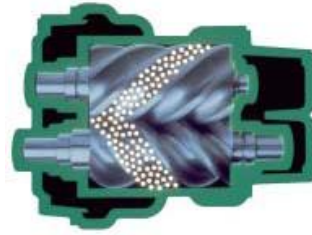
During the transport process, the meshing surface gradually moves towards the exhaust port, meaning the space between the meshing surface and the exhaust port gradually decreases. The gas within the lobe groove is gradually compressed, and the pressure increases. This is the **[Compression Process]**. Simultaneously with compression, lubricating oil is injected into the compression chamber due to the pressure difference and mixes with the air.

4、 Exhaust Process:

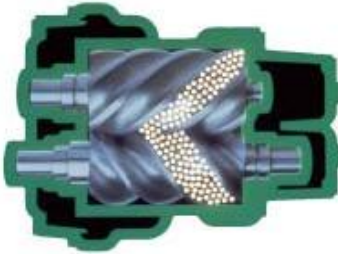
When the meshing end face of the rotor turns to coincide with the exhaust port of the casing (**at this time the pressure of the compressed gas is the highest**), the compressed gas begins to discharge, until the meshing surface of the lobe peak and groove moves to the exhaust end face. At this time, the space between the meshing surface of the two rotors and the lobe groove of the casing exhaust port is zero, completing the **[Exhaust Process]**. At the same time, the length of the lobe groove between the meshing surface of the rotor and the casing intake port reaches its maximum again, and the intake process is proceeding again.



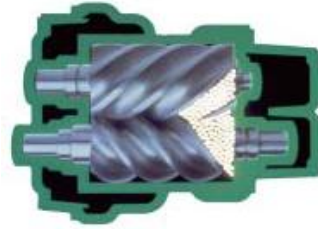
1.Intake Process



2. Sealing Process



3. Compression Process



4. Exhaust Process

Chapter 2: Air Compressor Installation

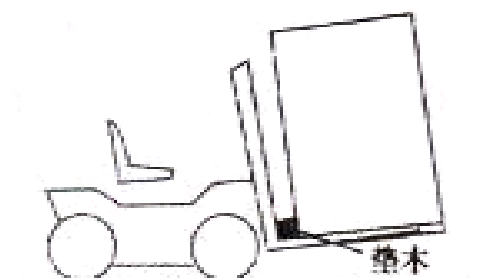
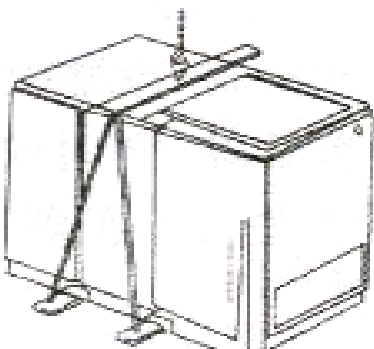
I. Installation

Pre-installation Notes:

1、 Before installation, check if the packaging box surface is intact and undamaged, and check if the unit is damaged. After unpacking, the handling and installation work of the unit must be strictly carried out according to the relevant handling precautions. There are two forklift holes under the base of the unit. When forklifting, place wooden blocks above to prevent the forklift from crushing the unit's door panels (see figure). If using slings, always use a spreader bar. The spreader bar can offset the side pressure generated by the slings pressing against the cabinet.



Safety Note: It is not advisable to pad protective materials between the slings and the unit's acoustic hood during loading and unloading. When lifting, the slings will crush the top side door panels of the unit.



- 2、 The selection of the air compressor installation site is most easily overlooked. Often, after purchasing the air compressor, it is placed at random place, piped up, and put into use immediately without prior planning. Little do they know that such a hasty result can lead to future compressor failures, difficult maintenance, and poor compressed air quality. Therefore, choosing an appropriate installation site is one of the prerequisites for the correct use of the air compressor system
- 3、 A wide, well-lit place is necessary to facilitate compressor operation, control, and maintenance.
- 4、 The relative humidity of the air should be low, with little dust, clean air, and good ventilation.
- 5、 The ambient temperature must be below 45° C. If the ambient temperature is too high, the output air of the compressor will be less.
- 6、 If the factory environment is poor, with much dust, etc., pre-filtration equipment must be added to maintain the service life of the air compressor system components.
- 7、 Reserve access pathways and install overhead cranes (especially needed for high-power air compressors) to facilitate maintenance.
- 8、 Reserve maintenance space. The distance between the air compressor and the wall should be at least 70 cm.
- 9、 The distance between the top of the air compressor and the ceiling should be more than one meter.

II. Precautions for Piping, Foundation, and Cooling System

1、 Air Pipeline Piping Precautions

- 1) **When piping the main line, the pipeline must have a slope of 1-2°** to facilitate the discharge of condensate in the pipeline.
- 2) The pressure drop of the piped pipeline must not exceed 5% of the set pressure of the air compressor. When piping, it is best to select a pipe diameter larger than the design value.
- 3) Branch lines must be connected from the top of the main line to avoid condensate in the pipeline flowing back into the working machines or into the air compressor.
- 4) Tools requiring lubrication should be equipped with a triple combination (air filter/water separator, pressure regulator, lubricator) to extend the tool's service life.
- 5) Do not arbitrarily reduce the size of the main line. If it is necessary to reduce or enlarge the pipeline, use reducers. Otherwise, turbulent flow will occur at the joints, leading to greater pressure loss and also significantly affecting the pipeline's service life.
- 6) If there are purification buffer facilities such as an air receiver and dryer after the air compressor, **the ideal piping sequence is Air Compressor + Air Receiver + Dryer**. This way, the air receiver can filter out part of the condensate, and the air receiver also has functions such as reducing the gas discharge temperature and stabilizing the output gas pressure. Lower temperature compressed air with less water content then enters the dryer, which can reduce the dryer's load and extend its service life.
- 7) If the system's air consumption is very large and the duration is very short, it is best to add an air

receiver as a buffer. This can reduce the number of load/no-load cycles of the air compressor, which is also very beneficial for the air compressor.

8) For compressed air with system pressure below 1.5 MPa, the flow velocity in the delivery pipe must be below 15 m/sec to avoid excessive pressure drop.

9) Minimize the use of elbows and various valves in the pipeline to reduce pressure loss.

10) The ideal piping is a main line that encircles the entire plant, so that compressed air can be obtained from both sides at any location. If the air consumption of a certain branch suddenly increases greatly, it can reduce the pressure drop. Also, configure appropriate valves on the circular main line to facilitate maintenance and isolation.

2、Foundation

1) The foundation should be built on hard soil or concrete. Before installation, the foundation surface must be ground level to avoid vibration of the air compressor.

2) If the air compressor is installed upstairs, vibration isolation treatment must be done to prevent vibration from transmitting downstairs or causing resonance, which poses safety hazards to both the air compressor and the building itself.

3) Screw air compressors produce little vibration, so no special foundation is needed, but **the ground on which they are placed must be flat, and the subsoil must not be soft soil.**

3、Cooling System

1) **For water-cooled air compressors, it is best to use soft water for cooling** to avoid chemical reactions of calcium, magnesium and other ions in the water due to high temperature, forming scale in the cooler and affecting the heat transfer efficiency of the cooler. **If using a cooling tower circulation system, a softening agent needs to be added to the water regularly to maintain water cleanliness.**

2) The automatic replenishment system of the cooling water circulation system must be perfect; otherwise, after running for some time, insufficient cooling water will cause the air compressor to overheat and automatically trip.

3) The cooling water system of the air compressor is best used alone, avoiding sharing with other systems, to prevent insufficient water volume from affecting the cooling effect.

4) The cooling tower must meet the cooling water volume specified by the air compressor, and the selection of the pump power must be correct. The cooling tower should be placed where heat dissipation is easy, ventilation is good, and it must be firmly supported to prevent tipping.

5) The water pressure of the cooling water should generally be maintained between 0.15-0.35 MPa.

6) Cooling water inlet temperature $\leq 32^{\circ}\text{C}$, cooling water outlet temperature should be kept below 40°C .

7) If it is an air-cooled air compressor, special attention must be paid to its ventilation environment. Do not place the air compressor near high-temperature machinery or in a poorly ventilated enclosed space, as this may cause high exhaust temperature and tripping. If used in a closed system, extraction and exhaust equipment must be added to facilitate air circulation. Generally speaking, the individual air volume of the

extraction and exhaust must be greater than the heat dissipation and exhaust air volume of the air compressor.

III. General Electrical Specifications and Safety Standards

1. Select the appropriate power cable cross-section and terminals according to the power size of the air compressor. Do not use cables that are too small, otherwise the power cable may overheat, burn out due to high temperature, and cause other dangers.

2、 It is best for the air compressor to use a separate power system, especially to avoid parallel use with other systems with different power consumption. If used in parallel, it may cause the air compressor to overload due to excessive voltage drop or three-phase current imbalance, causing the protection device to trip. High-power air compressors must pay special attention to this.

3、 Install an appropriate NFB (No-Fuse Breaker) according to the air compressor's power size to maintain the safety of the power system and the compressor itself during maintenance.

4、 When wiring the air compressor, the correctness of the power supply must be confirmed.

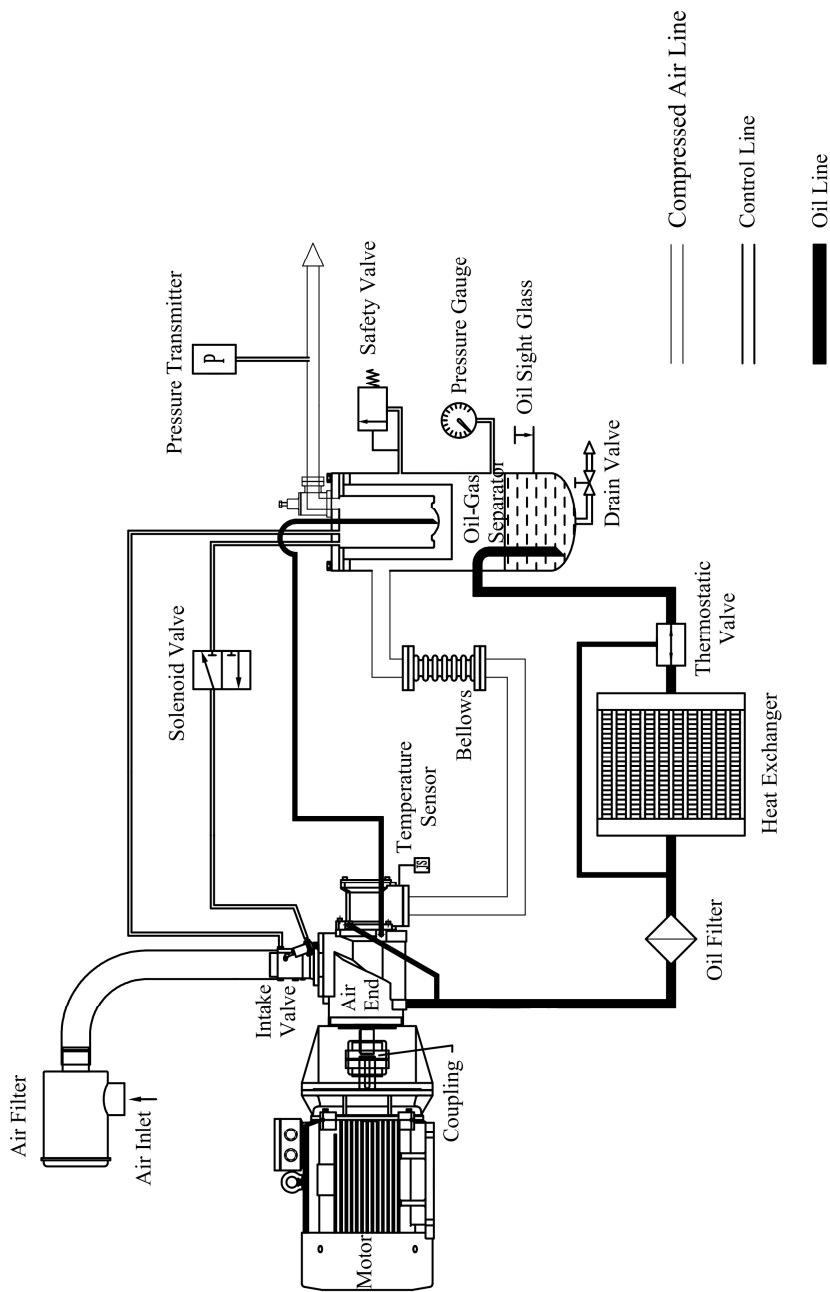
5、 The ground wire for the motor or system should be reliably grounded according to relevant regulations, and the ground wire must not be connected to the air delivery pipe or cooling water pipe.

6、 Normally, for three-phase AC motor overload operation, the operating current should not exceed the rated current by 3%. If the three-phase current is unbalanced, the ratio of the lowest phase current to the highest phase current must not exceed 5%. At the same time, if there is a voltage drop, the voltage drop must not be lower than 5% of the rated voltage.

7、 The air compressor must have a ground wire connected to the earth to prevent danger caused by leakage.

Chapter 3: System Process

Screw Compressor System Flow Diagram



I. System Process

1、 Air Process (Refer to the system flow diagram for each model)

1) Air is filtered of dust particles by the air filter, then enters the main compression chamber via the intake valve for compression; it mixes with lubricating oil, and the mixed compressed air enters the oil-gas tank. Then it passes through the oil-gas separator, pressure maintaining valve, and after-cooler.

2) Function description of components in the main air source path:

A、 Air Filter (Suction Filter)

The air filter is a dry paper filter with a pore size of about 10 μ m. Usually, it should be removed every 1000 hours to clean the surface dust. The cleaning method is to use low-pressure air to blow the dust from the inside out.

B、 Intake Valve (Suction Valve) - No-load/Full-load Control:

This type of intake valve uses piston control, utilizing the up and down movement of the piston to achieve no-load/full-load control.

When starting, stopping, or idling, a solenoid valve is used to control the intake valve piston to close the valve upwards, while also using a throttle valve to maintain the minimum pressure required for circulation.

When the motor runs at full load and the solenoid valve is energized, it stops venting. At this time, the intake valve piston is sucked downward due to the intake pressure difference, becoming the intake state.

If the pressure reaches the upper limit set by the pressure switch, the pressure switch activates, the solenoid valve starts venting, and pushes the intake valve piston upward to close the valve, entering the no-load state.

C、 Capacity Regulation Control:

When the system pressure gradually rises (without reaching the pressure switch setting), it first reaches the capacity regulation valve setting pressure. Then a small amount of air passes through, pushing the intake valve piston upward, and the intake volume gradually decreases; at this time, the system has already started capacity regulation. If the pressure continues to rise, the intake piston closes faster. Conversely, if the system pressure decreases, the intake piston opens more, increasing the intake volume. Until it falls below the capacity regulation valve setting value, the capacity regulation action stops.

3) Temperature Sensor

In cases of water loss, oil loss, insufficient water, insufficient oil, etc., it may lead to excessively high exhaust temperature. When the exhaust temperature reaches the set temperature value, the system will automatically shut down. The trip temperature is generally set at 110° C. The current exhaust temperature value can be read on the display panel.

4) Oil-Gas Tank (Oil-Gas Bucket)

The lower side of the oil-gas tank is equipped with an oil level indicator (sight glass). During

operation, the lubricating oil level should be between the high and low oil level limits of the oil level gauge. A drain valve is installed under the oil tank. Before each start, slightly open the drain valve to discharge the condensate in the oil-gas tank. Please note: Once oil flows out, immediately close this drain valve to prevent excessive lubricating oil from flowing out. There is a filling hole on the top of the tank for adding lubricating oil.

5) Oil-Gas Separator

For detailed content, please refer to the later section.

6) Safety Valve

When the system pressure setting is improper or fails, causing the internal system pressure of the oil-gas tank to be more than 0.11 MPa higher than the set discharge pressure, the **safety valve will automatically open protectively, releasing the internal compressed air, so that the internal system pressure of the oil-gas tank drops below the set discharge pressure. The safety valve has been adjusted and calibrated according to the nameplate parameters before leaving the factory. Do not disassemble or adjust it arbitrarily!**

7) Vent Valve

The vent valve is a normally closed solenoid valve. When stopping or idling, this valve opens, discharging the pressure in the tank to ensure the compressor can start or run under no-load conditions.

8) Minimum Pressure Valve

Located at the outlet of the oil-gas separator above the oil-gas tank, the general opening pressure is set to about 0.45 MPa. The functions of the pressure maintaining valve are:

A. During startup, it builds the internal system circulation pressure required for lubrication, ensuring lubrication of the body.

It only opens automatically after the pressure exceeds 0.45 MPa, which can reduce the air flow velocity through the oil-gas separator, ensuring the effectiveness of the oil-gas separator and protecting the oil-gas separator from damage due to excessive pressure difference.

9) After Cooler

A. If it is an air-cooled cooler, a cooling fan draws in cold air, which passes through the cooler to cool the compressed air. Its discharge temperature is generally below (Atmospheric Temperature + 15° C).

Air-cooled air compressors are directly related to the ambient temperature conditions of the placement location. When selecting a placement site, it is best to pay attention to the ventilation conditions of the environment.

B. If it is a water-cooled model, a shell-and-tube cooler is used, using cooling water to cool the compressed air. Its exhaust temperature is below 40° C (cooling water inlet temperature must not exceed 32° C). Water-cooled air compressors are less sensitive to ambient temperature conditions and make it easier to control their exhaust temperature. Special attention must be paid: if the cooling water quality is too poor, the cooler is prone to scaling and blockage. Also, if the pH value of the water is very low (i.e., high acidity), special copper material must be used to avoid corrosion.

10) Water Separator

A cyclone-type water separator can remove the moisture, oil droplets, and impurities condensed and separated after the air is cooled. After passing through the water separator, the compressed air can be directly sent to the using department.

When the compressor is running, the drain valve below the water separator should be slightly opened just enough for the condensate to flow out without causing significant air leakage, or an automatic drain valve should be installed.

2、Lubricating Oil Process (Refer to the system flow diagram for each model)

1) Oil Injection Process Description

Due to the system pressure in the oil tank, lubricating oil is pressed into the oil cooler. After cooling the lubricating oil in the cooler, and after cooling the lubricating oil on the cooler, it passes through the oil filter to remove impurity particles, then divides into two paths. One path is injected into the compression chamber from the lower end of the body to cool the compressed air, and the other path goes to both ends of the body to lubricate the bearing sets and drive gears. Afterwards, the lubricating oil from various parts gathers at the bottom of the compression chamber and is discharged with the compressed air.

The compressed air mixed with oil enters the oil-gas tank, separating a large portion of the oil. The remaining oil mist then passes through the oil-gas separator to filter out the remaining oil, enters the after-cooler through the pressure maintaining valve for cooling, and the compressed air can be sent to the using system through the exhaust port.

2) Function description of components on the oil path:

A.Oil Cooler (Oil Cooler)

The oil cooler has the same cooling methods as the air after-cooler: air-cooled and water-cooled. If the environmental conditions are poor, the fins of the air-cooled cooler (radiator) can easily be covered with dust, affecting the cooling effect, and the exhaust temperature will be too high, causing a trip. Therefore, at regular intervals, low-pressure compressor air should be used to blow the dust off the fin surfaces. If it cannot be blown clean, solvents must be used for cleaning, maintaining the cooling surface of the cooler clean. When a shell-and-tube cooler is blocked, it must be soaked with special chemicals and mechanically cleaned of the scale blocking the tubes, assuring they are completely cleaned to ensure sufficient heat exchange area.

B.Oil Filter

The oil filter is a paper filter whose function is to remove impurities from the oil, such as metal particles, carbon deposits from the oil, etc. The filtration accuracy is between 5μ and 10μ , providing complete protection for bearings and rotors.

Whether the oil filter should be replaced can be judged by the oil filter usage time set on the control panel and the signal from the differential



pressure switch to the controller. If the usage time reaches zero or the differential pressure switch activates, the panel will prompt "Usage Time Reached" or "Oil Filter Blocked" alarm but will not shut down. It must be replaced then.

For a new compressor, the lubricating oil and oil filter need to be replaced after the first 500 hours of operation. Afterwards, they are replaced according to the date displayed by the panel settings. If the oil filter differential pressure is too high and not replaced, it may lead to insufficient oil entering the compressor body, causing high exhaust temperature trip, and simultaneously affect the service life of the bearings due to insufficient oil.

C. Oil Separator

The filter element of the oil-gas separator is made of multiple layers of fine glass fibers. The oil mist contained in the compressed air is almost completely removed after passing through the oil-gas separator. Oil particle size can be controlled below 0.1 μm , and the oil content can be lower than 3 ppm. Under normal operation, the oil-gas separator can be used for approximately 3000 hours. However, the oil quality of the lubricant and the degree of environmental pollution significantly affect its service life. If environmental pollution is severe, consider installing a pre-air filter. As for lubricant selection, **it is essential to use our company's special screw compressor oil. The use of counterfeit or re-refined oil is strictly prohibited.** Safety valves and a pressure maintenance valve are installed before and after the oil-gas separator. The compressed air is directed from here to the after-cooler. The oil filtered by the oil-gas separator collects in a small circular recess at the bottom center and is returned to the compressor intake side via the oil return pipe, preventing the filtered lubricating oil from being discharged with the air.

D. Thermostatic Valve (Model AH-75A~AH-350A/W)

A thermostatic valve is installed before the oil cooler inlet. Its function is to maintain the exhaust temperature above the pressure dew point temperature. When starting up, the lubricating oil temperature is low. At this time, the thermostatic valve automatically opens the bypass circuit, allowing oil to enter the compressor body without passing through the oil cooler. If the oil temperature rises above 71° C, the valve gradually opens, and is fully open at 83° C. At this point, all oil passes through the oil cooler before entering the compressor body.

3. Cooling System

1) Air-Cooled Models

Cool air is drawn in by a circulating axial fan, blown over the cooling fins of the finned cooler, and exchanges heat with the compressed air and lubricating oil to achieve the cooling effect. The maximum allowable ambient temperature for this cooling system is 45° C. If the ambient temperature exceeds 45° C, the compressor system may automatically shut down due to excessive operating temperature, for example, if placed near a high-temperature boiler.

2) Water-Cooled Models

The design basis for cooling water temperature is 32° C, so the design of the cooling water circulation system requires special attention. Especially, the cooling water quality must meet or exceed general industrial water standards. The use of groundwater should be avoided if possible. If water quality

is poor, cleaning agents must be added regularly to the cooling tower to clean deposits, to avoid affecting the efficiency and service life of the cooler. In winter, in areas where the ambient temperature is below freezing, the cooling water in the compressor cooler must be drained completely after the unit is shut down.

II. Safety Protection System and Warning Devices

1. Motor Overload Protection

There are two main motors in the air compressor system: one is the main motor driving the compressor element, and the other is the motor driving the cooling circulation fan. Under normal conditions, the operating current of the motors does not exceed 3% of the rated current (except for factors such as voltage drop, three-phase imbalance, etc.). When the motor operating current exceeds the upper limit set by the controller's protection device, the overcurrent protection device will automatically cut off the main power, and the air compressor will shut down. At this time, the cause of the overload must be identified and the fault eliminated before manually resetting to restart the compressor. Otherwise, the air compressor cannot be restarted.

Common causes of motor overload:

- 1) Human operational error: such as self-adjusting exhaust pressure, improper system adjustment, etc.
- 2) Mechanical failure: such as internal motor loss, single-phase operation of the motor, safety valve failure, system setting failure, oil-gas separator blockage, etc.
- 3) Power supply failure: such as excessive voltage drop, three-phase imbalance, etc.

If an motor overload fault alarm is detected during operation, contact the manufacturer immediately to send personnel for inspection and accurately determine the cause. Otherwise, it may cause the motor windings to burn out and be damaged!

2.Excessive Exhaust Temperature Protection

The maximum exhaust temperature set by the system is 110° C. If it exceeds 110° C, the system automatically cuts off the power. There are many reasons for excessively high exhaust temperature, but the most common cause is poor heat dissipation of the oil cooler. For air-cooled oil coolers, if the cooling fins are clogged with dust, preventing cool air from freely passing through the cooler, the lubricating oil temperature will gradually rise, leading to a high-temperature shutdown. Therefore, low-pressure air should be used at regular intervals to remove dust from the cooling fins. If the clogging on the fins cannot be blown clean, it is best to clean them with cleaning fluid or solvent.

For air compressors using water-cooled coolers, high-temperature shutdown is generally caused by scaling and blockage inside the copper cooling tubes, reducing heat transfer efficiency. The maximum design ambient temperature for the air compressor is 45° C. The higher the ambient temperature, the higher the discharge air temperature. Therefore, it is necessary to choose a location with a relatively low ambient temperature and good ventilation to place the air compressor.

After an automatic protection shutdown occurs due to excessively high exhaust temperature,

the system cannot be restarted immediately. The cause must be accurately identified, the fault eliminated, and the fault manually reset before the system can be restarted!

3. Alarm Devices

There are three types of usage time alarm devices in this system: air filter usage time, oil filter usage time, and oil-gas separator usage time, all displayed on the control panel. When a filter usage time expiration fault indicator appears on the control panel, it means the filter's service life has been reached. The user must replace the spare part in the shortest possible time; otherwise, it will affect the normal operation and service life of the air compressor.

III. Control System and Electrical Circuits

1、 Control System

1) Motor Start (Reduced Voltage or Y Operation)

During this period, the intake valve is fully closed, and the vent valve is fully open. At this time, the intake side is under high vacuum. The lubricating oil required by the compression chamber and bearings is ensured by the pressure difference between the compression chamber and the oil-gas tank.

2) Motor Full Voltage Operation (Full Voltage or Δ Operation)

After the controller switches to full voltage operation, the solenoid valve opens due to being energized, the vent valve closes, and the pressure in the oil-gas tank gradually increases. When the pressure in the oil-gas tank rises to about 0.15 MPa, the intake valve fully opens, causing the pressure in the oil tank to increase rapidly, and the compressor begins full-load operation. When the pressure rises to 0.45 ~ 0.50 MPa, the minimum pressure valve opens automatically, and air can be output.

3) Load/No-Load Operation

When the discharge pressure reaches the upper limit of the system pressure setting, the controller will automatically cut off power to the solenoid valve. The solenoid valve closes, thus the intake valve also closes, and simultaneously the vent valve fully opens, discharging the compressed air from the oil-gas tank to the atmosphere. At this time, the compressor operates under no-load conditions, and the required lubricating oil is ensured by the pressure difference between the compression chamber and the oil-gas tank.

When the pressure in the pipeline system drops to the lower limit of the system setting, the controller will automatically supply power to the solenoid valve. The solenoid valve opens, the intake valve also fully opens, and simultaneously the vent valve closes, and the compressor loads and operates again.

4) Shutdown

After pressing the stop (OFF) button, the solenoid valve de-energizes and closes, and simultaneously the vent valve fully opens, discharging the air from the oil tank to the atmosphere. After a delay of about 15 seconds, when the pressure in the oil tank drops to a certain value, the motor stops.

5) Emergency Stop

When the exhaust temperature exceeds 110° C or the motor's overcurrent protection device activates due to overload, etc., the power will be cut off and the motor will stop immediately.

Simultaneously, the solenoid valve and intake valve also close, and the vent valve fully opens. **The emergency stop button should only be pressed when abnormal conditions occur during unit operation; otherwise, it may cause system malfunction.**

6) Automatic Shutdown After Prolonged No-Load Operation

If the system's compressed air consumption decreases, the compressor remains operating under no-load conditions. If the no-load operation time exceeds the set time, the air compressor will automatically shut down, and the motor will stop. When the system's air consumption increases and the system pressure decreases, the air compressor will automatically start to supplement the air volume. The time setting limit for shutdown after prolonged no-load operation is based on the principle that the motor should not start more than twice per hour. The customer can set this according to their usage conditions.

Excessively frequent starting of the motor will affect its service life and may even burn it out.

7) Variable Frequency Screw Air Compressor Control and Protection System

When the user's air consumption is small or temporarily stops, the main intake valve of the intake valve is closed, causing the compressor to run under load conditions, entering an unloaded state, thereby achieving energy saving. After air consumption resumes, the microcomputer controller reopens the main intake valve of the intake valve, causing the compressor to switch to full-load operation and resume loaded operation. At the same time, the microcomputer controller also monitors the unit. In case of abnormal conditions (such as motor overload, excessive exhaust temperature, etc.), it automatically shuts down to protect the compressor from damage. A safety valve is installed on the oil-gas tank. When the pressure in the oil-gas tank exceeds the set value, the safety valve will automatically open, rapidly venting and depressurizing to ensure unit safety. This machine has a complete pressure relief function, so under normal circumstances, the safety valve will not open.

2、Electrical Circuits

1) Screw Air Compressor Electrical Circuit

The electrical control of the air compressor can be divided into two systems: one is the internal control system; the other is the starter panel part. The starter panel is a commonly used Y- Δ starting control for general machinery. The control part is electronic. As the internal circuitry and control of the electronic control part are relatively complex, they will not be discussed in depth in this chapter. If damaged or faulty, please contact our company's service units directly.

2) Variable Frequency Screw Air Compressor Electrical Circuit

The electrical system consists of an inverter, main motor, fan motor, electrical control cabinet, solenoid valves, temperature sensors, pressure transmitters, microcomputer controller, operation panel, and other components. **For parameter settings and operation of the frequency conversion compressor, refer to the "User Manual".**

Chapter 4: Control Panel Description

I. Basic Operation of Keypad Panel

1. Key Description



Figure 1

- I** — Start Key: When the air compressor is in standby mode, pressing this key starts the air compressor. When the linkage control function is correctly set and the air compressor is No. 1 and set as the host, pressing the start key starts the air compressor and simultaneously activates the linkage control function.
- O** — Stop Key: When the air compressor is running, pressing this key stops the air compressor. When linkage control is set and the air compressor is No. 1 and set as the host, pressing the stop key stops the air compressor and simultaneously stops the linkage control function. When the equipment is stopped, long press the stop key to switch to the software version display interface.
- S** — Load/Unload Key / Confirm Key: When the air compressor is running, this key serves as the load/unload key, controlling the air compressor to run loaded or unloaded. In data setting mode, after modifying data, press this key to confirm data input. After entering the password, press this key to confirm password input and verify if the password is correct.
- ▼** — Down Key / Decrement Key: When viewing parameters, press this key to move the scroll

bar down. When modifying data, press this key to decrement the data at the current flashing position.

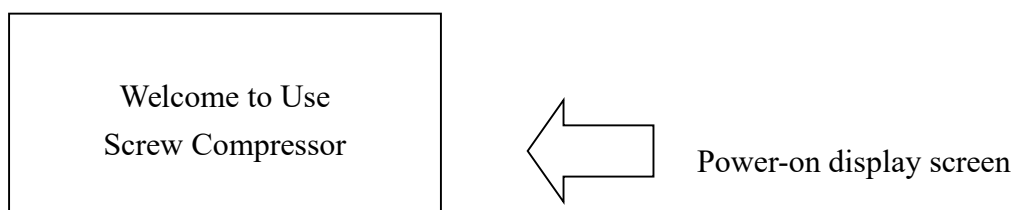
 —Up Key / Increment Key: When viewing parameters, press this key to move the scroll bar up. When modifying data, press this key to increment the data at the current flashing position.

 —Shift Key / Enter Key: When modifying data, this key acts as a shift key, moving the flashing cursor to the next data digit. When selecting a menu, press this key to enter the next level of the current menu. If the current menu has no submenu, it enters the setting mode of the current menu, and the current menu data displays a flashing cursor.

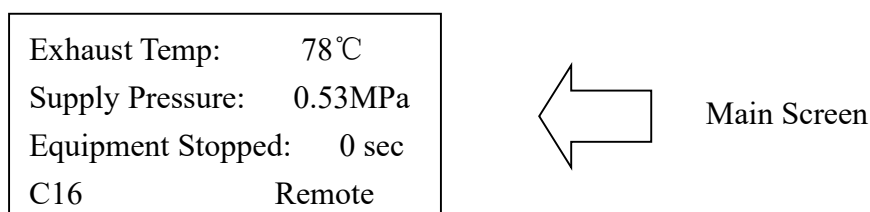
 —Return Key / Reset Key: In setting mode, press this key to exit setting mode. In parameter viewing mode, press this key to return to the previous menu. During a fault shutdown, long press this key to reset the fault.

2. Status Display and Operation

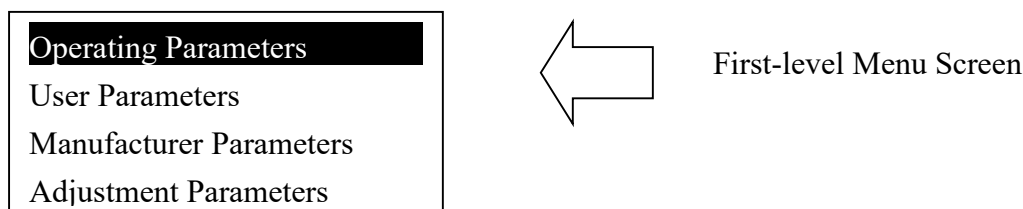
After the unit is powered on, the following interface is displayed:



After a 5-second delay, the following main interface is displayed:



Press the Down Key to enter the following menu selection interface:



3. Operating Parameters, Menu

Press the Down Key to move the black scroll bar to the "Operating Parameters" menu, then press the Enter Key to switch to the next level menu:

Main/Fan Current
Total Running Time
Current Running Time
Maintenance Parameters

Historical Faults
Manufacturing Date, Serial Number
Current Faults
Communication Status

Move the scroll bar to the corresponding menu item and press the Enter Key to view specific parameters. For example, to view "Main/Fan Current", move the scroll bar to the "Main/Fan Current" menu item and press the Enter Key to switch to the main/fan current value interface.

Host	(A)	Fan	(A)
A	50.1	2.1	
B	50.1	2.1	
C	50.1	2.1	

Press the Return Key to return to the previous menu or the main interface. If no operation is performed on a certain interface for 60 seconds, it will automatically return to the main interface.

5. User Parameter Viewing and Modification

In the first-level menu, press the Up or Down Key to move the black scroll bar to the "User Parameters" menu, then press the Enter Key to switch to the following menu:

Pressure, Temperature Preset
Start/Stop Delay Preset
Operation Mode Preset
Linkage Parameters Preset

Maintenance Parameters Reset
Maximum Usage Time Preset
Language Selection: Chinese/English
User Password: ****

Move the cursor to "Pressure, Temperature Preset", then press the Confirm Key to switch to:

Loading Pressure: 00.62 MPa
Unloading Pressure: 00.78 MPa
Fan Start Temp: 0080 °C
Fan Stop Temp: 0075 °C

Position the black scroll bar on the Loading Pressure menu, then press the Enter Key, switching to the following interface requiring user password input:

Enter Password

After this interface is displayed, a flashing digit appears. At this time, press the Increment or Decrement Key to modify the data at the current flashing position to equal the first digit of the password. Press the Shift Key to move the flashing cursor to the next data digit, modify the current flashing data to equal the second digit of the password, follow the above method to modify the third and fourth digits, and finally press the Confirm Key to confirm the input. After the system verifies the password is correct, it switches to the following interface:

Loading Pressure: 00.62 MPa*
Unloading Pressure: 00.78 MPa
Fan Start Temp: 0080 °C
Fan Stop Temp: 0075 °C

The "*" prompt in the upper right corner indicates the system has passed password verification.

In the interface shown above, press the Shift Key, and the first digit of the Loading Pressure begins to flash. The user can press the Increment or Decrement Key to modify the current flashing digit data to the target value. Then press the Shift Key to move the flashing cursor to the next data digit, continue modifying the data to the target value using the method described above. After modifying all data digits, press the Confirm Key to save the user-set data. After the parameter is successfully set, the controller buzzer emits a short prompt sound.

6. User Parameter Table and Functions

Level 1 Menu	Level 2 Menu	Default Value	Function Description
Pressure/Temp Preset	Loading Pressure	. MPa	The loading pressure value. When set to automatic operation, after startup, if the pressure is below this set value and the compressor is unloaded, the controller commands loading. If the compressor is in idle-stop mode, the controller starts the compressor.
	Unloading Pressure	. MPa	After startup, when the pressure is greater than this set value, the controller commands the compressor to unload.
	Fan Start Temp	0080 °C	When the exhaust temperature is higher than this set value, the fan is started.
	Fan Stop Temp	0070 °C	When the exhaust temperature is lower than this set value, the fan is stopped.
Start/Stop Delay Preset	Main Motor Delay	0008 Seconds	Sets the starting time for the main motor. Timing starts when the main motor starts. Overload protection is disabled during this period to withstand the motor startup inrush current.
	Fan Delay	0006 Seconds	Sets the starting time for the fan motor. Timing starts when the fan starts. Overload protection is disabled during this period to withstand the motor startup inrush current.
	Star-Delta Delay	0006 Seconds	Delay time for the star-delta reduced voltage startup.
	Loading Delay	0002 Seconds	Delay time before loading after switching to delta (full voltage) operation.
	No-Load Delay	0600 Seconds	Maximum continuous no-load running time. Exceeding this time switches the compressor to idle-stop mode.
	Shutdown Delay	0010 Seconds	During a normal shutdown, the compressor switches to no-load running and stops after this delay time.

	Restart Delay	0100 Seconds	Delay time required before the compressor can be restarted after a normal shutdown, idle-stop shutdown, or fault shutdown.
	Start/Stop Mode	Local / Remote	When set to Local, remote switches cannot start/stop the compressor. When set to Remote, both remote and local switches can start/stop the compressor.
	Loading Mode	Auto / Manual	In Manual mode, loading/unloading requires manual operation after startup. In Auto mode, the compressor loads/unloads automatically based on pressure after startup.
	Communication Mode	Disable / PC / Link	Disable: Communication is inactive. PC: Acts as a slave, communicating with external devices via MODBUS protocol. Link: Multiple compressors can form a network for coordinated operation.
	Communication Address	0001	Sets the communication address for linkage or communication with a host computer. Allowed range is 0-16 for linkage, and 0-99 for host computer communication.
Linkage Parameters Preset	Linkage Status	Host / Slave	Sets the role in a multi-compressor linkage network as "Host" or "Slave". The Host controls the start, stop, load, and unload of Slave units based on the supply pressure.
	Rotation Time	0099 Hours	In linkage control, sets the operating time before a unit rotates to standby, provided pressure conditions allow.
	Linked Units Count	0000	The number of air compressors in the linkage control network.
	Link Pressure Lower Limit	. MPa	During linkage operation, when the host pressure falls below this set pressure, a unit from the network is commanded to load or start.

	Link Pressure Upper Limit	. MPa	During linkage operation, when the host pressure rises above this set pressure, a unit from the network is commanded to unload or stop.
	Linkage Delay	0050 Seconds	The waiting time between consecutive control commands sent by the host during linkage operation.
Maint. Param. Reset	Oil Filter	0000 Hours	Accumulated usage time of the oil filter. Reset to zero here after replacing the oil filter.
	Oil Separator	0000 Hours	Accumulated usage time of the oil separator. Reset to zero here after replacing the oil separator.
	Air Filter	0000 Hours	Accumulated usage time of the air filter. Reset to zero here after replacing the air filter.
	Lubricating Oil	0000 Hours	Accumulated usage time of the lubricating oil. Reset to zero here after replacing the oil.
	Grease	0000 Hours	Accumulated usage time of the grease. Reset to zero here after replacing the grease.
	Belts	0000 Hours	Accumulated usage time of the belts. Reset to zero here after replacing the belts.
Max Usage Time Preset	Oil Filter	**** Hours	Warning is issued when the oil filter's accumulated usage time exceeds this value. Set to "0000" to disable the oil filter usage time warning.
	Oil Separator	**** Hours	Warning is issued when the oil separator's accumulated usage time exceeds this value. Set to "0000" to disable the oil separator usage time warning.
	Air Filter	**** Hours	Warning is issued when the air filter's accumulated usage time exceeds this value. Set to "0000" to disable the air filter usage time warning.

	Lubricating Oil	**** Hours	Warning is issued when the lubricating oil's accumulated usage time exceeds this value. Set to "0000" to disable the lubricating oil usage time warning.
	Grease	**** Hours	Warning is issued when the grease's accumulated usage time exceeds this value. Set to "0000" to disable the grease usage time warning.
	Belts	**** Hours	Warning is issued when the belts' accumulated usage time exceeds this value. Set to "0000" to disable the belts usage time warning.
Language Selection	Chinese / English	Chinese	When set to Chinese, the display interface is in Chinese. When set to English, the display interface is in English.
User Password	****	****	The user password can be modified here after verifying permissions (using the old user password or manufacturer password).

7. Viewing and Modifying Manufacturer Parameters

Manufacturer parameters are used to store data related to settings configured by the air compressor manufacturer. Viewing manufacturer parameters requires verification of the manufacturer password. In the primary menu, use the up or down arrow keys to move the black scroll bar to the "Manufacturer Parameters" menu, then press the Enter key to switch to the following interface:

Enter Password

After the user enters the correct manufacturer password and confirms, it switches to the manufacturer parameter interface shown below:

Main Motor Current: 100.0A

Fan Motor Current: 010.0A

Exh. Temp Warning: 0105°C

Exh. Temp Shutdown: 0110°C

More manufacturer parameters can be found in the Manufacturer Parameter Table. The method for modifying manufacturer parameters is the same as for modifying user parameters. Parameters such as "Operating Time", "Phase Sequence Protection", "Frequency Selection", and "Time Limit" within the manufacturer parameters require a super password to modify.

8.Manufacturer Parameter Table and Functions

Parameter Item	Default Value	Function and Purpose
Main Motor Current	Max Allowable Overload / 1.2	After the main motor start delay, if the motor current exceeds 1.2 times the set value, it trips after a delay according to the overload characteristic. (Overload characteristic see Table 2.1.1)
Fan Motor Current	Max Allowable Overload / 1.2	After the start delay, if the motor current exceeds 1.2 times the set value, it trips after a delay according to the overload characteristic.
Exhaust Temp Warning	105 °C	When the detected exhaust temperature is higher than this set temperature, a warning prompt is issued.
Exhaust Temp Shutdown	110 °C	When the detected exhaust temperature is higher than this set temperature, a fault shutdown is reported.
Shutdown Pressure	1.00 MPa	When the detected supply pressure is higher than this set pressure, a fault shutdown is reported.
Unloading Upper Limit	0.80 MPa	Used by the manufacturer to restrict the maximum unloading pressure the user is allowed to set. Unloading pressure $\leq$ value set here.
Total Operating Time	***** Hours	Modifies the total operating time of the air compressor.
Total Loaded Time	***** Hours	Modifies the total loaded operating time of the air compressor.
Historical Fault Reset	****	Enter "8888" and confirm to clear the historical fault records.
Current Imbalance Degree	0006	When (Max Phase Current / Min Phase Current) $\geq [1 + (\text{Set Value} / 10)]$, the imbalance protection activates and shuts down the unit. If set ≥ 15 , the imbalance protection is disabled.
Phase Loss Protection Time	002.0 S	If the phase loss protection time is set ≥ 20 seconds, the phase loss protection function is disabled. If imbalance protection is active, it may trigger instead.
Date	****(YYYY-MM-DD)	Records the manufacturing date of the air

		compressor.
Factory Serial Number	*****	The manufacturer inputs the factory serial number of the equipment.
Phase Sequence Protection	Disable / Enable	Used to select whether the phase sequence protection function is active.
Frequency Selection	50Hz / 60Hz	Selects the power supply frequency for the air compressor. Incorrect setting will cause deviations in detected current values.
Linkage Mode	Advanced / Compatible	In Compatible mode, the linkage control method is compatible with other models of controllers from our company. When linking with MAM8*0 controllers, it can be set to Advanced mode for more powerful linkage functions.
Overvoltage	**** V	When the controller detects voltage higher than the set value, it shuts down for protection and reports "Overvoltage". Set to 0000 to disable the overvoltage function.
Undervoltage	**** V	When the controller detects voltage lower than the set value, it shuts down for protection and reports "Undervoltage". Set to 0000 to disable the undervoltage function.
Low Temperature Protection	-0005 °C	When the controller detects an exhaust temperature lower than this value, it displays "Temperature Too Low" and prohibits starting the air compressor.
Time Limit	0000 Hours	When the compressor's cumulative running time exceeds the value set here, it reports a "Usage Error" and shuts down. Set to 0000 to disable the time limit function.
Warning Shutdown Delay	0010 Hours	After the controller detects that the usage time of the oil filter, oil separator, air filter, lubricating oil, grease, or belts exceeds their maximum usage time PLUS the time set here, it reports "Warning Too Long" and shuts down.
Comm. Preset Parameters	On / Off	Standby / Reserved
Parameter 1	****	After the user enters the manufacturer parameters, set this value. After saving,

		entering this value next time allows viewing all manufacturer parameters and modifying some manufacturer parameters.
--	--	--

9.Adjustment Parameters

Adjustment parameters are used to set controller-related data and are not allowed to be viewed or modified by users unauthorized by the manufacturer. Users must verify the manufacturer password before viewing adjustment parameters. The method for modifying adjustment parameters is the same as for modifying user parameters. The main functions and purposes are shown in the table below:

Parameter Item	Sub-item	Default Value	Function and Purpose
Main Motor Phase A	Standard Current	0000	Used for calibrating Main Motor Phase A current. Input the standard current value. The controller calculates the current coefficient based on the user input value divided by the currently detected current value and saves the coefficient. The standard current value is not saved, only used for calculation.
	Coefficient	1.000	Input the coefficient during current calibration. Controller displayed current value = Sampled value × Coefficient.
	Current Value	** . A	Displays the current value sampled by the controller and calibrated. This is a real-time value and cannot be set.
Main Motor Phase B	Standard Current	0000	Used for calibrating Main Motor Phase B current. Input the standard current value. The controller calculates the current coefficient based on the user input value divided by the currently detected current value and saves the coefficient. The standard current value is not saved, only used for calculation.
	Coefficient	1.000	Input the coefficient during current calibration. Controller displayed current value = Sampled value × Coefficient.
	Current Value	** . A	Displays the current value sampled by the controller and calibrated. This is a real-time value and cannot be set.
Main Motor Phase C	Standard Current	0000	Used for calibrating Main Motor Phase C current. Input the standard current value. The controller calculates the current coefficient based on the user

			input value divided by the currently detected current value and saves the coefficient. The standard current value is not saved, only used for calculation.
	Coefficient	1.000	Input the coefficient during current calibration. Controller displayed current value = Sampled value × Coefficient.
	Current Value	** . A	Displays the current value sampled by the controller and calibrated. This is a real-time value and cannot be set.
Fan Motor Phase A	Standard Current	0000	Used for calibrating Fan Motor Phase A current. Input the standard current value. The controller calculates the current coefficient based on the user input value divided by the currently detected current value and saves the coefficient. The standard current value is not saved, only used for calculation.
	Coefficient	1.000	Input the coefficient during current calibration. Controller displayed current value = Sampled value × Coefficient.
	Current Value	** . A	Displays the current value sampled by the controller and calibrated. This is a real-time value and cannot be set.
Fan Motor Phase B	Standard Current	0000	Used for calibrating Fan Motor Phase B current. Input the standard current value. The controller calculates the current coefficient based on the user input value divided by the currently detected current value and saves the coefficient. The standard current value is not saved, only used for calculation.
	Coefficient	1.000	Input the coefficient during current calibration. Controller displayed current value = Sampled value × Coefficient.
	Current Value	** . A	Displays the current value sampled by the controller and calibrated. This is a real-time value and cannot be set.
Fan Motor Phase C	Standard Current	0000	Used for calibrating Fan Motor Phase C current. Input the standard current value. The controller calculates the current coefficient based on the user input value divided by the currently detected current value and saves the coefficient. The standard current value is not saved, only used for calculation.

	Coefficient	1.000	Input the coefficient during current calibration. Controller displayed current value = Sampled value × Coefficient.
	Current Value	** . A	Displays the current value sampled by the controller and calibrated. This is a real-time value and cannot be set.

II. Basic Operation of the Touchscreen

1.1 Key Description

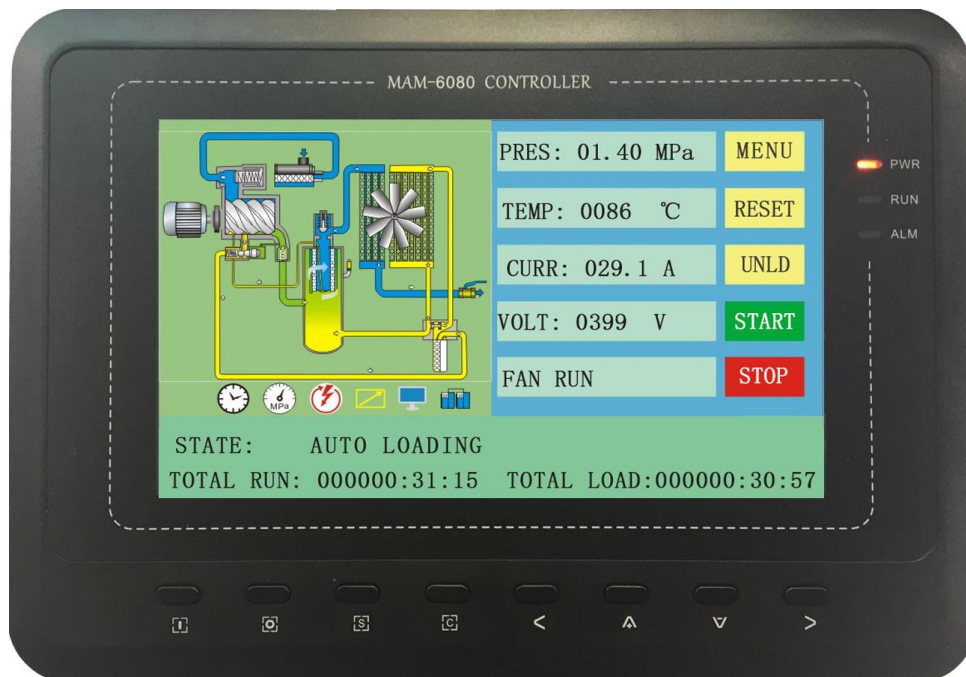


Figure 2

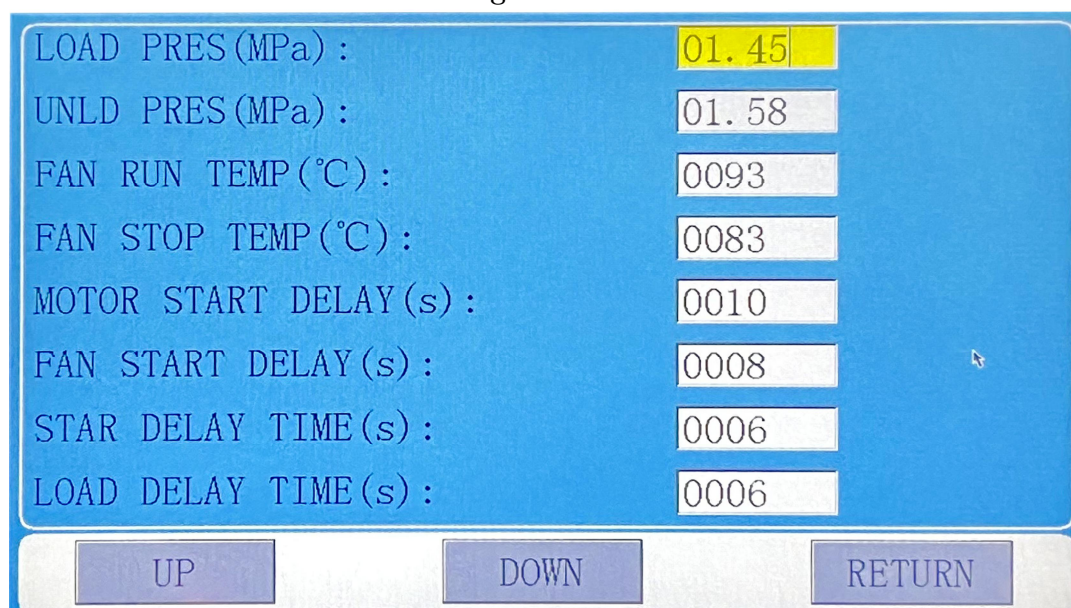


Figure 3



Start Key:

- When the air compressor is in standby mode, pressing this key starts the compressor.
- When the communication mode is set to "Linkage" and the communication address is 1, pressing this key starts the compressor and simultaneously activates the linkage control function.



Stop Key:

- When the air compressor is running, pressing this key stops the compressor.
-
- When the communication mode is set to "Linkage" and the communication address is 1, pressing the stop key stops the compressor and simultaneously deactivates the linkage control function. The host unit will no longer send commands to slave units.



Confirm Key / Load/Unload Key:

- When the compressor is running, this key functions as the Load/Unload key.
- When the input focus is on a numeric entry field and the field is in edit mode, pressing this key exits edit mode and saves the user-modified data.
- When the input focus is on a page navigation button, pressing this key executes the function corresponding to the button.



Return Key / Reset Key:

- During a fault shutdown, press and hold this key for 5 seconds to reset the fault.
- In setting mode, pressing this key exits setting mode and returns to view mode.
- In parameter view mode, pressing this key returns to the previous level/page.



Left Arrow Key:

- When the focus is on a numeric entry field in data view mode, pressing this key enters data edit mode, causing the least significant digit to blink.
- When the focus is on a numeric entry field in data edit mode, pressing this key moves the editing position to the digit to the left (higher place value).
- When the focus is on a parameter setting or display button, pressing this key modifies the current parameter and saves it.
- When the focus is on a page navigation button, pressing this key moves the focus to the next button.



Right Arrow Key / Enter Key:

- When the focus is on a numeric entry field in data view mode, pressing this key enters data edit mode, causing the most significant digit to blink.

- When the focus is on a numeric entry field in data edit mode, pressing this key moves the editing position to the digit to the right (lower place value).
- When the focus is on a parameter setting or display button, pressing this key modifies the current parameter and saves it.
- When the input focus is on a page navigation button, pressing this key moves the current focus to the next button.



Down Arrow Key / Decrement Key:

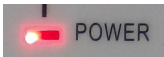
- When the currently focused element on the display is in data view mode, pressing this key moves the input focus to the next element.
- When the input focus is on a numeric entry field in data edit mode, pressing this key decreases (decrements) the value of the currently selected digit.
- When the current screen is the operating parameters display, pressing this key switches to the next page of operating parameters.



Up Arrow Key / Increment Key:

- When the currently focused element on the display is in data view mode, pressing this key moves the input focus to the previous element.
- When the input focus is on a numeric entry field in data edit mode, pressing this key increases (increments) the value of the currently selected digit.
- When the current screen is the operating parameters display, pressing this key switches to the previous page of operating parameters.

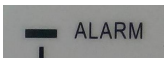
1.2 Indicator Description



Power: The indicator lights up when the controller is powered on.



Run: The run indicator lights up when the air compressor motor is operating.



Fault: The fault indicator flashes during a warning condition; it stays steadily lit during a fault shutdown. The light turns off after the fault is cleared and reset.

1.3 Status Display and Operation

After the touchscreen is powered on, it displays the controller logo "MAM-6080". After a short delay, it displays the following interface:



After a 5-second delay, the following operational parameter interface is displayed:

The interface displays the following information:

- PREs:** 01.40 MPa
- TEMP:** 0086 °C
- CURR:**
- VOLT:**
- FAN RUN**
- MODE:** AUTO
- LOADING**
- AL RUN:** 0000
- TIME:** 31:15
- TOTAL LOAD:** 000000:30:57

Control buttons include: MENU, RESET, UNLD, START, and STOP.

Icons and their functions:

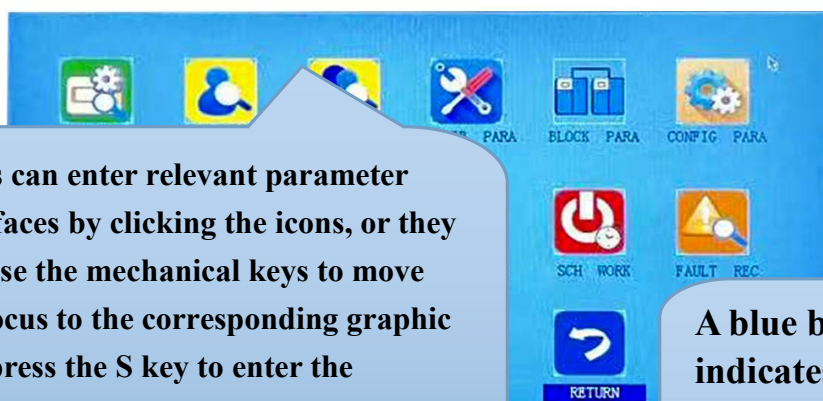
- Scheduled Start/Stop function:** Indicated by a clock icon.
- Power Failure Restart function:** Indicated by a lightning bolt icon.
- Linkage Control function:** Indicated by a gear icon.
- Scheduled Pressure function:** Indicated by a pressure gauge icon.
- Remote function:** Indicated by a remote control icon.
- Computer Monitoring function:** Indicated by a computer monitor icon.

When an element on the current interface is in focus, pressing the Left or Right arrow key will execute its corresponding function.

To prevent accidental operation, the Start and Stop keys must be pressed and held for 0.2 seconds to execute their corresponding functions.

Users can access the following menu selection interface by clicking the "Menu" button on the

display or by pressing the “”. From this interface, users can enter the respective parameter viewing and setting screens.



Users can enter relevant parameter interfaces by clicking the icons, or they can use the mechanical keys to move the focus to the corresponding graphic and press the S key to enter the respective parameters.

A blue background indicates the current interface focus is on this icon.

1.4 Operating Parameters

Click "Operating Parameters" to view the following related data and settings:

Menu Item	Default Value	Functional Description
Oil Filter Usage Time	0020H	Cumulative usage time of the oil filter.
Oil Separator Usage Time	0020H	Cumulative usage time of the oil separator.
Air Filter Usage Time	0020H	Cumulative usage time of the air filter.
Lubricating Oil Usage Time	0020H	Cumulative usage time of the lubricating oil.
Grease Usage Time	0020H	Cumulative usage time of the grease.
Factory Code	00000000	Displays the factory code.
Power Supply Voltage	0000V	Displays the power supply voltage.
Main Motor Current	A: 000.0A B: 000.0A C: 000.0A	Displays the main motor current.
Fan Motor Current	A: 000.0A B: 000.0A C: 000.0A	Displays the fan motor current.
Main Inverter Output Frequency	000.0 Hz	Displays the current output frequency of the main motor inverter.
Main Inverter Output Current	000.0 A	Displays the current output current of the main motor inverter.

Main Inverter Output Voltage	000.0 V	Displays the current output voltage of the main motor inverter.
Main Inverter Output Power	000.0 Kw	Displays the real-time output power of the main motor inverter.
Main Motor Current Session Consumption	0000000.0 Kw.H	Displays the electricity consumption accumulated for the current operating session, calculated by the controller based on the main inverter's real-time power output.
Main Motor Total Consumption	0000000.0 Kw.H	Displays the total cumulative electricity consumption, calculated by the controller based on the main inverter's real-time power output.
Pressure	00.00 MPa	
Integral Coefficient	00.00	
Main Motor Status Word	0000	The controller displays the value read from the main inverter's operating status register in this area.
Fault Word	0000	The controller displays the value read from the main inverter's fault status register in this area.
Frequency Command	000.0	The controller displays the main motor frequency value obtained through PID calculation here.
Fan Speed	0000 RPM	Displays the calculated real-time speed of the fan motor based on the read frequency.
Fan Inverter Output Frequency	000.0 Hz	Displays the current output frequency of the fan inverter.
Fan Inverter Output Current	000.0 A	Displays the current output current of the fan inverter.
Fan Inverter Output Voltage	000.0 V	Displays the current output voltage of the fan inverter.
Fan Inverter Output Power	000.0 Kw	Displays the real-time output power of the fan inverter.
Fan Current Session Consumption	000000.00 Kw.H	Displays the electricity consumption accumulated for the fan's current operating session, calculated by the controller based on the fan inverter's real-time power output.
Fan Total Consumption	000000.00 Kw.H	Displays the total cumulative electricity consumption for the fan, calculated by the controller based on the fan inverter's real-time power output.
Fan Status Word	0000	The controller displays the value read from the fan inverter's operating status register in this area.

Fault Word	0000	The controller displays the value read from the fan inverter's fault status register in this area.
Frequency Command	000.0	The controller displays the frequency value obtained through PID calculation in the frequency command display area.
Manufacturing Date	0000-00-00	Displays the manufacturing date.
Current Session Runtime	0000:00:00	The current operating time of the air compressor.
Current Session Load Time	0000:00:00	The current load operating time of the air compressor.
Main Inverter Output Frequency	000.0 Hz	Displays the current output frequency of the main motor inverter.
Software Version	CK0000M0000	
Checksum 1	0000 3FFF	
Checksum 2	7FFFFFFF_1	
Input Terminal Status	1 2 3 4 5 6 7 8 9 10 ● ● ● ● ● ● ● ● ● ● 1: Corresponds to digital input terminal 5 status 2: Corresponds to digital input terminal 6 status 3: Corresponds to digital input terminal 7 status 4: Corresponds to digital input terminal 8 status 5: Corresponds to digital input terminal 9 status 6: Corresponds to digital input terminal 10 status The circle color is Chinese Red when the terminal is closed, and light red when the terminal is open.	
Output Terminal Status	1 2 3 4 5 6 7 8 9 10 ● ● ● ● ● ● ● ● ● ● 1: Corresponds to relay output terminal 17 2: Corresponds to relay output terminal 16 3: Corresponds to relay output terminal 15 4: Corresponds to relay output terminal 14 5: Corresponds to relay output terminal 13 6: Corresponds to relay output terminal 12 The circle color is Chinese Red when the terminal is closed, and light red when the terminal is open.	

Line Frequency Main Motor ∅ UI	000000.0 Kw	Displays the product of the main motor's real-time current and real-time voltage sampled by the controller.
Line Freq. Main Motor Current Session Consumption	0000000.0 Kw.H	For line-frequency models, displays the electricity consumption calculated by the controller for the main motor's current operating session. (For reference only)
Line Freq. Main Motor Total Consumption	0000000.0 Kw.H	Displays the total cumulative electricity consumption calculated by the controller for the line-frequency operation of the main motor. (For reference only)
Line Frequency Fan Motor ∅ UI	000000.0 Kw	Displays the product of the fan motor's real-time current and real-time voltage sampled by the controller.
Line Freq. Fan Current Session Consumption	000000.00 Kw.H	For line-frequency fan operation, displays the electricity consumption calculated by the controller for the fan's current operating session. (For reference only)
Line Freq. Fan Total Consumption	000000.00 Kw.H	Displays the total cumulative electricity consumption calculated by the controller for the line-frequency operation of the fan motor. (For reference only)

1.5 User Parameters

User parameters are used to store data related to settings configured by the air compressor user. Modifying user parameters requires verification of the user password.

LOAD PRES (MPa) :	01.45
UNLD PRES (MPa) :	01.58
FAN RUN TEMP (°C) :	0093
FAN STOP TEMP (°C) :	0083
MOTOR START DELAY (s) :	0010
FAN START DELAY (s) :	0008
STAR DELAY TIME (s) :	0006
LOAD DELAY TIME (s) :	0006

UP

DOWN

RE

When the input focus is on a page turn button, press the S key to execute the corresponding function.

Touchscreen Operation (Focus background is yellow):

When the input focus is on a parameter field: If the password has already been verified, directly clicking on it will bring up the numeric keypad to modify the parameter. If the password has not been verified, clicking will pop up the password verification interface.

Button Operation:

In data view mode, press the Left or Right Arrow key to enter data edit mode.

In data view mode, press the Down or Up Arrow key to move the current focus to the next element.

In data edit mode, press the Up or Down Arrow key to modify the data of the currently selected digit.

In data edit mode, press the Left or Right Arrow key to move the editing position to the next data digit.

The main functions and purposes are shown in the following table:

Menu Item	Default Value	Functional Description
Supply Loading Pressure (MPa)	00.65	1. When loading mode is set to Auto and the compressor is in auto-unload operation, it automatically loads when pressure falls below this value. 2. When the compressor is in idle-stop mode, it automatically starts (if run conditions are met) when pressure falls below this value.
Supply Unloading Pressure (MPa)	00.80	1. Controls the compressor to unload when pressure is above this value and it is in loaded operation. 2. The "Supply Loading Pressure" setting cannot be greater than this value. "Supply Unloading Pressure" is limited by the "Unloading Upper Limit" in the manufacturer parameters.
Fan Start Temperature (°C)	0080	When the compressor is running, controls the fan to run when the exhaust temperature is higher than this set value.
Fan Stop Temperature (°C)	0070	When the compressor is running, stops the fan when the exhaust temperature is lower than this set value.
Main Motor Start Delay (s)	0008	Sets the starting time for the main motor. Timing starts at motor start. Main motor current overload protection is disabled during this time.
Fan Start Delay (s)	0003	Sets the starting time for the fan motor. Timing starts at fan start. Fan motor current overload protection is disabled during this time.
Star-Delta Delay (s)	0006	Delay time for the main motor star-delta reduced voltage start.
Loading Delay (s)	0002	Delay time before loading after switching to delta (full voltage) operation.
No-Load Delay Time (s)	0600	The maximum allowed continuous no-load running time for the compressor. Automatically stops and enters idle-stop mode after exceeding this time.
Shutdown Delay (s)	0010	During a normal shutdown, the compressor immediately enters no-load running, then stops after this set delay time.

Restart Delay (s)	0100	Delay time required before the compressor can be restarted after a normal shutdown, idle-stop shutdown, or fault shutdown.
Drain Valve Open Delay (s):	0002	Continuous draining time during automatic drain control. (Standby)
Drain Valve Close Delay (min):	0060	Time interval between drains during automatic drain control. (Standby)
Soft Start Delay (s):	0006	After this delay time elapses, the loading delay time begins. (This parameter is only active when the unit type is set to Soft Starter.)
Loading Mode:	Auto / Manual	Manual Mode: Automatically unloads when pressure is above "Unloading Pressure"; other scenarios are controlled by the Load/Unload key. Auto Mode: The controller automatically controls compressor loading/unloading based on pressure and the set load/unload pressures.
Start/Stop Mode:	Local / Remote	Local Mode: Remote start terminal has no function. Remote Mode: Remote start terminal function is active. Note: If a hardware input terminal is set to "Remote Start Enable", the Start/Stop mode is determined by that hardware's status. The mode is Remote when the terminal is closed and Local when open; this setting is inactive.
Operation Mode:	Line Freq. / Soft Start / Main&Fan VFD / Fan VFD / Main VFD	User selects the air compressor type according to requirements. Refer to the corresponding electrical diagram for wiring based on the selected type.
Communication Address:	0001	The controller's communication address when the communication mode is set to PC or Linkage.
Backlight Brightness Adjustment:	0004	Adjusts backlight brightness. Higher value indicates stronger brightness. (1~7 levels adjustable)
Communication Mode:	Disable / Linkage / Computer	Disable: Communication is inactive. Computer: Acts as a slave, communicates with external devices via MODBUS RTU protocol. Baud rate: 9600; Data format: 8N1; Parity: Even. Linkage: Multiple air compressors can form a network for coordinated operation.

Pressure Unit:	MPa / PSI / BAR	When set to MPa, pressure-related parameters are displayed in MPa. When set to PSI, pressure-related parameters are displayed in PSI. (Standby) When set to BAR, pressure-related parameters are displayed in BAR. (Standby)
Temperature Unit:	°C / °F	When set to °C, temperature-related parameters are displayed in °C. When set to °F, temperature-related parameters are displayed in °F. (Standby)
Language Selection:	Chinese / English	When set to Chinese, the display interface is in Chinese. When set to English, the display interface is in English. (Standby)
User Password:	****	Modifiable user password; can be reset using the old user password or the manufacturer password.
Sleep Backlight Brightness:	0000	Used to set the display backlight brightness when the controller is inactive for a long time.

1.6 Manufacturer Parameters

Manufacturer parameters are used to store data related to settings configured by the air compressor manufacturer. Users need to verify the manufacturer password to view or modify these parameters. The modification method is the same as for user parameters. The main functions and purposes are shown in the following table:

Menu Item	Default Value	Functional Description
Main Motor Rated Current (A):	Max Allowable Overload / 1.2	If the main motor current exceeds 1.2 times the set value, it trips after a delay according to the inverse time characteristic.
Fan Motor Rated Current (A):	Max Allowable Overload / 1.2	If the fan motor current exceeds 1.2 times the set value, it trips after a delay according to the inverse time characteristic.
Exhaust Temp Warning (°C):	0105	Warning prompt when exhaust temperature is higher than this set temperature.
Exhaust Temp Shutdown (°C):	0110	Fault shutdown when exhaust temperature is higher than this set temperature.
Front Bearing Warning Temp (°C):	0105	Warning prompt when front bearing temperature is higher than this set temperature. (Standby)

Front Bearing Shutdown Temp (°C):	0110	Fault shutdown when front bearing temperature is higher than this set temperature. (Standby)
Supply Shutdown Pressure (MPa):	00.90	Fault shutdown when supply pressure is higher than this set pressure.
System Shutdown Pressure (MPa):	01.00	Fault shutdown when system pressure is higher than this set pressure.
Unloading Pressure Upper Limit (MPa):	00.85	This is the maximum value for the "Unloading Pressure" in user parameters. Unloading Pressure $\leq$ value set here.
Current Imbalance Degree:	0006	When (Max Phase Current / Min Phase Current) $\geq$ [1 + (Set Value / 10)], the imbalance protection activates and shuts down the unit, reporting "Main Motor Imbalance". Set ≥ 15 to disable imbalance protection.
Phase Loss Protection Time (s):	002.0	If the phase loss protection time is set ≥ 20 seconds, the phase loss protection function is disabled.
Historical Fault Reset:	0000	Enter "8888" and confirm to clear historical fault records.
Warning Shutdown Delay (h):	0000	After a consumable warning, fault shutdown occurs if the warning persists beyond the time set here.
Maximum Usage Time (h):	0000	When the compressor's cumulative running time exceeds the value set here and the compressor is stopped, a fault alarm displays "Usage Error".
Manufacturer Password 2:	0000	Manufacturer sets a modifiable manufacturer password.
Overvoltage (V):	0410	When the controller detects voltage higher than the set value, it shuts down for protection and reports "Overvoltage". Set to 0000 to disable the overvoltage function.
Undervoltage (V):	0350	When the controller detects voltage lower than the set value, it shuts down for protection and reports "Undervoltage". Set to 0000 to disable the undervoltage function.
Communication Timeout (s):	002.0	Timing starts when the controller sends the first byte. If no response is received from the inverter within this time, the controller considers it a timeout and resends the command data.
Communication Interruption (s):	0020	The controller reports "Communication Interruption" if it fails to receive correct data continuously for longer than the set time.

Communication Recovery:	0015	After communication interruption, communication is considered restored after correctly receiving data consecutively for the set number of times.
Scheduled Start/Stop Function:	Enable / Disable	Enable: Scheduled Start/Stop function is active. Disable: Scheduled Start/Stop function is inactive.
Scheduled Pressure Function:	Enable / Disable	Enable: Scheduled Pressure function is active. Disable: Scheduled Pressure function is inactive.
Total Operating Time (h):	000100h:00m	Modifies the total operating time of the air compressor.
Total Loaded Time (h):	000100h:00m	Modifies the total loaded operating time of the air compressor.
Low Temperature Protection (°C):	-0050	At startup, if temperature is detected below the set value, prompts "Temperature Too Low" and prohibits startup. If detected 2 minutes after startup, reports "Temperature Sensor Failure" and shuts down.
Power Failure Restart Function:	Enable / Disable	Sets whether the power failure restart function is enabled.
Line Freq. Main Motor Power Coefficient:	0.000	Sets the coefficient used for calculating main motor power.
Line Freq. Main Motor Consumption (Kw.H):	0000000.0	Sets and modifies the electricity consumption of the line frequency main motor.
Line Freq. Fan Motor Power Coefficient:	0.000	Sets the coefficient used for calculating fan motor power.
Line Freq. Fan Motor Consumption (Kw.H):	0000000.0	Sets and modifies the electricity consumption of the line frequency fan motor.
Frequency Selection:	50Hz / 60Hz	Sets the power supply frequency.
Oil Sep. Diff. Press. Warning (MPa):	00.15	During loaded operation, when both supply pressure and oil-gas tank pressure are >0.5MPa, system warns if (Oil-gas tank pressure - Exhaust pressure - Pipeline resistance) > Diff. Press. Warning value.
Oil Sep. Diff. Press. Shutdown (MPa):	00.20	During loaded operation, when both supply pressure and oil-gas tank pressure are >0.5MPa, system shuts down if (Oil-gas tank pressure - Exhaust pressure - Pipeline resistance) > Diff. Press. Shutdown value.

Pipeline Resistance (MPa):	00.05	Pipeline pressure resistance.
Rear Bearing Warning Temp (°C):	0000	Warning prompt when rear bearing temperature is higher than this set temperature. (Standby)
Rear Bearing Shutdown Temp (°C):	0000	Fault shutdown when rear bearing temperature is higher than this set temperature. (Standby)
Factory Serial Number:	12345678	Manufacturer's factory serial number.
Manufacturing Date:	2016-02-20	Manufacturer's manufacturing date.

1.7 Calibration Parameters

Calibration parameters are used to set controller-related data. Users must verify the calibration password before viewing or modifying them. The main functions and purposes are shown in the table below:

Menu Item	Default Value	Functional Description
Main Motor Phase A Coefficient	1.000	Used for current calibration. Current coefficient range: 0.800-2.000. Current Value = Sampled Value × Current Coefficient
Main Motor Phase B Coefficient	1.000	
Main Motor Phase C Coefficient	1.000	
Fan Motor Phase A Coefficient	1.000	
Fan Motor Phase B Coefficient	1.000	
Fan Motor Phase C Coefficient	1.000	
Temperature 1 Coefficient	1.000	Used for exhaust temperature calibration. Temperature coefficient range: 0.800-2.000. Temperature Value = Detected Temperature Value × Temperature Coefficient
Temperature 2 Coefficient	1.000	Note: For MAM6080 controller, this parameter is standby.
Temperature 3 Coefficient	1.000	

Temperature 4 Coefficient	1.000	
Temperature 5 Coefficient	1.000	
Temperature 6 Coefficient	1.000	
Pressure 1 Coefficient	1.000	Used for supply pressure calibration. Pressure coefficient range: 0.800-2.000. Pressure Value = Detected Pressure Value × Pressure Coefficient
Pressure 2 Coefficient	1.000	Note: For MAM6080 controller, this parameter is standby.
Voltage Coefficient	1.000	Used for voltage detection calibration. Voltage coefficient range: 0.800-2.000. Voltage Value = Detected Voltage Value × Voltage Coefficient
Main Motor Current Period	0004	Controls the refresh rate of current.
Voltage Period	0004	Controls the refresh rate of voltage.
Temperature 1 Zero Point	0002	Used to adjust the controller's temperature zero point. When the controller temp sensor terminal is connected to the resistor corresponding to -20°C, adjust this value to set the temp to -20°C. For temp calibration.
Temperature 2 Zero Point	0002	Note: For MAM6080 controller, this parameter is standby.
Temperature 3 Zero Point	0002	
Temperature 4 Zero Point	0002	
Temperature 5 Zero Point	0002	
Temperature 6 Zero Point	0002	
Pressure 1 Zero Point	0002	When the supply pressure value is less than the set value, the displayed pressure is 0.00, used to prevent zero drift of the supply pressure sensor.
Pressure 2 Zero Point	0002	When Pressure 2 value is less than the set value, the displayed pressure is 0.00, used to prevent zero drift of the pressure sensor. (Standby)

P1 Pressure Range (MPa)	01.60	Sets the range of the controller's supply pressure sensor.
P2 Pressure Range (MPa)	01.60	Sets the range of the controller's Pressure 2 sensor. (Standby)
Phase Sequence Protection Value (V)	000.9	Reports "Phase Sequence Error" when the voltage detected by the 3-phase sequence detection circuit is below the value set here. Set this value to 0 to disable phase sequence protection.
Phase Loss Protection Value (V)	000.0	Reports "Phase Sequence Error" when the detected phase loss voltage is below the value set here. Set this value to 0 to disable the phase loss protection function of the phase sequence. Note: For MAM6080 controller, this parameter is standby.
Main Motor CT Ratio	020	Main Motor Rated Current / 5
Fan Motor CT Ratio	001	Fan Motor Rated Current / 2.5
Standby		Used for controller manufacturer debugging.

1.8 Linkage Control Parameters

Linkage control parameters are used to set linkage-related functions. Users must verify the linkage parameter password before modifying them. The main functions and purposes are shown in the table below:

Menu Item	Default Value	Functional Description
Number of Linked Units:	0002	The number of air compressors in the linkage control network during linkage operation.
Linkage Loading Pressure (MPa)	00.63	During linkage operation, when the host pressure falls below this set pressure, find a unit from the network to load or start.
Linkage Unloading Pressure (MPa)	00.78	During linkage operation, when the host pressure rises above this set pressure, find a unit from the network to unload or stop.
Linkage Delay Time (s):	0020	The waiting time between consecutive control commands sent by the host during linkage operation.

Rotation Time (min):	0060	When the host pressure is between the "Linkage Loading" and "Linkage Unloading" pressures, and there are both running and stopped units in the network, if this condition persists for the set time, the host sends a stop command to the running unit(s) and a start command to the stopped unit(s).
Linkage Network:	Line Freq-Line Freq VFD-Line Freq VFD-VFD	Line Freq-Line Freq: For linking line frequency air compressors with line frequency air compressors. VFD-Line Freq: For linking variable frequency drive air compressors with line frequency air compressors. VFD-VFD: For linking variable frequency drive air compressors with variable frequency drive air compressors.

1.9 Hardware Parameters

Hardware parameters are used to set the functions of multi-function terminals 5-10. The main functions and purposes are shown in the table below:

Menu Item	Default Value	Functional Description
Terminal 10 Function:	Emergency Stop	No Function / Emergency Stop / Remote Start / Remote Stop / Remote Jog / Remote Hold / Water Lack NC / Remote Load / Remote Start Enable / Remote Load/Unload Enable / Air Receiver High Temp NC / Coil High Temp NC / Bearing High Temp NC / Electrical Fault NC / Motor Overload NC / Fan Overload NC / Oil Filter Block NC / Oil Filter Block NO / Oil Separator Block NC / Oil Separator Block NO / Air Filter Block NC / Air Filter Block NO / Air End Fault NC / Refrigerated Dryer Fault NC / Main Inverter Fault NO / Main Inverter Fault NC / Fan Inverter Fault NO / Fan Inverter Fault NC / Soft Starter Fault NO Note: Users can set the digital input function as required.
Terminal 9 Function:	Water Lack	
Terminal 8 Function:	Oil Filter	
Terminal 7 Function:	Oil Separator	
Terminal 6 Function:	Air Filter	
Terminal 5 Function:	Remote Switch	

1.10 Consumables Parameters

Consumables parameters are used to set consumable timers. Users must verify the consumables password before viewing or modifying them. The main functions and purposes are shown in the table below:

Menu Item	Default Value	Functional Description
Oil Filter Usage Time (h)	0000	Cumulative usage time of the oil filter. Manually reset to zero after replacing the oil filter.
Oil Separator Usage Time (h)	0000	Cumulative usage time of the oil separator. Manually reset to zero after replacing the oil separator.
Air Filter Usage Time (h)	0000	Cumulative usage time of the air filter. Manually reset to zero after replacing the air filter.
Lubricating Oil Usage Time (h)	0000	Cumulative usage time of the lubricating oil. Manually reset to zero after replacing the oil.
Grease Usage Time (h)	0000	Cumulative usage time of the grease. Manually reset to zero after replacing the grease.
Oil Filter Max Usage (h)	2000	1. Controller warns when oil filter cumulative usage time exceeds the value set here. 2. Set to "0000" to disable the oil filter warning function.
Oil Separator Max Usage (h)	2000	1. Controller warns when oil separator cumulative usage time exceeds the value set here. 2. Set to "0000" to disable the oil separator warning function.
Air Filter Max Usage (h)	2000	1. Controller warns when air filter cumulative usage time exceeds the value set here. 2. Set to "0000" to disable the air filter warning function.
Lubricating Oil Max Usage (h)	2000	1. Controller warns when lubricating oil cumulative usage time exceeds the value set here. 2. Set to "0000" to disable the lubricating oil warning function.
Grease Max Usage (h)	2000	1. Controller warns when grease cumulative usage time exceeds the value set here. 2. Set to "0000" to disable the grease warning function.

1.11 Inverter Presets

Inverter presets are used to set inverter parameters. Users must verify the inverter preset password before viewing or modifying them. The main functions and purposes are shown in the table below (Parameters based on Schneider ATV61, ATV71 inverters as an example):

Menu Item	Default Value	Functional Description
Inverter Name		
Start Address 1:	2135	Corresponding address 1 for the inverter start command.
Send Data:	0001	This set value is the inverter start value. (Refer to the inverter manual, communication section, for different inverters.)
Start Address 2:	2135	Corresponding address 2 for the inverter start command.
Send Data:	0001	This set value is the inverter start value. (Refer to the inverter manual, communication section, for different inverters.)
Stop Address:	2135	Corresponding address for the inverter stop command.
Send Data:	0001	This set value is the inverter start value. (Refer to the inverter manual, communication section, for different inverters.)
Reset Address:	2135	Corresponding address for the inverter reset command.
Send Data:	0001	This set value is the inverter start value. (Refer to the inverter manual, communication section, for different inverters.)
Frequency Write Address:	2136	Register address corresponding to the communication given frequency for the inverter.
Frequency =	$\frac{\text{Calculated Value} * 0001}{0001}$	The calculated value is the frequency value with 1 decimal place. Converted to corresponding data via the formula for different inverters and sent to the inverter. E.g., Controller wants inverter to run at 50Hz, calculated value is 500. For inverters expecting frequency write value with 2 decimals: Formula: $\text{Calculated Value} * 0010 \div 0001$; For inverters expecting frequency write value with 1 decimal: Formula: $\text{Calculated Value} * 0001 \div 0001$; For some inverters where 10000 corresponds to max output frequency: Formula: $\text{Calculated Value} * 0020 \div 0001$;
Run Status Address:	2135	Address to read the inverter run status.
Run Status =	$\text{Status Word AND } 0001 = 0001$	Formula used to determine if the inverter is running. (Refer to inverter manual, communication section.)

Data Format:	8N1-N	Sets the data format for communication between the controller and the inverter. This setting must match the inverter's communication format setting. 8N1-N: 1 start bit, 8 data bits, 1 stop bit, no parity; 8N1-E: 1 start bit, 8 data bits, 1 stop bit, even parity; 8N1-O: 1 start bit, 8 data bits, 1 stop bit, odd parity; 8N2-N: 1 start bit, 8 data bits, 2 stop bits, no parity; Note: Baud rate fixed at 9600 for communication with inverter.
Frequency Address	0C82	Address to read inverter frequency. (Refer to inverter manual)
Frequency Display =	Received * 0001 ÷ 0001	Formula to calculate inverter frequency. Controller converts the read frequency to a value with 1 decimal place.
Voltage Address	0C88	Address to read inverter voltage.
Voltage Display =	Received * 0001 ÷ 0001	Formula to calculate inverter voltage. Controller converts the read voltage to a value with 1 decimal place.
Current Address	0C84	Address to read inverter current.
Current Display =	Received * 0001 ÷ 0001	Formula to calculate inverter current. Controller converts the read current to a value with 1 decimal place.
Power Address	0C8B	Address to read inverter power.
Power =	Received * 1 * 001 ÷ 0001	Formula to calculate inverter power.
Fault Address	8000	Address to read inverter faults.
Fault Status =	Fault Received Value AND 0000 ≠ 0000	Formula to determine if the inverter has reported a fault.
Emergency Stop Address	2135	Corresponding address for the inverter emergency stop command.
Send Data	0001	This set value is the inverter start value. (Refer to the inverter manual, communication section, for different inverters.)

1.12 Screen Calibration

Screen calibration is used to calibrate the accuracy of screen touch operations. The user must verify the screen calibration password before entering the screen calibration interface.

After entering the screen calibration interface, use a fingertip or other pointed tool to sequentially tap points A, B, C, D, and E. If the desired effect is achieved, click "Confirm"; the controller will restart to save the settings. If the expected effect is not achieved, click "Recalibrate" and repeat the calibration process until the ideal result is obtained.

1.13 Scheduled Pressure

Scheduled Pressure is used to set pressure values for specific time periods. The user must verify the scheduled pressure password before modifying these parameters. The main functions and purposes are shown in the following table:

Menu Item	Default Value	Functional Description
Loading Pressure (MPa)	00.65	When the current time is between the "Pressure Start Time" and "Pressure End Time", the compressor loads if pressure falls below this set value.
Unloading Pressure (MPa)	00.80	When the current time is between the "Pressure Start Time" and "Pressure End Time", the compressor unloads if pressure rises above this set value.
VFD Operating Pressure (MPa)	00.70	When the current time is between the "Pressure Start Time" and "Pressure End Time", this sets the target supply pressure for stable VFD compressor operation. The controller adjusts the inverter frequency to maintain pressure near this value when pressure fluctuates. (Active only when unit type is set to Main VFD or Main & Fan VFD)
Pressure Start Time	00:00	When not "00:00", the scheduled pressure function is activated; otherwise, it is disabled.
Pressure End Time	00:00	When not "00:00", the scheduled pressure end function is activated; otherwise, it is disabled.

1.14 Scheduled Start/Stop

Scheduled Start/Stop is used to set the weekly automatic start/stop times. Up to four start/stop periods can be set for each day. The user must verify the scheduled start/stop password before modifying these times. If the time is set to "00:00", the corresponding function is disabled.

1.15 Historical Faults

Records historical fault information to help users identify the cause of faults and troubleshoot external issues. The controller can record up to 100 historical faults.

1.16 Main Motor VFD Parameters

Main Motor VFD Parameters are used to set parameters for the main motor variable frequency drive. The user must verify the main VFD password before modifying these parameters. The main functions and purposes are shown in the following table:

Menu Item	Default Value	Functional Description
Main VFD Pressure (MPa)	00.70	Sets the target supply pressure for stable VFD compressor operation. The controller adjusts the inverter frequency to maintain pressure near this value. (Active only for Main VFD or Main & Fan VFD types)
Main Ascending Rate	1000	During PID adjustment, limits the increment of each PID calculation result. Prevents excessive frequency increase during operation, causing rapid motor acceleration.
Main Descending Rate	1000	During PID adjustment, limits the decrement of each PID calculation result. Prevents excessive frequency decrease during operation, causing rapid motor deceleration.
Main Motor Power (KW)	022.0	Sets the motor rated power, used to calculate the actual power during VFD operation. (Active only for Main VFD or Main & Fan VFD types)
Main Motor Speed (RPM)	1500	Sets the motor speed at maximum frequency, used to calculate the actual speed during VFD operation. (Active only for Main VFD or Main & Fan VFD types)
Main Integral Initial Value	0080	Integral uses this set value when detected pressure < (Set Pressure - Integral Range). Also used when detected pressure > (Set Pressure + Integral Range).
Main Integral Range (MPa)	00.05	During VFD operation, integral gain is active when (Set Pressure - Integral Range) < Detected Pressure < (Set Pressure + Integral Range).
VFD Main Motor Power Coefficient	0.000	Sets the coefficient used for calculating main motor power.
Main Proportional Gain	0025	Affects how quickly the system tracks the set pressure. Higher values track faster but can cause oscillation; lower values track slower and adjust more slowly.
Main Integral Gain	0030	Affects tracking speed and steady-state error for set pressure. Higher values track faster with smaller error; lower values track slower with larger error.

Main Derivative Gain	0000	Primarily used for systems with significant lag (e.g., temperature). Generally not used; set to "0000".
Main Frequency Upper Limit (Hz)	050.0	The maximum operating frequency allowed when the compressor is loaded.
Main Frequency Lower Limit (Hz)	030.0	The minimum operating frequency allowed during adjustment when pressure exceeds the set pressure but hasn't reached the unloading pressure.
Main No-Load Frequency (Hz)	025.0	The operating frequency allowed when the compressor is unloaded.
Main Inverter Station Number	001	Sets the station number for the main inverter. Must match the inverter's communication station number.
Main PID Cycle (s)	000.8	The time interval at which the controller performs a PID calculation to adjust the main motor speed.
Main Inverter Model	ATV61	The controller can pre-store communication addresses for up to 10 different inverter types. (Requires inverter support for MODBUS RTU protocol)

Main Shutdown Method	Ramp Stop / Coast Stop	1. Main Inverter start mode set to Communication Control: Ramp Stop: When manufacturer parameter shutdown method is Ramp Stop, upon stop command, loading valve disengages, controller sends ramp stop command to inverter. Inverter stops according to its set deceleration time. Coast Stop: When manufacturer parameter shutdown method is Coast Stop, upon stop command, loading valve disengages, controller sends frequency commands via 485 port to lower frequency, then sends stop command 1 second before the shutdown delay countdown ends. 2. Main Inverter start mode set to Terminal Control: Ramp Stop: When manufacturer parameter shutdown method is Ramp Stop, upon stop command, loading valve disengages, controller opens the main inverter run terminal. Inverter stops according to its set deceleration time. Coast Stop: When manufacturer parameter shutdown method is Coast Stop, upon stop command, loading valve disengages, controller keeps main inverter run terminal closed, controls frequency down, then opens the terminal 1 second before the shutdown delay countdown ends.
Main Inverter Start Method	Comm. Start/Stop / Terminal Start/Stop	Comm. Start/Stop: Start/Stop the inverter via RS485 communication. Terminal Start/Stop: Start/Stop the inverter via digital terminals. Note: 1. Controller settings must match the inverter start/stop method configuration. 2. When user needs line frequency/VFD switching, terminal 12 serves as the VFD enable control terminal, and the controller can only start the inverter via communication start/stop.
Comm. Start Inverter Retries	06	After the controller sends a start command, if the inverter does not execute the run command, it will resend the start command up to this set number of times.

Comm. Stop Inverter Retries	06	After the controller sends a stop command, if the inverter does not execute the stop command, it will resend the stop command up to this set number of times.
VFD Main Motor Consumption (Kw.H)	0000000.0	Sets the cumulative electricity consumption for main motor VFD operation.
Pre-Start Inverter Delay (S)	001.0	Delay time after pressing the start key before sending the start command to the inverter.
Integral Gain 2	0000	Affects tracking speed and steady-state error for set pressure. Higher values track faster with smaller error; lower values track slower with larger error.
Integral Gain 2 Range (MPa)	00.00	Sets the operating range for Integral Gain 2.
Constant Power Pressure 1 (MPa)	0.60	For constant power operation: When detected pressure $\geq$ this value, the maximum allowed output frequency is limited to the "Constant Power Freq 1" setting.
Constant Power Pressure 2 (MPa)	0.70	For constant power operation: When detected pressure $\geq$ this value, the maximum allowed output frequency is limited to the "Constant Power Freq 2" setting.
Constant Power Pressure 3 (MPa)	0.80	For constant power operation: When detected pressure $\geq$ this value, the maximum allowed output frequency is limited to the "Constant Power Freq 3" setting.
Constant Power Pressure 4 (MPa)	0.90	For constant power operation: When detected pressure $\geq$ this value, the maximum allowed output frequency is limited to the "Constant Power Freq 4" setting.
Constant Power Pressure 5 (MPa)	1.00	For constant power operation: When detected pressure $\geq$ this value, the maximum allowed output frequency is limited to the "Constant Power Freq 5" setting.
Constant Power Pressure 6 (MPa)	1.10	For constant power operation: When detected pressure $\geq$ this value, the maximum allowed output frequency is limited to the "Constant Power Freq 6" setting.

Constant Power Pressure 7 (MPa)	1.20	For constant power operation: When detected pressure $\geq$ this value, the maximum allowed output frequency is limited to the "Constant Power Freq 7" setting.
Constant Power Frequency 1 (Hz)	180.0	See Note 1 below table.
Constant Power Frequency 2 (Hz)	160.0	
Constant Power Frequency 3 (Hz)	140.0	
Constant Power Frequency 4 (Hz)	120.0	
Constant Power Frequency 5 (Hz)	100.0	
Constant Power Frequency 6 (Hz)	80.0	
Constant Power Frequency 7 (Hz)	60.0	
Integral Coefficient	00.00	
Frequency Reduction	000.0	
Low Frequency Shutdown Delay (s)	0000	If set to 0 seconds, the low-frequency function is disabled.

Note 1: For Constant Power Control:

Constant Power Pressure 1 $\leq$ Constant Power Pressure 2 $\leq$ Constant Power Pressure 3 $\leq$ Constant Power Pressure 4 $\leq$ Constant Power Pressure 5 $\leq$ Constant Power Pressure 6 $\leq$ Constant Power Pressure 7

Note 2:

Constant Power Frequency 1 $\geq$ Constant Power Frequency 2 $\geq$ Constant Power Frequency 3 $\geq$ Constant Power Frequency 4 $\geq$ Constant Power Frequency 5 $\geq$ Constant Power Frequency 6 $\geq$ Constant Power Frequency 7

Note 3:

Assuming $M > N$, if Constant Power Pressure N is set to 00.00, then Constant Power Pressure M and its corresponding Constant Power Frequency M settings have no effect.

Note 4:

When the user does not need the constant power function, set Constant Power Pressure 1 to 00.00 MPa.

1.17 Fan Motor VFD Parameters

Fan Motor VFD Parameters are used to set parameters for the fan motor variable frequency drive. The user must verify the fan VFD password before modifying these parameters. The main functions and purposes are shown in the following table:

Menu Item	Default Value	Functional Description
Fan VFD Temperature (°C)	0078	Sets the target exhaust temperature for stable compressor operation. The controller adjusts the fan inverter frequency to maintain temperature near this value. (Active only for Fan VFD or Main & Fan VFD types)
Max VFD Temperature (°C)	0085	When exhaust temperature is $\geq$ this value, control the fan inverter output frequency to the upper limit set in manufacturer parameters. (Active only for Fan VFD or Main & Fan VFD types)
Fan Ascending Rate	1000	During PID adjustment, limits the increment of each PID calculation result. Prevents excessive frequency increase during fan operation, causing rapid fan acceleration.
Fan Descending Rate	1000	During PID adjustment, limits the decrement of each PID calculation result. Prevents excessive frequency decrease during operation, causing rapid fan deceleration.
Fan Rated Power (KW)	001.5	Sets the fan rated power, used to calculate the actual power during VFD operation. (Active only for Fan VFD or Main & Fan VFD types)
Fan Rated Speed (RPM)	1500	Sets the fan speed at maximum frequency, used to calculate the actual speed during VFD operation. (Active only for Fan VFD or Main & Fan VFD types)
VFD Fan Start (°C)	0070	When exhaust temperature is greater than this set value, the VFD fan starts. (Active only for Fan VFD or Main & Fan VFD types)
VFD Fan Stop (°C)	0065	When exhaust temperature is lower than this set value, the VFD fan stops. (Active only for Fan VFD or Main & Fan VFD types)
Fan Integral Initial Value	0020	Integral uses this set value when detected temperature $<$ (Set VFD Temp - Integral Range). Also used when detected temperature $>$ (Set VFD Temp + Integral Range).

Fan Integral Range (°C)	0005	Integral gain is active when (Set VFD Temp - Integral Range) < Detected Temperature < (Set VFD Temp + Integral Range). Outside this range, the integral initial value is used.
Fan Proportional Gain	0100	Affects how quickly the system tracks the set temperature. Higher values track faster but can cause oscillation; lower values track slower and adjust more slowly.
Fan Integral Gain	0020	Affects tracking speed and steady-state error for set temperature. Higher values track faster with smaller error; lower values track slower with larger error.
Fan Derivative Gain	0000	Generally not used; set to "0000".
Fan Frequency Upper Limit (Hz)	050.0	The maximum operating frequency allowed during adjustment when temperature exceeds the VFD operating temperature.
Fan Frequency Lower Limit (Hz)	010.0	The minimum operating frequency allowed during adjustment when temperature is below the set VFD operating temperature.
VFD Fan Power Coefficient	0.900	Coefficient for calculating VFD fan power.
Fan Inverter Station Number	002	Sets the communication station number for the corresponding fan inverter.
Fan PID Cycle (s)	001.5	The time interval at which the controller performs a PID calculation to adjust the fan speed.
Fan Inverter Model	ATV31	Selects the built-in inverter protocol.
Fan Inverter Start Method	Comm. Start/Stop / Terminal Start/Stop	Sets the fan inverter start method.
VFD Fan Consumption (Kw.H)	000000.00	VFD fan electricity consumption.
Integral Coefficient	00.00	

III. Controller Functions and Technical Parameters •

1. Digital I/O: 3 digital inputs, 5 relay digital outputs.
2. Analog I/O: One Pt100 temperature input, one 4~20mA pressure signal input, two sets of three-phase current inputs (with matching CTs).
3. Phase Sequence Input Voltage: 3-phase 380V/220V.

4. Controller Power Supply: AC20V, 5VA (10VA recommended).

5. Display Range:

① Exhaust Temperature: $-50 \sim 150^{\circ}\text{C}$, Accuracy: $\pm 1^{\circ}\text{C}$.

② Operating Time: $0 \sim 999999$ hours.

③ Current Display Range: $0 \sim 999.9\text{A}$.

④ Pressure: $0 \sim 1.60\text{MPa}$. Accuracy: 0.01MPa .

6. Phase Sequence Protection: When phase sequence error is detected with the compressor stopped, response time ≤ 2 seconds.

7. Motor Protection: The controller provides phase loss, imbalance, overload, undervoltage, and overvoltage protection for the main motor, and overload protection for the fan motor.

① Phase Loss Protection: Response time equals the set time when any phase is missing. If phase loss protection time is set >20 seconds, phase loss protection is disabled.

② Imbalance Protection: Response time is 5 seconds when the current ratio between any two phases exceeds the imbalance degree.

③ Inverse Time Overload Protection Characteristic (time in seconds), see table below (Table 2.1.1). Multiple = $I_{\text{actual}} / I_{\text{set}}$. When motor operating current is ≥ 1.2 times to 3.0 times the set current, it trips after the delay specified in the table.

$I_{\text{actual}} / I_{\text{set}}$	≥ 1.2	≥ 1.3	≥ 1.5	≥ 1.6	≥ 2.0	≥ 3.0
Trip Time (S)	60	48	24	8	5	1

Table 2.1.1 Motor Inverse Time Protection Characteristic Table

④ Undervoltage/Overvoltage Protection: Undervoltage and overvoltage trip values can be set.

8. Temperature Protection: Response time $\leq 2\text{s}$ when detected temperature exceeds the set temperature.

9. Output Relay Contact Rating: 250V, 5A; Contact Life: 500,000 operations.

10. Current Display Error: Less than 1.0%.

11. RS485 Communication Interface: Can be set to link with other compressors or act as a slave device communicating with external equipment via MODBUS RTU protocol. As slave: Baud rate 9600bps, 1 start bit, 8 data bits, 1 stop bit, even parity.

12. Remote Start/Stop: When start/stop mode is set to Remote, the user can start/stop the compressor via a remote switch.

13. Remote/Local Linkage Control Function.

IV. Warnings and Prompts

1. Air Filter Warning: When air filter usage time expires, the text display shows "Air Filter Usage Time Expired".

2. Oil Filter Warning:

① Switch Signal Detection: When the oil filter differential pressure switch closes, the text display shows "Oil Filter Blocked".

② Usage Time Warning: When oil filter usage time expires, the text display shows "Oil Filter Usage Time Expired".

3. Oil Separator Warning: When oil separator usage time expires, the text display shows "Oil Separator Usage Time Expired".

4. Lubricating Oil Warning: When lubricating oil usage time expires, the text display shows "Lubricating Oil Usage Time Expired".

5. Grease Warning: When grease usage time expires, the text display shows "Grease Usage Time Expired".

6. Belts Warning: When belt usage time expires, the text display shows "Belt Usage Time Expired".

7. High Exhaust Temperature Warning: When the system detects exhaust temperature exceeds the "Exhaust Temp Warning" value set in manufacturer parameters, the text display shows "High Exhaust Temperature".

V. Safety Protection

1、 Motor Protection: The MAM880 air compressor controller provides overload, phase loss, imbalance, overvoltage, and undervoltage protection for the main motor, and overload protection for the fan motor.

Electrical Fault	Fault Display	Possible Cause
Overload	"Main Motor or Fan Overload"	Excessive load, bearing wear, other mechanical faults
Phase Loss	"Main Motor Phase Loss *Phase"	Power supply, contactor, or motor phase loss
Imbalance	"Main Motor Imbalance"	Poor contactor contact, internal motor open circuit
Overvoltage	"Overvoltage"	High supply voltage
Undervoltage	"Undervoltage"	Low supply voltage

2. Excessive Exhaust Temperature Protection: If exhaust temperature exceeds the set upper limit, the controller alarms and shuts down. Fault display shows "High Exhaust Temperature".

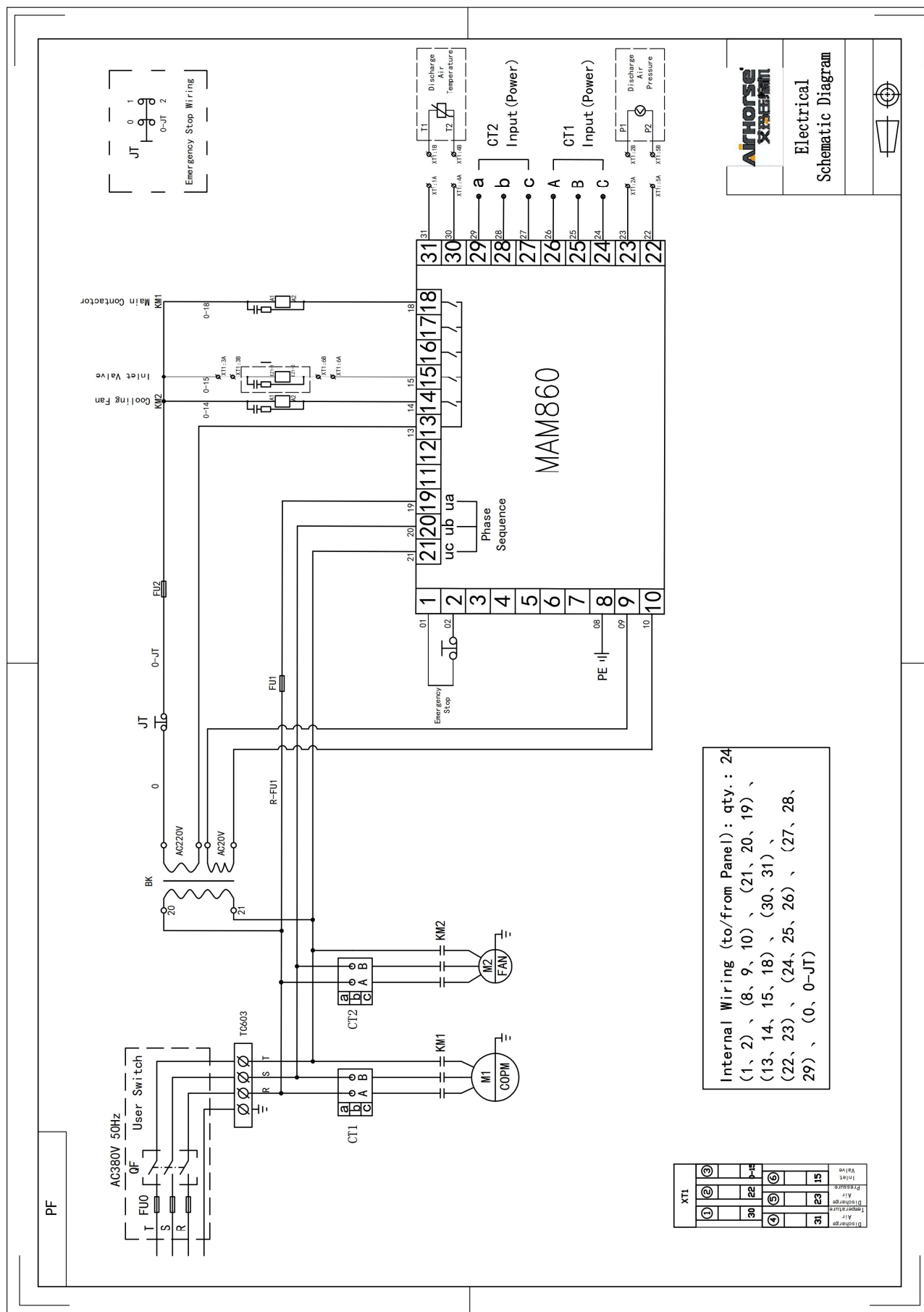
3. Anti-Rotation Protection: When a phase sequence error is detected with the compressor stopped, the fault display shows "Phase Sequence Error" and starting is prohibited. Simply swap any two power supply phases and check motor rotation direction.

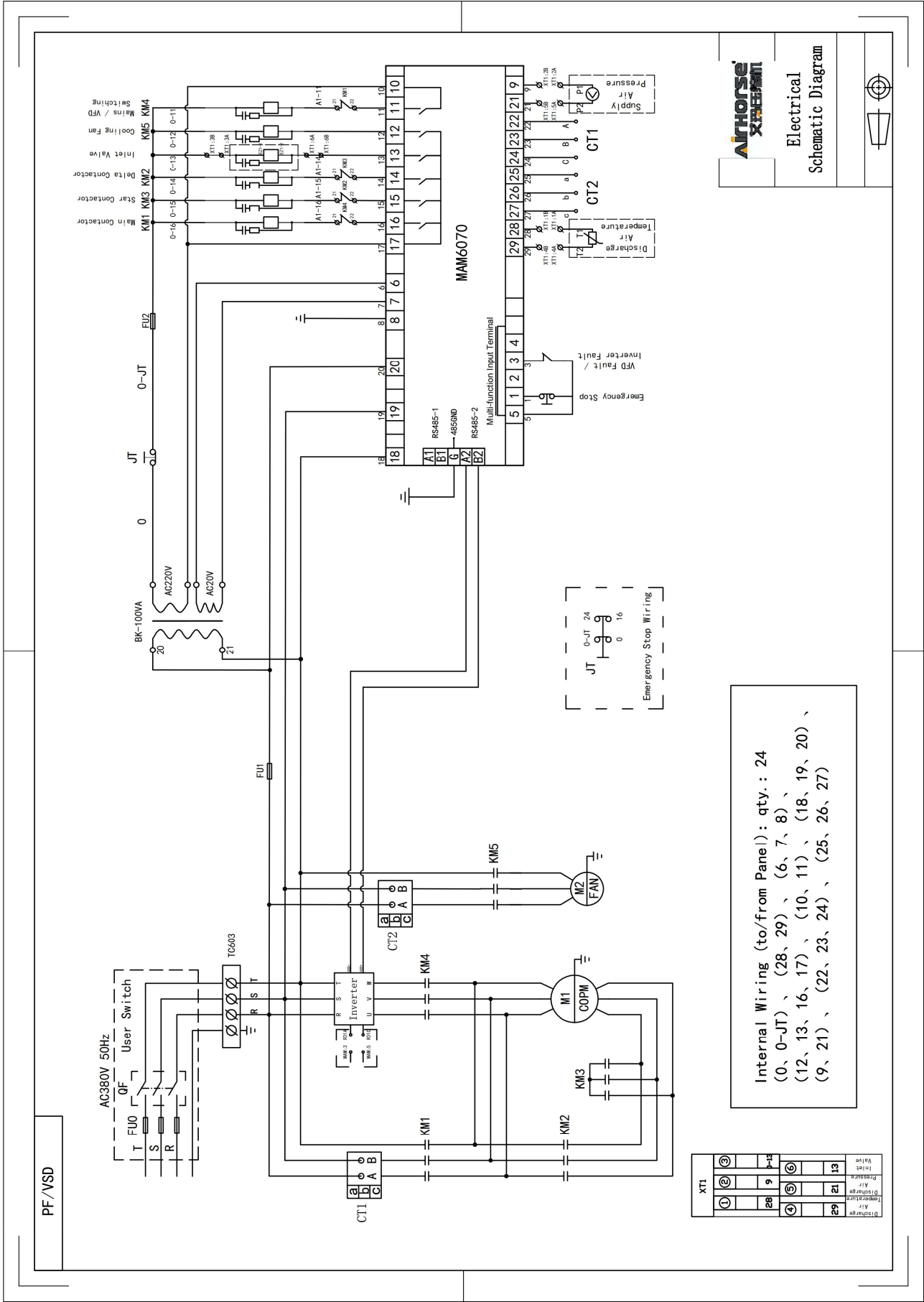
4.Overpressure Protection: If discharge pressure exceeds the set upper limit, the controller alarms and shuts down. Fault display shows "High Discharge Pressure".

5. Sensor Failure Protection: The controller alarms and shuts down if the pressure or temperature sensor is open circuit. Fault display shows "*** Sensor Failure".

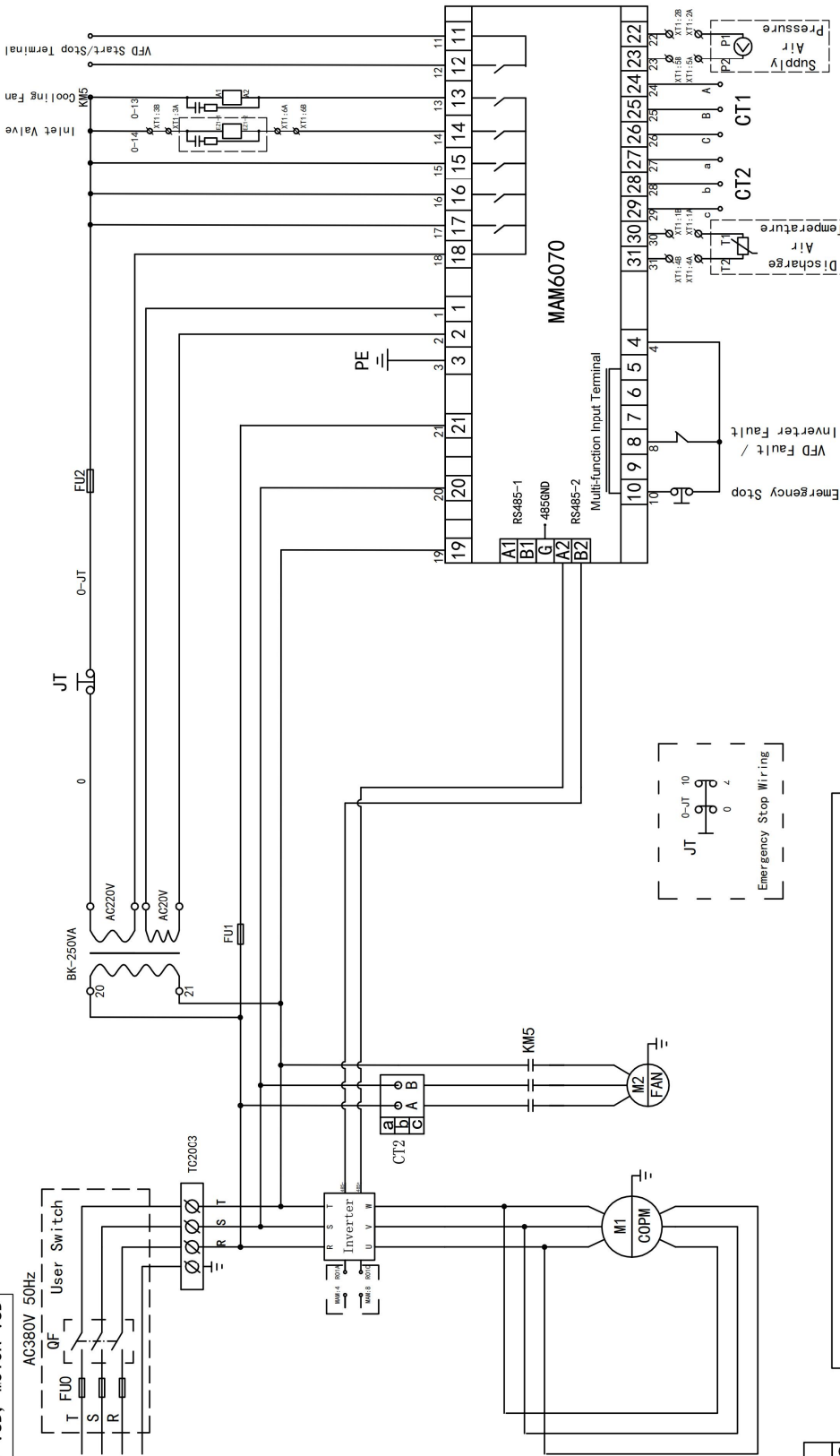
6. Low Temperature Protection: Two minutes after compressor start, if the system detects exhaust temperature is below the low-temperature protection value set in manufacturer parameters, the controller alarms and shuts down. Fault display shows "Exhaust Temperature Sensor Failure".

VI. Electrical Wiring Diagrams





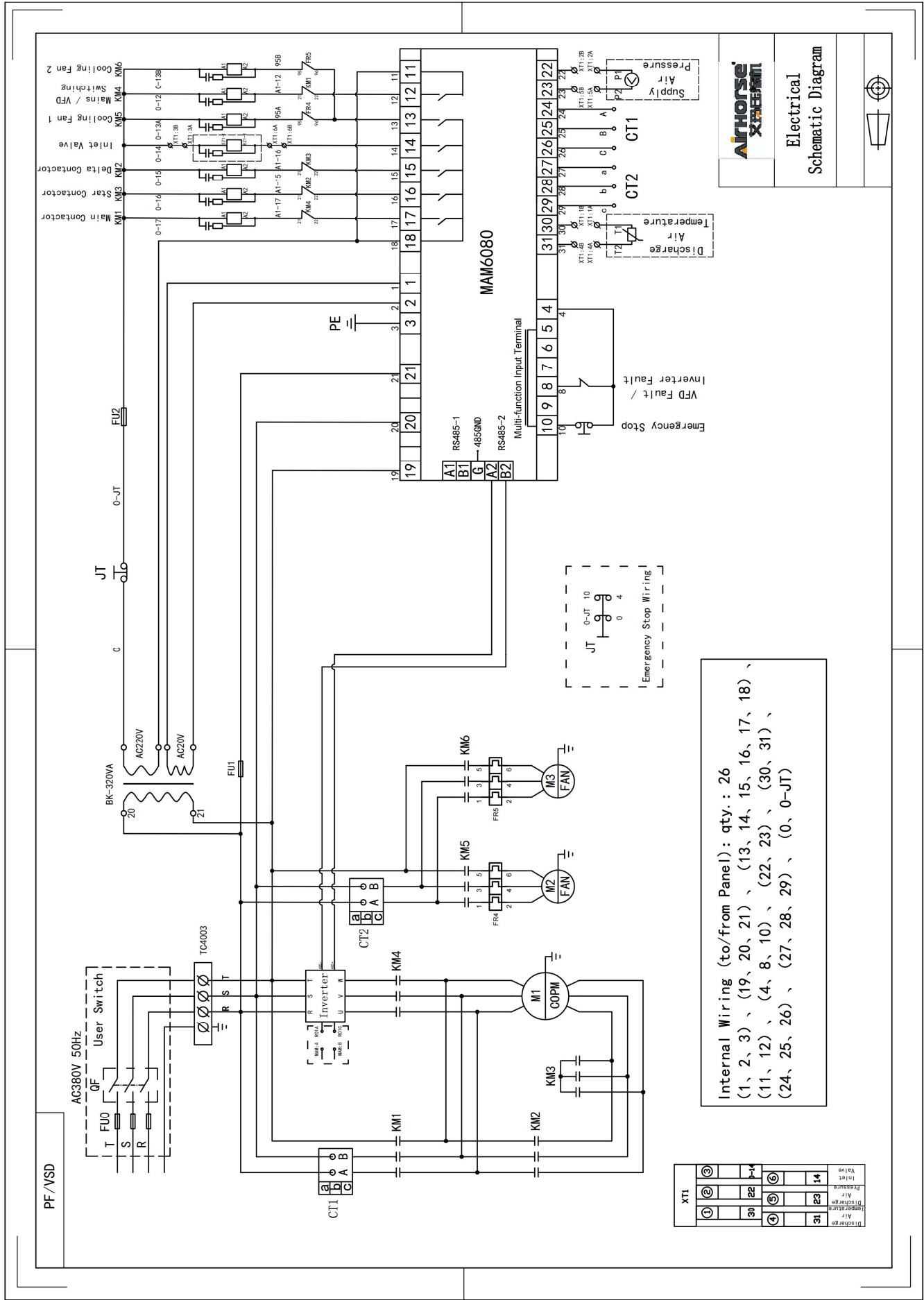
PERM MAGNET VSD, MOTOR VSD



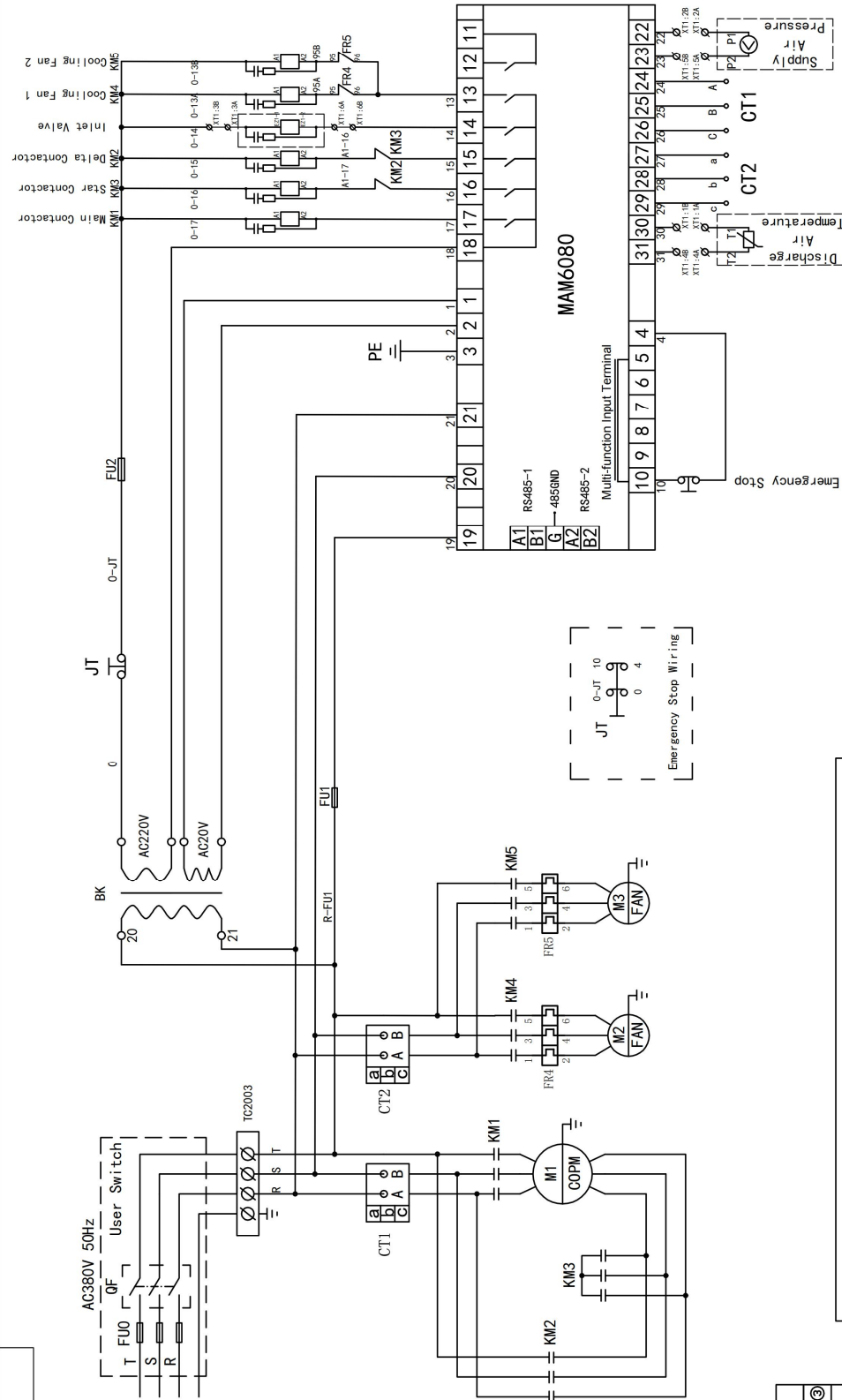
Internal Wiring (to/from Panel): qty. : 26
 (1, 2, 3) 、 (19, 20, 21) 、 (13, 14, 15, 16, 17, 18) 、
 (11, 12) 、 (4, 8, 10) 、 (22, 23) 、 (30, 31) 、
 (24, 25, 26) 、 (27, 28, 29) 、 (0, 0-JT)

XT1	30	22	14
①	②	③	④
⑤	⑥	⑦	⑧
⑨	⑩	⑪	⑫
⑬	⑭	⑮	⑯
⑰	⑱	⑲	⑳
㉑	㉒	㉓	㉔
㉕	㉖	㉗	㉘
㉙	㉚	㉛	㉜
㉝	㉞	㉟	㊱
㊲	㊳	㊴	㊵
㊶	㊷	㊸	㊹
㊺	㊻	㊼	㊽
㊾	㊿	①	②
③	④	⑤	⑥
⑦	⑧	⑨	⑩
⑪	⑫	⑬	⑭
⑮	⑯	⑰	⑱
⑲	⑳	㉑	㉒
㉓	㉔	㉕	㉖
㉗	㉘	㉙	㉚
㉛	㉜	㉝	㉞
㉟	㊱	㊲	㊳
㊴	㊵	㊶	㊷
㊸	㊹	㊺	㊻
㊼	㊽	㊾	㊿

Electrical Schematic Diagram



PF



Internal Wiring (to/from Panel): qty.:26
 (1, 2, 3) 、 (19, 20, 21) 、 (13, 14, 15, 16, 17, 18) 、
 (4, 10) 、 (22, 23) 、 (30, 31) 、 (24, 25, 26) 、
 (27, 28, 29) 、 (0, 0-JT)

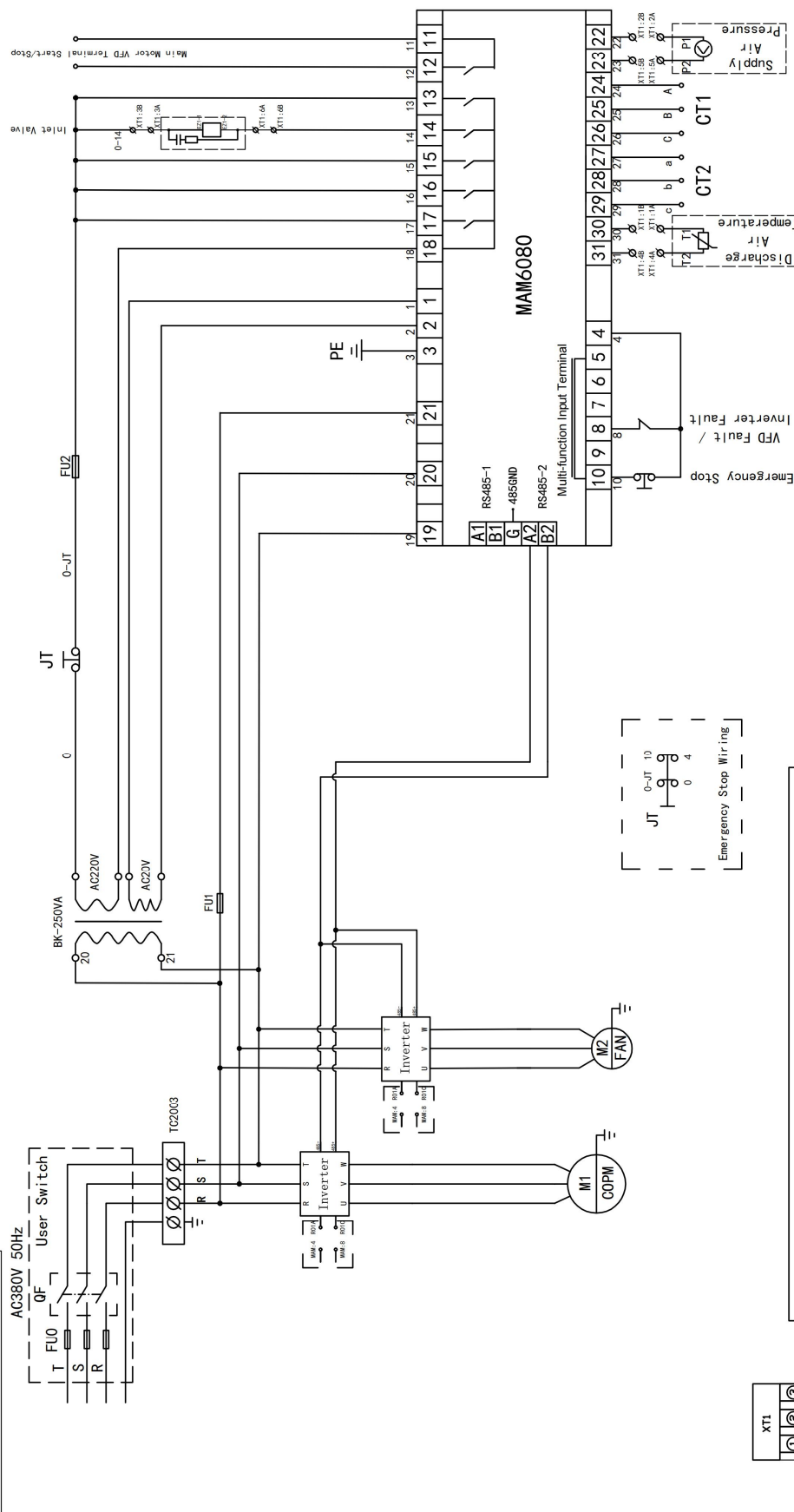
XT1	①	②	③
Discharge Air	30	22	14
Temperature Air	④	⑤	⑥
Inlet Air Pressure			
Valve			

Airhorse
 艾特马

Electrical
 Schematic Diagram



PERM MAGNET VSD, MOTOR VSD



Internal Wiring (to/from Panel): qty.: 26
 (1, 2, 3) 、 (19, 20, 21) 、 (13, 14, 15, 16, 17, 18) 、
 (11, 12) 、 (4, 8, 10) 、 (22, 23) 、 (30, 31) 、
 (24, 25, 26) 、 (27, 28, 29) 、 (0, 0-JT)

XT1				XT2				XT3				XT4				XT5				XT6				XT7				XT8				XT9				XT10				XT11				XT12				XT13				XT14				XT15				XT16				XT17				XT18				XT19				XT20				XT21				XT22				XT23				XT24				XT25				XT26				XT27				XT28				XT29				XT30				XT31				XT32				XT33				XT34				XT35				XT36				XT37				XT38				XT39				XT40				XT41				XT42				XT43				XT44				XT45				XT46				XT47				XT48				XT49				XT50				XT51				XT52				XT53				XT54				XT55				XT56				XT57				XT58				XT59				XT60				XT61				XT62				XT63				XT64				XT65				XT66				XT67				XT68				XT69				XT70				XT71				XT72				XT73				XT74				XT75				XT76				XT77				XT78				XT79				XT80				XT81				XT82				XT83				XT84				XT85				XT86				XT87				XT88				XT89				XT90				XT91				XT92				XT93				XT94				XT95				XT96				XT97				XT98				XT99				XT100			
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑	㉒	㉓	㉔	㉕	㉖	㉗	㉘	㉙	㉚	㉛	㉜	㉝	㉞	㉟	㊱	㊲	㊳	㊴	㊵	㊶	㊷	㊸	㊹	㊺	㊻	㊼	㊽	㊾	㊿	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100																																																																																																																																																																																																																																																										

Electrical Schematic Diagram

Chapter 5: Operation

I. Trial Run, Startup, and Shutdown

- 1、 Connect the power cables and ground wire. Test that the main voltage is correct and the three-phase power supply is proper.
- 2、 Check that the oil level in the oil tank is between the H (High) and L (Low) marks.
- 3、 **If starting the trial run long after delivery, add approximately 0.5 liters of lubricating oil through the intake valve and manually rotate the compressor several turns. This prevents damage due to oil shortage in the compressor body upon startup. Take special care not to let foreign objects fall into the compressor body to avoid damage.**
- 4、 Check the cooling system.
- 5、 Press "START". Within the first few seconds of starting, press the "EMERGENCY STOP" button to check if the rotation direction is correct (refer to arrow direction). If the rotation is incorrect, swap any two of the three-phase power wires.
- 6、 Press "START" again. The air compressor begins operation.
- 7、 **Observe if the control panel indicators are normal. If there are abnormal noises, vibrations, or oil leaks, immediately press "EMERGENCY STOP", shut down, and investigate the cause.**
- 8、 Keep the exhaust temperature between 60° C and 100° C.
- 9、 **After pressing the "OFF" button, the timing relay activates after 10-15 seconds, and then the motor stops. This prevents the compressor from stopping directly under heavy load conditions.**
- 10、 When the "STOP" button is pressed, the vent valve automatically releases air.

II. Pre-Startup Checks

Performing these checks before startup is essential preliminary work to avoid major compressor failures and improve operational efficiency.

1、 Open the manual drain valves on the oil tank and water separator to discharge condensate that accumulated during shutdown. Neglecting this will shorten the lubricating oil's service life and can easily cause bearing burn-out.

2、 Check that the oil level is between H and L. The oil level should not be too high or too low. Replenish promptly if insufficient.

Do not mix lubricating oils of different brands. Before adding oil, ensure the system is completely depressurized before opening the oil filler cap.

3、 Observe the oil level during operation. Under normal operation, the oil level should be between the high and low limits.

III. Precautions During Operation

1、 If abnormal noises or unusual vibrations occur during operation, stop the machine

immediately.

2、 During operation, the piping system and internal vessels are pressurized. Do not loosen pipes or plugs, or open unnecessary valves.

3、 If the oil level becomes invisible in the sight glass during prolonged operation and the exhaust temperature is too high, stop the machine immediately. After venting all pressure from the system, replenish the lubricating oil.

4、 Condensate will accumulate in the after-cooler and cyclone separator during long operation periods. Drain them regularly every day or install an automatic drain valve. Otherwise, the compressed air system will contain some condensate.

5、 During operation, check and record parameters displayed on the control panel (voltage, current, air pressure, exhaust temperature, oil level, etc.) every 2 hours for future maintenance reference.

IV. Handling Method for Long-Term Shutdown

If the compressor will be shut down for an extended period, handle it carefully according to the following methods, especially in seasons or areas of high humidity.

1、 Shutdown for more than 3 weeks:

1) Wrap electrical equipment like the motor control panel with plastic or oiled paper to prevent moisture ingress, or place desiccant inside.

2) Completely drain the water from the oil cooler and after-cooler.

3) Take the opportunity to rectify any existing faults to facilitate future reuse.

4) Drain the condensate from the oil-gas tank, oil cooler, and after-cooler again after a few days.

2、 Shutdown for more than 2 months:

1) In addition to the above procedures, also perform the following:

2) Seal all openings to prevent moisture, dust, and other foreign matter from entering.

3) Wrap the safety valve, electrical control panel, etc., with oiled paper or similar material to prevent corrosion.

4) Before shutdown, replace the lubricating oil and run the compressor for thirty minutes. Drain the condensate from the oil tank and oil cooler again after two or three days.

5) Completely drain the cooling water.

6) If possible, move the machine to a low-dust, dry storage location.

3、 Restart Procedure after Long Shutdown:

1) Remove the plastic or oiled paper from the unit.

2) Measure the three-phase insulation resistance of the motor; it should be above 1 M Ω .

3) Follow the other steps as described in the "Trial Run" section.

Chapter 6: Maintenance and Inspection

I. Lubricating Oil Specifications and Maintenance

1、Please use AirHorse Screw Compressor Special Oil (Shell brand, BP46 Semi-Synthetic oil, if you cannot find same grade, any lubricate oil specially for screw air compressor will be fine.) .

2、Oil Change Procedure:

A: Run the air compressor to raise the oil temperature, facilitating drainage. Then press the OFF button to stop operation.

B: Open the oil drain valve. If pressure is present, drainage will be fast but may spray out. Open slowly to avoid oil splashing.

C: After all oil is drained, close the oil drain valve, open the oil filler cap, and add new oil. Note: All lubricating oil must be drained from the system, including from pipelines, the cooler, and the oil tank.

D: Add new oil.

II. Belt Adjustment

For belt-driven models, check the belts after the first 30 hours of operation on a new machine. If daily inspection finds them too loose, adjust them immediately. Subsequently, adjust every 1500 hours.

1、Use a tension gauge and spring balance to apply load to the belt and measure its deflection. If within the standard value, adjustment is not needed. If deflection exceeds the standard, adjust the belt tension.

2、To adjust belt tension, first slightly loosen the four fixing screws of the motor base. Then use the adjacent adjustment screws to modify the belt tension. After measuring with the tension gauge, tighten the motor's fixing screws.

3、If replacing belts, replace all belts together. Do not replace only one belt, otherwise tension will be unbalanced.

4、Be careful not to splash lubricating oil onto the belts or pulleys during adjustment or replacement.

III. Pressure System Adjustment

1、System Pressure Adjustment:

Pressure adjustment is performed via the keypad on the microcomputer controller. Two pressure points are displayed (values can be set via the keypad): one is the Unloading Pressure (upper limit),

where the compressor unloads when pressure rises to this value; the other is the Loading Pressure (lower limit), where the machine automatically loads when system pressure drops to this value after unloading, causing pressure to rise. Within the maximum pressure allowed by the model's design, both pressure points can be adjusted according to on-site usage conditions.

IV. Oil-Gas Separator Replacement Steps

- 1) After stopping the air compressor, close the air outlet and open the drain valve. Confirm there is no pressure inside the system.
- 2) Disconnect the pipeline above the oil tank, and also disconnect the pipeline from the pressure maintenance valve outlet to the cooler.
- 3) Remove the fixing screws on the top of the oil-gas tank.
- 4) Remove the oil-gas tank cover.
- 5) Remove the old oil-gas separator and install a new one.
- 6) Reassemble the oil-gas tank in the reverse order of disassembly.
- 7) When replacing the oil-gas separator, prevent unclean items from falling into the oil tank to avoid affecting compressor operation.
- 8) If the compressor uses an external oil-gas separator, unscrew it counterclockwise and replace it with a new one.



V. Recommended Maintenance Schedule

Item No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Part Time	Lubricating Oil	Oil Filter	Air Filter	Oil-Gas Separator	O-Ring	Rotor Bearings	Drive Motor Bearings	Fan Motor Bearings	Intake Controller	Cooler	Connections/Fittings	Safety Valve	Belts	Pulley	Temperature Protection	Pressure Gauge	Pressure Sensor	Electrical Components	Instrument Components	MPV	AC Contactor
500hr	0	0	△							△		✓	✓		✓			✓	✓		△
2500hr	0	0	0				*			△		✓	✓		✓				✓		△
4500hr	0	0	0	0					✓	△		✓	✓	✓	✓	✓	✓	✓	✓		△
6500hr	0	0	0				*			△	△	✓	✓		✓			✓	✓		✓
8500hr	0	0	0	0				✓	✓	△		✓	✓	✓	✓	✓	✓	✓	✓		△
10500hr	0	0	0		0	✓	*	*		△		✓	✓		✓			✓	✓	✓	△
12500hr	0	0	0	0					✓	△	△	✓	✓	✓	✓	✓	✓	✓	✓		✓
14500hr	0	0	0				*	✓		△		✓	✓		✓			✓	✓		△
16500hr	0	0	0	0					✓	△		✓	✓	✓	✓	✓	✓	✓	✓		△
18500hr	0	0	0			0	*	✓		△	△	✓	✓		✓			✓	✓		✓
20500hr	0	0	0	0	0			*	✓	△		✓	✓	✓	✓	✓	✓	✓	✓	✓	0
22500hr	0	0	0				*			△		✓	✓		✓			✓	✓		△
24500hr	0	0	0	0				✓	✓	△	△	✓	✓	✓	✓	✓	✓	✓	✓		△
26500hr	0	0	0				*			△		✓	✓		✓			✓	✓		△
28500hr	0	0	0	0				✓	✓	△		✓	✓		✓	✓	✓	✓	✓		✓
30500hr	0	0	0		0	0	*	*		△	△	✓	✓		✓			✓	✓	✓	0

Legend: O Replace √ Inspect/Check △Clean *Add Lubricant/Oil

- 1、 This maintenance schedule is provided for user reference. The maintenance intervals for new products and components are highly dependent on the compressor's operating environment. Poor environments may lead to shorter consumable life or component coking/failure. In good environments, replacement intervals can be extended to every 3000 hours. (Oil product number: BP46 Screw Air Compressor Special Oil).
- 2、 This list does not include your company's routine daily maintenance items such as: checking oil level, recording pressure gauge readings, oil temperature, draining every 4 hours, and cleaning the air filter and cooler based on environment and temperature.
- 3、 If using the original fully synthetic special oil (Oil product number: BP46 Screw Air Compressor Special Oil), the oil change interval can be extended to 6000-8000 hours.
- 4、 Qualified manufacturers can also choose the original BP46 Screw Air Compressor Special Oil. Using this oil eliminates the need for complete oil changes; only the oil filter, air filter, and oil-gas separator need replacement. Simply top up the oil when the level is low.

Chapter 7: Troubleshooting

I. Troubleshooting Guide

Item	Fault Condition	Possible Causes	Corrective Actions
I	Failure to Start (Electrical Fault Light On)	1. Fuse blown 2. Protection relay faulty 3. Start relay faulty 4. Start button poor contact 5. Voltage too low 6. Motor fault 7. Compressor element fault 8. Phase loss protection relay fault	1. Replace fuse. 2. Replace protection relay. 3. Replace start relay. 4. Have electrician check/replace. 5. Have electrician check power supply. 6. Have electrician check/replace motor. 7. Manually rotate element. If it doesn't turn, contact our service department. 8. Check power cables and connections.
II	Displays Y-Δ Start but Unit Doesn't Run	1. Emergency stop switch faulty 2. Control circuit fault or loose wire	1. Replace component. 2. Have electrician check/replace.
III	High Operating Current, Auto Shutdown (Electrical Fault Light On)	1. Voltage too low 2. Discharge pressure too high 3. Incorrect lubricant specification 4. Loose belt drive 5. Oil-gas separator blocked (high oil pressure) 6. Compressor element fault	1. Check power supply system. 2. Check pressure. If exceeds set point, check settings & pressure sensor. 3. Check oil type, replace oil. 4. Check and adjust tension. 5. Replace oil-gas separator. 6. Manually rotate element. If it doesn't turn, contact our service department.
IV	Operating Current Lower Than Normal	1. Air consumption too high (running below set pressure) 2. Air filter blocked 3. Intake valve malfunction (butterfly valve stuck) 4. Capacity regulation valve improperly adjusted	1. Check consumption, add compressor if needed. 2. Clean or replace. 3. Dismantle, clean, and lubricate. 4. Readjust/Reset.

V	Exhaust Temperature Lower Than Normal (Below 75°C)	1. Cooling water flow too high 2. Low ambient temperature 3. No-load operation too long 4. Temperature sensor deviation 5. Thermostatic valve fault	1. Adjust cooling water outlet valve. For air-cooled, reduce cooler surface area. 2. Adjust cooling water outlet valve. For air-cooled, reduce cooler surface area. 3. Reset high-pressure shutdown timer. 4. Replace temperature sensor. 5. Replace thermostatic valve.
VI	High Exhaust Temp, Auto Shutdown, Fault Display (Exceeds 100°C set point)	1. Insufficient lubricant 2. Insufficient cooling water 3. High cooling water temperature 4. High ambient temperature 5. Oil cooler blocked 6. Incorrect lubricant specification 7. Thermostatic valve fault 8. Dirty air filter 9. Oil filter blocked 10. Cooling fan fault	1. Check oil level, stop and add oil if below "L". 2. Check inlet/outlet water temp difference. 3. Check inlet water temperature. 4. Increase ventilation, reduce room temp. 5. Check oil line temp difference (~5°C normal). If lower, cooler may be blocked; remove and clean with chemical. 6. Check oil type, replace oil. 7. Check if oil passes through oil cooler. If not, replace thermostatic valve. 8. Clean air filter with low-pressure air. 9. Replace oil filter. 10. Replace cooling fan.
VII	High Oil Content in Air, Shortened Oil Top-up Intervals, Filter Smokes at No-load	1. Oil level too high 2. Oil return orifice blocked 3. Low discharge pressure 4. Intake valve check function failed 5. Oil-gas separator damaged 6. Minimum pressure valve spring fatigue 7. Oil return check valve fault 8. Incorrect lubricant specification	1. Check oil level, drain to between "H" & "L". 2. Dismantle and clean. 3. Check discharge pressure, adjust if needed. 4. Check intake valve, replace if necessary. 5. Replace with new part. 6. Replace spring. 7. Replace with new part. 8. Check oil type, replace oil.
VIII	Cannot Unload, Pressure Remains/ Rises at No-load,	1. Pressure sensor failure 2. Intake valve malfunction 3. Solenoid vent valve failure (coil burnt) 4. Capacity regulation diaphragm damaged / orifice too small	1. Check/Repair, replace if necessary. 2. Dismantle, clean, and lubricate. 3. Check/Repair, replace if necessary. 4. Check/Repair/Replace, enlarge orifice appropriately.

	Safety Valve Activates		
IX	Cannot Reach Full Load	1. Pressure sensor fault 2. Three-phase solenoid valve fault 3. Intelligent controller fault 4. Time delay relay fault 5. Intake valve malfunction 6. Minimum pressure valve malfunction 7. Proportional valve fault 8. Intake valve servo cylinder blocked 9. Water separator cup leaking air 10. Control line leak	1. Replace pressure sensor. 2. Replace three-phase solenoid valve. 3. Replace intelligent controller. 4. Replace time delay relay. 5. Dismantle, clean, and lubricate. 6. Dismantle, check valve seat & check ring for wear, replace. 7. Check nozzle & proportional valve for blockage. 8. Check, dismantle and clean. 9. Check if water separator cup leaks continuously. 10. Check leak location and tighten.
X	Compressor Air Output Lower Than Normal	1. Intake filter blocked 2. Intake valve malfunction 3. Minimum pressure valve malfunction 4. Oil-gas separator blocked 5. Vent valve leaking 6. Intake proportional valve setting error	1. Clean or replace. 2. Dismantle, clean, and lubricate. 3. Dismantle, check valve seat & check ring for wear/spring fatigue, replace. 4. Check/Repair, replace if necessary. 5. Check/Repair, replace if necessary. 6. Check/Repair, replace if necessary.
XI	Frequent Load/Unload Cycling	1. Pipeline leak 2. Pressure differential setting too small 3. Unstable air consumption	1. Check leak location and seal/tighten. 2. Reset (typically 0.1 MPa differential). 3. Increase air receiver capacity.
XII	Oil Mist from Air Filter when Stopping	1. Intake valve leaking 2. Stopped under load 3. Three-way solenoid valve malfunction 4. Electrical wiring error 5. Minimum pressure valve leaking 6. Vent valve not venting	1. Check/Repair, replace if necessary. 2. Check if intake valve stuck; if so, dismantle, clean, lubricate. 3. Check, replace if necessary. 4. Have electrician check/correct wiring. 5. Check/Repair, replace if necessary. 6. Check vent valve, replace if necessary.

II. Screw Air Compressor Operation Log Sheet

Year _____ Month _____

Date								
Item								
1、Oil-Gas Tank Oil Level								
2、Air Filter Indicator								
3、Oil Filter Indicator								
4、Oil Separator Indicator								
5、Operating Current (A)								
6、Operating Voltage (V)								
7、Discharge Pressure (kg/cm ²)								
8、Exhaust Temperature (° C)								
9、Operating Hours (Hour)								
Recorder								
Remarks								

Chapter 8: Spare Parts

How to Order Spare Parts?

You must order from our company or authorized agents to guarantee genuine, high-quality spare parts.

Information you should provide: Machine Model, Machine Manufacturing Date, Part Number, Name, and Quantity. Tip: To ensure maximum compressor utilization, it is recommended to keep an adequate stock of spare parts (see table below).

Part Name	Replacement Cycle	Remarks
Screw Air Compressor Special Oil	Every 2000H	Replace after first 500H of operation, then every 2000H. Oil code: BE-003246RA or (BE-06000HRA, 6000-8000H oil)
Oil Filter	Every 2000H	Replace after first 500H of operation, then every 2000H.
Air Filter	Every 2000H	Blow clean weekly.
Oil-Gas Separator	Every 3000-4000H	Monitor oil pressure vs outlet air pressure differential. Replace immediately if differential reaches 1.5 Bar.
Special Belts	According to usage condition	
Coupling	According to usage condition	
Pressure Sensor	According to usage condition	
Temperature Sensor	According to usage condition	
Control Solenoid Valve	According to usage condition	
AC Contactor	According to usage condition	Check contacts at 5000H (clean), replace at 10000H.
Minimum Pressure Valve	According to usage condition	Check seals at 8000H (replace), then replace seals every 5000H thereafter.
Intake Valve	According to usage condition	Check solenoid seal at 5000H (clean/replace), then check/clean seals every 5000H.

Note: Depending on environmental conditions, replacement intervals can be extended to every 3000H in good environments.