

## LM Model Guide Specification

### 1.0 General

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

### 2.0 Horizontal/Vertical Water Source Heat Pumps

Units shall be designed to operate throughout the range of entering fluid temperature of 40°F to 120°F in the cooling mode and 20°F to 90°F in the heating mode. Equivalent units from other manufacturers can be proposed provided approval to bid is given 10 days prior to bid closing. All equipment with a nominal capacity of 134,000 BTUH Total Cooling or lower must be listed in the current AHRI Applied Equipment Directory under the AHRI Standard ARIISO- 13256-1, WLHP, GWHP and GLHP Rating. All equipment in this section must meet or exceed the national standard minimum EER and COP as listed in ASHRAE 90.1. All units shall conform to UL1995 standard and certified to CAN/CSA C22.1 No 236 by Intertek-ETL.

All units shall have ARI-13256-1 labels, and ETL/UL or NRTL or CSA labels.

#### 2.01 Basic Construction

- A. 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 and 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.
- B. All units shall have stainless steel drain pans to comply with this project's IAQ requirements. No exceptions shall be allowed.
- C. All water source heat pumps shall be fabricated from sheet metal finished with G90 galvanized steel. All interior surfaces shall be lined with 1/2 inch thick, multi density acoustic insulation. All insulation must meet NFPA 90A and be certified to meet the GREENGUARD Indoor Air Quality Standard 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.

Option to C: All interior surfaces shall be lined with 1/2" thick closed cell foam insulation

- D. Unit shall have a floating base pan consisting of a 1/2" (12 mm) thick high density rubber pad between the compressor base plate and the unit base pan to prevent transmission of vibration to the structure.
- E. All units shall have a factory installed four sided filter rack capable of accepting either one or two inch filters. Units shall have a 1 inch thick 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 factory-shipped filters upon completion of start-up.

Option to E: All units shall have a factory-installed four-sided filter rack with 2" MERV8 filters.

Option to E: All units shall have a factory-installed four-sided filter rack with 2" MERV13 filters.

- F. Cabinets shall have separate holes and 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.
- G. Hanging brackets shall be provided as standard for horizontal units
- H. All units shall have condensate overflow switch, Air-Coil and Water-Coil Freeze sensor as standard.

## 2.02 Fan and Motor Assembly

- A. Units shall have a direct-drive centrifugal fan. The fan motor shall be a factory pre-programmed high efficiency constant torque ECM type.

The fan motor shall be isolated from the fan housing by torsionally flexible isolation.

Option for A: The fan motor shall be a pre-programmed high efficient constant CFM ECM type

- B. The fan and motor assembly must be capable of overcoming the external static pressures as shown on the schedule. External static pressure rating of the unit shall be based on a wet coil. Ratings based on a dry coil shall NOT be acceptable.
- C. All units shall have removable blower inlet ring as standard for ease of service and maintenance.

## 2.03 Refrigerant Circuit

Units shall use R-410A refrigerant. All units shall have a factory sealed and fully charged refrigerant circuit with the following components:

- A. Two stage hermetic compressor specifically designed for heat pump operation and shall be internally protected) with thermal overload protection and mounted on rubber vibration isolators.
- B. Bi-directional refrigerant metering thermal expansion valves
- C. Finned tube refrigerant to air heat exchanger not exceeding 14 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.

Option for C: Coils shall have Duo-Guard coating for enhanced protection against formicary and other corrosion. Copper tubes shall be tin coated and aluminum fins coated to pass 1000 hour ASTM B117 salt fog testing.

- D. Reversing valve. Reversing valves shall be four way solenoid activated refrigerant valves which shall fail to the heating operation should the solenoid fail to function. Reversing valves which fail to the cooling operation shall not be allowed.
- E. Coaxial (tube in tube) refrigerant to water heat exchanger. Refrigerant to water heat exchangers shall be insulated and with copper inner water tube and steel outer refrigerant tube design rated to withstand 600 PSIG working refrigerant pressure and 400 PSIG working water pressure. Shell

and 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. The contractor supplying the water source heat pumps with Shell and Tube heat exchangers shall be responsible for any additional installation costs. Braze 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 Braze Plate heat exchangers shall be responsible for any additional costs.

Option for E: Cupro-Nickel water coil – The refrigerant to water heat exchanger shall be of cupro-nickel inner water tube construction.

- F. Safety controls including both a high pressure and low pressure switch. Temperature sensors shall not replace these safety switches. See the controls section of this specification for additional information.
- G. Access fittings shall be factory installed on high and low pressure refrigerant lines to facilitate field service.
- H. 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 below.

## 2.04 Electrical

A control box shall be located within the unit and shall contain a transformer, controls for the compressor, reversing valve and fan motor operation and shall have a terminal block for low voltage field wiring connections. The transformer shall be rated for a minimum 75 VA. All units shall be name-plated for use with time delay fuses or HACR circuit breakers. Unit controls shall be 24 volts.

## 2.05 Solid-State Safety Circuit

All units shall have a solid-state UPM safety control circuit with the following features:

1. Anti-short cycle time delay (5 minute delay on break).
2. Random start on power up mode.
3. Brown out/surge/power interruption protection.
4. Low pressure switch 120 second bypass timer.
5. Shutdown on the following fault indications:
  - a. High or low refrigerant pressure safety switches inputs.
  - b. Freeze sensors shall monitor refrigerant temperature to the water coil in the heating mode and refrigerant coil in the cooling mode.
  - c. condensate sensor input.
6. Alarm output which closes for selectable dry contact closure or 24 VAC remote fault indication.

7. Alarm output selectable for constant output for general alarm notification, or pulse output for annunciation of the specific fault alarm
8. Selectable reset of unit at thermostat or disconnect.
9. 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 a fault 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.
10. Ability to defeat time delays for servicing.
11. A light emitting diode (LED) to indicate safety alarms. The LED shall annunciate the following alarms:
  - a. high refrigerant pressure,
  - b. low refrigerant pressure,
  - c. low refrigerant temperature to the water coil in the heating operation,
  - d. high level of condensate in the drain pan,
  - e. brown out/surge/ power interruption.
12. The LED will display each fault condition as soon as the fault occurs. If a permanent lockout occurs, then the fault LED will display the type of fault until the unit is reset.
13. UL listed, CUL listed, and RFI, ESD, and transient protected.

Freeze Protection: A freeze stat shall sense the entering refrigerant temperature to the coaxial coil (in the heating mode) and shall activate the compressor lockout circuit when the refrigerant temperature drops below either 15°F or 30°F. The factory default is 30°F and the temperature setting may be set at 15°F by cutting the resistor (R42) located above dip switch. The freeze stat may not provide protection in the case of loss of flow in the heating mode. A flow switch or pressure differential switch is recommended to prevent unit operation in case of loss of flow. A second freeze sensor shall be mounted at the refrigerant inlet to the air coil. Should the refrigerant temperature drop below 30°F the unit will go into a soft lockout.

## 2.06 Options

- A. Extra quiet construction: Optional compressor blanket shall be provided on units having a capacity above 24,000 BTUH.
- B. Hot Gas Reheat: Units as noted on the schedule shall be equipped with optional Hot Gas Reheat (HGRH).

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 set point once the thermostat control is satisfied. Cooling or heating requirements shall take precedent over HGRH.
- C. Water Differential Switch. A water differential switch shall be factory piped between the fluid inlet and outlet piping to prevent unit operation if there is no fluid flow.
- D. DDC Controls: Unit shall be equipped with a factory installed DDC control capable of interfacing with BACnet, Modbus, N2 and Lonworks. 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

incorporated into a 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.

- E. Unit mounted disconnect. A non-fused factory mounted disconnect shall be installed on the unit.
- F. Two Way Motorized Water valve: A two way motorized water valve shall be mounted in the interior of the unit. The valve shall cycle open whenever there is a call for compressor operation. The valve shall be equipped with an end switch.
- G. Internal Load Match Pump: An internal load match pump shall be installed in the unit. 208-230 volt units only
- H. Conversion Kit for horizontal discharge configuration shall be available should the discharge arrangement need to be field changed.
- I. Electric Heat: Factory installed UL listed electric heater packages shall be available for the units. Available only on vertical units with top discharge and horizontal units with end blow configuration.
- J. The following relays shall be factory installed in the unit
  - a. EMS Relay for remote enabling of the unit.
  - b. Auxiliary pump relay to enable a pump operation when calling for compressor operation.
  - c. Compressor monitoring relay – provides a contact closure whenever the compressor contactor is energized
- L. Soft Start shall be installed to limit inrush current on startup. 208/230 V units only.
- M. Phase Loss and reversal protection shall be provided on the unit to protect the compressor from operating in reverse rotation.
- N. A Comfort alert module shall be installed in the units to assist in service diagnostics.

### **3.0 Hose Kits**

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". The hoses shall be either 2 or 3 feet long, with steel constructed fittings and assembly as "fire rated" tested according to UL 94 with a VO rating of ASTM 84. Non-fire rated hoses are not acceptable. Optional ball valves with P/T ports, flow controller, Y strainer and electric valve shall be included as specified in the schedule.