

**MODEL HP024  
WATER-TO-WATER HEAT PUMPS**

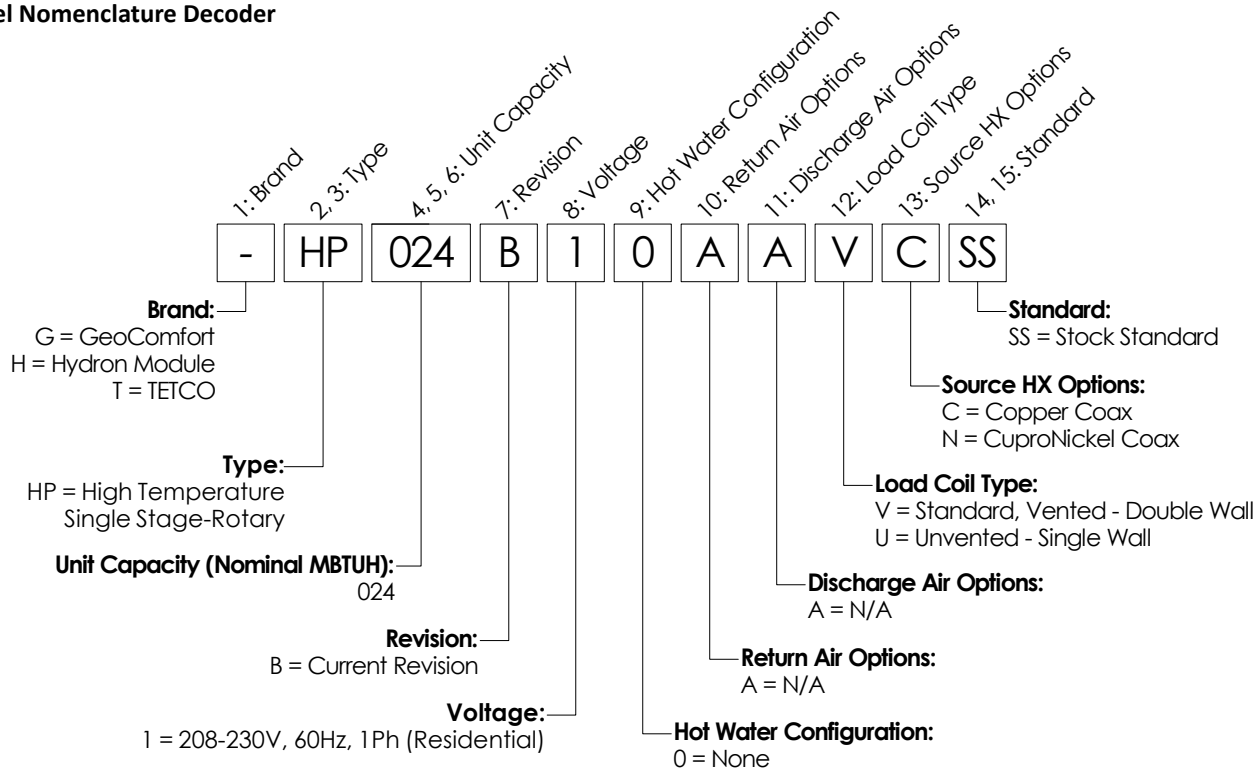
# Engineering Submittal Data

Project Name: \_\_\_\_\_  
 Engineer: \_\_\_\_\_  
 Contractor: \_\_\_\_\_  
 Architect: \_\_\_\_\_  
 Date Received: \_\_\_\_\_  
 Date Submitted: \_\_\_\_\_

| Unit Tag | Model Number |
|----------|--------------|
| _____    | _____        |
| _____    | _____        |
| _____    | _____        |
| _____    | _____        |
| _____    | _____        |
| _____    | _____        |
| _____    | _____        |
| _____    | _____        |
| _____    | _____        |
| _____    | _____        |
| _____    | _____        |
| _____    | _____        |
| _____    | _____        |
| _____    | _____        |
| _____    | _____        |
| _____    | _____        |
| _____    | _____        |
| _____    | _____        |
| _____    | _____        |
| _____    | _____        |

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Model Nomenclature Decoder



AHRI Performance Data, HP024 Vented Coaxial Heat Exchanger

| UNIT  | Rating Type | F/L HEAT | F/L COP |
|-------|-------------|----------|---------|
| HP024 | WL          | 41,000   | 4.2     |
|       | GW          | 31,300   | 3.6     |
|       | GL          | 23,000   | 3.1     |

AHRI Performance Data, HP024 Unvented Coaxial Heat Exchanger

| UNIT  | Rating TYPE | F/L HEAT | F/L COP |
|-------|-------------|----------|---------|
| HP024 | WL          | 41,800   | 4.4     |
|       | GW          | 32,600   | 3.8     |
|       | GL          | 23,900   | 3.2     |

Ground Loop (GL) Notes:

- Rated in accordance with ISO Standard 13256-2 which includes Pump Penalties.
- Heating capacities based on 32°F EST & 104°F ELT.

Ground Water (GW) Notes:

- Rated in accordance with ISO Standard 13256-2 which includes Pump Penalties.
- Heating capacities based on 50°F EST & 104°F ELT.

Water Loop (WL) Notes:

- Rated in accordance with ISO Standard 13256-2 which includes Pump Penalties.
- Heating capacities based on 68 °F EST & 104 oF ELT.

Notes:

- Entering load temperature over 120°F-125°F (depending on entering source temperature) heating and under 45°F is not permissible. Maximum leaving load temperature is 130°F.
- Floor heating is most generally designed for 85°F entering load temperature.

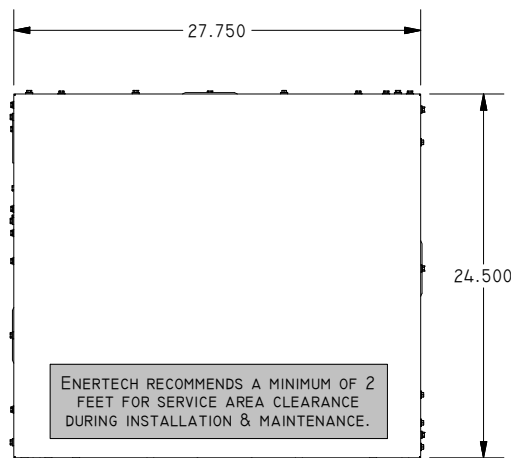
Single Compressor Unit Electrical Data

| Model | Voltage Code/ HWG Option | 60 Hz Power |       | Compressor |      | Fan Motor FLA | HWG Pump FLA | Ext. Loop Pump FLA | Total Unit FLA | Min Circuit AMPS | Max Brkr HACR |
|-------|--------------------------|-------------|-------|------------|------|---------------|--------------|--------------------|----------------|------------------|---------------|
|       |                          | Volts       | Phase | LRA        | RLA  |               |              |                    |                |                  |               |
| HP024 | 10                       | 208/230     | 1     | 70.0       | 13.5 | 0.0           | 0.0          | 4.0                | 17.5           | 20.9             | 30            |

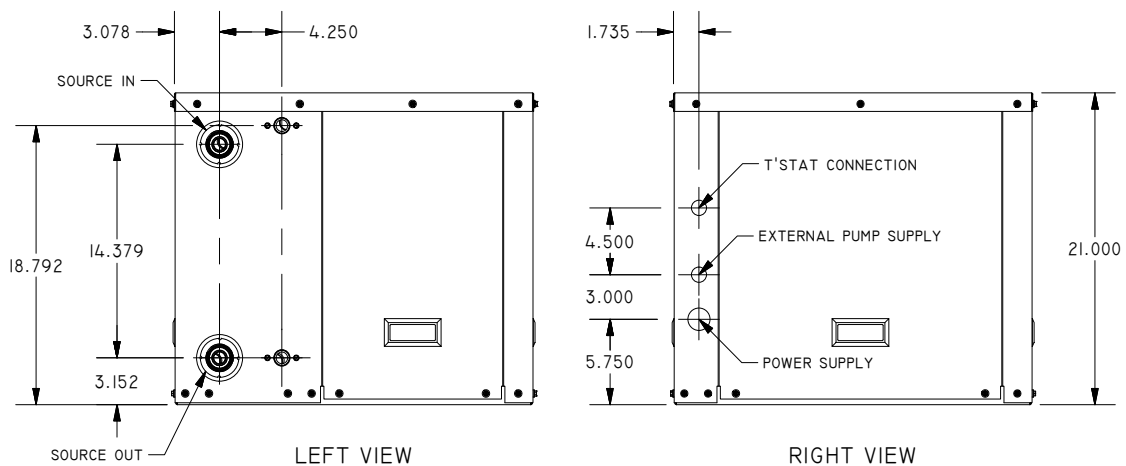
Notes:

1. All line and low voltage wiring must adhere to the National Electrical Code and local codes, whichever is the most stringent.
  2. In determining the correct supply wire size and maximum length, reference NFPA 70, Section 310. If the calculation is close to the maximum allowable ampacity of a particular wire size, use the next size up. This will ensure that no adverse effects occur, such as light dimming and/or shortened compressor life.
  3. Min/Max Voltage: 208/230/60 = 187-252
- \*The external loop pump FLA is based on a maximum of two UP26-116F-230V pumps.

Unit Dimensional Data



TOP VIEW



LEFT VIEW

RIGHT VIEW

| HP024    |                   |        |                 |      |                |             |
|----------|-------------------|--------|-----------------|------|----------------|-------------|
| MODEL    | SOURCE Water: D/O |        | LOAD Water: FPT |      | Factory Charge | Unit Weight |
|          | IN                | OUT    | IN              | OUT  |                |             |
| Vented   | 1-1/4"            | 1-1/4" | 3/4"            | 3/4" | 63 oz          | 248 lbs     |
| Unvented | 1-1/4"            | 1-1/4" | 1"              | 1"   | 52 oz          | 253 lbs     |

Notes:

- Electrical connections are 1" DIA for high voltage, & 1/2" DIA for low voltage.

Glossary of Terms

|  |  |
|--|--|
| CFM = Airflow, Cubic Feet/Minute                               | HR = Total Heat Of Rejection, Btu/hr               |
| COP = Coefficient of Performance = BTU Output / BTU Input      | KW = Total Power Unit Input, Kilowatts             |
| DH = Desuperheater Capacity, Btu/hr                            | LAT = Leaving Air Temperature, Fahrenheit          |
| EAT = Entering Air Temperature, Fahrenheit (Dry Bulb/Wet Bulb) | LC = Latent Cooling Capacity, Btu/hr               |
| EER = Energy Efficiency Ratio = BTU output/Watts input         | SC = Sensible Cooling Capacity, Btu/hr             |
| EWT = Entering Source Water Temperature, Fahrenheit            | LWT = Leaving Source Water Temperature, Fahrenheit |
| ELT = Entering Load Water Temperature, Fahrenheit              | LLT = Leaving Load Water Temperature, Fahrenheit   |
| GPM = Water Flow, Gallons Per Minute                           | TC = Total Cooling Capacity, Btu/hr                |
| HC = Total Heating Capacity, Btu/hr                            | WPD = Water Pressure Drop, PSI & Feet of Water     |
| HE = Total Heat Of Extraction, Btu/hr                          |  |

Note: EWT=EST, LWT=LST

| Heating                                   | Cooling  |
|---|--|
| $LAT = EAT + \frac{HC}{CFM \times 1.08}$  | $LAT (DB) = EAT (DB) - \frac{SC}{CFM \times 1.08}$ |
| $LWT = EWT - \frac{HE}{GPM \times 500^*}$ | $LWT = EWT + \frac{HR}{GPM \times 500^*}$          |
| $LC = TC - SC$                            |  |

\*500=Constant factor for pure water. Brine should be 485.

Performance Data Table Notes (pages 6 and 7):

1. If EST is 50-80°F and ELT is 110-120°F, it is recommended to run ≥6 GPM on the load side; if EST is 81-90°F and ELT is 100-120 °F, it is recommended to run ≥8 GPM on the load side and 3 GPM on the source side. It is permissible to run through the gray areas intermittently. It is recommended to follow the aforementioned GPM guidelines to avoid extended operation in these areas. At any time, reference the operating envelope to determine whether extended operation is permissible or not.
2. Capacity data is based on 15% (by mass) methanol antifreeze solution (multiplier: 485) on the source side and pure water (multiplier: 500) on the load side.
3. Any condition outside this performance table is not allowed to ensure safe and continuous operation.
4. Performance data accurate within ±15%.
5. Capacity data includes the load-side internal pump power but not the source-side pump power and it does not reflect pump power correction for AHRI/ISO conditions.
6. Performance data is based upon the lower voltage of dual voltage rated units.
7. Interpolation of unit performance data is permissible; extrapolation is not.
8. Due to variations in installation, actual unit performance may vary from the tabulated data.

NOTE: Recommended load flow rate is 3 gpm/ton.

**Water Flow Selection**

Proper flow rate is crucial for reliable operation of geothermal heat pumps. The performance data shows three flow rates for each entering water temperature (EWT column). The general “rule of thumb” when selecting flow rates is the following:

- Top flow rate: Open loop systems (1.5 to 2.0 gpm per ton)
- Middle flow rate: Minimum closed loop system flow rate (2.25 to 2.50 gpm/ton)
- Bottom flow rate: Nominal (optimum) closed loop system flow rate (3.0 gpm/ton)

Although the industry standard is adequate in most areas of North America, it is important to consider the application type before applying this “rule of thumb.” Antifreeze is generally required for all closed loop (geothermal) applications. Extreme Southern U.S. locations are the only exception. Open loop (well water) systems cannot use antifreeze, and must have enough flow rate in order to avoid freezing conditions at the Leaving Source Water Temperature (LST) connection.

Calculations must be made for all systems without antifreeze to determine if the top flow rate is adequate to prevent LST at or near freezing conditions. The following steps provide this calculation:

1. Determine minimum EST based upon your geographical area.
2. Go to the performance data table for the heat pump model selected and look up the Heat of Extraction (HE) at the “rule of thumb” water flow rate (GPM) and at the design Entering Load Water Temperature (ELT).
3. Calculate the temperature difference (TD) based upon the HE and GPM of the model.
  - $TD = HE / (GPM \times 485)$ .
  - Calculate the LWT.
  - $LWT = EWT - TD$ .
4. If the LST is below 35-38°F, there is potential for freezing conditions if the flow rate or water temperature is less than ideal conditions, and the flow rate must be increased.

**Example 1:**

EST = 50°F, ELT = 100°F

Model 024 (unvented heat exchanger) flow rate = 3 gpm; HE = 20,900 Btuh

$TD = 20,900 / (3 \times 500) = 13.9^\circ\text{F}$

$LST = 50 - 13.9 = 36.1^\circ\text{F}$

Water flow rate should be adequate under these conditions.

**Example 2:**

EST = 40°F, ELT = 100°F

Model 024 (unvented heat exchanger) flow rate = 3 gpm; HE = 17,700 Btuh

$TD = 17,700 / (3 \times 500) = 11.8^\circ\text{F}$

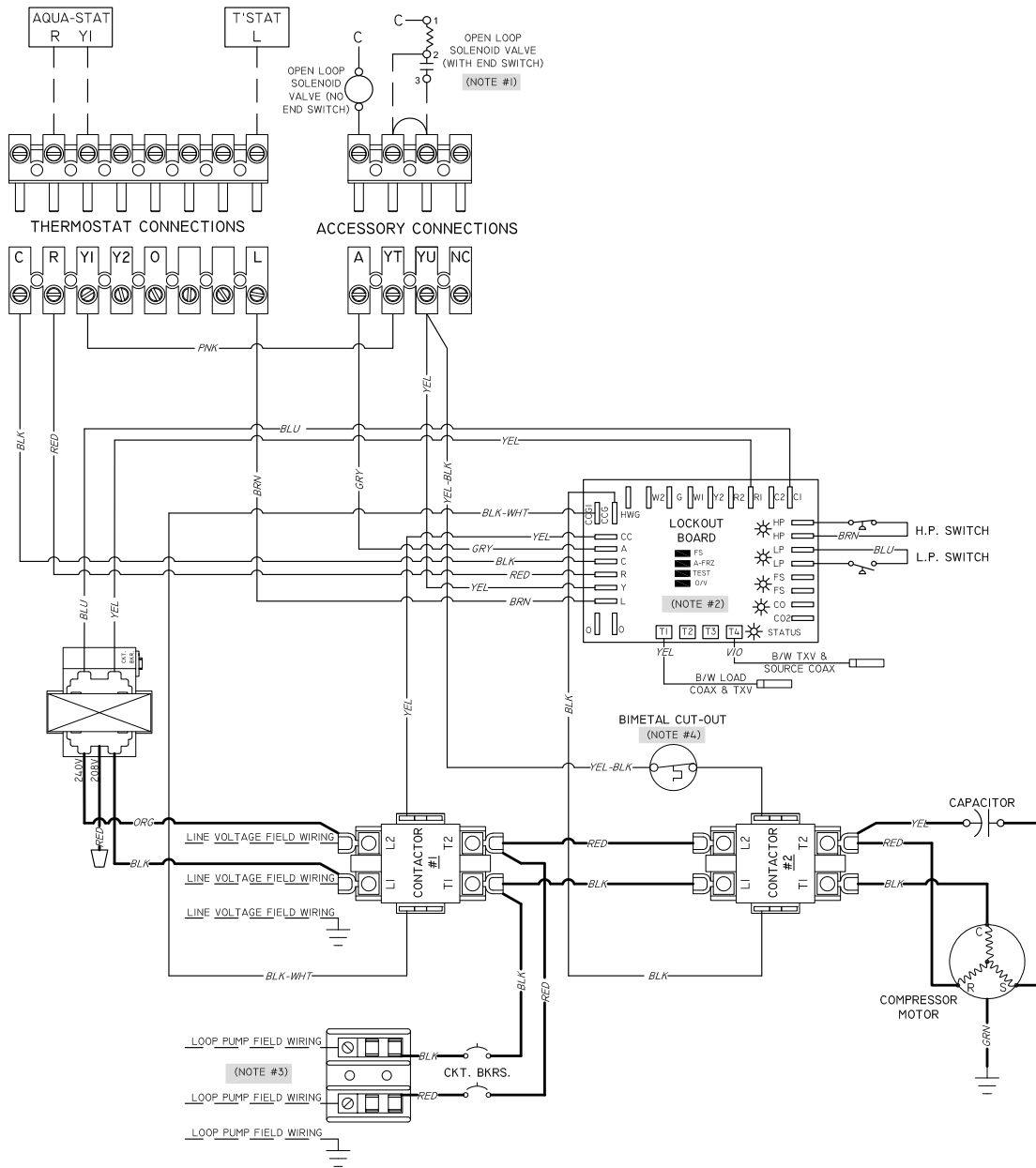
$LST = 40 - 11.8 = 28.2^\circ\text{F}$

Water flow rate must be increased to 7 gpm to prevent freezing conditions





Single Stage, Single Phase, 208/230V, 60hz, Residential



NOTES:

1. FACTORY INSTALLED JUMPER (BLACK) BETWEEN 'YT' AND 'YU' TERMINALS. REMOVE FOR USE WITH SOLENOID VALVE WITH END SWITCH.
2. SEE LOCKOUT BOARD LABEL FOR JUMPER SELECTION/ DESCRIPTION.
3. LOAD SIDE PUMPING IS HANDLED VIA CONNECTION TO THE LOOP PUMP TERMINAL BLOCK (I.E. THE LOOP PUMP AND LOAD PUMPS CAN BE POWERED FROM THE UNIT AS LONG AS NO MORE THAN THREE UP26-116 PUMPS ARE CONNECTED).
4. BIMETAL CUT-OUT IS A NORMALLY CLOSED SPST SWITCH THAT WILL OPEN ON TEMPERATURE RISE.



**General**

Packaged Water-to-Water Single-Stage “HP” Series Geothermal Heat Pumps shall be constructed based on all information to follow. Equipment shall be completely assembled, piped, internally wired, charged with refrigerant, and tested.

Units shall be supplied completely factory built capable of operating over an entering water temperature range from 25° to 90 °F (-3.9 to 32.2 °C) on the source side and 50-130 °F (10.0 to 54.4 °C) on the load side as standard. All equipment listed in this section must be rated and certified in accordance with air-conditioning, Heating and Refrigeration Institute/ International Standards Organization (AHRI/ISO 13256-2). All equipment must be tested, investigated, and determined to comply with the requirements of the standards for Heating and Cooling Equipment UL-1995 for the United States and CAN/CSA-C22.2 NO.236 for Canada, by Intertek Testing Laboratories (ETL). The units shall have AHRI/ISO and ETL-US-C labels.

All units shall be fully quality tested by factory run testing under normal operating conditions as described herein. Quality control system shall automatically perform via computer: helium leak check of both the water and refrigerant circuits, pressure tests, double evacuation and accurately charged system, perform detailed heating and cooling mode tests, and quality cross check all operational and test conditions to pass/fail criteria.

**Basic Construction**

The heat pumps shall be fabricated from powder coated heavy gauge galvanized steel. This corrosion protection system shall meet the stringent 1000 hour salt spray test per ASTM B117.

All units must have a minimum of three access panels for serviceability of compressor compartment. See IOM manuals for service clearances.

All interior surfaces shall be lined with 3/8 inch (9.5mm) thick, 3-6 lb/ft<sup>3</sup> (24 kg/m<sup>3</sup>) acoustic type closed cell, non-porous, non-fibrous Nitrile/Vinyl insulation. Standard cabinet panel insulation must meet UL-1995 and ASTM E 84/ UL 723 Flame 25 / Smoke 50 requirements, air erosion and mold growth limits of UL-181, stringent fungal resistance test per ASTM-C1071 and ASTM G21, and shall meet zero level bacteria growth per ASTM G22. The insulation shall be UL-GREENGUARD certified under the Childrens and Schools classification and approved by the Factory Mutual Research Corporation. For added protection it shall be protected with an EPA-approved antimicrobial agent.

Cabinets shall have separate holes and knockouts for entrance of line voltage and low voltage control wiring. All factory-installed wiring passing through factory knockouts and openings shall be protected from sheet metal edges at openings by plastic ferrules. Supply and return water connections shall be brass FPT fittings, and shall be securely mounted flush to the cabinet allowing for connection to a flexible hose without the use of a back-up wrench. All water connections and electrical knockouts must be in the compressor compartment as to not interfere with the serviceability of unit.

The unit shall be supplied with extended range internal insulation. All internal water lines and the evaporator side refrigeration tubing shall all have closed cell EPDM insulation. The water to refrigerant coaxial heat exchanger shall have 8# closed cell foam applied or closed cell EPDM foam tape wrap.

Option: Sound attenuating compressor blanket for additional noise reduction.

**Refrigerant Circuit**

All units shall contain R-410A sealed refrigerant circuit including a high efficiency single-stage compressor designed for heat pump operation, a thermostatic expansion valve for refrigerant metering, coaxial refrigerant to water heat exchangers (single wall on the source side and double wall on the load side), and safety controls (see controls section). Refrigerant access ports shall be factory installed on high and low pressure refrigerant lines to facilitate field service. All units have factory installed bi-directional filter/drier for added moisture protection.

Hermetic compressors shall be internally sprung. The compressor shall have a dual level vibration isolation system. The compressor will be mounted on EPDM rubber grommets secured to a large heavy gauge compressor mounting plate, which is then mounted to the cabinet base with specially engineered sound-tested PU foam vibration isolation pads for maximized vibration attenuation. Compressor shall have thermal overload protection. Compressor discharge and suction refrigerant lines to have shock loops directly at compressor for additional vibration elimination.

Refrigerant to water heat exchangers (source and load water coils) shall be of copper inner water tube and steel refrigerant outer tube coaxial design, shall have enhanced rifled and knurled inner tube, rated to withstand 650 PSIG (4482 kPa) working refrigerant pressure and 500 PSIG working water pressure (3445 kPa) for single-wall coaxial heat exchanger and 300 PSIG (2068 kPa) for double-wall coaxial heat exchanger, and designed to have a low water pressure drop (max. 15ft. hd.).

Refrigerant metering shall be accomplished by thermostatic expansion valve only. Expansion valves shall be dual port balanced types with external equalizer for optimum refrigerant metering. The expansion valves must be bi-directional without the use of check valves. Units shall be designed and tested for operating ranges of entering water temperatures from 25° to 90°F (-3.9° to 32.2°C).

**Option:** The unit will be supplied with a cupro-nickel coaxial water to refrigerant heat exchanger (source heat exchanger only) and/or a load-side single-wall refrigerant-to-water coaxial heat exchanger.

### Electrical

A control box shall be located within the unit compressor compartment and shall contain a 75VA transformer, 24 volt activated, 2 or 3 pole compressor contactor, terminal block for thermostat wiring and digital controller for complete unit operation and control. Units shall be name-plated for use with time delay fuses or HACR circuit breakers. Unit controls shall be 24 Volt and provide heating or cooling as required by the remote aquastat/sensor.

For residential units, source pump high voltage terminal block including minimum 7amp circuit breaker protection to be provided for field wiring of source pumps.

A detachable low voltage thermostat terminal strip with screw terminals to be provided for field wiring.

### Digital Control Board System

Units shall have a digital control system. The control system shall interface with a heat pump type 24V thermostat. The control system shall have the following features:

- Anti-short cycle time delay on compressor operation (5 minutes).
- Random start on power up mode.
- Low voltage protection.
- High voltage protection.
- Unit shutdown on high or low refrigerant pressures.
- Unit shutdown on low temperature (low source coil temp OR low load coil temp).
- Option to reset unit at thermostat or disconnect (soft or hard reset functions)
- Fault retry logic. The same fault trip has to occur 3 times before a hard lockout. If a fault occurs 3 times sequentially without thermostat meeting temperature, then lockout requiring manual reset will occur. A soft or hard reset will restart the unit.
- Ability to defeat time delays for servicing (test mode).
- Light emitting diode (LED) on circuit board to indicate high pressure, low pressure, low/high voltage, low water temperature, faulty temperature sensor(s), and control voltage status.
- The low-pressure switch shall not be monitored for the first 30 seconds after a compressor start command to prevent nuisance safety trips.
- 24V output to cycle a motorized water valve or other device with compressor contactor.
- Water coil (evaporator) low temperature sensing selectable for water or anti-freeze.
- Domestic water safety realized by adding an additional contactor which is energized through a thermal switch on the load water outlet

## Revision Table

| <b>Date</b> | <b>Note</b>                                   | <b>Page</b> |
|-------------|---|-------------|
| 27JAN2020   | Wiring Diagram updated (minor layout changes) | 8           |
| 20DEC2019   | Unit Electrical Data Table updated            | 3           |
| 25OCT2019   | Wiring Diagram updated                        | 8           |
| 16AUG2019   | Layout changes made                           | Various     |
| 15AUG2019   | HP Rev B. document created                    | ALL         |



# ENERTECH

ENERGY + TECHNOLOGY

[enertechusa.com](http://enertechusa.com)



Enertech Global is continually working to improve its products. As a result, the pricing, design and specifications of each product may change without notice and may not be as described herein. For the most up-to-date information, please visit our website, or contact our Customer Service department at [info@enertechgeo.com](mailto:info@enertechgeo.com). Statements and other information contained herein are not express warranties and do not form the basis of any bargain between the parties, but are merely Enertech Global's opinion or commendation of its products.