

## Frequently Asked Questions

### **1. What is an Air to Water Heat Pump? (a/k/a AWHP, ATWHP, Reverse Cycle Chiller, or Hydronic heat Pump)**

- An ATWHP is a special type of ultra-high efficiency heat pump that is self-contained (keeps all of the refrigerant outdoors in the outdoor unit) and connects to indoor heating, cooling, or hot water loads or equipment via insulated PEX water lines. ATWHPs are used with any, all, or a combination of radiant heating, radiant cooling, ductless room fan coil units, duct system air handlers, and hot water heater tanks (indirect type).

### **2. Does the air to water heat pump chiller heat pump consume water?**

- The air to water heat pump (reverse cycle chiller) does not consume any water and works in all humidity conditions. It uses a ultra-high efficiency DC-Inverter variable speed compressor with a small amount of R410a refrigerant self-contained in the outdoor unit. The water or water/glycol fluid is only used in a sealed loop, to transfer heating or cooling between the outdoor unit and the indoor units. Actually, a chiller is defined as a split system where water or water/glycol lines connect the indoor equipment to the outdoor equipment.

### **3. How many indoor units will the chiller support?**

- In general, the air to water heat pump chiller can support any number of indoor units, that together, do not exceed the BTU capacity of the chiller(s). It is also possible to use more indoor units than the math supports, as long as you realize that they cannot all run at full speed at the same time and still deliver the expected cooling or heating.

### **4. What different size systems are available?**

- 2 sizes of outdoor units - the CX34 (CX35 is similar) with 2 tons cooling, 2.75 tons heating, and the CX50 with 3.5 tons cooling and 4.8 tons heating. These are modular, meaning that they can be combined in any combination to achieve systems up to 10.5 tons cooling and 14.4 tons heating.

### **5. Can I use it with a ducted or central system?**

- We offer ducted AHU (hydronic air handler units) for ducted systems. These connect into a ducted system in the same manner as a regular AHU. In addition, you can use any standard fan coil ducted unit/hydronic air handler

of the correct capacity that you may purchase on the open market, they are available through most HVAC supply houses. Please contact us to help with sizing this type of unit as the sizing will be non-standard.

#### **6. How does our Air-to-Water compare to a multi-head or VRF mini-split system?**

- Same or better heating performance, better cooling performance.
- Ability to totally integrate variable backup heating, no “heat strips” or portable heaters ever needed.
- Ability to also perform domestic water heating.
- Ability to work with radiant heating (and/or radiant cooling in most climates).
- Can work with any or all of ductless, central duct, mini-duct, radiant, water heating, all in the same application.
- No refrigerant handling, self-contained outdoor unit is an “appliance”, enables DIY or lower-skill installation.
- No refrigeration license needed, can be installed by HVAC and plumber contractor.
- No refrigerant is ever inside the building envelope.
- Indoor-side system, once installed, is future-proof and uses a water or water/glycol mix, it is compatible with future technologies, and next-gen refrigerants that you definitely don’t want indoors. The newer high-efficiency and environmentally friendly refrigerants tend to be highly toxic and/or flammable (refrigerants such as R32, R290, etc., this is stuff that you don't want inside the building envelope).
- No arbitrary line-set length limits or vertical lift limits.
- Multiple indoor head units possible - up to 12 or more indoor units, according to the loads and design.
- Leaks - in a multi-head (or VRF) mini-split system, if there is ever a leak, you may need to rip down a lot of drywalls to find it. Not bragging about leaks, but with mini-splits that can happen from time to time. With water, if a leak were to occur it will be immediately obvious and you will know where a leak is, as a few gallons will come out before the unit stops itself. Of course, with a PEX system, there are rarely if ever leaks. With PEX piping, which is also commonly used for normal plumbing, you should not ever have a leak.

#### **7. What about Comparison to EVI Compressor Units?**

- For most users in the USA, an EVI compressor will not result in any annual savings. In general, EVI compressors have better performance at very cold

temperatures, but sacrifice efficiency during the milder part of the heating season and have poor cooling performance. If you are in a climate where more than 15% of your annual heating hours are below 0F there may be some advantages to EVI. Please contact us for the ASHRAE Hourly Normals report for your nearest weather station, we can show you how many hours you will have per year at each temperature. Only in extreme elevations do we see advantages in USA for EVI compressors. Even in Canada, or coastal Alaska, EVI usually calculates out to higher annual energy use.

#### **8. What about floor heating (Radiant Heating)?**

- Once you have experienced the comfort and efficiency of in-floor heating, you may never again be satisfied with any other type of heating. Our system is highly compatible with hydronic floor heating and is designed to deliver an optimum floor heating experience. Our system can work with in-floor radiant or radiant in walls or ceiling, or with radiant panels. And radiant can be used in combination with other means such as fan coils, air handlers, etc.

#### **9. What about Radiant Cooling? (And Radiant Cooling Dew Point Control?)**

- Like radiant heating, radiant cooling can be far more comfortable, increase indoor air quality, and can be the most efficient cooling choice available. Our system is highly compatible with radiant cooling and produces a special radiant cooling controller that can ensure that the system works at maximum capacity while never producing a radiant surface below the dew point. Care must be taken in regards to dew point control, to prevent unwanted condensation.

#### **10. What is the SEER rating?**

- There is no US DOE, EnergyStar, or other SEER test or rating for air to water heat pump chillers. ATWHP units are rated under AHRI 550/590 which does not include SEER and are rated with IPLV. IPLV is to chillers what SEER is to standard air conditioners. It's the official AHRI efficiency rating and it's the only rating that matters for chillers. IPLV is the industry-standard way of measuring the overall efficiency of a hydronic (chiller) cooling system. IPLV stands for Integrated Part Load Value, it's a similar concept to SEER, where part-load performance is measured and rated so that customers can have a way to do an apples-to-apples comparison of real-world operating efficiency between various brands and models. IPLV and NPLV are specified in AHRI 550/590.

### **11. What is the HSPF Rating?**

- As with SEER, air to water heat pumps do not have a HSPF rating since HSPF is not available under AHRI 550/590. However, SCOP is available under IEC EN14825. For example, the CX50 is also certified under EN14285 where it has a SCOP of 4.55, which converts to an equivalent HSPF 15.51. But note, this is not a HSPF rating, only an equivalent.

### **12. How about Dehumidification?**

- Like all air conditioning systems, when the cooling coils are below the dew point, dehumidification is performed. Our system performs strong dehumidification comparable to a standard air conditioning system. And when used with DHC (Dynamic Humidity Control), our system can lower the coil temperature well below the standard condition to perform hyper-dehumidification and can also turn off dehumidification when not needed, to save energy..

### **13. What is the Psychrologix™ Controller?**

- The Psychrologix™ is a very unique and special controller. It is a programmable indoor controller that automates many features such as chiller reset, auto-changeover from cooling to heating, alarms, vacation mode, and many other features and includes the DHC (Dynamic Humidity Control) function. Note, this controller is not a thermostat, all thermostat functions are handled by the individual fan coil unit thermostats or in the case of ducted systems, by a standard thermostat.

### **14. What is DHC/Dynamic Humidity Control?**

- DHC control can automatically manage the chiller cooling parameters to increase or decrease, or stop, dehumidification. If indoor humidity rises, the system can automatically decrease the coil temperature to a lower temperature so as to perform accelerated dehumidification. During times when humidity is within the ASHRAE recommended range, the DHC will "turn off" dehumidification, allowing the system to continue to manage sensible (regular thermometer) temperature at a greatly reduced power consumption level. Indoor humidity occurs after an event such as a exterior door opening on a humid day, or taking a hot shower. Once removed, humidity will not increase again on its own, until the next humidity event occurs. Our system

efficiency can increase up to 50% above it's exceptionally high official EER ratings during periods when dehumidification is not needed.

### **15. What's involved in installation?**

- The chiller outdoor unit needs a stable mounting position like a concrete pad, a power connection, and insulated water lines connected to the indoor unit(s). Usually 1" PEX flexible water lines are used for this. No refrigeration technician, gauges, extra refrigerant, or special tools are needed. Mainly, you need an electrician for power connection of  $\geq 15\text{a}$  (per ODU) and then make your water line connections. Each indoor unit is powered separately using standard household power. Other than that, you will install the water lines and may add a small expansion tank, some fittings, etc. depending on the design. Longer water line runs or complex routing may require a small booster pump which we can provide, contact us with your design to confirm. Recommended for water lines is oxygen-free PEX which is available from Home Depot or Lowes, etc. Standard loop design using accurate measurements can naturally achieve a system pressure balance.

### **16. What about backup heat for extra-cold days?**

- Some locations may need backup heat, this will be known from the Manual J report. Integrated backup heat is another thing that makes our system unique among mini-split systems since the backup heat can be seamlessly incorporated into the system, avoiding, for example, the need for portable heaters. Like all heat pumps, heating capacity is reduced as outdoor weather gets colder. If you live in a very cold climate you may need backup heat occasionally. The globally-accepted way to add backup heat to a hydronic heat pump system is to use a normal water heater (like from Lowes or Home Depot) installed on the supply line. When backup heat is needed, the chiller can enable the tank heater that runs based on its own thermostat.
- Our system also offers an advanced, highly-efficient fully integrated backup heater, the V18. The V18 provides dynamically variable backup heat that precisely adds just the right amount of backup heat into the system based on the actual, real-time capacity and load differential. Rather than chasing and overshooting a thermostat, the v18 receives communications from our heat pump to adjust power and exactly match any BTU shortfall in real time. The V18 installs in-line as a precisely modulating tankless heater with almost zero pressure drop.

### **17. Why is capacity lower when outdoor temperatures are lower?**

- ALL heat pumps, including our system, have reduced capacity at lower ambient temperatures. The factor that has the largest effect on efficiency, is the amount of "lift", i.e., the  $\Delta T$  between the ambient and the heat pump operating outlet temperature. As ambient drops lower, the lift becomes higher. This is why we design systems that can work properly with the lowest amount of lift. The advantages of lower lift is explained by the following Carnot calculation where  $(T^1 - T^2)$  is the amount of lift.

### **18. How does it work with water heating?**

- We don't specifically offer our chillers as water heaters however they can do a great job of heating water. In this case, the chiller connects to a "heat exchanger tank" - this is also called a "solar" or "indirect" tank. It is a hot water tank with a heat exchanger coil inside. You will also use an electronic valve ordered from us called a DN25-DHW valve. The chiller monitors the tank temperature using an included sensor. The chiller can temporarily switch from its normal cooling or heating function for a brief interval, to quickly heat the water tank whenever the tank needs heat. This is very advantageous, as water heated by the chiller can use up to 70% less energy than a standard electric water heater would use for the same amount of water heating.

### **19. What kind of hot water tank is used?**

- A heat pump such as our system needs an "indirect" tank, such as a boiler tank or a solar tank, this is a tank with a coil inside. Of course, we suggest our DHW80 or DHW40 tanks as they are very high spec tanks made with duplex 2205 grade stainless steel and have a industry-leading over-sized coil with a very large surface area. If you provide your own water heating tank, make sure of the following: it must have at least .35 ft<sup>2</sup> coil surface area per gallon, and, an inside diameter not less than 1". And make sure it has a provision for a backup heating element so you can take full advantage of our automated anti-legionella function.

### **20. What about recirculating hot water systems?**

- We don't ever recommend recirculating hot water systems, in general, they waste energy in order to save water and for most people the economics are better to not waste the energy. And we don't suggest them for our system, as this type of system puts a continuous parasitic load on the DHW tank . If you

decide to use recirculating hot water with our system, we suggest to only use it with very well-insulated water lines and a "smart" recirc system such as those that have a "call" button or motion sensor, for example, AquaMotion.

**21. Can I use it to unload or replace an existing boiler?**

- Yes, our air to water heat pump chillers can provide very low cost heating when compared to an electric, propane, or oil fired boiler. You can configure the chiller as primary and only run the boiler if needed.

**22. Can we support old-style radiators or baseboard heaters?**

- Generally radiators are designed to receive very hot water, as high as 180F. No heat pump including our system will operate at those temperatures. For example, if using our system at 105F with a radiator rated at 160F, the radiator capacity will be reduced to a factor around 37% of the original rating. Usually, radiators are replaced with fan coil units, in many cases the existing piping can still be used.

**23. What about using it for a server room or computer room?**

- It's perfect, our air to water chiller development started out as an effort to design the world's most efficient air conditioner for small computer rooms/server rooms, and it succeeded beyond our expectations. The server room version also has an available "free cooling" option that in cold weather, can allow the system to run at its full rated capacity with the compressor off, running only fans and water pump saving a large amount of energy cost without bringing in any outside air. Free cooling COP can be as high as 41 (EER 140) during cold weather periods. In addition, the stackable design of our chiller system allows for a highly redundant N+N configuration.

**24. What are the power requirements?**

- The system is designed for global use and is therefore very flexible. It can use voltage between 208v to 240v and can use either 50Hz or 60Hz power. Indoor units (IDUs) are a little different - we offer 60Hz IDUs for 110v to 130v. We also offer a 208-240v unit that can run on 50Hz or 60Hz and also direct DC48v. So, wherever you are and whatever kind of power you have, we have a solution. A 20a circuit is needed.

**25. What kind of refrigerant is used?**

- The CX34 uses R410a in the outdoor unit (ODU). Other system models use R32.

## **26. What external controls can be used?**

- The CX34 standard included controller is all that most people would ever need. In addition, we offer the Psychrologix controller option for dynamic humidity control. Further, customers have the ability to control the CX34 by relays (such as from a standard single-stage heat pump thermostat). And for advanced users, we offer the (free) ability to control the CX34 via Modbus RTU (can be used also with BACnet gateway).

## **27. What kind of maintenance is needed?**

- Unlike chillers that have a cooling tower, our air to water heat pumps are air cooled like a regular air conditioner and such, only require the same periodic coil cleaning as would a standard AC/heat pump. It is a sealed outdoor appliance, there are no user-serviceable parts inside, and no need for servicing. Any indoor fan/coil units need to have their filters removed, cleaned, and re-inserted on a regular basis. You can determine the frequency of this requirement based on the filter's appearance (and your air quality).

## **28. What is the expected life span of the system?**

- The system is engineered using best-of-breed components sourced from top providers around the world. German brand Wilo VSD water pumps, USA valves, heat exchangers from (SWEP) Sweden and (Multi-Stack) Australia, electronics from Japan, Mitsubishi compressor (Japan) and Panasonic variable speed fan (Japan), and the list goes on. All components are selected based on reliability and performance. The system is easily serviceable and is designed for a 20-year lifetime.

## **29. What minimum and maximum range of ambient temperatures are supported?**

- The standard system is designed for low ambient heating and cooling, and supports standard high ambient cooling conditions. Heating is available from as low as -4F (-20C) or below. We only have test data to -4F however under certain conditions the unit can operate as low as -17. Cooling range is rated up to 122F (50C). The unit can provide cooling at a reduced capacity up to 138F (59C).

## **30. How long can the lineset be?**



- There is no refrigerant lineset needed or used with our self-contained chiller. All of the indoor units are connected to the chiller using standard insulated CPVC or PEX (or similar) water line. The water line can be any length up to hundreds of feet. To calculate the actual distance, we need to know the plumbing design and which indoor units are being used (so we can know the pressure drop spec). But regardless, our inexpensive variable speed booster pump controlled by the chiller can provide a virtually unlimited allowable line distance.

### **31. What is the warranty?**

- Limited Warranty is 5 years on the compressor and 2 years on other components. See warranty document.

### **32. Is the unit certified?**

- The unit is fully certified for USA and Canada and has obtained approval under UL 60335-2-40 and CSA 22.2. These certifications are recognized in over 90 countries worldwide. If you need other international certifications such as SAA, CB, CE, SONCAP, etc. we can provide any of these on quantity orders.
- Further, the CX34 is AHRI-certified. AHRI is the official, independent 3rd party testing & certification organization used by the global HVAC industry and by government regulators worldwide. When AHRI certifies that a unit has a particular capacity or efficiency level, this certification is indisputable evidence that the performance stated by the manufacturer is accurate. Our units are also certified for Europe by TUV where they hold an A+++ rating, the highest possible rating.
- We are also certified by the California Energy Commission (Titles 21, 24).

### **33. What is a DC-Inverter drive?**

- Whether it is used for a compressor, a pump, or a fan motor, DC Inverter motors are recognized as being more efficient, mainly because they use less power and can infinitely adjust their speed in real time to match the current demand. They also run cooler, last longer, and make far less noise.
- DC Inverter motors actually have no inverter in them, this is a poor name that was applied years ago and has remained in use. Actually, AC power runs through a rectifier circuit converting it to DC power.

- DC inverters are not only more efficient at a given speed, but having the ability to match the speed to the current application saves even more power.