1 Basic data

ES-50A
EPSEA Air-cooled refrigerated air dryer

1.1 Rated working condition

Rated flow rate*	6.5m³/min
Rated inlet pressure	0.7MPa
Rated pressure drop	0.03MPa
Rated inlet temp.	38℃
Rated ambient temp.	38℃
Rated PDP.	10℃

*Related to 1bar a and 20℃ 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 and pressure C_1

	0.6MPa	0.7MPa	0.8MPa	0.9MPa	1.0MPa
25℃	1.08	1.2	1.32	1.4	1.56
30℃	0.99	1.1	1.21	1.32	1.11
38℃	0.9	1.0	1.1	1.2	1.3
40℃	0.81	0.9	0.99	1.08	1.17
45℃	0.72	0.8	0.88	0.96	1.04

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Ambient temperature correction factor C_2

20℃	25℃	30℃	35℃	38℃	40℃
1.16	1.12	1.08	1.03	1.00	0.98

PDP. correction factor C_3

3℃	5℃	7℃	10℃
0.7	0.78	0.89	1

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)

1.3 Working conditions

Fluid	Compressed air
Max. working pressure	1.0MPa
Min. working pressure	0.6MPa
Max. inlet air temp.	45℃
Min. inlet air temp.	10℃
Ambient temp.	2-40℃

1.4 Machine characteristics	
Length×width×height	900×500×880MM(EST.)
Weight	90kg
Air inlet pipe	R1-1/2
Cooling method	Air cooling
1.5 Electrical characteristics	
Power supply	1Phase/220V/50Hz
Compressor operating frequency	50Hz
Compressor power	1.14kW
Rated power	1.4kW
Control form	Instrument control
1.6 Description of main components	
Name	**Overview**
Compressor	Adopting advanced fully enclosed rotor 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 exclusive research and development of copper tube sleeve fin evaporator, cyclone centrifugal water separation structure, formed by a unique welding integrated heat exchange structure, independently designed and produced, can achieve flexible and variable structural customization and adjustment changes according to customer special requirements. Evaporator:Pure copper and aluminum fins,selected from high-quality purple copper and hydrophilic aluminum foil, with good heat dissipation effect. Water splitting structure:Adopting a cyclone centrifugal water separation structure and collision with a partition (wire mesh) dual pipe system to ensure higher water separation efficiency.
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.

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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.
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.
Pressure gauge	Made of high-quality stainless steel material, 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 R22 refrigerant injects a continuous stream of vitality and energy into the refrigeration system, ensuring stable operation and efficient performance of the system.
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.

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2 Functional characteristics

The structural design is reasonable, adopting the design concept of golden ratio, and has a strong sense of three-dimensional structure. Strictly follow ISO9001, GB150, ISO7183, QS and Inspection Specification for Pressure Vessels for design, manufacturing, production, and testing to ensure product safety and reliable operation.

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.

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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 2-10 ℃ 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.

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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 joint venture brand of fully enclosed compressors for the entire series. Our independently designed and produced condensers are paired with well-known brands of large air volume external rotor fans, ensuring the efficient operation of the machine.

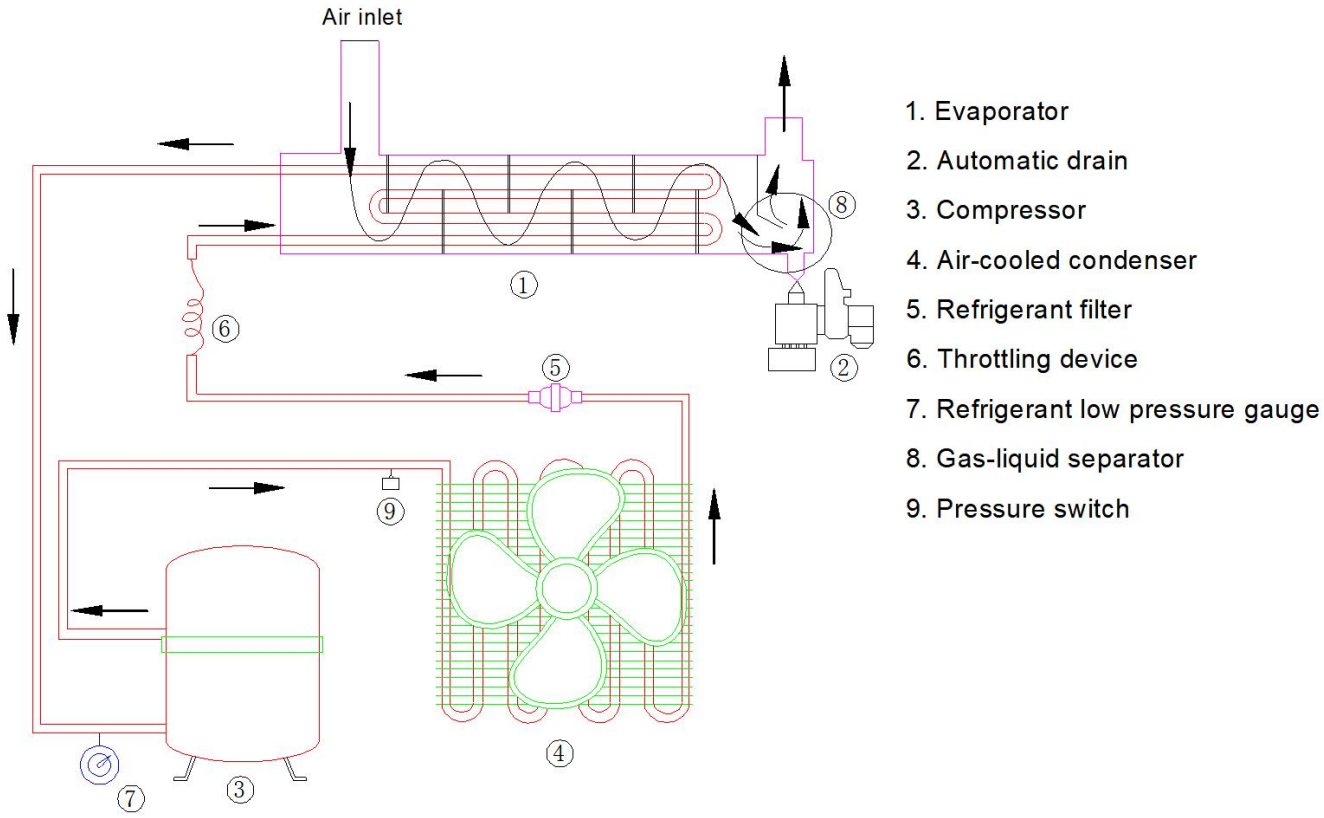

Figure 1

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4 Main features of the machine

4.1 Strictly standardize product design and production to ensure product safety and reliability

①Strictly according to ISO9001, GB150 standard, ISO7183 standard, QS, pressure vessel inspection code for design, manufacture, production and testing, to ensure that the product is safe and reliable operation.

②No foundation installation, can be installed under reasonable ambient temperature.

4.2 Optimized refrigeration system design, stable dew point of 10℃

①The dew point is more stable. When the intake temperature reaches 38 ℃ under standard operating conditions, the exhaust pressure dew point can be stabilized at 10 ℃, ensuring the continuity and reliability of system operation.

②Adopt external rotor axial fan, large air volume, long life.

③Independently designed and produced heat exchanger.The air-cooled condenser is produced independently and adopts hydrophilic aluminum foil for higher heat exchange efficiency.

4.3 Energy efficient

①The entire series of products use fully enclosed compressors from joint venture brands. After careful selection, we have adopted the most matching high-efficiency rotor or scroll refrigeration compressors to ensure excellent performance and stable reliability.

②We 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.

③Cooling system with automatic pressure switch to control the fan power to maximize the effect of power saving, compared with the power saving of more than 30%.

4.4 System optimization, reject ice blockage

①Adopting a smaller evaporator heat transfer temperature difference design to ensure that the evaporator evaporation temperature is higher than 0 ℃, effectively avoiding ice blockage phenomenon.

②The fan start-stop control adopts a pressure control strategy to improve control reliability and further reduce the risk of "ice blockage" in the cold dryer under low flow or low ambient temperature.

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4.5 Optimize the design of refrigeration control system

①The refrigeration components and control components are all made of international high-quality brands to improve their service life.

②The air-cooled model adopts pressure control to reasonably control the start-stop of the fan.

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