

EP Model Guide Specification

General

Furnish and install FHP water source heat pumps as indicated on the plans with capacities and characteristics as listed in the schedule with the specifications that follow. The units shall be manufactured in an ISO 9001:2000 certified facility.

Equivalent units from other manufacturers can be proposed provided approval to bid is given 10 days prior to bid closing.

Horizontal & Vertical Water Source Heat Pumps

Units shall be designed to operate throughout the range of entering fluid temperature of 40°F to 110°F in the cooling mode and 50°F to 80°F in the heating mode (20°F to 80°F in the heating mode when equipped with the optional extended range package). All equipment shall be lower than a nominal capacity of 135,000 BTU/h of Total Cooling (TC) listed in the current ARI Applied Equipment Directory under the ARI Standard ARI ISO-13256-1, WLHP, GWHP, and GLHP Rating.

All equipment in this section must meet or exceed the national standard minimum Energy Efficiency Ratio (EER) and Coefficient of Performance (COP) as listed in ASHRAE 90.1 per the following:

ARI-ISO-13256-1, WLHP Rating (13.0 EER and 4.3 COP for units with a nominal cooling capacity of 17,000 BTU/h or larger – 12.2 EER and 4.3 COP for units with a nominal cooling capacity lower than 17,000 BTU/h).

For the ARI-ISO-13256-1, GLHP Rating a minimum 13.4 EER and 3.1 COP.

All units shall be listed with Intertek (ETL), Nationally Recognized Testing Laboratories (NRTL) or Canadian Standards Association (CSA). All units shall have ARI-13256-1 labels with ETL or NRTL or CSA or equivalent labels.

Standard Construction

Units shall have the air flow arrangement as shown on the plans. If units with these arrangements are not used, the contractor supplying the water source heat pumps is responsible for any extra costs incurred by other trades. Contractor must submit detailed mechanical drawings showing ductwork requirements and changes or relocation of any other mechanical or electrical system. If other arrangements make servicing difficult the contractor must provide access panels and clear routes to ease service. **The architect must approve all changes 10 days prior to bid.**

All units shall have stainless steel drain pans to comply with this project's Indoor Air Quality (IAQ) requirements. No exceptions will be allowed.

All water source heat pumps shall be fabricated from G-90 galvanized sheet metal for corrosion protection.

All interior surfaces are lined with ½" thick, 1.5lb./cubic foot dual density Micromat insulation for thermal insulation and acoustical attenuation (½" thick closed cell foam insulation is optional). Insulation must be non-combustible, non-hygroscopic and anti-fungal. Insulation must meet NFPA 90A and 90B for fire protection, UL181 erosion requirements, and be certified to meet GREENGUARD indoor air quality (IAQ) standards for low emitting products.

One blower access panel and two compressor compartment access panels shall be removable with supply and return air ductwork in place.

Unit shall be equipped with double compressor isolation. The unit shall have a floating base pan consisting of the compressor mounted on rubber grommets and a heavy gauge steel plate supported by a ½" (12 mm) thick, high density rubber pad on the base of the unit to prevent transmission of vibration to the structure.

All units shall have a factory installed four sided filter rack with access panel, capable of accepting either one or two inch filters. Units shall have a 1 inch thick, MERV 5 throwaway type glass fiber filter as standard. The filter rack shall incorporate a 1 inch duct flange. The contractor shall purchase one spare set of filters and replace the factory shipped construction filter upon completion of start-up.

High Efficiency Filtration – Units shall include MERV 8 (sizes 007-070) or MERV 13 (sizes 015-070 with ECM Constant Airflow option).

Cabinets shall have separate knockouts for entrance of line voltage and low voltage control wiring.

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. Water connections which protrude through the cabinet shall not be allowed.

Hanging brackets shall be provided as standard for horizontal units.

Condensate overflow protection sensor shall activate a circuit upon sensing when a high level of condensate water is in the drain pan resulting in a hard lockout in the unit.

Freeze protection sensors shall be provided on both sides of the refrigeration circuit. Sensors that measure water temperature shall not be allowed. (Refer to Solid State Safety Circuit section in this spec guide).

Fan and Motor Assembly

The blower housing shall feature a removable inlet ring to facilitate removal and servicing of the directdrive centrifugal fan. The fan motor shall be isolated from the fan housing by torsionally flexible isolation.

The fan motor shall be a 3-speed, permanently lubricated, PSC type with thermal overload protection for the 7,000 BTU/h through 12,000 BTU/h units (EP007, EP009, and EP012). 15,000 to 70,000 Btu/Hr units (EP015-070) shall come supplied with a factory pre-programmed ultra efficient direct-drive, constant torque electrically commutated motor (ECM) for maximum efficiency and quiet operation. These motors shall feature three pre-programmed torque settings that can be changed in the field to meet air flow design requirements in specification. The 460V-3PHz-60Hz units with these motors must be able to operate without the need for a neutral wire for the motor. (A constant airflow ECM for selectable specified units is available as an optional motor on sizes 015-070.)

The fan and motor assembly must be capable of overcoming the external static pressures (ESP) as shown on the schedule. ESP rating of the unit shall be based on a wet coil. Ratings based on a dry coil will NOT be acceptable.

Refrigerant Circuit Components

Units shall use R-410A refrigerant. All units shall have a factory sealed and fully charged refrigerant circuit.

Hermetic compressor: Hermetic rotary, or scroll compressors shall be specifically designed for R-410A refrigerant, shall be thermally protected, and shall be located in an insulated compartment to minimize sound transmission.

Refrigerant metering shall be via thermal expansion valves (TXV) only.

Finned tube refrigerant-to-air heat exchanger not exceed 16 fins per inch. Refrigerant-to-air heat exchangers shall utilize enhanced aluminum fins and rifled copper tube construction rated to withstand 600 PSIG refrigerant working pressure. All air coils shall have non-ferrous aluminum end plates.

DuoGuard™ Coil Coating – A corrosion protection option for refrigerant to air heat exchangers that features tin plating of the copper tubing and coating of the aluminum fins with a protective film. The tin plating provides best in class protection of the copper tubing from formicary corrosion while the fin coating provides protection against salt spray and other corrosive elements. Duo Guard protected coils can exceed 1000 hours salt spray per ASTM standard B-117.

Coaxial (tube in tube) refrigerant to water heat exchanger. Refrigerant to water heat exchangers shall be of copper inner water tube and steel outer refrigerant tube design rated to withstand 600 PSIG working refrigerant pressure and 450 PSIG working water pressure. Shell & Tube style refrigerant to water heat exchangers shall be treated as pressure vessels and shall require refrigerant pressure relief valves piped to the exterior of the building. Brazed Plate water to refrigerant heat exchangers shall require additional centrifugal separators added to the supply water piping at each unit. Each separator shall have an automated clean out valve piped to a waste line. The contractor supplying water source heat pumps with Brazed Plate heat exchangers shall be responsible for any additional costs.

CuNi water coil – The refrigerant-to-water heat exchanger shall have inner tube constructed of Cupro-Nickel. Refrigerant safety controls shall include both high and low pressure safety switches. Temperature sensors shall not replace these safety switches. Access fittings (Schrader Valves) shall be factory installed on high and low pressure refrigerant lines to facilitate field service.

Electrical

A control box shall be located within the unit and shall contain a transformer, controls for the compressor, reversing valve and fan motor and shall have a terminal block for low voltage field wiring connections. The transformer shall be rated for a minimum 75VA. All units shall be nameplated for use with time delay fuses or Heating, Air Conditioning & Refrigeration (HACR) circuit breakers.

Option: Control transformer shall be rated for minimum 100VA.

Unit controls shall be 24 volts.

All transformers shall have a push button reset circuit breaker on the secondary power.

Solid State Safety Circuit

All units shall have a solid-state Unit Protection Module (UPM) safety control circuit with the following features.

Anti-short cycle time delay on compressor operation (5 min. delay on break).

Random start on power up mode.

Brown out/surge/power interruption protection.

Low Pressure Switch 120 second bypass timer.

High refrigerant pressure shutdown.

Low refrigerant pressure shutdown.

Low water temperature shutdown. Freeze sensors shall monitor refrigerant temperature to the water coil in the heating mode and shall activate the lockout circuit when water temperature drops below either 15°F or 35°F depending on the selection. 15°F is field selectable for installations utilizing antifreeze; see IOM for details.

Air coil freeze protection shutdown refrigerant coil in the cooling mode.

Condensate overflow protection: A condensate sensor shall activate the lockout circuit upon sensing a high level of condensate in the drain pan and immediately put the unit into a hard lockout. COP shall be standard on all units.

Alarm output which closes for either dry contact closure or 24 VAC remote fault indication. Alarm output is selectable for constant output for general alarm notification, or pulse output for annunciation of the specific fault alarm. Selectable reset of unit at thermostat or disconnect.

Activation of any safety device shall prevent compressor operation via a lockout circuit. The lockout circuit shall be reset at the thermostat or at the contractor supplied disconnect switch. Units which may be reset at the disconnect switch only shall not be acceptable. Refer to Solid State Safety Circuit section.

Automatic intelligent reset. Unit shall automatically reset after a safety shut down and restart the unit after the anti-short cycle timer and random start timer expire. Should subsequent faults re-occur within 60 minutes after reset, then a permanent lockout will occur. Reset attempts shall be selectable for either 2 or 4 tries. A condensate overflow will place the unit in an immediate hard lockout.

Ability to defeat time delays for servicing (reduces all time delays to 5 seconds for diagnostic work).

A light emitting diode (LED) to indicate safety alarms. The LED shall annunciate the following alarms:
High refrigerant pressure.

Low refrigerant pressure.

Low refrigerant temperature to the water coil in the heating operation

Low refrigerant temperature to the air coil in cooling operation.

High level of condensate in the drain pan.

Brown out/surge/ power interruption.

The LED will display each fault condition as soon as the fault occurs. If a permanent lockout occurs, then the fault will be transmitted to the alarm circuit output terminals until the unit is reset. ETL listed, and RFI, ESD, and transient protected.

Safety devices include:

Low pressure cutout set at 40 PSIG (280 kPa) for loss of charge protection (freezestat and/or high discharge gas temperature sensor is not acceptable).

High pressure cutout control set at 600 PSIG (4125 kPa).

Low supply water temperature sensor protection which monitors refrigerant temperature that could result in water heat exchanger freezing.

Low air coil temperature sensor protection which monitors refrigerant temperature that could result in air heat exchanger freezing.

High level of condensate sensor that shuts off the compressor if the condensate drain pan fills with water.

On board voltage detection that disables the compressor control circuit if there are extreme variations exceeding +/- 10% in supply voltage.

Factory Installed Options:

Extra quiet sound package: Units above capacity of 18,000 Bth/hr. shall be provided with a compressor blanket.

Insulation: All units shall have ½" thick closed-cell foam insulation.

All units shall have a factory installed four sided filter rack with access panel and either 2" MERV 8 filter or MERV 13 pleated filter. (MERV 13 option available only on sizes 015-070 and with ECM Constant Airflow option).

Units that are in the capacity range of 15,000 BTU/h through 70,000 (EP015 – EP070) shall have a factory pre-programmed constant airflow ECM for premium motor fan efficiency and constant air delivery over a wide range of external static pressure.

Refrigerant to air coils shall have DuoGuard™ coating for enhanced protection against formicary and other forms of corrosion.

Copper tubes shall be tin coated and protective coated aluminum fins rated at 1,000 hour salt spray protection and salt fog testing by the American Society for Testing & Materials (ASTM B117) equivalent or better.

Cupro-Nickel Water Coil: the refrigerant to water heat exchanger shall be of cupro-nickel inner water tube construction.

Coaxial refrigerant to water heat exchanger shall be insulated to allow for geothermal applications.

All transformers shall be rated 100VA and shall have a push button reset circuit on the secondary power.

Hot Gas Reheat: Units as noted on the schedule shall be equipped with optional Hot Gas Reheat (HGRH). HGRH shall be either on/off control or modulating as noted in the specifications.

On/Off HGRH shall be controlled by a humidistat connected to the unit H terminal and shall start the unit in the reheat mode should the humidity be above setpoint once the thermostat control is satisfied. Cooling or heating requirements shall take precedent over HGRH.

Modulating Hot Gas Reheat (MHGRH) shall be active at all times. A 0 - 10 VDC signal from a sensor located in the unit discharge air supply shall modulate the hot gas valve to maintain an adjustable preset leaving air temperature to the conditioned space.

Passive Dehumidification can be achieved with the Constant Airflow ECM by reducing nominal airflow by 15%. This control feature lowers air coil temperature and prevents over-cooling of the space when in dehumidification mode.

Hot Gas Bypass: For units as noted on the schedule, supply each unit with a ETL listed and MEA listed modulating hot gas bypass valve with factory supplied and installed controls to prevent air coils from frost development by taking hot gas and bypassing the water coil and expansion device and reintroducing the hot gas into the refrigerant line prior to the air coil. The hot gas bypass valve shall maintain a minimum refrigerant suction pressure to allow for a light load cooling mode or a low entering air temperature.

Water Side Economizer: Water side economizer shall be completely installed at the factory, with an additional condensate drain pan, motorized 3 way valve, aqua stat, and all internal electric controls. Water side economizer shall be rated at 400 psi and UL listed for application with the heat pump. This option is externally mounted outside the unit.

Automatic Flow Control Valves: Units shall have internal automatic flow control valves set to 3.0 GPM for nominal to of refrigeration capacity.

Two-Position Water Valve: Units shall have internally piped and wired 2-position water solenoid valve to close off flow if unit cycles off.

Circulating Pump: The internal pump option is an internally mounted on/off circulating pump. The internal pump cannot be used in conjunction with the two position water valve.

Straight Cool: units shall only operate in cooling mode.

Heat Recovery Hot Water Kits: 208/230V-1Ph-60Hz and 208/230V-3Ph-60Hz units shall be equipped with factory installed internal heat recovery kit for domestic hot water production. This kit shall include an internally protected hot water circulation pump, copper double wall vented coaxial water-to-refrigerant heat exchanger, 140°F (60°C) hot water temperature limit switch and an on/off switch/circuit breaker.

Flow Proving Switch: prevents unit operation if there is no fluid flow. This factory installed, internally mounted device shall be rated at 600 psi and disable the compressor if a lack of waterflow occurs.

DDC Controls: Unit shall be equipped with a factory installed DDC control capable of interfacing with BACnet™, Modbus, N2 or Lon works® (with optional card).

The controller shall be pre-programmed to control the unit and monitor the safety controls.

The unit shall be able to operate as a standalone or be integrated into the building management system.

A leaving water and leaving air sensor shall be installed in the unit.

Wall sensors shall be available for controlling zone temperature.

Unit mounted disconnect: A non-fused factory mounted disconnect shall be installed on the unit.

Electric Heat: factory installed ETL listed electric heater packages shall be available for the units. Available only on vertical units and horizontal units with end blow configuration.

Relays shall be factory installed in the unit as follows:

EMS Relay for remote enabling of the unit.

Auxiliary pump/valve relay to enable a pump/valve operation when calling for compressor operation.

Compressor monitoring relay – provides a contact closure whenever the compressor contactor is energized.

Blower monitoring relay – provides a contact closure whenever the blower motor is energized.

Boilerless control shall activate an electric heater (internal or external unit) and disable compressor should water temperature drop below set point.

Includes a relay and splitting the power supply to the unit into a blower motor and control power supply and a compressor power supply. The relay (when energized) deactivates the compressor control circuit. Wire transformer for 208V operation.

Phase loss and reversal protection shall be provided on the unit to protect the compressor from operating in reverse rotation on three phase units.

A comfort alert module shall be installed in the unit to assist in service diagnostics (sizes 024-070 only).

Field Installed Options

All units shall be connected by hoses and have a maximum working pressure 400 PSI for sizes ½" – 1" and 300 PSI for sizes 1 ¼ – 2".

A variety of hose kits are available depending on the job requirement. Kits 2 through 6 include supply and return ported ball shut-off valves with P/T ports. Hose kit options are available in the accessories section of the BST selection software.

Kit 1 – Hose kit either 24" or 36" long.

Kit 2 – Hose kit with ball valves on the supply and return hoses. Valves shall have P/T ports to facilitate pressure and temperature readings.

Kit 3 – Hose kit with automatic flow control valve. The design flow rate is preset at the factory per the specified design conditions and shall automatically limit the flow to this value. This shall facilitate balancing of the fluid loop and allow each unit the required flow.

Kit 4 – Hose kit with an automatic flow control valve and a Y-strainer and blow down valve on the supply side. The filter screen is 20 mesh, 304 stainless steel. This shall prevent dirt and debris from entering the water coil.

Kit 5 – Hose kit with an automatic flow control valve and a 24V, 2-position solenoid valve on the return. This shall be used to shut off flow to the unit when there is not a call for heating or cooling. (Typically used with a VFD pumping.)

Kit 6 – Hose kit with an automatic flow control valve, Y-strainer/BD valve on the return. 24V, automatic flow valve, blow down valve and two position solenoid valve.

Thermostats

The unit control may be as simple as a single stage thermostat or the unit may have a DDC controller integrated into the building management system. All external low voltage control wiring is made to the thermostat terminal located in the unit electrical box. Thermostats may be manual change over, auto change over, programmable or nonprogrammable depending on the requirements of the project. A full line of thermostats are available from FHP Bosch as an accessory.