

Hydroponic Chiller

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1. What Is Hydroponic?

Hydroponics is a method of growing plants without soil, with the plants receiving their nutrients directly from a nutrient-rich water solution. Unlike traditional soil cultivation, hydroponic systems provide all the basic elements plants need to grow in a controlled, soilless environment.

In a hydroponic system, plants are typically grown in an inert growing medium such as perlite, rockwool, coir, or other soilless substrates. The roots of the plant are submerged or periodically exposed to a nutrient-rich water solution that contains a balanced mixture of essential minerals and nutrients that the plant needs to grow.

There are several types of hydroponic systems, each with its own way of delivering nutrients to plants:

Nutrient Film Technology (NFT): In this system, a thin layer of nutrient solution continuously flows through the plant roots, providing a continuous supply of nutrients and oxygen.

Drip Irrigation Systems: Drip irrigation systems deliver nutrient solution to the roots of each plant through a network of pipes and emitters, allowing for precise control of nutrient delivery.

Ebb and flow (ebb and flow): This system periodically injects nutrient solution into the growing medium and then allows the nutrient solution to drain away, providing oxygen to the roots.

Aeroponics: Plants are suspended in a fine mist of air or nutrient solution to maximize the roots' exposure to oxygen.

Deep Water Culture (DWC): In DWC, plant roots are suspended in a nutrient-rich, oxygenated aqueous solution. Air stones or diffusers are used to provide oxygen to the roots.

Wick System: Nutrient solution is drawn through the wick into the growing medium where it is absorbed by the plant roots.



Hydroponic

2.What is A Hydroponic Chiller?

A hydroponic water chiller is a refrigeration system that provides process cooling to the hydroponic reservoir. Water temperatures that are too high will seriously affect plant growth. The ideal water temperature for hydroponics promotes a good balance between the plant's oxygen use and metabolism. For commercially grown plants, temperatures can be between 59 and 86 degrees Fahrenheit.



10HP Hydroponic Chiller

3.How Do Hydroponic Chillers Work?

A hydroponic water chiller works on the same principle as a standard industrial chiller. The nutrient-rich solution within the system is circulated through a chiller containing a cooling coil, cooling it to the desired temperature.

4.Why Need a Water Chiller System for Hydroponics?

Hydroponics is a type of hydroponics in which plants are grown in a nutrient-rich water-based solution instead of soil. Hydroponic systems, like traditional nurseries, require sunlight or grow lights to keep crops growing properly.

Temperature control is especially important when growing plants hydroponically because different plants grow best at different temperatures. Cucumbers, for example, thrive in high temperatures.

Using a water cooling system, reflective metal to protect the reservoir from ambient heat, or investing in a hydroponic chiller are all options for controlling the ambient temperature of your hydroponic reservoir. Industrial chillers have the highest cooling efficiency of any temperature control technology.



Hydroponic Process

5.What's the Difference Between Air-cooled & Water-cooled

Hydroponic Chillers? There are two types of Hydroponic chiller: one is **air-cooled**

Hydroponic chiller, the other is **water-cooled Hydroponic chiller**;

Air-cooled Hydroponic chillers use ambient air to dissipate heat from the brewing processes. They are energy-efficient, space-saving, and less maintenance that helps save money.

Water-cooled Hydroponic chillers use water from an external water cooling tower to dissipate heat from the brewing processes. These systems are longer lifespan, Relatively quiet, and more consistent cooling performance than the air-cooled Hydroponic chiller.

6.What Are the Differences Between Hydroponic Scroll Chiller and Hydroponic Screw Chiller?

Hydroponic Scroll Chiller

•1/2 HP-60HP

•Danfoss/Panasonic Scroll Compressor

•Built with water tank and water pump

Hydroponic Screw Chiller

Above 60HP

Hanbell/Bitzer Screw compressor

Without water tank and water pump



Air-cooled Hydroponic Scroll Chiller



Air-cooled Hydroponic Screw Chiller



Water-cooled Hydroponic Scroll Chiller



Water-cooled Hydroponic Screw Chiller

7.What Are The Main Components of Hydroponic Chillers?

7.1 Compressor

The compressor is the key mover in water chiller because it produces pressure variations to stir the refrigerant around.

From 1/2HP(1/2 Ton) to 60HP(50Ton) Hydroponic chiller , which is with **Panasonic** or **Danfoss brand Scroll compressor** ,

Above 60HP Hydroponic chiller,which is with **Hanbell** or **Bitzer screw compressor**;



Panasonic Compressor

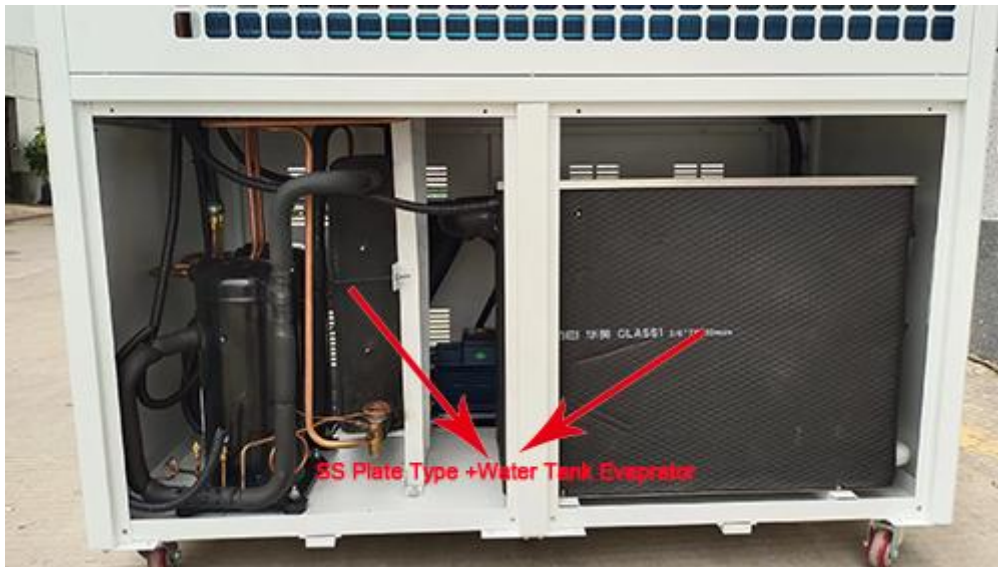


Danfoss Compressor

7.2 Evaporator

The evaporator is a crucial component of air-cooled water chiller, as it is responsible for extracting heat from the liquid being cooled, it is located between the compressor and the expansion valve. There are three types of evaporators : **coil in water tank evaporator** , **shell and tube evaporator**, **304SS stainless steel plate type evaporator**.





SS Plate Type+ Water Tank Evaporator

7.3 Water Pump

The water pump is designed to increase the pressure and the flow of the chilled water in a closed space.

Hydroponic Chiller is used with 304 Stainless Steel Water pump.



7.4 Condenser

The condenser for air-cooled Hydroponic cooler is equipped with efficient cross-seam fins and female threaded copper tubes for high heat exchange efficiency and good stability. Its function is to cool down the refrigerant steam released from the compressor into a liquid or gas-liquid mixture.



Aluminum fin+fan Condenser for air -cooled Hydroponic chiller

The condenser for water-cooled Hydroponic cooler is shell and tube ,with the internal copper tubes employing an outer thread embossing process. This design effectively enhances the heat exchange efficiency between the refrigerant and water during the process. Compared to traditional smooth copper tubes, the outer thread embossing process increases the surface area of the copper tubes, thereby expanding the contact area for heat exchange and improving the thermal conductivity of the condenser. This optimization design allows the condenser of the water-cooled chiller to transfer heat from the refrigerant to the water more rapidly and consistently, enabling the water to carry away the heat.



Shell and tube Condenser for water-cooled Hydroponic chiller

7.5 Controller Panel

Water chillers use precision digital temperature controller, it RS485 communication port, which can do remote monitoring and control. Simple operation, low failure rate, high safety factor, easy installation.



Controller Panel

8. What are the Key Features of a Hydroponic Chiller?

- Energy-efficient Panasonic/Danfoss/Hanbell/Bitzer compressor
- Chilled Outlet water temperature control 7°C to 25°C
- Precise temperature controller
- Environment-friendly refrigerant R407c/r410a
- PID temperature controller
- Easy installation ,operation and low cost of maintenance

- 304 Stainless Steel Plate Type /Shell And tube as evaporator

9.Benefits of Hydroponic Water Chillers

Industrial chillers can be used to achieve temperature control within hydroponic cultures to aid proper plant growth. A water chiller system for hydroponics offers the following benefits over other process cooling methods:

- High-efficiency cooling with reliable operation
- Suitable for large-scale hydroponic systems
- Custom chiller sizes
- Remote operation via R485 to monitor and regulate process temperatures

10.How to Choose Right Hydroponic Chiller for Your Hydroponic Process?

How to calculate right cooling capacity for your Hydroponic chillers?

- First, determine the approximate amount of water (in gallons) for your hydroponic system.
- Next, try to find the maximum temperature for your process. You can do this by turning on all heat-producing appliances or recording the system's temperature during the hottest times of the day.
- Use ice packs to cool the system to the desired temperature to avoid increasing the amount of water in the system.
- Once the desired temperature is reached, the ice is removed from the system and the process water is circulated.
- After removing the ice pack for the first time, record the system temperature.
- After 1 hour, record the current system temperature.
- Subtract the initial temperature from the current temperature and record this value, called the temperature difference.
- Use this simple formula to find your ideal chiller capacity in BTU/hr: Amount of water in system (gallons) * 8.34 * Temperature difference (°F)
- We can offer hydroponic water chillers ranging in capacity from 1/2 to 100 tons. They can keep the temperature within $\pm 0.1^{\circ}\text{C}$ of your desired set point.

Types of Hydroponic chiller system?

There are two types of chiller :**Air Cooled Hydroponic Chiller** and **Water Cooled Hydroponic Chiller**.

Water cooled chiller needs a separated water cooling tower and water cooling pump ,if you don't have existing water cooling tower,we suggest you use air cooled chiller; But if your ambient temperature is very high above 55°C ,we suggest you use water cooled chiller , as it is easier to dissipate heat for water cooled chiller with water cooling tower.



Guangdong Tongwei Machinery Co.,ltd. www.refrigerationchillers.com

But Most customers use air cooled Hydroponic chiller ,which is more easily install and save space.

Whether chillers need built-in Tank or not?

In a chiller system, a tank is usually equipped to buffer the thermal load of the chiller.

But should we choose a built-in type of tank or an external type of tank?

A chiller with a built-in tank is easier to install and can be used simply by connecting a water pipe to your application.

But it has a limited capacity and is not suitable for applications with larger chilled water demands.External tank's capacity can be customized according to specific needs.

It can buffer a larger heat load, store more chilled water, but the installation will be more troublesome.

If you don't have external water tank ,we suggest our chiller built-with water tank ,which is easy for you to install.

Cooling capacity unit conversion?

1 KW=860 kcal/h ;

1 TON=3.517 KW;

1 KW=3412 Btu/h;

11. *Get a Quote* on Industrial Hydroponic Chillers Now

As a leading industrial chiller manufacturer,we engineer and produce high-quality process chillers compatible with a broad range of industrial processes.

Depending on your needs, we also offer custom chillers to ensure that each client receives the industrial chiller best suited to their unique process.

Request a quote now on our Hydroponic water chillers or learn about the other *air-cooled chillers* and water-cooled chillers.