# **GENERAL**

Furnish and install ClimateMaster SW Water-Source Heat Pumps as indicated on the plans. Equipment shall be completely assembled, piped and internally wired. Capacities and characteristics as listed in the schedule and the specifications that follow.

Units shall be supplied completely factory built capable of operating over an entering water temperature range from 20° to 120°F (-6.7° to 48.9°C) as standard. All equipment listed in this section must be rated 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 60335-2-40 4th Edition, UL 60335-1 6th Edition for the United States and Can/CSA C22.2 No.

60335-2-40:22, CAN/CSA C22.2 No 60335-1:16 for

Canada, by Intertek Testing Laboratories (ETL). The units shall have AHRI/ISO and ETL-US-C labels.

All units shall pass a factory acceptance test. The quality control system shall automatically perform the factory acceptance test via computer. A detailed report card from the factory acceptance test shall ship with each unit. **(NOTE: If unit fails the factory acceptance test it shall not be allowed to ship. Unit serial number will be recorded by factory acceptance test and furnished on report card for ease of unit warranty status.)**

# **BASIC CONSTRUCTION**

All units must have multiple removable panels for serviceability of compressor compartment.

**Units having only one access panel shall not be acceptable.** All units must have front access for side- by-side installations.

The heat pumps shall be fabricated from heavy gauge galvanized steel with powder coat paint finish. Both sides of the steel shall be painted for added protection. All interior surfaces shall be lined with 1/2-inch (12.7 mm) thick, 11/2 lb/ft3 (24 kg/ m3) acoustic type glass fiber insulation. Insulation placement shall be designed in a manner that will eliminate any exposed edges.

Standard cabinet panel insulation must meet NFPA 90A 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. **Unit insulation must meet these stringent requirements or unit(s) will not be accepted.**

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 copper FPT fittings. **Contractor shall be responsible for any extra costs involved in the installation of units that do not have this feature.** Contractor must ensure that units can be easily removed for servicing and coordinate locations of electrical conduit and lights with the electrical contractor.

Unit(s) shall have exterior indicator lights showing,

1. compressor operation (on/off) and 2) unit “fault” status. Contractor shall be responsible for providing control circuitry and indicator lights for units not providing this feature.

**Option: UltraQuiet package - Sizes 036, 060, and 120 include sound-attenuating insulation on**

**unit base pan and all removable panels plus a refrigerant line muffler.**

# **REFRIGERANT CIRCUIT**

Units shall have sealed, isolated refrigerant circuit(s), each including a high efficiency scroll compressor designed for heat pump operation, a thermostatic expansion valve for refrigerant metering, a reversing valve, load and source coaxial (tube in tube) refrigerant to water heat exchangers, and safety controls including a high pressure switch,

low pressure switch (loss of charge), and low water temperature sensors. Access fittings shall be factory installed on high and low pressure refrigerant lines to facilitate field service. Activation of any safety device shall prevent compressor operation via a microprocessor lockout circuit. **Units with brazed plate heat exchangers will not be accepted.**

Unit shall be supplied with extended range insulation, which adds closed cell insulation to internal water lines, and provides insulation on suction side refrigeration tubing including refrigerant to water heat exchangers.

Hermetic compressors shall be internally sprung. The compressors shall have a dual level vibration isolation system. The compressors will be mounted on specially engineered sound-tested EPDM vibration isolation grommets to a large heavy gauge compressor mounting plate, which is then isolated from the cabinet base with EPDM grommets for maximized vibration attenuation.

Compressors shall have thermal overload protection.

Refrigerant to water heat exchangers shall be of copper inner water tube and steel refrigerant outer tube design, rated to withstand 625 PSIG (4309 kPa) working refrigerant pressure and 450 PSIG (3101 kPa) working water pressure. The refrigerant to water heat exchanger shall be “electro-coated” with a low cure cathodic epoxy material a minimum of 0.4 mils thick (0.4 – 1.5 mils range) on all surfaces. The black colored coating shall provide a minimum of 1000 hours salt spray protection per ASTM B117-97 on all external steel and copper tubing. The material shall be formulated without the inclusion of any heavy metals and shall exhibit a pencil hardness of 2H (ASTM D3363-92A), crosshatch adhesion of 4B-5B (ASTM D3359-95), and impact resistance of 160 in-lbs (184 kg-cm)

direct (ASTM D2794-93).

Units charged with 62 ounces or greater of R-454B shall be supplied with a Refrigerant Detection System (RDS) with sensors to be strategically placed within the cabinet. In the event of a refrigerant leak, the RDS disables compressor operation and the unit blower runs to disperse any concentration of leaked refrigerant in compliance with UL 60335-2-40 safety standards for flammable refrigerants. **Units charged with 62 ounces or greater of R-454B that do not have an RDS shall not be acceptable.**

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

**Option: The Refrigerant Detection System (RDS) package shall consist of the RDS module and sensors to be strategically placed within the cabinet. In the event of a refrigerant leak, the RDS disables**

**compressor operation and the unit blower runs to disperse any concentration of leaked refrigerant in compliance with UL 60335-2-40 safety standards for flammable refrigerants (Optional for sizes 036-060).**

# **ELECTRICAL**

A control box shall be located within the unit compressor compartment and shall contain a 75VA transformer, 24V activated, 3-pole compressor contactor, terminal block for thermostat wiring and solid-state controller for complete unit operation.

Reversing valve wiring shall be routed through this electronic controller. Units shall be name-plated for use with time delay fuses or HACR circuit breakers. Unit controls shall be 24V and provide heating or cooling

as required by the remote aquastat/sensor. Units with two compressors (120 and 340) shall have a solid-state time delay relay and random start to prevent both compressors from starting simultaneously.

# **ENHANCED SOLID STATE CONTROL SYSTEM (CXM2)**

Units shall have a solid-state control system. Units utilizing electro-mechanical control shall not be acceptable. The control system microprocessor board shall be specifically designed to protect against building electrical system noise contamination, EMI, and RFI interference. The control system shall interface with a heat pump type thermostat. The control system shall have the following features:

* 1. Anti-short cycle time delay on compressor operation.
  2. Random start on power up mode.
  3. Low voltage protection.
  4. High voltage protection.
  5. Unit shutdown on high or low refrigerant pressures.
  6. Unit shutdown on low water temperature.
  7. Option to reset unit at thermostat or disconnect.
  8. Automatic intelligent reset. Unit shall automatically reset the unit 5 minutes after trip if the fault has cleared. If a fault occurs 3 times sequentially without thermostat meeting temperature, then lockout requiring manual reset will occur.
  9. Ability to defeat time delays for servicing.
  10. The low-pressure switch shall not be monitored for the first 120 seconds after a compressor start command to prevent nuisance safety trips.
  11. 24V output to cycle a motorized water valve or other device with compressor contactor.
  12. Unit Performance Sentinel (UPS). The UPS warns when the heat pump is running inefficiently.
  13. Water coil low temperature sensing (selectable for water or anti-freeze).
  14. Air coil low temperature sensing.
  15. Minimized reversing valve operation (Unit control logic shall only switch the reversing valve when cooling is demanded for the first time. The reversing valve shall be held in this position until the first call for heating, ensuring quiet operation and increased valve life).
  16. Emergency shutdown contacts.
  17. Entering and leaving water temperature sensing.
  18. Leaving air temperature sensing.
  19. Compressor discharge temperature sensing.

**NOTE: Units not providing the eight safety protections of anti-short cycle, low voltage, high voltage, high refrigerant pressure, low pressure (loss of charge),**

**air coil low temperature cut-out, water coil low temperature cut-out, and condensate overflow protections will not be accepted.**

When CXM2 is connected to AWC99U01 thermostat or handheld service tool, the installer/service technician can; check DIP switch S2 settings; run operation modes manually; check all physical inputs from thermostat and refrigerant pressure switches status, (Y1, Y2, W, O, G, H, ESD, NSB, OR, HP switch, and LOC switch); current or at time of fault the following temperatures - water coil (LT1), compressor discharge, leaving air, leaving water, entering water and control voltage; record last five faults, list possible reasons, and clear faults. When the AWC99U01 communicating thermostat is used

this same functionality can be viewed and adjusted remotely in the web portal or mobile app. **Systems not providing remote access, diagnosis, and adjustment functionality will not be accepted.**

**Option: Enhanced Solid State Control System (DXM2.5)**

This control system is a communicating controller.

Control shall have the above-mentioned features of the CXM2 control system along with the following expanded features:

1. Removable thermostat connector.
2. Night setback control.
3. Random start on return from night setback.
4. Override temperature control with 2-hour timer for room occupant to override setback temperature at the thermostat.
5. Dry contact night setback output for digital night setback thermostats.
6. Ability to work with heat pump or heat/cool (Y, W) type thermostats.
7. Ability to work with heat pump thermostats using O or B reversing valve control.
8. Boilerless system heat control at low loop water temperature.
9. Ability to allow up to three units to be controlled by one thermostat.
10. Relay to operate an external damper.
11. Relay to start system pump.
12. 75VA control transformer. Control transformer shall have load side short circuit and overload protection via a built-in circuit breaker.

**NOTE: Units not providing the seven safety protections of anti-short cycle, low voltage, high voltage, high refrigerant pressure, low pressure (loss of charge), air coil low temperature cut-out, and water coil low temperature cut-out**

When DXM2.5 is connected to AWC99U01 communicating thermostat or handheld service tool, the installer/service technician can; check and set CFM; check DIP switch S1, S2, and S3 settings;

run operation modes manually; check all physical inputs from thermostat and refrigerant pressure switches status, (Y1, Y2, W, O, G, H, ESD, NSB, OR, HP switch, and LOC switch); current or at time of fault the following temperatures - water coil (LT1), air coil (LT2), compressor discharge, leaving air, leaving water, entering water and control voltage; record last five faults, list possible reasons, and clear faults. When the AWC99U01 communicating thermostat is used this same functionality can be viewed and adjusted remotely with the only portal or mobile

app. **Systems not providing remote access, diagnosis, and adjustment functionality will not be accepted**.

**Option: MPC (Multiple Protocol Control) interface system**

Units shall have all the features listed above (either CXM2 or DXM2.5) and the control board will be supplied with a Multiple Protocol interface board. Available protocols are BACnet MS/TP, Modbus, or Johnson Controls N2. The choice of protocol shall be field selectable/changeable via the use of a simple selector switch. Protocol selection shall not require any additional programming or special external hardware or software tools. This will permit all units to be daisy-chain connected by a 2-wire twisted pair shielded cable. The following points must be available at a central or remote computer location:

1. Source leaving water temperature
2. Load leaving water temperature
3. Command of space temperature setpoint
4. Cooling status
5. Heating status
6. Low temperature sensor alarm
7. Low pressure sensor alarm
8. High pressure switch alarm
9. Hi/low voltage alarm
10. Unoccupied/occupied command
11. Cooling command
12. Heating command
13. Fault reset command
14. Itemized fault code revealing reason for specific shutdown fault (any one of seven)

This option also provides the upgraded 75VA control transformer with load-side short circuit and overload protection via a built-in circuit breaker.

**WARRANTY**

ClimateMaster shall warranty equipment for a period of 12 months from start up or 18 months from shipping (which ever occurs first).

**Option: Extended 4-year compressor warranty covers compressor for a total of 5 years.**

**Option: Extended 4-year refrigeration circuit warranty covers coils, reversing valve, expansion valve and compressor for a total of 5 years.**

**Option: Extended 4-year control board warranty covers the CXM2/DXM2.5 control board for a total of 5 years.**

# **FIELD-INSTALLED OPTIONS**

**Hose Kits**

All units shall be connected with hoses. The hoses shall be 2-feet (61-cm) long, braided stainless steel; fire-rated hoses complete with adapters. Only fire- rated hoses will be accepted.

**Valves**

The following valves are available and will be shipped loose:

1. Ball valve; bronze material, standard port full flow design, FPT connections.
2. Ball valve with memory stop and PT port.
3. “Y” strainer with blowdown valve; bronze material, FPT connections.
4. Motorized water valve; slow acting, 24V, FPT connections.

**Hose Kit Assemblies**

The following assemblies ship with the valves already assembled to the hose described:

1. Supply and return hoses having ball valve with PT port.
2. Supply hose having ball valve with PT port; return hose having automatic flow regulator valve with PT ports, and ball valve.
3. Supply hose having “Y” strainer with blowdown valve, and ball valve with PT port; return hose having automatic flow regulator with PT ports, and ball valve.
4. Supply hose having “Y” strainer with blowdown valve, and ball valve with PT port; return hose having ball valve with PT port.

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