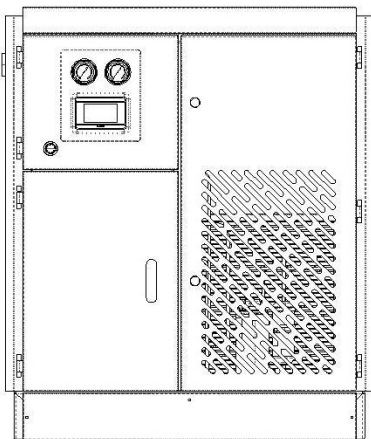


## 一、Parameter Condition

|                                                                                                                                                   |                |       |                                                                                    |                |      |      |         |                |      |        |
|---------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------|------------------------------------------------------------------------------------|----------------|------|------|---------|----------------|------|--------|
| EPV-069AH Refrigerated Air Dryer                                                                                                                  |                |       |  |                |      |      |         |                |      |        |
| 1.1 Rated Operating Condition                                                                                                                     |                |       |                                                                                    |                |      |      |         |                |      |        |
| Rated Flow Rate                                                                                                                                   | m³ /min        | 6.9   |                                                                                    |                |      |      |         |                |      |        |
| Rated Intake Pressure                                                                                                                             | MPa            | 0.7   |                                                                                    |                |      |      |         |                |      |        |
| Rated Pressure Drop                                                                                                                               | MPa            | 0.015 |                                                                                    |                |      |      |         |                |      |        |
| Rated Intake Temp.                                                                                                                                | °C             | 45    |                                                                                    |                |      |      |         |                |      |        |
| Rated Ambient Temp.                                                                                                                               | °C             | 38    |                                                                                    |                |      |      |         |                |      |        |
| Rated PDP                                                                                                                                         | °C             | 7     |                                                                                    |                |      |      |         |                |      |        |
| 1.2 Multiply The Actual Flow Rate In Other Conditions By The Following Correction Factor                                                          |                |       |                                                                                    |                |      |      |         |                |      |        |
| Intake Temp. Correction Factor C1                                                                                                                 |                |       |                                                                                    |                |      |      |         |                |      |        |
| °C                                                                                                                                                | <3             | 3~44  | 45                                                                                 | 48             | 50   | 53   | 55      | 58             | 60   | >60    |
| C1                                                                                                                                                | No Use         | 1     | 1                                                                                  | 0.88           | 0.8  | 0.7  | 0.64    | 0.57           | 0.52 | No Use |
| Intake Pressure Correction Factor C2                                                                                                              |                |       |                                                                                    |                |      |      |         |                |      |        |
| MPa <sub>b</sub>                                                                                                                                  | <0.25          | 0.3   | 0.4                                                                                | 0.5            | 0.6  | 0.7  | 0.8~1.6 | >1.6           |      |        |
| C2                                                                                                                                                | Restricted Use | 0.56  | 0.68                                                                               | 0.79           | 0.9  | 1    | 1       | No Use         |      |        |
| Ambient Temp. Correction Factor C3                                                                                                                |                |       |                                                                                    |                |      |      |         |                |      |        |
| °C                                                                                                                                                | <3             | 3~37  | 38                                                                                 | 39             | 40   | 41   | 42      | >42            |      |        |
| C3                                                                                                                                                | Restricted Use | 1     | 1                                                                                  | 0.93           | 0.86 | 0.79 | 0.71    | Restricted Use |      |        |
| Dew Point Correction Factor C4                                                                                                                    |                |       |                                                                                    |                |      |      |         |                |      |        |
| °C                                                                                                                                                | 3              |       |                                                                                    | 7              |      |      | 10      |                |      |        |
| C4                                                                                                                                                | 0.7            |       |                                                                                    | 1              |      |      | 1       |                |      |        |
| For example: when the ambient temp. is 40°C, the intake pressure is 0.6 MPa, the intake temp. is 45°C, and the required exhaust dew point is 10°C |                |       |                                                                                    |                |      |      |         |                |      |        |
| Then the actual flow rate is 6.9*0.86*0.9 = 5.4 m³ /min.                                                                                          |                |       |                                                                                    |                |      |      |         |                |      |        |
| 1.3 Use Condition                                                                                                                                 |                |       |                                                                                    |                |      |      |         |                |      |        |
| Use Fluid                                                                                                                                         | /              |       |                                                                                    | Compressed Air |      |      |         |                |      |        |
| Max Working Pressure                                                                                                                              | MPa            |       |                                                                                    | 1.6MPa         |      |      |         |                |      |        |
| Min Working Pressure                                                                                                                              | MPa            |       |                                                                                    | 0.25MPa        |      |      |         |                |      |        |
| Max Air Inlet Temp.                                                                                                                               | °C             |       |                                                                                    | 60             |      |      |         |                |      |        |
| Min Air Inlet Temp.                                                                                                                               | °C             |       |                                                                                    | 3              |      |      |         |                |      |        |
| Max Ambient Temp.                                                                                                                                 | °C             |       |                                                                                    | 45             |      |      |         |                |      |        |
| Min Ambient Temp.                                                                                                                                 | °C             |       |                                                                                    | 1              |      |      |         |                |      |        |

## 1. 4 Equipment Characteristics

|                     |      |                                        |
|---------------------|------|----------------------------------------|
| Length*Width*Height | mm   | 1050×680×1235 (subject to the actual ) |
| Weight              | kg   | 166±10% (subject to the actual )       |
| Inlet/Outlet        | inch | Rp1-1/2                                |
| Cooling Type        | /    | Air-cooled                             |

## 1. 5 Electrical Characteristics

|                                |                    |                   |
|--------------------------------|--------------------|-------------------|
| Power Supply                   | Voltage//Frequency | 220V//50/60       |
| Compressor Operating Frequency | Hz                 | 30~90             |
| Compressor Power Range         | kW                 | 0.35~1.04         |
| Compressor Power               | kW                 | 1.04              |
| Rated Power of the Equipment   | kW                 | 1.4               |
| Control Mode                   | /                  | VSD Control Board |

## 1. 6 Equipment Parts

|                                              |                                                                                                                                                                          |
|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hermetic Rotary Compressor                   | Internationally renowned brand, excellent variable-speed control performance, and motor efficiency up to 95%                                                             |
| Pure Copper Sleeve Aluminum Fin Condenser    | Stable condensation effect, and the heat exchange area ratio exceeds 3.5 m <sup>2</sup> /kW                                                                              |
| 3-in-1 High-performance Plate Heat Exchanger | The temperature difference between inlet and outlet is 5°C, with good precooling heat exchange effect, pressure drop within 3%, and water separation efficiency of 99.9% |
| Electronic Expansion Valve                   | 500-step fine adjustment, precisely controls to suitable evaporation temperature                                                                                         |
| Bypass Valve                                 | Controllable opening, stable bypass, precisely controls to the target temperature, no ice blockage                                                                       |
| Zero Loss Automatic Drainer                  | Large - diameter drainage, hard to clog. No air consumption, high drainage volume, one unit suffices for a 65m <sup>3</sup> /min machine.                                |
| R-410A                                       | Environmentally friendly and pollution-free. At the same evaporation temperature, the refrigeration capacity is increased by more than 35% compared with R22             |
| High and Low Pressure Sensors                | Accurate measurement with a precision of 0.01bar                                                                                                                         |
| Temperature Sensor                           | Accurate measurement with a precision of 0.1 °C                                                                                                                          |
| 4.3-inch FLEXEM Intelligent Touch Screen     | High-definition LCD display, 24-bit true color; fast running speed, CPU frequency 600MHz                                                                                 |

## 二、Control System

### Main Characteristics

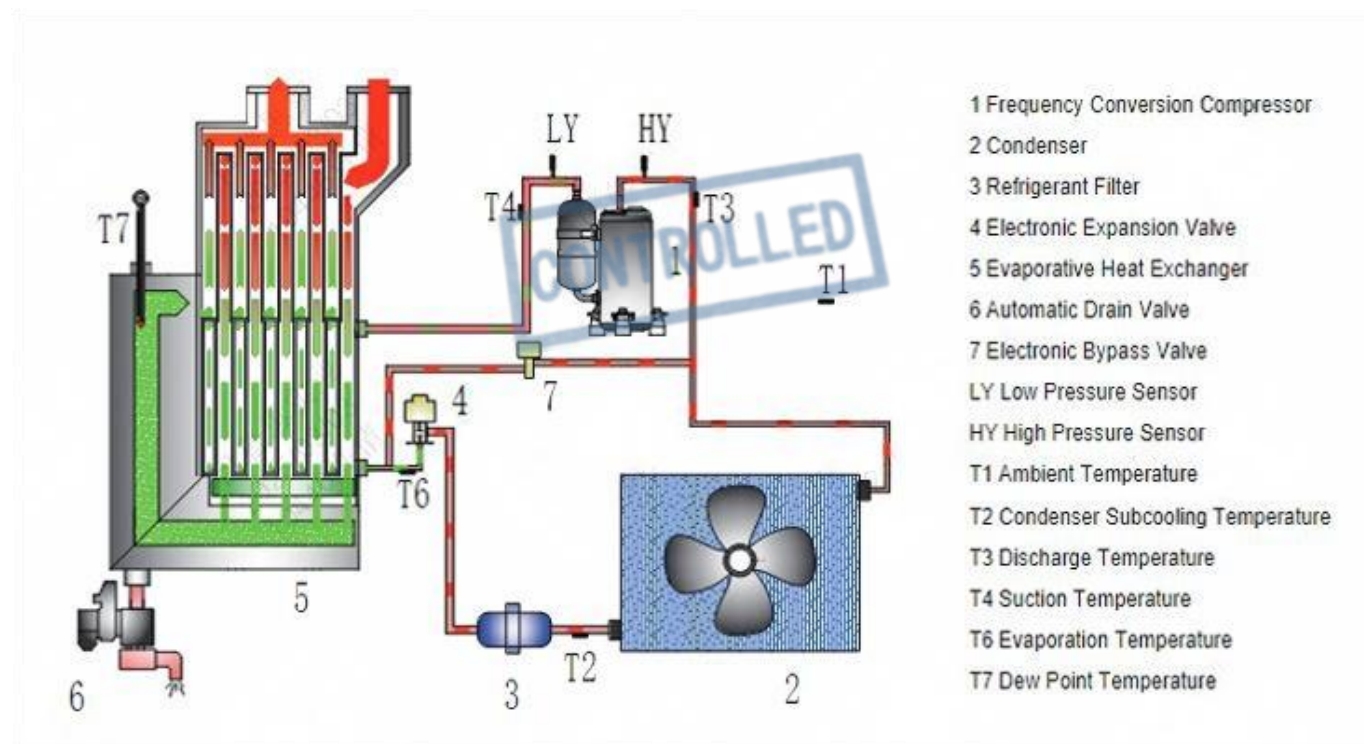
2. 1 Standard high-definition screen, with clear process principle and operation parameters
2. 2 Precise control with variable dew point to achieve stable drying performance
2. 3 Wide-range adjustment from 30 to 90Hz, enabling precise frequency matching from 0 to rated flow rate, energy-saving, stable and no ice blockage

- 2.4 Comprehensive intelligent protection mechanism. High and low pressure alarms, exhaust temperature alarm, high and low pressure sensor fault alarm, each temperature probe fault alarm, phase sequence alarm, overload alarm, ambient temperature alarm, etc. will all be displayed in real time when they occur
- 2.5 Simple to install and easy to disassemble, small and exquisite, taking up no space and convenient for layout
- 2.6 Equipped with standard Internet of Things box and 485 interface, enabling remote start-stop, remote alarm and remote data detection

### 三、Function Features Introduction

It adopts well-known brand compressors and VSD technology. It can automatically adjust the running frequency of the compressor and the opening of the electronic expansion valve according to the actual gas consumption on site, adjust the output of refrigeration capacity, stably control the set target temperature, and save electricity. Moreover, the automatic adjustment function of the electronic expansion valve ensures that the dryer will no ice blockage.

#### 3.1 Working Principle



As shown in the figure, the refrigerated air dryer is mainly divided into refrigeration cycle part and air heat exchange part. According to the temperature of the compressed air inlet, a corresponding pre-cooler will be equipped. According to the cooling mode of the condenser, the refrigerated air dryers are divided into air-cooled type and water-cooled type.

**Refrigeration part:** The refrigeration compressor sucks in and compresses the low-temperature and low-pressure gaseous refrigerant in the evaporator, causing its pressure and temperature to rise simultaneously. The high-temperature and high-pressure refrigerant vapor is then forced into the condenser. Inside the condenser, the relatively high-temperature refrigerant vapor exchanges heat with the cooler cooling water or air. The heat contained in the refrigerant is taken away by the water or air, causing the refrigerant to condense and turn into a liquid state. This liquid is then conveyed to the throttling mechanism. After throttling, it forms a low-temperature and low-pressure liquid and enters the evaporator. The low-temperature and low-pressure liquid refrigerant in the evaporator absorbs the heat from the

compressed air and vaporizes (commonly known as "evaporation"). The refrigerant vapor in the evaporator is then sucked away by the compressor. In this way, four processes - compression, condensation, throttling, and evaporation - are formed in the refrigerant system, completing one cycle.

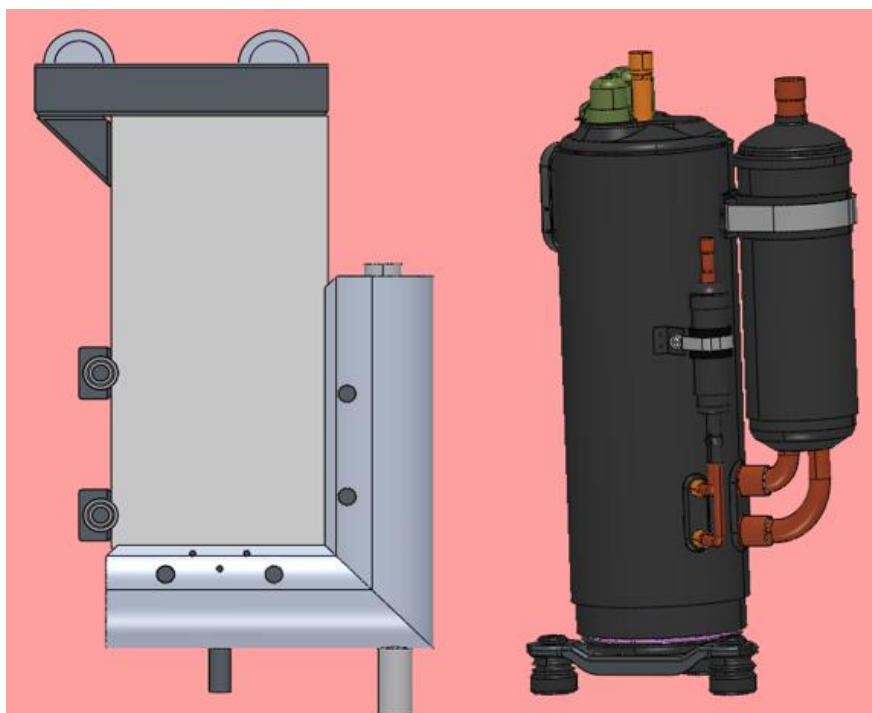
**Air heat exchange part:** The compressed air enters the evaporator and undergoes heat exchange with the refrigerant, which cools the compressed air to a dew point temperature ranging from 2 to 10 ° C. During the cooling process of the compressed air, water will be separated out. At the same time, oil and some impurities will also be condensed. Then, gas-liquid separation is carried out through a separator, and the separated liquid is discharged through an automatic drain valve, thus achieving the purpose of freezing, purifying and dehumidifying.

The above is the working principle of the refrigerated air dryer. Since the air consumption of users is not constant, while the total energy consumption of power frequency machines remains the same regardless of the change in air consumption, the variable frequency refrigerated air dryer was developed. When the air consumption is low, the variable frequency refrigerated air dryer reduces the rotation speed of the compressor through frequency conversion without changing the dew point of the finished gas, thereby reducing the overall operating energy consumption of the machine. When the air consumption is high, it increases the rotation speed of the compressor through frequency conversion to maintain the dew point of the finished gas. Based on this principle, the variable frequency refrigerated air dryer achieves energy - saving effects by controlling the rotation speed of the compressor.

### 3.2 Main features of the machine:

- 3.2.1 It can automatically adjust the output power according to the actual air consumption, with obvious energy - saving effects;
- 3.2.2 It can provide a constant cooling capacity output under the same working conditions, and accurately and stably control the dew point of the finished gas;
- 3.2.3 It enables soft - start of the motor, thereby extending the service life of the compressor;
- 3.2.4 It uses environmentally - friendly refrigerants to manufacture green products.

### 3.3 Features of the main components:



- 3.3.1 **Plate heat exchanger:** It adopts a 3-in-1 high-performance plate heat exchanger, which has the characteristics of high heat exchange efficiency, small heat loss, compact and lightweight structure, small floor space, wide application range, long service life, etc. At the same time, with the large flow channel design, the pressure drop is less than 0.2 bar. Coupled with its high heat exchange efficiency, including excellent pre-cooling effect, it can reduce the refrigeration capacity and further save energy.
- 3.3.2 **Variable frequency compressor:** It adopts the rotary compressor from well-known international brand. It features a simple structure, high rotational speed, compact dimensions, small volume and light weight. It has small vibration and runs stably. Also, it has excellent variable-speed operation performance with a wide variable-speed range. On the other hand, the variable frequency compressor can further enhance the refrigeration capacity by increasing the rotational speed. With a smaller size, it can perform more work and has a lower cost
- 3.3.3 **Variable frequency controller:** Each compressor needs to be deeply paired with the corresponding control board, and the parameters need to be adjusted one by one to enable the system to reach the optimal operating state. At the same time, as the most important component and the carrier of all core control logic and programs, it is a key link to achieve the best energy savings under various working conditions, and represents the true technology of the variable frequency refrigerated air dryers.

#### 四、Energy consumption comparison

When air consumption varies at different times, the variable frequency refrigerated air dryer has significant energy-saving advantages over the power frequency one.

Example 1: The user configured 6.9m<sup>3</sup> processing capacity of the plate change frequency conversion refrigerated air dryer, compared with the shell-tube type frequency refrigerated air dryer. Target dew point is 10℃, inlet temperature is 45℃, the production line is operating at full load during the day, assume that the fan is often rotating, and it is only operating at half load at night. Due to differences in pre-cooling effects, the fan configurations for frequency conversion and power frequency refrigerated air dryers are different. 6.9 m<sup>3</sup> shell-tube power frequency refrigerated air dryer is equipped with 1.25kW compressor. The frequency conversion refrigerated air dryer is equipped with the compressor 5SS072, the power 0.691kW@60Hz, the frequency reaches 90Hz (1.04kW) and the same effect as the power frequency refrigerated air dryer, then the power consumption of a day is:

| Type                               | Plate Change VSD Refrigerated Air Dryer | Shell&Tube Power Frequency Refrigerated Air Dryer |
|------------------------------------|-----------------------------------------|---------------------------------------------------|
| Fan Configuration                  | 1*400mm—0.17kW                          | 2*350mm—0.3kW                                     |
| Daily compressor power consumption | 1.04*12+1.04/2*12=18.7kW                | 1.25*24=30kW                                      |
| Daily fan power consumption        | 0.17*12+0.17*12*0.5=3.1kW               | 0.3*12+0.3*12*0.5=5.4kW                           |

|                                |                                          |                                       |
|--------------------------------|------------------------------------------|---------------------------------------|
| Daily total energy consumption | $18.7+3.1=21.8 \text{ kW}\cdot\text{h}$  | $30+5.4=35.4 \text{ kW}\cdot\text{h}$ |
| Daily energy savings           | $35.4-21.8=13.6 \text{ kW}\cdot\text{h}$ |                                       |
| Energy-saving ratio            | $13.6/35.4=38.4\%$                       |                                       |

Example 2: The user configured  $6.9\text{m}^3$  processing capacity of the plate change frequency conversion refrigerated air dryer, compared with the plate frequency refrigerated air dryer. Target dew point is  $10^\circ\text{C}$ , inlet temperature is  $45^\circ\text{C}$ , the production line is operating at full load during the day, assume that the fan is often rotating, and it is only operating at half load at night. Due to the pre-cooling effect is the same, the fan configuration is also the same.  $6.9 \text{ m}^3$  plate change power frequency refrigerated air dryer is equipped with  $1.16\text{kW}$  compressor. The frequency conversion refrigerated air dryer is equipped with the compressor 5SS072, the power  $0.691\text{kW}@60\text{Hz}$ , the frequency reaches  $90\text{Hz}$  ( $1.04\text{kW}$ ) and the same effect as the power frequency refrigerated air dryer, then the power consumption of a day is:

| Type                               | Plate Change VSD Refrigerated Air Dryer | Plate Change Power Frequency Refrigerated Air Dryer |
|------------------------------------|-----------------------------------------|-----------------------------------------------------|
| Fan Configuration                  | $1*400\text{mm}-0.17\text{kW}$          | $1*350\text{mm}-0.15\text{kW}$                      |
| Daily compressor power consumption | $1.04*12+1.04/2*12=18.7\text{kW}$       | $1.16*24=28.8\text{kW}$                             |
| Daily fan power consumption        | $0.17*12+0.17*12*0.5=3.1\text{kW}$      | $0.15*12+0.15*12*0.5=2.7\text{kW}$                  |
| Daily total energy consumption     | $18.7+3.1=21.8 \text{ kW}\cdot\text{h}$ | $28.8+2.7=31.5 \text{ kW}\cdot\text{h}$             |
| Daily energy savings               | $31.5-21.8=9.7 \text{ kW}\cdot\text{h}$ |                                                     |
| Energy-saving ratio                | $9.7/31.5=30.8\%$                       |                                                     |

Based on the above two cases, it can be seen that compared with the traditional shell&tube power frequency refrigerated air dryer and the plate change power frequency refrigerated air dryer, the variable frequency plate change refrigerated air dryer can significantly reduce power consumption when it is under half load for half of the time, and the energy-saving effect is obvious. The combination of plate change and variable frequency, which provides dual energy-saving features, is definitely the best choice.

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