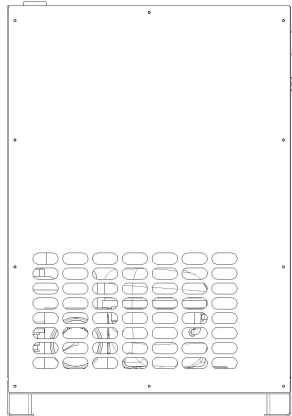


1 Basic data

EP-003AH EPSEA Air-cooled refrigerated air dryer								
1.1 Rated working condition								
Rated flow rate*	0.3m³/min							
Rated inlet pressure	0.7MPa							
Rated pressure drop	0.003MPa							
Rated inlet temp.	45°C							
Rated ambient temp.	38°C							
Rated PDP.	7°C							
*Related to 1bar a and 20°C according to ISO 7183								
1.2 For different operating pressure and temperature, the following correction factors are to be taken into account								
Correction factor for compressed air inlet temperature C₁								
32°C	35°C	38°C	40°C	42°C	45°C	50°C	55°C	60°C
1.53	1.39	1.25	1.2	1.06	1.00	0.83	0.68	0.58
Inlet pressure correction factor C₂								
0.4MPa	0.5MPa	0.6MPa	0.7MPa	0.8MPa	0.9MPa	1.0MPa	1.6MPa	
0.76	0.86	0.93	1.00	1.04	1.07	1.12	1.2	
PDP. correction factor C₃								
3°C		7°C				10°C		
0.81		1				1.17		
Ambient temperature correction factor C₄								
25°C	30°C	35°C	38°C	40°C	45°C			
1.10	1.06	1.03	1.00	0.96	0.71			
Selection of flow rate of the dryer under different working conditions can be obtained by dividing the actual flow rate of the air compressor with the correction factor.								
Selection of dryer flow rate = actual flow rate of air compressor / (C ₁ * C ₂ * C ₃ * C ₄)								
1.3 Working conditions								
Fluid	Compressed air							
Max. working pressure	1.6MPa							
Min. working pressure	0.6MPa							
Max. inlet air temp.	60°C							
Min. inlet air temp.	10°C							
Ambient temp.	2-45°C							

1.4 Machine characteristics	
Length×width×height	380*300*550MM(EST.)
Weight	29kg
Pipe	Rp1/2
Cooling method	Air cooling
1.5 Electrical characteristics	
Power supply	1Phase/220V/50Hz
Compressor operating frequency	50Hz
Compressor power	0.105kW
Rated power	0.173kW
Control form	Intelligent control
1.6 Description of main components	
Name	Overview
Compressor	Adopting advanced fully enclosed reciprocating compressor design,Not only is the performance stable and reliable, but also the operating noise is extremely low.As the core power source of the refrigeration system, it can effectively drive the entire refrigeration cycle, ensuring efficient refrigeration effect.
Heat exchanger	Our company's exclusively developed aluminum plate fin heat exchanger adopts an advanced "three in one" high-efficiency heat exchange system, which not only improves heat exchange efficiency, but also ensures the stability and durability of the system.This heat exchanger is made of environmentally friendly materials, which have excellent antioxidant performance and effectively extend its service life. At the same time, it meets environmental requirements and brings a greener and safer guarantee to your production process.
Condenser	We adopt a pure copper and aluminum fin design, carefully selected top quality purple copper material, combined with efficient hydrophilic aluminum foil, to ensure excellent heat dissipation effect.This design not only improves condensation efficiency, but also greatly enhances the stability and durability of the equipment, ensuring long-term stable operation.

Throttling device	As the core hub for throttling, pressure reduction, and flow regulation, it not only accurately controls fluid pressure and flow rate, but also effectively prevents wet compression, protects the compressor from liquid-hammering, and has abnormal overheating protection function to ensure stable and safe operation of the system.
Bypass valve	It is intelligent guardian of the refrigeration system can accurately regulate the evaporation temperature, effectively ending the phenomenon of "ice blockage" and ensuring stable operation.
Fan	Our cooling fan has excellent performance, large air volume, and high efficiency, ensuring that the equipment can maintain good heat dissipation during operation, thereby improving the stability and service life of the equipment.
Refrigerant filter	Having excellent filtration and water absorption performance, effectively intercepting impurities and moisture, ensuring efficient and stable operation of the refrigeration system, and achieving a clean operating environment.
Low pressure protector	Our low-pressure protector can effectively prevent compressor damage caused by low operating pressure in the refrigeration system, ensuring the stable operation of the system. This protector adopts advanced sensing technology and precise control system, which can monitor the operating pressure of the refrigeration system in real time and automatically take protective measures to prevent compressor damage when the pressure is below the safety threshold.
Pressure gauge	Made of high-quality stainless steel material with oil filling and shock resistance characteristics, it can accurately reflect the system's operating pressure data in real time, providing reliable and clear pressure information for operators.

Drainer	As a transporter of condensate, the drain plays an indispensable role. It is not only a bridge for the flow of condensate, but also an important component to ensure the stability of gas dew point. By efficiently transporting condensate, the drain effectively avoids equipment performance degradation caused by condensate accumulation, ensuring stable and reliable gas dew point, and safeguarding the production safety and economic benefits of the enterprise.
Refrigerant	The use of environmentally friendly refrigerants R410A injects a continuous stream of vitality and energy into the refrigeration system, ensuring its stable operation and efficient performance.
AC contactor	As a communication and liaison station for load electrical appliances, contactors play a crucial role in circuits. It ensures the safe transmission and distribution of electrical energy, and protects the normal operation of load appliances.
Intelligent controller	As the brain center of machine operation, it provides precise command and regulation, achieving intelligent and efficient workflow.



2 Functional characteristics

The equipment adopts a well-known brand of environmentally friendly refrigerant compressor to ensure efficient and stable operation. It is worth mentioning that our exclusively developed vertical counter flow heat exchanger, with its innovative design, can effectively control the pressure drop to less than 0.15 Bar, significantly reducing system power consumption and bringing substantial energy-saving effects to users.

In addition, our product is also equipped with an intelligent electromagnetic bypass control system, which can maximize the rational use of refrigeration capacity and accurately control excess cooling capacity, ensuring the stability of dew point temperature and avoiding the occurrence of ice blockage. The application of this intelligent system not only improves the operational efficiency of the system, but also enhances its stability and reliability.

3 Working principle

As shown in figure 1, the refrigerated dryer is mainly divided into refrigeration cycle part and air heat exchange part.

According to the condenser cooling method, it is divided into air cooling and water cooling.

3.1 Refrigeration part

In these four basic processes of the refrigeration cycle, each step plays an important role in ensuring the realization of refrigeration efficiency. Among them, the performance of refrigeration compressors is particularly crucial. It not only needs to complete the suction and compression of refrigerant gas, but also ensures that its pressure and temperature are appropriately increased to meet the needs of subsequent condensation and evaporation.

The condenser is another important component in the refrigeration system. Here, the high-temperature and high-pressure refrigerant vapor exchanges heat with the cooling medium, releasing heat to the outside world and condensing into a liquid state. The selection of cooling medium usually depends on the specific application environment and requirements, which may be cooling water or air.

The throttling device is a "throttling" part in the refrigeration system, which can lower the high-pressure liquid refrigerant to a low-pressure state, allowing the refrigerant to exist in a low-temperature and low-pressure state when entering the evaporator. In this way, when the refrigerant absorbs heat and vaporizes in the evaporator, it can effectively reduce the temperature inside the evaporator, thereby achieving refrigeration effect.

The evaporator is the starting point of the entire refrigeration cycle and a key link in heat absorption. Here, the low-temperature and low-pressure liquid refrigerant absorbs the surrounding heat and vaporizes. As the refrigerant vaporizes, the temperature inside the evaporator gradually decreases, achieving the purpose of refrigeration.

In this way, through the cyclic process of compression, condensation, throttling, and evaporation, the refrigeration system can continuously absorb heat from the environment and discharge it to the outside world, thereby achieving refrigeration effect.

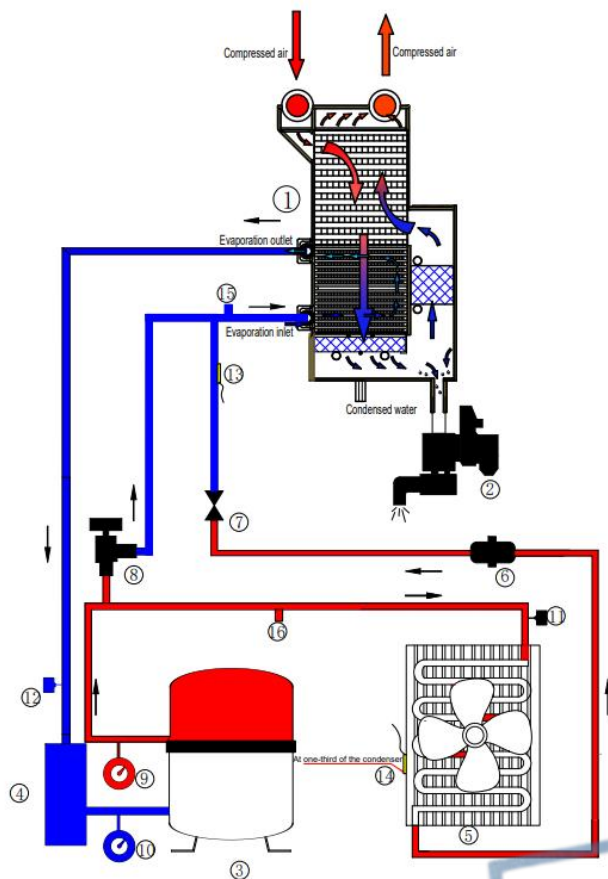
3.2 Air heat exchange part

When compressed air enters the evaporator, it undergoes an efficient heat exchange process with the refrigerant. This process can lower the temperature of compressed air to a dew point temperature of 2-7 °C to achieve a deep cooling effect. During the cooling process, the moisture in the compressed air will gradually condense and precipitate, while the oil and some impurities in it will also be condensed together.

In order to effectively separate these condensates and gases, we have adopted an efficient separator. The separator can accurately separate gas and liquid, ensuring that clean gas can flow out smoothly. The separated liquid is discharged through an automatic drainage valve, achieving the purpose of freezing, cleaning, and dehumidification.

Throughout the process, we focus on balancing efficiency and effectiveness, ensuring that while achieving dehumidification purpose, we also minimize energy consumption and waste generation as much as possible. This design makes our system more environmentally friendly and efficient, and can bring users a better user experience.

The above is the working principle of a refrigerated dryer. We strive for excellence in every refrigeration process of the refrigeration cycle, using a well-known brand of environmentally friendly refrigerant compressors for the entire series. Our independently designed and produced condensers are paired with well-known brands of large air volume external rotor fans. We have a uniquely designed three in one plate heat exchanger and a self-developed intelligent controller for the refrigerated dryer, ensuring the efficient operation of the machine.



1. Three-in-one efficient heat exchange system structure
2. Electronic drain valve
3. Refrigeration compressor
4. Liquid reservoir
(it is integrated with compressors in some models)
5. Air-cooled condenser
(pure copper and aluminum fins)
6. Refrigerant filter
7. Throttling device
8. Solenoid bypass valve
9. Refrigerant high pressure gauge
(not available in some models)
10. Refrigerant low pressure gauge
11. High pressure protector
(not available in some models)
12. Low pressure protector
13. Evaporation temperature sensor
14. Condensation temperature sensor
15. Charging (charge during operation)
16. Charging (charge during stop)

Figure 1

4 Main features of the machine

4.1 Environmentally friendly refrigerant, fulfillment of corporate social responsibility

Using R410A environmentally friendly refrigerant, compared to traditional R22 refrigerant, R410A has a higher refrigeration efficiency per unit volume and does not damage the ozone layer.

4.2 Optimized refrigeration system design, stable dew point of 7°C

- ① The dew point is more stable. When the intake temperature reaches 45 °C under standard operating conditions, the exhaust pressure dew point can be stabilized at 7 °C, ensuring the continuity and reliability of system operation.
- ② The vertical counter flow heat exchanger adopts a high-end structure with gas flow direction, effectively enhancing the heat exchange process, improving heat exchange efficiency, and making the system operation more efficient.
- ③ The design of vertical counter flow heat exchangers helps to facilitate the smooth separation of liquid condensate, ensuring that there is no accumulated water inside the system and avoiding corrosion to the equipment. At the same time, the high-efficiency water separator adopts a dual

water separation structure of initial and final stages, accurately controlling the water separation process, effectively ensuring that the dew point of compressed air does not rebound after reheating, and maintaining a stable operating state.

4.3 Energy efficient

- ① This machine has excellent overall efficiency and low input specific power. This is due to its super large pre cooling and heat exchange capacity, which reduces the refrigeration load of the entire machine, thereby achieving lower specific power.
- ② The entire series of products use environmentally friendly refrigerant compressors from well-known brands. After careful selection, we have adopted the most matching high-efficiency rotor or scroll refrigeration compressors to ensure excellent performance and stable reliability.
- ③ We independently design and produce condensers, combined with well-known brands of large air volume external rotor fans, which not only provide better heat dissipation, but also are more durable, providing users with long-lasting and stable cooling effects.
- ④ In order to reduce the pressure drop of the entire machine, we have adopted a larger channel design. Compared to most compact cross flow economic heat exchanger structures on the market, their pressure drop is generally 0.35Bar, while our high-end models only have a pressure drop of 0.15Bar. This reduced pressure drop can directly save users 1.2% of electricity consumption while ensuring more sufficient gas supply to meet various usage needs.

4.4 System optimization, reject ice blockage

- ① Adopting a smaller evaporator heat transfer temperature difference design to ensure that the evaporator evaporation temperature is higher than 0 °C, effectively avoiding ice blockage phenomenon.
- ② Adopting an intelligent electromagnetic bypass control system to maximize the rational utilization of refrigeration capacity, while accurately controlling excess cooling capacity, ensuring stable system operation.
- ③ The fan start-stop control adopts a refrigerant condensation temperature control strategy to improve control reliability and further reduce the risk of "ice blockage" in the refrigerated dryer under low flow or low ambient temperature.

4.5 Optimize the design of refrigeration control system

- ①The entire series of refrigerated dryers adopt dedicated intelligent controllers to achieve precise management and efficient control of the refrigeration process.
- ②The air-cooled model is equipped with advanced temperature control mechanism, which monitors the refrigerant condensation temperature in real time, intelligently adjusts the fan start and stop, ensuring that the temperature is stable within the ideal range and improving refrigeration efficiency.
- ③The high and low pressure protection of refrigeration compressors has been comprehensively upgraded, using membrane pressure switches instead of traditional reed pressure switches to improve the accuracy and reliability of pressure detection, further enhancing the safety and stability of the system.

4.6 Environmentally friendly materials with excellent corrosion resistance

- ①The "three in one" high-efficiency heat exchange system uses high-quality aluminum alloy materials, which have excellent corrosion resistance and can operate stably for a long time without being affected by environmental corrosion.
- ②The surface of aluminum alloy can naturally form a tight and sturdy AL_2O_3 protective film, which can effectively protect the material from corrosion and ensure that the compressed air entering the heat exchange system is not subjected to secondary pollution, providing users with a safer and more reliable user experience.

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