

USER MANUAL

For Oil Injected Air Compressor DA Series

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Contents

1. Safety Precautions	1
1.1 Electrical Safety	1
1.2 Driving Components	1
1.3 Key Points of High Temperature and High Pressure	1
1.4 Drainage	2
2. Inspection and Handling	2
2.1 Product Warranty of Compressors	2
2.2 Specifications and Model Verification	2
2.3 Inspection of Accessories and Appearance	3
2.4 Handling Precautions	3
3. Installation	4
3.1 Environment Requirements	4
3.2 Installation Location Requirements	5
3.3 Ventilation and Cooling Requirements	5
3.4 Selection Requirements for Air Rate of Ventilating fans	6
3.5 Warning	6
3.6 Suggestions for Pipeline	7
3.7 Electric Appliances Installation Precautions and Control System	10
4. System Introduction	15
4.1 Overall System	15
4.2 Composition of the Compressor Unit	15
4.3 Lubricating Oil System	16
4.4 Oil-gas Separation System	16
5. Controller Operation	17
5.1 Controller interface	17
5.2 Key Description	17
5.3 I/O port description	17
5.4 Use of Menu pages and page items	19
5.5 Troubleshooting	19
5.6 Fault codes	21
5.7 Schematic Wiring Diagram	22
6. Components	23
6.1 Air Filter	23
6.2 Inlet Valve	23
6.3 Oil-gas tank	23
6.4 Oil Separator	24

6.5 Safety Valve	24
6.6 Pressure Maintenance Valve	24
6.7 After Cooler	24
6.8 Oil Cooler	25
6.9 Oil Filter	25
6.10 Temperature Sensor	25
7. Maintenance and Repairing	25
7.1 Air Filter	25
7.2 Lubrication of Motor Bearing	26
7.3 Compressor Bearing	27
7.4 Air Compressor Lubrication Oil	27
7.5 Oil Separator	28
7.6 Oil Return Pipeline	28
7.7 Engine Oil Filter	28
7.8 Pipe Joint	28
7.9 Air intake Valve	29
7.10 Pressure Maintenance Valve	29
7.11 Safety Valve	29
7.12 Relief Solenoid Valve	29
7.13 Temperature Control Valve	29
7.14 Cooler	30
7.15 Electric Insulation	31
7.16 Periodic Inspection and Cleaning	31
7.17 Inverter Maintenance	31
8. Safety Protection and Warning Device	32
8.1 Motor Overload Protection	32
8.2 Protection for Over-temperature of Exhaust	33
8.3 Setting and Description of Other Protection and Warning	33
8.4 Failure Causes and Troubleshooting	33

1. Safety Precautions

Please carefully read through the manual and follow the instructions during the operation before using DENAIR air compressor, to avoid hazardous events and prevent machines being damaged.

1.1 Electrical Safety

- (1) Once the air compressor power up, it will be very dangerous, only qualified electricians and electrical engineers are allowed to perform the installation.. The operators shall perform the safety operations strictly in accordance with the operation way specified in this manual under national regulations and safety code.
- (2) Do not open the door when power on because of the electrical shock hazard.
- (3) Users and installation engineer shall provide ground wire connection and install protective circuit for compressor units under national electrical standards.
- (4) Each compressor shall be installed with an exclusive breaker, which shall comply with the correspondent NFB capacity. For detailed information, please find in the instructions of Chapter 3.7.
- (5) Make sure the power is turned off before any maintenance to avoid accidents. There shall be a warning label saying “No switching on” hanging on the power switch.

1.2 Driving Components

- (1) Do not open soundproof enclosure before the air compressor complete shutting down.
- (2) Do not dismount the model until the motor and fan are stopped, and make sure power is totally shut off.
- (3) Do not wear excessive loose clothes during maintenance to avoid accidents.

1.3 Key Points of High Temperature and High Pressure

- (1) For those high temperature pipelines and components contains (which we stamped the warning sign), do not touch before it is 100% cooling down--to prevent scald accident.
- (2) Air compressor might contain high pressured fluid inside the components or pipelines, make sure the fluid is completely out of the machine before dismounting. Do not point the high pressured fluid to any person for avoiding any injury.
- (3) The compressed air provided by the air compressor is only for industrial purpose. Do not breathe the compressed air under any circumstances, otherwise, it may cause bodily injury, disease or death.

1.4 Drainage

- (1) Remember to open the oil-gas tank and air receiving tank's draining valve to drain the condensate water out before starting the air compressor, for ensuring the lubrication oil will not be emulsified and compressor will not be stuck due to the deterioration of the lubrication oil.
- (2) Inspect the function of after treatment and draining devices regularly to ensure the compressed system well.

2. Inspection and Handling

Please carefully read this chapter to ensure the rights of the customers. Handling shall be implemented as the manner mentioned in section 2.4 to avoid accidents and damage to the unit.

2.1 Product Warranty of Compressors

Denair Screw Air Compressors are all conducted under the strict quality management and performance test before delivery. The warranty period of the compressor shall be 18 months from the date of production of the compressor or 12 months from the date of formal commissioning of the compressor, except special noted (according to the terms of the product warranties). During the product warranty period, any quality issue and damage caused by manufacturing reasons, Denair will provide free service for the products after confirmation. Any other uncontrollable factors such as delivering, striking, natural disasters and wars etc., or the machine is not maintaining accordingly to the instructions, or not using Denair original consumables and lubrication oil, or using random service man not from or appointed by Denair, warranty will not cover these faults.

To all of our clients, during the operation, if the issues occur, please contact Denair directly or our appointed service agency for help. Do not troubleshoot by yourself without any instruction, which may make the machine more damaged.

2.2 Specifications and Model Verification

Please check whether the nameplate specifications (see Fig. 2.1) is same to your requirements.

ROTARY SCREW AIR COMPRESSOR			
Product Model	:	Product ID	:
Serial Number	:		
Max. Working Pressure	:	bar	psi MPa
Free Air Delivery	:	m ³ /min	cfm l/s
Motor Power	:	kW	hp
Voltage	:	V	Ph Hz
Dimensions	:	* *	mm
Weight	:	kg	
Date of Manufacture	:	/ 20	
Manufacturer	:	Denair Energy Saving Technology (Shanghai) PLC.	
Address	:	No. 6767, Tingfeng Rd., Jinshan District, Shanghai, China	

DENAIR Group  

Fig2.1

Note:

Model: named by Denair

Model specifications: made by following national standard JB/T2589-86

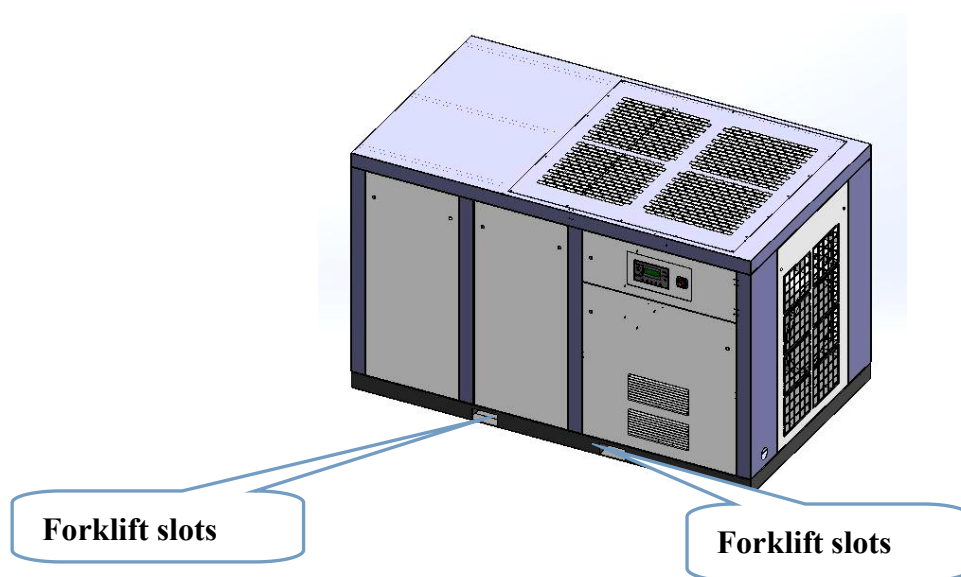
2.3 Inspection of Accessories and Appearance

Please check whether spare parts are all in ready after receiving the air compressor. If there is any quality problem, please contact us immediately. All Denair air compressors shall be attached with the followings:

- (1) One copy of operation manual;
- (2) One copy of Warranty;
- (3) Two keys.

2.4 Handling Precautions

Please choose proper forklift or crane for handling according to the weight of the air compressor. Please do not stand underneath the air compressor and keep at a safe distance as far as possible during hoisting.



This series of Denair Compressor all adopt direct coupling driven method. Installing form of motor is B35, which utilize flexible coupling to transmit power and movement, enhance the rolling torque, and ensure the compensation of relative displacement of the two bearings. The run-out tolerance, which is about the motor flange seam allowance to motor spindle radial circular and the motor flange fitting surface to motor spindle end round face, are listed in the table 2.1 as follow. When the ambient temperature is 45°C, the maximum temperature of the motor's front cover should be $\leq 95^{\circ}\text{C}$.

Diameter of Flange seam allowance(mm)	Circular run-out tolerance(mm)
60~95	0.0800
>95~230	0.1000
>230~450	0.1250
>450~680	0.1600

Table 2.1

3. Installation

Please carefully read this chapter before installation to ensure the proper installation and reliable operation of the air compressor.

3.1 Environment Requirements

- (1) Install the air compressor in a well ventilation indoor space to avoid the places with high dust, high humidity, etchant gas, metallic dust and direct sunlight or rainwater.
- (2) The range of ambient temperature is 0°C~45°C.
- (3) Kept away from boilers and high temperature equipment and shall be equipped with well

ventilation environment while being installed in outdoors.

- (4) The ventilating fans around or over the air compressor shall set apart at least 900 mm maintenance space (see Fig. 3.1).
- (5) The altitude shall be less than 1000 m.
- (6) The relative humidity shall be less than 95%.

3.2 Installation Location Requirements

Screw air compressor can be installed on any smooth and horizontal floor which may withstand the weight of the air compressor. There is no need for any special foundation. The air compressor shall be fixed with foundation bolts and rubber blanket to slow down the vibration while being installed on the steel frame, ships or vehicles.

3.3 Ventilation and Cooling Requirements

No matter the air compressor is installed indoors or outdoors, good ventilation shall be ensured to avoid heat short cycle or interaction effect from heat extraction of the machines, so the locations of vent pipes, ventilating fans and compressors must be considered (there are typically three ways, see Fig. 3.1).

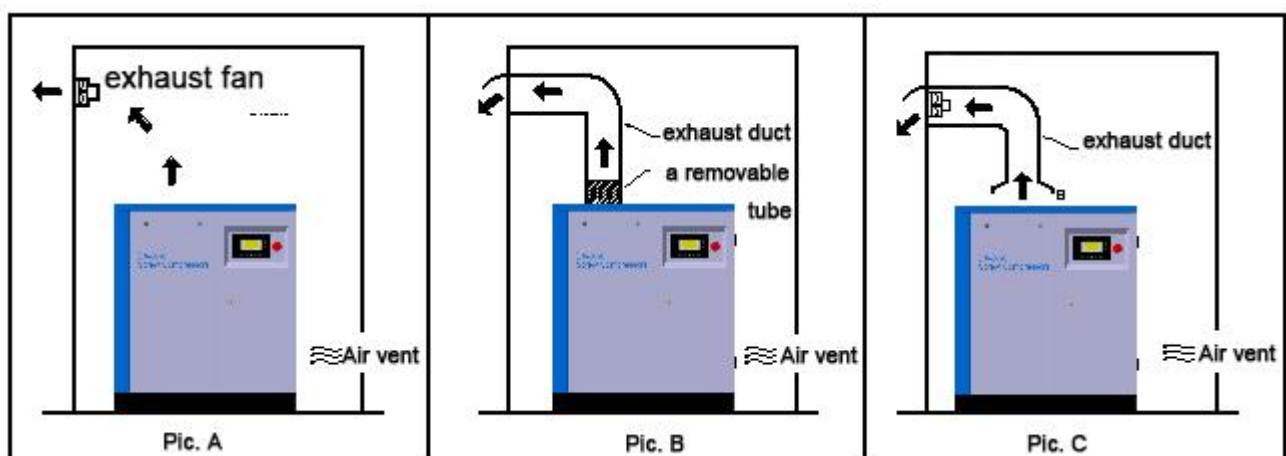


Fig 3.1

Note:

- (1) Pic. A: When there is no request for exhaust duct, refer to Table 3.1 Ventilation Rate (1) for the recommended exhaust air rate, and please install the ventilating fans as high as possible.
- (2) Pic. B: While using exhaust duct without the ventilating fans, the exhaust air rate of the compressor and the pressure loss in the exhaust duct shall be calculated. When the pressure loss is less than 20Pa, there is no need to install ventilating fans and the dismountable exhaust air hose shall be directly installed at the air outlet of the compressor. (It is recommended that customers should use the ventilation design of Fig. A and Fig. C best).

- (3) Pic. C: When the pressure loss in the exhaust duct is higher than 20Pa, ventilating fans shall be installed additionally. Please refer to Table 3.1 Ventilation Rate (2) for the recommended exhaust air rate of ventilating fans. Pay note the pressure loss in the exhaust duct and exhaust temperature increasing while choosing ventilating fans.

3.4 Selection Requirements for Air Rate of Ventilating fans

Cooling method of the unit	Air cooling										
Motor power of the unit (KW)	5.5	7.5	11	15	18.5	22	30	37	45	55	75
Exhaust air rate (1) (m3/min)	90	90	135	225	225	270	360	360	450	540	900
Exhaust air rate (2) (m3/min)	55	55	55	90	90	170	170	170	170	240	340
Motor power of the unit (KW)	90	110	132	160	185	200	220	250	315	355	400
Exhaust air rate (1) (m3/min)	1125	1350	1650	2000	2300	2500	2750	3125	3950	4450	5015
Exhaust air rate (2) (m3/min)	470	500	500	750	750	750	1100	1100	1100	1400	1400
Cooling method of the unit	Water Cooled										
Motor power of the unit (KW)	37~90		110~200			220~315			355~400		
Exhaust air rate (1) (m3/min)	250		500			800			1100		

Table3.1

3.5 Warning



The compressed air and electricity are dangerous. Please ensure the following points before any operation on the air compressor:

3.5.1 Make sure that power has been cut off with the switch locked and the notice plate hung on.

3.5.2 All the pressure within the entire air compressor system shall be relieved.

- (1) It is prohibited to dismount all kinds of caps or mounting and dismounting any joint or device while the air compressor is running. Because, the high temperature fluid and the compressed air leakage in the air compressor may cause severe personal injury and even death.
- (2) The air compressor motor starting electrical control box has a high voltage hazard, all installation work should be carried out by recognized electricians. Before working on the electrical system, ensure that the

manual disconnect switch can cut off the system power, compressor wiring must contain no fuse switch in the supply line. The person responsible for the installation of this equipment must equip proper grounding, maintenance space and lightning protection devices for all electrical components.

- (3) The air compressor cannot be operated under the exhaust pressure when it is higher than specified on the nameplate of the air compressor, otherwise the motor will overload which may result in the breaker tripping of the motor.
- (4) Only use safe solvents to clean air compressors and auxiliary devices.
- (5) The manual stop valve (separate-type) shall be installed on the exhaust pipeline. If the safety valve is installed between the stop valve and the air compressor, safety valve must have sufficient capacity to release the maximum continuous air flow of the compressor.
- (6) Once any pressure is released through the safety valve due to over-high pressure in the system, the reason for that must be promptly found out immediately.
- (7) If lubrication oil enter the air system there will be adverse effects. It is very necessary to correctly select and install after treatment equipment such as air dryers, fine filters (oil separators), etc. to minimize any liquid carrier in the air. Using plastic housing without a metal cover on pipelines might cause dangerous. From the safety matters, any pressure system should contain a metal housing. For this reason, we recommend you to check the air system again.
- (8) Air receive tank should be installed and maintained in accordance with the regulations of *Monitoring Specification for Pressure Vessel* issued by Ministry of Labor of the People's Republic of China.
- (9) Please read through the operation manual before start the machine.
- (10) All kinds of covers and shields need to be reinstalled after the routine maintenance work completed.

Notice: The shield should always be closed during the air compressor operation.

Warning

Not taking the above mentioned safety advice may cause mechanical faults, property damages, serious personal injuries and even death. Any intake and exhaust pipe connected to the inlet/outlet connections must take vibration, pulse, temperature, maximum pressure, resistance to corrosion and chemical resistance into concern. Besides that, compressed air might contain slight lubrication oil provided from the oil-injected air compressor shall be noted as well, so it is necessary to ensure the reasonability and compatibility, the pipelines and after treatment equipment and on site compressed air requirement.

3.6 Suggestions for Pipeline

3.6.1 Pipeline

Inside cooler could cooling the exhaust temperatures below the dew point (under most environment conditions), so a large amount of condensation water will be separating out. A draining valve will be necessary to be installed near the exhaust outlet, and a drainage pipe should be connected to the water drainage device.

Key point: The drainage device shall be inclined downward in order to work normally.

Notice: In order to facilitate checking the working condition of the automatic drain valve, there should be a discharge pipe (transparent hose) in the discharge line. If the downstream pipe further cools the air, it is possible to generate condensation water again. Therefore, another condensation water drain valve should be installed in the lower part of the pipe system.

Key point: The diameter of the exhaust pipeline shall be kept at least the same size as exhaust connection pipeline inside the air compressor. All pipelines and joints shall comply with the maximum operating temperature of the unit, and the nominal pressure shall be kept at least the same range with oil-gas separator's designed pressure. It is important to check each joint dimension of the air compressor, the proper length and dimension of the pipe, the number and category of the joints and valves to reach the maximum efficiency of the air compressor. It is important to comprehensively consider the air system of the whole plant to ensure the safety of the entire system while installing new air compressors. During the air compression process, condensed water shall be generated in the air line. Because the water vapor in the environment is concentrated at the time of pressurization, it is cooled in the air line behind and condensed into water. Almost all air compressors need to eliminate the moisture in the compressed air on the integral piping system. This work requires every customer to pay special attention when using the air compressor and designing the piping system for routine maintenance - the common problems caused by water.

- (1) The water of the internal system of the air compressor may emulsify the lubrication oil and the air compressor will be scaled and stuck.
- (2) The water in the pipeline of the internal system of the air compressor will contribute to such poor conditions as corrosion and scale formation and even worse situations.
- (3) The instrument is obstructed,
- (4) Stuck the control valve,
- (5) Frozen air pipeline risk under low temperature environment.

Any of the above problems can cause partial or even complete shutdown of the plant. The air dryer can reduce the water vapor concentration and prevents the formation of liquid water in the air line. The combination of a dryer with a filter, an after cooler and an automatic drain valve can effectively improve the air quality in the air system. To solve the problem of water in the air outside the compressor, two types of dryers can be used, i.e., a refrigerated dryer and a purge desiccant dryer. Refrigerated dryer is generally used when the dew point of the compressed air

pressure is between 1°C and 4°C, and purge desiccant dryer is used when the pressure dew point requirement must be below 1°C. Please contact your local Denair branch office or a pointed distributor who will assist you in selecting the right dryer.

Note: If there is no pulsation isolation device (such as a shared air tank), the rotary air compressor cannot be connected to a reciprocating air pressure system. We recommend using separate air lines to connect two different types of air compressors to a common air receiver tank. When multiple air compressors are installed in parallel in the factory (optional), a shut-off valve and discharge drain valve should be provided for each air compressor before sharing the air tank.

Notice:

- (1) The drainage device shall be installed at end of the air outlet of the compressor during parallel connection.**
- (2) The drain valves of oil-gas tank and air receiver tank shall be opened to drain condensate water out completely before start the air compressor, It is to make sure that the oil products of the unit will not be emulsified and the compressor will not be stuck due to deterioration of oil products.**
- (3) The drainage function of drainage devices of each after treatment device (equipment) shall be inspected regularly to make sure that the whole system can operate functionally.**

3.6.2 Suggestions for Piping of Air Pipeline

- (1) According to the size of the air outline, choose the same or larger size pipes to connect the air outlet and air receiver tank to reduce the pressure drop.
- (2) Using flange between the air outlet and air receiver tank, will facilitate further maintenance. Add a shut off(close to the side of air receiver tank), to isolate the system without any leakage and reduce energy consumption.
- (3) Flexibility of the pipes should be taken into consideration to avoid resonance of the pipes as much as possible during the installation. Air pipelines should have a slope at least 1/100 to make sure the condensed water can running out smoothly.
- (4) Add an air dryer after the air receive tank to make sure the compressed air is dry enough to supply the using equipment, because the moist compressed air affect the performance of the using equipment.

See standard configuration of the general air system in the architecture below.

Please contact Denair for different air qualities and their respective detailed configuration.

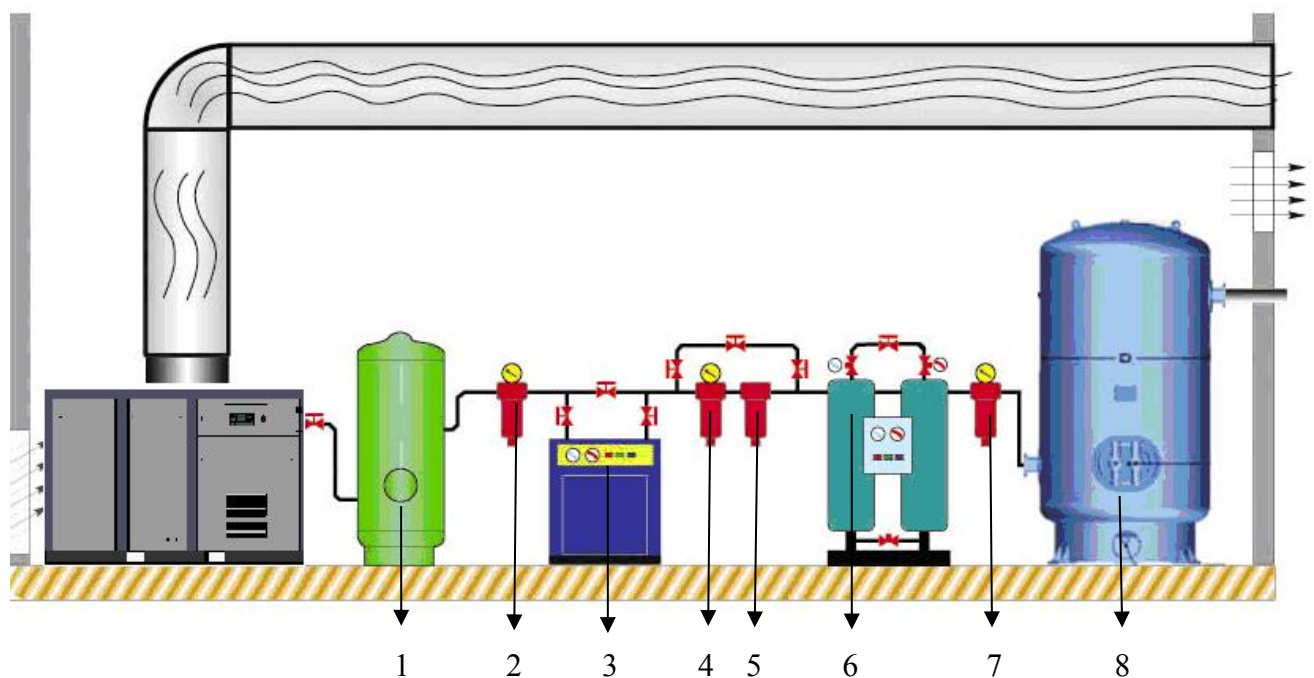


Fig 3.7

Notes:

- | | |
|----------------------|----------------------|
| 1. Air receiver | 5. Oil filter |
| 2. Pre-filter | 6. Desiccant dryer |
| 3. Refrigerate dryer | 7. Ultra-filter |
| 4. Ultra-filter | 8. Air receiver tank |

3.7 Electric Appliances Installation Precautions and Control System

3.7.1 Regulations on electric appliances installation preparatory measures

Before proceeding with the electrical installation, we recommend that you review the safety precautions in this manual by first looking at the air compressor nameplate or motor nameplate. The nameplate lists the working pressure, the maximum discharge pressure, and the characteristics and power of the motor. Make sure that the circuit voltage matches the voltage specified on the nameplate of the air compressor. Open the electric cabinet and make sure all electrical connections are correct and secure. Verify that the control transformer supply voltage correctly. Check if the motor and control circuit are firmly connected and close the electric cabinet.

Please refer to the JB6213.5-92 national standard and the following listed specifications, select the appropriate specifications of the main power line, grounding wire and no fuse switch (NFB) to ensure the safety of electrical appliances. The power cord safety current is set when the peripheral temperature is 35°C, the operating temperature is less than 55°C, and the cable length is within 20 meters based on the 600V PVC wire. When the power cord cannot meet the above conditions, the specifications of the power cord should be

increased so that the pressure drop cannot exceed the limit and the air compressor cannot be started, or even an electrical hazard may occur.

- (1) The air compressor is best to use an isolated power system, especially to avoid parallel use with other different power consumption systems, that may cause overload due to excessive voltage drop or three-phase current imbalance or Protection device trips, pay special attention to this request for high-power air compressors.
- (2) Air compressors must verify the correctness of their voltage when distributing power. The ground wire of the air compressor should be erected, and the ground wire must not be directly connected on the air or cooling water pipes.
- (3) The air compressor must pull a wire to the ground to prevent danger due to leakage.
- (4) Limited to the size of the electric cabinet, cable should not be too thick. If the cross-sectional area of the power cable is large, using two or more power cables instead of one. When using multiple power cords, each power cord must be three-phase balanced, otherwise it will cause cable overheating and unbalanced composite voltage. The input supply voltage should be kept within $\pm 10\%$ of the rated voltage, and the three-phase voltage difference must be within 3%. The air compressor must have the correct ground wire, otherwise, it may causing interference. If this issue cannot be improved, the controller may cause fluctuations of temperature, current, and pressure values.

KW Specifications	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90
Full-load current (A)	9.8	16.4	24.6	32.6	41	49	66	81	98	119	167	195
Sectional area of the power line (mm ²)	2.5	4.0	10	10	16	16	16	25	35	50	70	95
Sectional area of the earthing wire (mm ²)	2.5	4.0	10	10	16	16	16	25	25	25	35	50
Breaker NFB(Fixed Speed)	50	50	70	70	100	100	125	125	200	225	300	300
Breaker NFB(VSD)	30	30	50	50	50	100	100	100	125	150	200	225
KW Specifications	110	132	160	185	200	220	250	280	315	355	400	

Full-load current (A)	235	280	336	377	432	460	521	588	655	738	830
Sectional area of the power line (mm ²)	120	150	185	240	240	150*2	150*2	185*2	185*2	240*2	240*2
Sectional area of the earthing wire (mm ²)	70	70	95	120	120	150	150	185	185	240	240
Breaker NFB(Fixed Speed)	400	400	500	500	600	700	800	1000	1000	1200	1200
Breaker NFB(VSD)	250	400	400	500	500	500	600	700	800	900	1000

Note:

- (1) Voltage: 380V, 50/60HZ.
- (2) As for movable electrical appliance, when its grounding wire and power cord are placed together in a hose or cable, it should have the same wire diameter as the power cord.
- (3) The electrical installation of the air compressor must be done by a professional electrician. It must be determined that the power supply is a three-phase four-wire system. Please strictly check the wiring positions of U, V, W, and N. If the N wire (Neutral Wire) is incorrectly connected to the live wire, all control circuits will be burned.

3.7.2 Driving motor

The correct rotating of the air compressor drive motor is counterclockwise from the drive end. When checking the air compressor motor rotating, the motor jog time should be as short as possible. Press the "Emergency Stop" button immediately after pressing the start button. If the motor rotates incorrectly, the main switch shall be placed in the disconnected state, and the signboard shall be locked and hang the sign of "Forbidden to switch on and someone is working" plate. Open the electric control box door and change any two connectors (R, S, T) on the starter, close and tighten the electric cabinet door, and check the motor rotating again.

3.7.3 Fan motor

Observe whether the fan exhausts air to outside. If the direction is not correct, turn the main power switch off. Lock and hang up the signboard, "Forbidden to switch on and someone is working." Please change any two terminals on the contactor of the fan, then close the locking electric cabinet and check the direction.

3.7.4 VSD Control system

- (1) Variable frequency starting

PLC make the output frequency from 0Hz up to 50Hz and the motor speed from 0 to rated speed by controlling the inverter. During this period, the inlet valve open while the discharge valve close and draining solenoid valve will be powered on, the pressure of oil gas tank will rise up.

(2) Variable frequency running

When the pressure inside of oil gas tank rise up to a certain extent, the pressure sustaining valve will open and the air will go out. The control system will make the PID closed-loop control to the output frequency of inverter according to the feedback from the setting pressure and output pressure, which controlled the discharge pressure of air compressor accurately.

(3) Heavy-load/no-load compressor

When the pressure persistently rises to the unload pressure settings, the release solenoid valve starts to exhaust air. The inlet valve is closed so that the air enters from the bypass pipeline and the pressure in the oil-gas barrel starts to discharge, meanwhile the pressure maintenance valve is quickly closed to isolate the system pressure. The pressure in the oil-gas barrel is consistently discharge to a certain value, i.e. the no-load pressure to provide the pressure required by lubricating oil circulation. At this time, the air enters from the bypass pipeline and exhausted by the release solenoid valve after being compressed and this circulation is called the no-load running. When the system pressure drops to the settings of the loading pressure, the release solenoid valve will stop discharging, the inlet valve will be fully opened and the compressor will be running with load for a second time.

(4) Shutdown

After pressing the STOP button, the release solenoid valve starts to exhaust air. When the inlet valve is closed, the pressure maintenance valve will be closed, the pressure in the oil-gas barrel will start to discharge and be isolated with the system pressure. The motor shall stop running after the pressure in the barrel is exhausted to the no-load pressure and the motor will be shut down after 20s. The pressure in the oil-gas barrel is consistently exhausted to zero.

(5) High temperature tripping or motor overloading

When the exhaust temperature is greater than 105°C or the motor results in current protective device actions due to overload, the power supply will be cut off which will immediately shut down the motor. Meanwhile the inlet valve is closed, the release valve will be fully opened and the pressure maintenance valve will be closed and the pressure in the oil-gas barrel will be exhausted to zero. Only when there are abnormalities during the running of the unit, it is allowed to press the emergency shutdown, otherwise it may easily cause the system failure.

(6) Automatic stop system for overtime idling and reboot time setting

If the air used by the system reduced, the compressor keeps running at no-load conditions. If the no-load running time exceeds the set time, the compressor will be automatically shut down and the motor will stop running. When the air used by the system increases, the system pressure may reduced and the air compressor will automatically start to supply the air amount. For the time

setting of shutdown caused by long-time no-load running, another setting was made by the controller of the air compressor. The air compressor cannot be restarted up until five minutes later after shutting down the motor.

3.7.5 Fixed Speed Control system

(1) Start-up of the electromotor (pressure drop or Y running)

The inlet valve is fully closed, the release valve is fully opened and the release solenoid valve is closed during this period, meanwhile the inlet side is of high vacuum and the lubricating oil required by the compression chamber and bearings is ensured by the difference between the vacuum in the compression chamber and the atmospheric pressure in oil-gas barrel.

(2) Full pressure running of the electromotor (full pressure or Δ running)

The release solenoid valve is opened with power on after the control system switches to full pressure running. When the release solenoid valve is closed, the pressure in the oil-gas barrel will gradually rise. When the inlet valve is opened little by little, the pressure in the oil-gas barrel will rapidly rise so that the inlet valve is fully opened and the compressor starts the heavy-load running. When the pressure rises to a certain value, the pressure maintenance valve is fully opened and the air is output.

(3) Heavy-load/no-load compressor

When the pressure persistently rises to the unload pressure settings, the release solenoid valve starts to exhaust air. The inlet valve is closed so that the air enters from the bypass pipeline and the pressure in the oil-gas barrel starts to discharge, meanwhile the pressure maintenance valve is quickly closed to isolate the system pressure. The pressure in the oil-gas barrel is consistently discharge to a certain valve, i.e. the no-load pressure to provide the pressure required by lubricating oil circulation. At this time, the air enters from the bypass pipeline and is exhausted by the release solenoid valve after being compressed by the compressor and this circulation shows the no-load running. When the system pressure drops to the settings of the loading pressure, the release solenoid valve will stop discharging, the inlet valve will be fully opened and the compressor will be running with load for a second time.

(4) Shutdown

After pressing the STOP button, the release solenoid valve starts to exhaust air. When the inlet valve is closed, the pressure maintenance valve will be closed, the pressure in the oil-gas barrel will start to discharge and will be isolated with the system pressure. The motor shall stop running after the pressure in the barrel is exhausted to the no-load pressure and the motor will be shut down after 20s. The pressure in the oil-gas barrel is consistently exhausted to zero.

(5) High temperature tripping or motor overloading

When the exhaust temperature is greater than 105°C or the motor results in current protective

device actions due to overload, the power supply will be cut off which will immediately shut down the motor. Meanwhile the inlet valve is closed, the release valve will be fully opened and the pressure maintenance valve will be closed, the pressure in the oil-gas barrel will be exhausted to zero. It is allowed to press the emergency shutdown, only when there are abnormalities during the running of the unit, otherwise it may easily cause the system failure.

(6) Automatic stop system for overtime idling and reboot time setting

If the air used by the system reduces, the compressor keeps running at no-load conditions. If the no-load running time exceeds the setting time, the compressor will be automatically shut down and the motor will stop running. When the air used by the system increases, the system pressure will be reduced and the air compressor will automatically start to supply the air amount. For the time setting of shutdown caused by long-time no-load running, another setting has be made by the controller of the air compressor. The air compressor cannot be restarted up until five minutes after shutting down the motor.

3.7.6 Electrical circuit

The electrical control of the air compressor consists of two systems, including the internal control system and the part of the start up disk. The start up disk is the Y- Δ start up control used by general machineries. The control part is the electronic control. The electronic control part will not be presented thoroughly in this chapter due to the complicated internal circuit and control. If there is any loss or fault, please contact the customer service center of Denair.

4. System Introduction

4.1 Overall System

This compressor is rotary screw air compressor electric driven, single compression, and with after treatment equipment (air receiver tank, air dryer , filters) as a whole compressed air system.

4.2 Composition of the Compressor Unit

Air compressors are made by these following main components:

- (1)Air filter
- (2)Compressor
- (3)Oil separator
- (4)Pressure maintenance valve
- (5)After-cooler assembly

(6) Oil-gas barrel

The air enters the air compressor and flows through the inlet filter and the inlet valve. The compression of the screw air compressor is generated by the meshing of a pair of helical rotors (one is male and the other is female), which are respectively installed on two parallel shafts and in the high-strength cast iron casing. The inlet and the outlet are located at either ends of the shell respectively. The slot of the female rotor is matched with male motor and driven by it, and the exhaust end employs the bearing to prevent the rotor axial floating. The oil-gas mixture is exhausted from the outlet of the main engine and enters the oil-gas separation system which removes the most lubricating oil in the oil-gas separator. The lubricating oil will flow back to system and enter the cooling system with the compressed air leaving a little PPM oil content. The after-cooling system consists of a heat exchanger and drain device. The exhausted air after cooling will condense much vapor contained in the air which can be removed in the posterior pipeline and equipment terminal of the unit. The inlet valve is close while the release valve is opened and the compressed air enters in the inlet valve from the bypass pipeline during unload running.

4.3 Lubricating Oil System

Lubrication oil is forced by pressure, flow from oil separators, oil-gas tank to cooler and thermal control valve bypass ports. Temperature control valve controls the compressor discharge temperature above the dew point. When the air compressor is in cold start, part of the lubrication oil bypasses to the cooler. When the temperature of the system rises above the setting value of the thermostatic valve, the lubrication oil will flow through the cooler. When the compressor is operating in a high temperature environment, all the lubrication oil flows through the cooler. The oil cooler outlet temperature of the compressor is controlled to eliminate the possibility of water vapor condensing in the oil separator. By maintaining a sufficiently high oil temperature, the temperature of the oil-gas mixture discharged from the compressor can be maintained above the dew point. The temperature-controlled lubrication oil is filtered through the oil filter under constant pressure and enters into the compressor.

4.4 Oil-gas Separation System

The oil-gas separation system is composed of the oil-gas barrel with specially designed internal structure, two-level gathered separator element and cooling oil recovery device. Basic operation principle of the oil-gas barrel: The oil-gas enters from the inlet and impact the head of the oil-gas barrel to separate the oil dropping from the oil-gas mixture based on the state. The machinery impact can be applied to the oil-gas barrel, which can separate oil drops with large diameter relying on its own gravity of the oil drop, which is suitable for the oil drops with diameter greater than 1um.

When using the method of machinery impact, impacting the head by the oil-gas mixture may control the oil molecules with a certain flow rate so that the oil drops will fall to the bottom of the oil-gas barrel during discharging and the oil contained in the air can be reduced.

Notice:

When the air compressor adopts water cooling type, please install a Y filter in front of the water inlet of the air compressor additionally, otherwise the water cooling system of the air compressor will fail to work.

5. Controller Operation

5.1 Controller interface

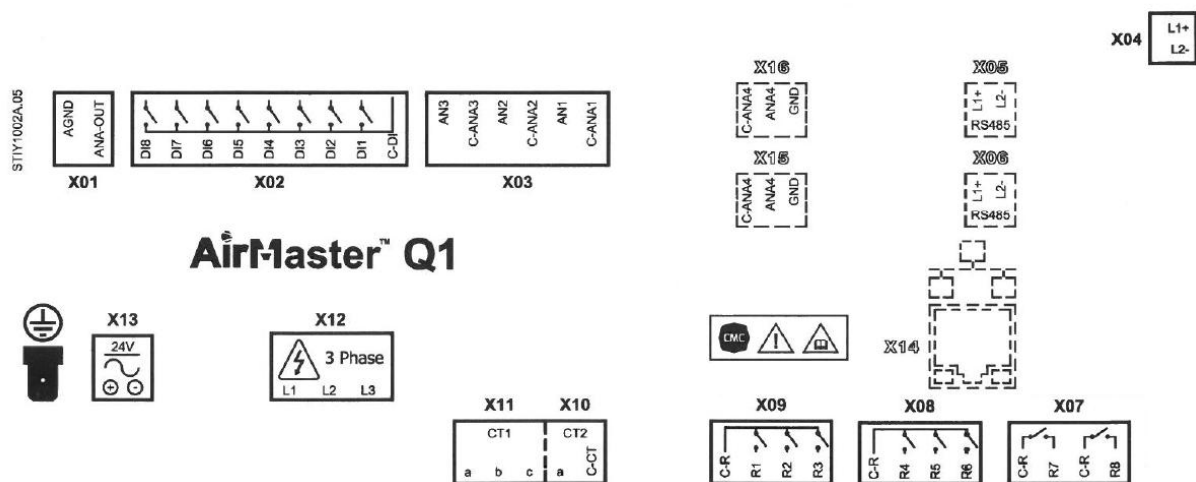


Fig5.1 CMC Controller

5.2 Key Description

BUTTON	FUNCTION	REMARKS
	START	The machine can be started by pressing this key.
	STOP	The machine can be stopped by pressing this key
	RESET	Reset by pressing this key
	SET	Enter button
	UP	Page up by pressing this key
	DOWN	Page down by pressing this key
	EXIT	Exit from current interface by pressing this key

5.3 I/O port description



Airmaster Q1 I/O port resources summary:

X01 Analog output $\times 1$; 4~20mA

X02 Digital input $\times 8$

X03 Analog input pressure $\times 2$; 4~20mA; temperature $\times 1$; PT100, PT1000, KTY

X04 Communication $\times 1$; Airbus; Modbus RTU

X05 Communication $\times 1$ (option); Airbus; Modbus RTU

X06 Communication $\times 1$ (option); Airbus; Modbus RTU

X07 Relay output $\times 2$

X08 Relay output $\times 3$

X09 Relay output $\times 3$

X10 Fan motor current transformer input $\times 1$

X11 Main motor current transformer input $\times 1$ (two-way detection or three-way detection)

X12 Three-phase electrical input $\times 1$

X13 Power input $\times 1$

X14 Ethernet access port $\times 1$ (option)

X15 Ai card (option) is used for the second temperature or LED driver; it takes the same position as X06; choose one of two;

X16 Ai card (option) is used for the second temperature or LED driver; it takes the same position as X05; choose

one of two;

5.4 Use of Menu pages and page items

Users of Airmaster™ Q1 should note that Menu pages and Menu page items are arranged sequentially from P00 to P99 and item 01 through item 99 and that some Menu pages and Menu page items are intentionally omitted or not displayed. This can be for a number of reasons and is perfectly normal!

Default page numbers and display names are as follows:

Page	Display name	Page	Display name	Page	Display name
P00	Home	P10	EQUIP settings 1	P20	Diagnostics
P01	Service Timers	P11	EQUIP settings 2	P21	Run schedule
P02	Utilisation	P12	EQUIP settings 3	P30	Programmer CONFIG page views
P03	Error Log	P13	VSD settings	P31	
P04	Event Log	P14	Motor protection	P32	
P05	Service Provider	P15	Inhibits	P40	Programmer CONFIG lookup tables
P06	Controller Data	P16	Warning alarm	P80	ISC – Main menu
P07	Equipment data	P17	IMM stop alarm	P81	ISC – Settings
P08	Message codes	P18	I/O CONFIG	P82	ISC - Priority
P09	Access	P19	Sensor CONFIG		

5.5 Troubleshooting

5.5.1. Pressing the start button does not turn on normally, please check:

- Are there any alarms? After eliminating the alarm, reset, power on.
- Are there any prohibition items? If the pressure in the oil and gas cylinder is too high, it is forbidden to start, after eliminating the problem, reset, start.
- Is the start/stop mode changed to remote mode? If yes, switch back to local start/stop control and start.
- Is the controller X07 wiring reliable? If the cable is loose, please re-connect the cable reliably and turn on.

5.5.2. Press the stop button to stop the routine, please check:

- a. Is the start/stop mode changed to remote mode? If yes, switch back to local start/stop control.
- b. Has the limit of “number of motor starts per hour” been set? If it is, you need to wait for the shutdown countdown to be completed before you can shut down.
- c. Press the emergency stop button in case.

5.5.3. Main motor overload E: 0082, please check:

- a. P14.03 Is the correct rated current of the main motor entered?
- b. Whether P19.04.01 input the correct current transformer range value.
- c. Check the input voltage.
- d. Check other faults of bearings, pipelines, machinery, etc.

5.5.4. The phase sequence of the main motor is unbalanced E: 0083

- a. Adjust P14.06 phase sequence unbalance setting angle.
- b. If the real phase sequence is indeed very unbalanced, you can set P17.09 (phase sequence unbalance detection) to off.

5.5.5. The main motor transformer fault E: 0084, please check:

- a. Is the main motor transformer wiring reliable?
- b. Is the detected main motor current less than 1/5 of the rated current?

5.5.6. Clock failure E: 2386

- a. Enter P10.15 time setting, reset the time, confirm, return, reset.

5.5.7. Short circuit E: 0812, please check:

- a. Whether all wiring of the controller is loose and touches the controller housing.
- b. Is there any other conductor touching the controller housing.
- c. Is the input power of the controller stable and is it higher than 24VAC?

5.5.8. Pressure, temperature sensor failure, please check:

- a. Whether the wiring is reliable
- b. Whether it is the correct signal input value

5.5.9. After setting the language, the display is still English.

- a. There are multiple language setting locations
- b. The default language setting location P10.14 after power on
- c. After logging in as an administrator, set the language in P09.02.03.
- d. After logging in as another customer administrator, set the language on its corresponding P09.XX.03

5.6 Fault codes

Error code:

E: 0010	Emergency stop
E: 0070	The fan motor shuts down
E: 0082	Main motor overload
E: 0083	The phase sequence of the main motor is unbalanced
E: 0084	Main motor current transformer failure
E: 0085	Fan motor current transformer failure
E: 0086	Fan motor overload
E: 0814	Deflation failure
E: 0812	Short circuit

Error code for analog shutdown:

E: 0115	Exhaust pressure sensor failure shutdown
E: 0119	Exhaust pressure is too high to stop
E: 0125	Exhaust temperature sensor failure shutdown
E: 0129	Exhaust temperature is too high to stop
E: 0131	Low system pressure failure
E: 0135	System pressure sensor failure shutdown
E: 0139	Exhaust pressure is too high to stop

Alarming error code::

A: 0119	High exhaust pressure warning
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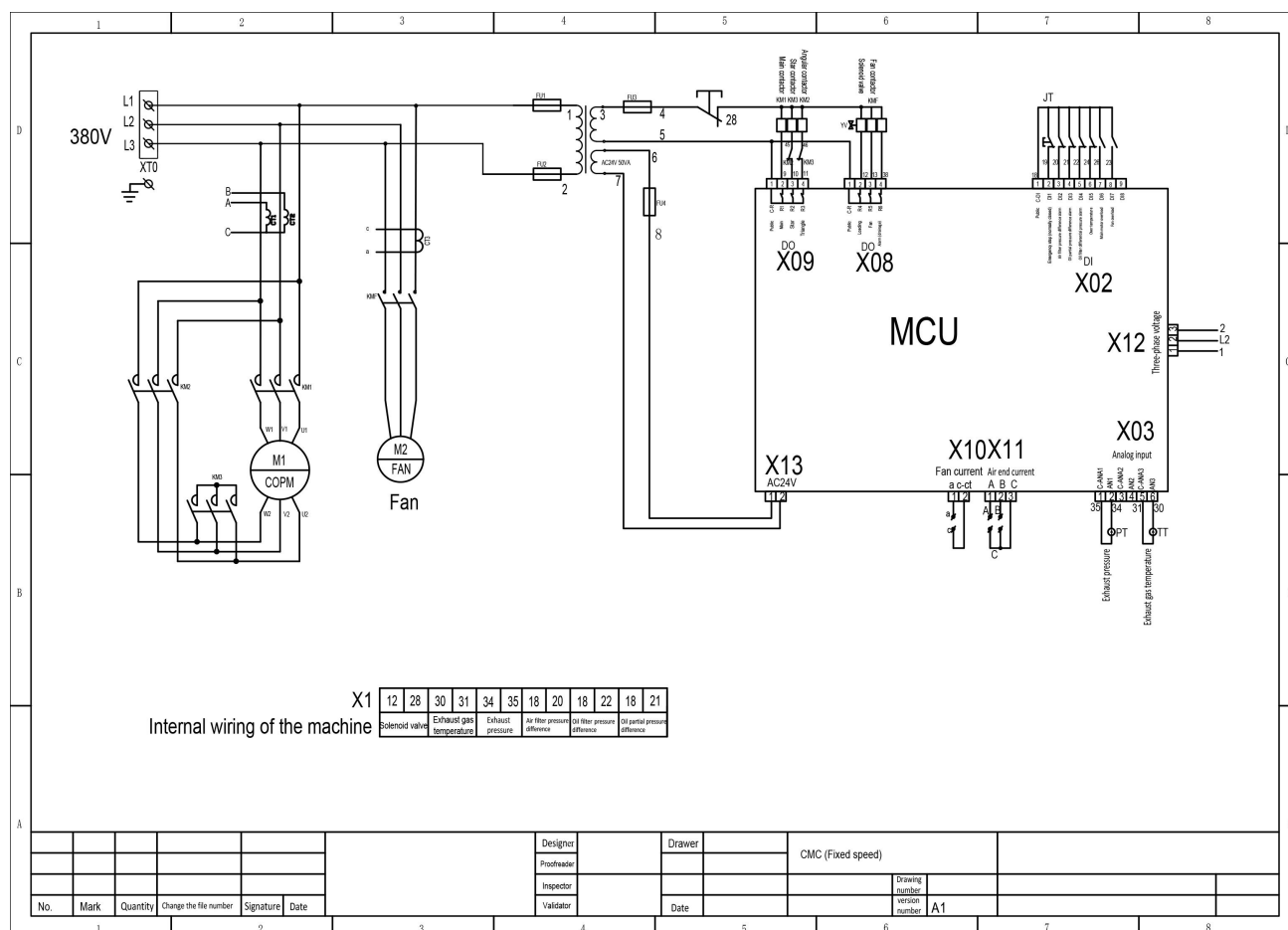
A: 0129	High exhaust temperature warning
A: 0139	System high pressure warning
A: 2030	Air filter high differential pressure warning
A: 2040	Oil filter high differential pressure warning
A: 2240	Oil/water separator failure warning
A: 2816	Power failure
A: 2831	Airbus RS485 communication failure
A: 2836	Clock failure
A: 4806	The maintenance time of 4806 air filter is up
A: 4807	The maintenance time of 4807 oil filter is up
A: 4808	The maintenance time of 4808 oil/water separator is up

Operation prohibited:

R: 3137	The system pressure is high and prohibition to start
R: 3123	Low ambient temperature prohibits starting

Note: Please refer to the operation manual of CMC controller for more details.

5.7 Schematic Wiring Diagram



6. Components

6.1 Air Filter

The air filter is a kind of dry paper filter to filtrate the air entering the compressor. The filtration efficiency has direct effects on the service time of the lubrication oil, oil filter, oil separator and bearing. The air filter blocked will affect the inlet air volume, DENAIR service technician will recommend to change a new one base on the working environment and service time on every onsite inspection. When the alarm shows, please change a new air filter.

6.2 Inlet Valve

The inlet valve is a kind of piston valve which facilitates the movement of the piston with the air source entering through the bottom of the piston, thus controlling the air intake. The piston moves farther with more controlled air source to make the air inlet smaller and reduce the air intake, otherwise the air intake increases.

6.3 Oil-gas tank

Besides the store the lubrication oil, the main purpose of the oil-gas tank is primarily separating the oil-gas mixture by centrifugal force. The separating performance has an effect to oil separator, thus affecting the oil content in the air. The oil level indicator on the side of the tank is used to view the oil level. The draining valve on the bottom is used for draining the condensate water in the oil-gas tank before starting up the air compressor. Besides that, it also used for changing the lubrication oil and periodic maintenance.

6.4 Oil Separator

The oil separator, composed two layers of fine glass fibers, can be used to filter the oil spill contains in the compressed air. The filtered oil gathers in the central flute and flows back to the compressor to prevent the oil draining with the air. The oil content in the air can be controlled under 3PPM for normal operation under the nominal pressure. The dust pollution in the working environment, the quality of the lubrication oil, the filtration efficiency of the oil filter and condensate water draining out of oil-gas tank before start all have a great effect on the service time of the oil separator and the filtration efficiency. The compressed air will contain more oil and lead to “oil throwing” phenomenon in case of blocking or poor filtration efficiency. Denair service technician will suggest changing a new oil separator based on working environment and service time on every onsite inspection. When the alarm shows, please change a new oil separator.

6.5 Safety Valve

An air compressor in abnormal operation or pressure sensor failure may result in a continuous increase of the pressure in the oil-gas tank. When the pressure increases to the set value, the safety valve on the oil-gas tank will automatically open to discharge pressure and eject the lubrication oil to reduce the pressure in the oil-gas tank and ensure the safety. In order to avoid accidents, the set pressure of the safety valve has been adjusted before delivery and shall not be adjusted under any circumstances.

6.6 Pressure Maintenance Valve

The functions are as follows:

- A When it starts, the pressure maintenance valve facilitates the establishment of the pressure required by the lubrication oil circulation to ensure the lubrication of the parts.
- B The pressure maintenance valve helps to keep the pressure in the oil-gas tank at a minimum value, protect the oil separator from being damaged by large differential pressure, and maintain the best separation of oil and gas to reduce the oil content.
- C The pressure maintenance valve can be used to separate the system and the oil-gas separator and prevent the condensate water from reflowing in the compressed air and pipelines for non-load or stop.

6.7 After Cooler

The after cooler is used to cool the compressed air, control the exhaust outlet temperature and prevent air dryer being damaged or poor effect caused by high temperature. The efficiency of the cooler may be reduced for blocking or scales. So, clean it during daily maintenance to ensure cooling effect.

6.8 Oil Cooler

The cooler is used to cool the lubrication oil. When the efficiency of the cooler is facing blocking or water scales, the system may be halted for high exhaust temperature. So clean it during daily maintenance to ensure cooling effect.

6.9 Oil Filter

As a paper filter, the oil filter is used to remove the impurities in the oil to improve the lubrication effect and reduce its damage to the compressor bearing and other parts. Denair service technician will measure the pressure value in front and at the back of the oil filter, observe the quality of the lubrication oil at every onsite inspection. Technician may suggest changing a new product based on the synthetic judgment. When the alarm shows, please change a new oil filter. If the blocked parts are not replaced, the lack of oil in the lubrication pipeline system may cause the exhaust temperature too high, or shorten the service time of the key parts, components or bearing. Even worst, the compressor may be burned out.

6.10 Temperature Sensor

The sensor is used to detect the exhaust temperature of the compressor and send the message to the controller to maintain the normal operation of the compressor. If the exhaust temperature is detected too high, the controller will shut down the air compressor to prevent the parts from being damaged and accidents.

6.11 Pressure Sensor

The compressor is equipped with a pressure sensor to send the message to the controller for process and judgment to ensure the normal operation, make sure the air compressor in a perfect protection.

7. Maintenance and Repairing

Make sure the power is off, motor and fan are completely stopped before dismount the machine. A warning sign “Warning: under overhaul, do not start” shall be set on the starter. Discharge all the compressed air out of the model before maintain the inner pressure parts.

7.1 Air Filter

The air filter shall be replaced when the maintenance indicator light lit up. The service time is determined by the quality of the ambient air, usually 3000 hours. The air filter has a direct effect on the service life of the oil filter and oil separator. Replacing as follows: dismount the fixing bolt of the air filter and replace with a new one. Note, the sealing gasket of the filter shall stick close to the permanent seat.

7.2 Lubrication of Motor Bearing

The oil filling bearing shall be periodically filled with lubrication oil according to the instructions for use of the motor or the following table

7.2.1 Supplementary amount and interval table of lubrication grease.

Power (kW)	Initial filling amount (g) Note (1)	Supplementary amount (g) Note (2)	Supply interval for operating for 24h per day (h)
18.5	100	30	1500
22	100	30	1500
37	100	30	1500
45	200	30	1500
55	200	30	1500
75	200	30	1500
90	200	30	1500
110	200	40	1500
132	200	40	1500
160	200	40	1500
185	200	40	1500
200	250	50	1500
220	250	50	1500
250	250	50	1500
280	250	50	1500
315	250	50	1500
355	280	60	1500
400	280	60	1500

Note:

- (1) The initial filling amount is the new filling amount after decomposing the clean bearing. The bearing is filled with about 1/3, and the rest is filled in the inner bearing cover (the filling is complete when the motor is delivered).
- (2) The amount of replenishment is the amount of grease injected into the bearing during each replenishment interval. Please replenish it timely according to the compressor operation hours.
- (3) Please note that if you replenish more at a time it cannot extend the replenishment period. Please follow the instruction.

(4) If the grease is accumulated on the “slippery grease storage area”, the bearing is overheated because of the stirring resistance and slippery. Please open the cap to clean the lubricating grease (once after filling 2-3 times).

(5) The amount of fuel must be filled in accordance with the standard value, adding too much can also cause damage to the motor.

(6) The cycle of grease replacement depends on the size of the motor, its usage, and the working environment. It is recommended that the cycle and amount of grease should be changed according to the oil labeling requirements on the motor.

7.2.2 The lubrication greases in the following specification have been filled when delivering. Please use the lubrication grease with the same quality and specification to ensure the service time of the bearing.

Marketability	Biggest lubricating grease manufacturer, easy to buy
Allowable temperature	Generally, the lubricating grease is $-20^{\circ}\text{C} \sim 120^{\circ}\text{C}$, the others-out of this range shall use low or high temperature grease.
For high-speed and major diameter bearing	For good resistance to pressure (oil film strength). The hard ones are better. For better voice, vibration and exhaust effect, the soft ones are better.(avoid using Silicon grease)
Load resistance	For belt and gear with high load, the one with good resistance to pressure is better.(avoid using Silicon grease)
Water resistance	Avoid using Na or Ca grease under high humidity condition.
Consistency	The soft ones are better in terms of the temperature increase which is determined by the lubricity and exhaust effect when filling under creak, abnormal vibration and cold environment for the similar hardness.
Lubricity	Please use the grease with good lubricity and select the grease based on its strengths and weaknesses.

7.3 Compressor Bearing

The compressor bearing is a consumable part (change after 30,000 working hours). The noise and vibration may be high during the operation because the service time is shortened because of the combination of normal or abnormal wear, the inlet air quality, lubrication oil quality and oil filtration effect. The Denair service technician will decide whether need to change the bearing based on these factors.

7.4 Air Compressor Lubrication Oil

Lubrication oil is a special oil for the rotary screw air compressor, do not mixed with other type of oil, otherwise the air compressor may be seriously damaged. Draining all the used lubrication oil before

filling the new lubrication into the model, otherwise will shorten the service life of new lubrication oil. Normally, during the changing the oil, we request to change the oil filter and oil separator too. Oil replacement method as follow: make sure the power is off; release the pressure inside the oil gas separator; open the cover; draining all used lubrication oil out all the oil gas tank and cooler; close oil draining valve; power on, restart the air compressor for operating 3 seconds and stop it; turn off the power; open the oil draining valve again to draining the left oil after making sure there is no pressure inside the oil gas tank. While filling the new lubrication oil, make sure the oil gas tank is sealed, during the filling could observe the oil level through the oil level mirror, make sure the oil gas tank is fully filled. Then start the air compressor, the lubrication oil shall drop to the half of the oil level mirror, if shows lower, please stop the machine and refill some lubrication oil, but remember to not add to much this time.

7.5 Oil Separator

The filter screen will be gradually blocked after using for a while, thus will cause some pressure drop. The cleanliness of the oil separator has an effect on the quality of the filtered oil. Too much blocking may increase the oil content of the outlet compressed air and the normal supplementary amount of the lubrication oil and the power consumption. Generally, the service time of the oil separator is between 3000-6000hrs and varies with the environmental quality (dust), periodic clean and filter replacement.

7.6 Oil Return Pipeline

Inspect the smoothness of the oil return pipeline periodically. During the operation, the pipeline appears high temperature is a normal sign, if the pipeline not warm or there is too much oil in the condensate water, it means the pipeline is blocked. Please clean the pipeline, and inception as follow: inspection the oil separator, oil separator, oil return pipeline, connectors, non return valve get blocked or not.

7.7 Engine Oil Filter

The service time of the filter is 2000-3000 hrs based on the maintenance instruction and varies with the working condition, dust, inlet filter efficiency and the daily clean or maintenance of the unit. However, the filter shall be replaced in case of a poor filtration efficiency to avoid damaging the machine.

Replacement as follows: disassemble and assemble the lubrication oil filter with a special tool to avoid deforming the enclosure or affecting the function. The oil receiver shall be placed under the filter to receive the spilled lubrication oil when dismounting. The lubrication oil filter shall be cleaned before installation. The sealing gasket shall be covered with the lubrication oil before lock-in.

7.8 Pipe Joint

Please check the leakage of all pipe joints regularly as well as the aging and crack of the hose. According to the problem, please change the gasket, O-ring or hose, or apply with sealant. When maintaining or dismounting the parts, the parts shall be relocked in case of any loose ones or resealed if necessary. The Denair service technician will suggest whether to buy a

repair kit during the maintenance service.

7.9 Air intake Valve

Regularly dismount the spring of the air intake valve to remove dust and add grease or change the spring ring to ensure the sensitivity of the spring to control the air volume.

7.10 Pressure Maintenance Valve

The pressure maintenance valve shall be regularly dismounted to remove dust and add grease. If O-ring or sealing ring get blocked, that shall be changed in case of any damage. A regular test of the valve sealing helps to reduce leakage.

7.11 Safety Valve

- (1) The safety valve has been adjusted before delivery. Do not adjust.
- (2) The safety valve shall periodically test the effectiveness of its operation, and the pressure of the air compressor shall be pressed to the corresponding opening pressure of the safety valve to confirm that the blowout is normal and no jam.

7.12 Relief Solenoid Valve

- (1) In case of a frequent operation of the non-load and load of the air compressor, please set an appropriate load/unloading pressure according to the air consumption, otherwise the service time of the relief solenoid valve will be reduced by half.
- (2) The abnormal movement of the relief solenoid valve has a direct effect on the normal use. Therefore, a periodic inspection is very necessary.
- (3) The relief solenoid valve shall be regularly inspected for:
 - a particulate in the solenoid valve (disassemble it to inspection);
 - b normal pickup of the coil rod of the energized solenoid valve (touch the coil rod with a tool like electro-probe);
 - c normal operation of the non-load and load.

7.13 Temperature Control Valve

The by-pass of temperature control valve closes while the oil temperature is high, on the contrary it will open in normal circumstances. Check the valve whether its normal by this way.

7.14 Cooler

7.14.1 Air Cooler

After using for a while, the heat dissipation may become poor because the dirt and dust attached on the surface, thus increasing the exhaust temperature. Please clear the air cooler regularly, use high pressure air to blow the dust off, it is very important to strengthen the cooling capacity. The ambient air quality will affect the maintenance period.

7.14.2 Water cooler

(1) Please confirm the below items before using the water cooler:

- a. Please check if there is any leakage of the pipe connections before start the hydraulic system;
- b. Please open two fluid oil valve;
- c. Please check if there is any leakage of each flanges' sealing;
- d. Please check if there is any leakage of the outlets or plugs;
- e. Better to add a softer water device for the cooling water, or cleaning the cooling regularly.

(2) Start the model after checking the mentioned items. Routine cleaning and regular inspections are necessary. Please set a shelter when the model is installed outside, and provide a good ventilation to the machine.

- a. Do the regular maintenance at least once a half year or one year;
- b. Observe and clear the condition of cooler tube by dismount the return water cover;
- c. The cooling water may be frozen in low temperature environment like Winter, please drain the water out once the model is stopped, to prevent the cooler from cracking inside.
- d. The cooling water may be freezing in low temperature environment in Winter.

(3) To control corrosion and prevent leakage, please do the clearing regularly.

- a. Way to dismount

Completely close the in and out end of the two fluid, stop the flow. Draining all the water out of the cooler; In order to be convenient for the re-assembly, please make the mark of connection part. Unscrew the nut on the stand, remove the fastening ring, and move the oil cooler to a place where it is easy to work (if it can be cleaned and inspected without removal, it is ok). Remove the water caps on the return and inlet sides, remove the seals and the pressure ring (steel), erect the cooling core and the cylinder, and pull the outer cylinder upwards. Pull it out vertically to avoid scratching the moving tube sheet sealing surface. After the outer cylinder is pulled out, the decomposition work is completed. Then, please clean the inside and outside of the cooling pipe, the inner side of the tube, and the connection and inlet and outlet ports. The cleaning method is based on the degree of contamination, using cleaning oil, steam, hot kerosene, and cleaning agent. If there are many contaminants in the cooling pipe, you can use nylon brushes or iron rods to clean them one by one. During cleaning, take care not to damage the sealing surfaces. When cleaning with liquids containing moisture, dry them afterwards. (Note: If it is not absolutely necessary, do

not dismount the cooling core.)

b. Assembly method

The assemble is exact reverse order of the dismounting operation, please change a new seal during the assemblation. Secure the sealing ring on the tube plate and attach it to the interface marked on the water cap. Put the assembled oil cooler back into the place and fix it on the support frame with the fastening ring.

c. Please check the pressure after the assembling as follow:

Filling the oil in the tube, and seal one side; increase pressure for 5 minutes to 10Kg/cm²G, then to 15Kg/cm²G, maintain it for 20-30 minutes. Draining the oil and assemble back to the place where it is after confirming the pressure gauge show the pressure is 15Kg/cm²G.

7.15 Electric Insulation

Measure the insulation value of the compressor motor and fan motor regularly to avoid burning the motor without warning. The minimum safe insulation value is 500VDC, 5MΩ. The insulation deterioration must be handled as soon as possible.

7.16 Periodic Inspection and Cleaning

After air compressor operation for a certain time, regular inspection and cleaning shall follow the <Compressor Periodic Maintenance Schedule>. Denair service technician and the qualified service engineers will provide periodic inspection and cleaning services.

7.17 Inverter Maintenance

1) Daily Maintenance

Components inside of inverter will be aging, potential failures of inverter will occurred and service life of inverter will decreased because of the temperature, humidity, dust and vibration influences. Hence, it is necessary to do the daily maintenance on inverters.

Warning:

Because there are still high voltage on the filter capacitor after power off, so it is not allowed to do the maintenance right now, and only can operate until the inverter displace interface showing up and finishing to use the multimeter to test the voltage of busbar which is not exceeding 36V.

Daily inspection item:

- 1) Is there any anomalous change of the voice while motor in running condition?
- 2) Is there any vibration while motor in running condition?
- 3) Is there any change of the installation environment of inverter?

- 4) Does the fan of inverter work well?
- 5) Does the inverter over-heat?

Daily clearance:

- 1) Always keep the inverter clear.
 - 2) Efficiently clear the dust on the surface of inverter, prevent the dust, especially metal dust into the inside of inverter.
 - 3) Efficiently clear the oil dirty of cooling fan of inverter.
- 2) Inspection regularly: Please regularly inspect the parts that is hard to inspect in running condition.

Inspected items in regular time:

- 1) Inspect air flue, clear it regularly
- 2) Inspect if any loosening of the screw
- 3) Inspect if any corrosion of inverter
- 4) Inspect if any pull arc of the amphenol connector
- 5) Make insulation test for major loop

Warning: When you use the megger (please the DC 500V megger) to test the insulation resistance, you should disconnect the major loop and inverter. Don't use insulation resistance meter to test the insulation of control loop.

8. Safety Protection and Warning Device

8.1 Motor Overload Protection

There are two main motors in air compressor system, including air compressor main driving motor and cooling and circulating fan motor. For main motors, in the normal condition, the running current shall not exceed the setting value of micro-computerized controller due to voltage drop, three-phase imbalance and etc. When the running current of the more exceeds the upper limit defined by electrical protection device, the micro-computerized controller will automatically cut off the power and shut down the motor where the air compressor will be unable to start up unless reconnected to power supply. For reset, just press down the set switch with your hand.

Warning: Voltage fluctuation shall be controlled $\leq(-10\% \sim +10\%)$ and imbalance between phases shall not exceed 3%, otherwise the temperature within the motor will sharply increase. For example, when the imbalance of voltage reaches 3.5%, the temperature of the motor will increase approximately 25%.

Reasons for general motor overload:

- 1) Manual misoperation: voluntarily adjust exhaust pressure, inappropriate system adjustment and

etc.

- 2) Mechanical failures: internal wear and tear of the motor, under-phased running of the motor, safety valve's failure to actuate, system setting failures, obstruction of oil separator and etc.

If the motor is found overloaded in the process of running, please contact maintenance supplies of Denair or specified region, go for inspection and clarify the reason of overload, otherwise the burnout of the motor which will cause a lot of troubles for in-situ air requirements and maintenance fees.

8.2 Protection for Over-temperature of Exhaust

The highest exhaust temperature set by the system is 105°C, where the system will automatically cut off the power when it exceeds 105°C. Generally, many reasons can result in over-temperature of exhaust, among which the most common one is the failure of oil cooler. For air cooled oil cooler, if the fins are obstructed by dust which makes the cooling air fail to pass through the cooler freely, the temperature of lubricating oil will gradually increase and result in shutting down. Therefore, it is necessary to utilize the low pressure air to remove the dust on the fins every once in a while. For failure to blow off the obstruction on the fins, cleansing solution or solvent is recommended. The designed highest temperature of the air compressor is 45°C where the exhaust temperature will increase with the ambient temperature, so it's important to select a region of low ambient temperature and good ventilation to place the air compressor.

8.3 Setting and Description of Other Protection and Warning

See the introduction given in Section 5.6 and 5.7 of this manual.

8.4 Failure Causes and Troubleshooting

Fault	Cause	Trouble shooting
Start up failure	Fault of control voltage	Check the specification of the control voltage, fuse and connection cord
	Actuation of emergency switch	Check whether the emergency actuates or the contact is disconnected
	Failure of the power supply to turn on	Check whether the power supply is turned on Check the power supplies of the motor and controller
	Low voltage	The diameter of the wiring is too small / change the specification of the wiring diameter The voltage of power supply is too low/ adjust it to the right voltage

Under-pressure of the system	The requirement of the system for air exceeding the capacity of the compressor	Add air compressor
	Poor actuation of inlet valve	Check and maintenance
	Leakage of system air	Check and maintain the pipeline
	Belt slipping	Adjust the tension of the belt
	Inlet filter too dirty	Replace the inlet filter
	Controller pressure too low	Check the accuracy of the settings and pressure detector
	Draining solenoid valve unable to close	Check whether the solenoid valve is excited, the valve gets stuck And the controller outputs signals (connection cord or relay)
	Air pipeline obstructed, the valve not full opened	Check the pressure of each parts within the air compressor and remove the obstruction or open the valve
Over-dampness of the system	Improper installation of the water drain pipe of the air compressor pipeline	Modify the improper arrangement of water drain pipe
	Poor heat dissipation of the cooler	The cooler is too dirty and requires cleaning
	Air dryer not installed Air dryer not opened	Install and open the air dryer
Great pressure fluctuation	Air requirements fluctuating sharply	Increase the capacity of air reservoir
	The scope of set pressure of empty/ loaded car too large	Change the pressure settings
Excess of oil content in the exhaust and great oil consumption	Leakage of lubricating oil System	Check whether the oil lines and oil seals leak or replace the parts
	Oil separator obstructed	Replace the oil separator
	Leakage of oil separator	Check the oil separator
	Oil return pipeline obstructed	Check all the parts of the oil return pipeline and remove any foreign matter
	The compressor running under the set pressure	Reduce the air consumption or add air compressor and adjust the compressor to operate under the nominal pressure

Annex I: Table of Cycles for Periodic Maintenance of Air Compressor

Table of Cycles for Periodic Maintenance of Air Compressor

Item	Content	Daily	weekly	500Hr	1500Hr	3000Hr	6000Hr	12000Hr	18000Hr	30000Hr	Remark
				Monthly	Quarterly	Half-year	Annually	Two-year	Three-year	Five-year	
Indicator light of instrument board	Visually inspect the abnormality of indicator light	◎									
Exhaust temperature (°C)	Check	◎									
Condensate water within oil-gas barrel	Drain water	◎									
Oil level	Check	◎									
transparent hose and core sleeve	Check/replace	◎									
Inlet connection hose	Check/replace	◎						●			
Pipeline (rubber/ metal)	Check/replace	◎						●			
Pipeline connection	Check						◎				
Cooler	Check/replace		○								

○Clean ◎Adjust/Check ●Replace

Cooling fan	Clean		○								
Pre-filter screen	Clean		○								
Motor	filling grease				◎						
Air filter	Clean/Check/Replace		○		◎	●					500hrs first maintenance
Oil filter	Replace				◎	●					500hrs first maintenance
Air compressor lubricant oil	Add/replace										500hrs first maintenance
Semi-synthetic lubricating oil					◎	●					
Full-synthetic lubricating oil						◎	●				
Oil Separator	Check/replace					◎	●				
Coupling/elastomer	Check/replace						◎	●			
electric insulation	Phase/Ground Resistance Check						◎	●			
Heat control valve	Check/replace						◎	●			
Inlet valve	Check/replace						◎	●			
Pressure maintenance valve	Check/replace						◎	●			
Safety valve	Check/replace						◎	●			

Draining solenoid valve	Check/replace						◎	●			
Pressure sensor	Verify and check/replace						◎		●		
Temperature sensor	Verify and check/replace						◎		●		
Compressor seal	Check/replace						◎			●	
Compressor bearing	Check/replace						◎			●	
Remark											
◆ This maintenance cycle is a recommended period and shall be modified according to different actual environments and working conditions.											
◆ The maintenance sysle will be shorter according to operating environment and condition.											
◆ The listed replace cycle is based on condition below:											
◆ 6000hrs running for a year											
◆ Environment temp. not higher than 45°C											
◆ Yearly average temp not higher than 30°											



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Specifications are subject to change without notice.