**NOTICE!**

TRANQUILITY® MODEL “TRL” SIZE 006-015 60 Hz

ENGINEERING SPECIFICATIONS



**This product specification document is furnished as a means to copy and paste ClimateMaster product information into project specification. It is not intended to be a complete list of product requirements. This document is an excerpt from the product submittal and must not be used without consulting the complete product submittal. For complete product installation and application requirements, please consult the complete product submittal. ClimateMaster is not responsible for misuse of this document or a failure to adequately review specific requirements in the product submittal.**

ClimateMaster

TRANQUILITY® MODEL “TRL” SIZE 006-015 60 Hz

ENGINEERING SPECIFICATIONS

Revised: February 24, 2023

General:

Furnish and install ClimateMaster Tranquility® “TRL” 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 40° to 120°F (4.4° to 43.3°C) as standard. Equivalent units from other manufacturers may be proposed provided approval to bid is given 10 days prior to bid closing. 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 13256-1) with a minimum EER of 14.0. 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 pass a factory acceptance test. The quality control system shall automatically perform 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 shall be recorded by factory acceptance test and furnished on report card for ease of unit warranty status.)***

Basic Construction:

Units shall have one of the following air flow arrangements: Left Inlet/Straight (Right) Discharge; Right Inlet/Straight (Left). Left Inlet/Back Discharge; Right Inlet/Back Discharge (limited to sizes 6 & 9 only). Left Inlet/Straight (Right) & Back Discharge; Right Inlet/Straight (Left) & Back Discharge as shown on the plans. Unit hanger brackets to be integrally designed into the top panel with rubber isolation grommets packaged separately.

If units with these arrangements are not used, the contractor is responsible for any extra costs incurred by other trades. All units must have a minimum of three access panels for serviceability of compressor compartment. Units having only one or two access panels to compressor/heat exchangers/expansion device/refrigerant piping ***or do not have bottom access panel shall*** not be acceptable.

All cabinets shall have supply air knockouts on side opposite of the return air and in the back. Field shall configure cabinets by removing factory knockouts and bending back integrally designed supply air duct flanges per model configuration shown on plans. For air noise attenuation purposes, there shall be a unit integrated sound attenuation box that helps reduce air flow noise transmission. Units not having supply air noise attenuation boxes are not acceptable.

The heat pumps shall be fabricated from heavy gauge galvanized steel. Compressor section interior surfaces shall be lined with 1/2 inch (12.7 mm) thick, 1-1/2 lb/ft3 (24 kg/m3) acoustic type glass fiber insulation. Air handling section interior surfaces shall be lined with 1/2 inch (12.7 mm) thick, 1-1/2 lb/ft3 (24 kg/m3) foil-faced fiber insulation for ease of cleaning. Insulation placement shall be designed in a manner that will eliminate any exposed edges to prevent the introduction of glass fibers into the air stream. Units without foil-faced insulation in the air handling section will not be accepted.

Standard insulation must meet NFPA Fire Hazard Classification requirements 25/50 per ASTM E84, UL 723, CAN/ULC S102-M88 and 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.

All units to have supply are knock outs with integrally designed 1" supply air duct collars, 1 inch (25.4 mm) bottom access filter frames with 1 inch (25.4 mm) filters factory installed. If units with these factory-installed provisions are not used, the contractor is responsible for any extra costs to field install these provisions, and/or the extra costs for their sub-contractor to install these provisions.

All units must have an insulated panel separating the fan compartment from the compressor compartment. Units with the compressor in the air stream are not acceptable. Units shall have factory installed 1 inch (25.4mm) wide filter frames for filter removal from the bottom. Units shall have a 1 inch (25.4mm) thick throwaway type glass fiber filter. The contractor shall purchase one spare set of filters and replace factory shipped filters on completion of start-up. If units utilize non-standard filter sizes then the contractor shall provide 12 spare filters for each unit.

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. All water connections and electrical knockouts must be in the compressor compartment corner post as to not interfere with the serviceability of unit. 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.

Option: Factory configured supply air openings.

Option: The unit will be supplied with optional factory installed 2 inch air filter frames with filter access door and return air duct flanges (typically used for ducted return installation).

 A corresponding 2 inch throwaway type glass filter will ship with the factory installed frame.

Option: UltraQuiet package shall consist of additional sound insulation applied to the base pan, removable panels and blower housing.

Option: The unit shall be supplied with extended range insulation which adds closed cell insulation to internal water lines and provides insulation on suction side of refrigerant tubing including the refrigerant to water braze plate heat exchanger.

Fan and Motor Assembly:

Fan and motor assembly shall be attached on a slide down fan deck assembly that can be access and removed from the bottom of the unit when it is installed. In service mode, the blower assembly shall hang below the unit resting on a service rail and be provided with quick electrical disconnecting means to facilitate easy field servicing and removal. The fan deck assembly shall be mechanically designed to prevent from dropping without first removing safety screw and then pulling back a safety release latch. The fan motor shall be multi-speed, permanently lubricated, ECM type, with internal thermal overload protection. Units supplied without permanently lubricated motors must provide external oilers for easy service. The fan motor shall include a torsionally flexible motor mounting system or saddle mount system with resilient rings to inhibit vibration induced high noise levels associated with “hard wire belly band” motor mounting. The airflow rating of the unit shall be based on a wet coil and a clean filter in place. ***Ratings based on a dry coil and/or no filter shall NOT be acceptable.***

Water and Refrigerant Circuits:

All units shall contain an EarthPure® (HFC-410A) sealed refrigerant circuit including a high efficiency rotary compressor designed for heat pump operation, a thermostatic expansion valve for refrigerant metering, an enhanced corrugated aluminum lanced fin and rifled copper tube refrigerant to air heat exchanger, reversing valve, braze plate refrigerant to water heat exchanger, and safety controls including a water flow switch, high pressure switch, low pressure (loss of charge) switch, water coil low temperature sensor, and air coil low temperature sensor. 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. The lockout circuit shall be reset at the thermostat or at the contractor supplied disconnect switch. Units that cannot be reset at the thermostat shall not be acceptable.

Hermetic compressors shall be internally sprung. The compressor shall have a dual level vibration isolation system. The compressor will be mounted on specially engineered sound-tested EPDM vibration isolation grommets to heavy gauge compressor mounting rails, which are then isolated from the cabinet base with rubber grommets for maximized vibration attenuation. Compressor shall have thermal overload protection. Compressor shall be located in an insulated compartment away from air stream to minimize sound transmission.

Refrigerant to air heat exchangers shall utilize enhanced corrugated lanced aluminum fins and rifled copper tube construction rated to withstand 625 PSIG (4309 kPa) refrigerant working pressure. Refrigerant to water heat exchangers shall be of copper inner plates stacked and brazed together allowing separate water and refrigerant flow pathways, rated to withstand 650 PSIG (4482 kPa) working refrigerant and water pressure.

Option: The unit will be supplied with internally factory mounted two-way motorized water valve (MWV) for variable speed loop pumping requirements. Valve to be normally closed type.

Option: The unit will be supplied with internally factory mounted automatic water flow (AFR) regulators.

*Option: High pressure water flow switches for water loop applications with designed pressures between*

*161 to 300 PSI.*

Option: The unit will be supplied with internally mounted secondary pump for primary/secondary applications, including single-pipe systems.

Option: The refrigerant to air heat exchanger shall be E-coated.

Option: The refrigerant to air heat exchanger shall be Tin-plated.

Refrigerant metering shall be accomplished by thermostatic expansion valve only. Expansion valves shall be dual port balanced type with external equalizer for optimum refrigerant metering. Units shall be designed and tested for operating ranges of entering water temperatures from 40° to 120°F (4.4° to 48.9°C). Reversing valve shall be four-way solenoid activated refrigerant valve, which shall default to heating mode should the solenoid fail to function. If the reversing valve solenoid defaults to cooling mode, an additional low temperature thermostat must be provided to prevent over-cooling an already cold room.

Drain Pan:

The drain pan shall be constructed of 304 stainless steal. Drain pan shall be fully insulated. Drain outlet shall be located at pan as to allow unobstructed drainage of condensate. Drain outlet shall be connected from pan directly to a MPT connection or a coupling will be provided for connection to a non-threaded 3/4" PVC or 1" Copper coupling fitting. No hidden internal tubing extensions from pan outlet extending to unit casing (that can create drainage problems) will be accepted. Drain pan to be accessed and removed from the bottom of the unit. ***Units without bottom removable drain pans shall not be accepted.*** The unit as standard will be supplied with solid-state electronic condensate overflow protection.Mechanical float switches will NOT be accepted.

Electrical:

A control box shall be located within the unit compressor compartment and shall contain a 75VA transformer, 24 volt activated, 2 pole compressor contactor, terminal block for thermostat wiring and solid-state controller for complete unit operation. The entire control box shall be capable of rotating 120 degrees, allowing access to the electrical section from the front, bottom, or top (table top service requires unit top panel to be removed) of the unit. **Units without front, bottom, and top access** **will not be accepted.** Low voltage wires shall enter the box through a hole in the lower left side and high voltage wires shall enter the box through a hole in the upper left side. Reversing valve and fan motor 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 24 Volt and provide heating or cooling as required by the remote thermostat or sensor.

Enhanced Solid State Control System (CXM2):

This control system is a communicating controller.

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. Condensate overflow electronic protection.
8. Option to reset unit at thermostat or disconnect.
9. 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. ***(NOTE: This is not applicable for all fault codes. LWT and LT1 will shut down the unit as soon as it goes below temperature and it will lock out.)***
10. Ability to defeat time delays for servicing.
11. Light emitting diode (LED) on circuit board to indicate high pressure, low pressure, low voltage, high voltage, low water/air temperature cut-out, condensate overflow, and control voltage status.
12. 24V output to cycle a motorized water valve or other device with compressor contactor.
13. Unit Performance Sentinel (UPS). The UPS warns when the heat pump is running inefficiently.
14. Water coil low temperature sensing (selectable for water or anti-freeze).
15. Low water flow cut out switch ensures water flow through the braze plate heat exchanger protecting the equipment from low or no flow scenarios.
16. Automatic time-based reset for flow switch. If flow is re-established within 60 seconds after flow being interrupted, the unit will restart the compressor after the 5 minutes anti short cycle.

***NOTE: Units not providing the 9 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, water flow verification switch, and condensate overflow protection 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), air coil (LT2), compressor discharge, 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.**

Remote Service Sentinel (CXM2):

Solid state control system shall communicate with thermostat to display (at the thermostat) the unit status, fault status, and specific fault condition, as well as retrieve previously stored fault that caused unit shutdown. The Remote Service Sentinel allows building maintenance personnel or service personnel to diagnose unit from the wall thermostat. The control board shall provide a signal to the thermostat fault light, indicating a lockout. The test button on the controller is pressed to display the specific code as indicated by a sequence of flashes. A detailed flashing code shall be provided at the thermostat LED to display unit status and specific fault status such as over/under voltage fault, high pressure fault, low pressure fault, low water temperature fault, condensate overflow fault, etc. Units that do not provide this remote service sentinel shall not be acceptable.

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 control board for a total of 5 years.

FIELD INSTALLED OPTIONS

Hose Kits:

All units shall be connected with hoses. The hoses shall be 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:

a. Ball valve; bronze material, standard port full flow design, FPT connections.

b. Ball valve with memory stop and PT port.

c. “Y” strainer with blowdown valve; bronze material, FPT connections.

d. Motorized water valve; slow acting, 24v, FPT connections.

Hose Kit Assemblies:

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

a. Supply and return hoses having ball valve with PT port.

b. Supply hose having ball valve with PT port; return hose having automatic flow regulator valve with PT ports, and ball valve.

c. 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.

d. Supply hose having “Y” strainer with blowdown valve, and ball valve with PT port; return hose having ball valve with PT port.

**Thermostats:**

The thermostat shall be a ClimateMaster mechanical or electronic type thermostat as selected below with the described features:

a. Thermostat (Communicating) (AWC99U01)

 An electronic communicating web-enabled touchscreen thermostat shall be provided. The thermostat shall offer three stages of heating and two stages of cooling with precise temperature control and have a four-wire connection to the unit. The thermostat shall be capable of manual or automatic change-over operation and shall operate in standard or programmable mode. An integrated humidity control feature shall be included to control a humidifier and/or a dehumidifier. The thermostat shall include a utility demand reduction feature to be initiated by an independent time program or an external input.

 The thermostat shall provide access to via the web portal or mobile application to include temperature adjustment, schedule adjustment including occupied/unoccupied, entering water temperature, leaving water temperature, water coil temperature, air coil temperature, leaving air temperature, and compressor discharge temperature. A graphical system layout to be provided with real-time operating mode information of the temperature sensors for easy diagnostics.

 The thermostat shall display system faults with probable cause and troubleshooting guidance. The system shall provide in clear language last five faults, time of faults, operating temps at time of fault, and possible reasons for the fault. The thermostat shall provide access for immediate manual control of all outputs via the web portal/mobile application for rapid troubleshooting.

b. Single-Stage Digital Auto or Manual Changeover (ATA11U01)

 Thermostat shall be a single-stage, digital, auto or manual changeover with HEAT-OFF-COOL-AUTO system switch and fan ON-AUTO switch. Thermostat shall have an LCD display with temperature and setpoint(s) in ºF or ºC. The Thermostat shall provide permanent memory of setpoint(s) without batteries. A fault LED shall be provided to display specific fault condition. Thermostat shall provide temperature display offset for custom applications.

c. Multi-stage Manual Changeover Programmable 5/2 Day (ATP21W02)

 Thermostat shall be 5 day/2 day programmable (with up to 4 setpoints per day), multi-stage (2H/1C), manual changeover with HEAT-OFF-COOL-EM HEAT system settings and fan ON-AUTO settings. Thermostat shall have an LCD display with temperature, setpoint(s), mode, and status indication. The temperature indication shall be selectable for ºF or ºC. The thermostat shall provide permanent memory of setpoint(s) without batteries. Thermostat shall provide convenient override feature to temporarily change setpoint.

d. Multi-stage Automatic or Manual Changeover Programmable 7 Day (ATP32U03C)

 Thermostat shall be 7 day programmable (with up to 4 setpoints per day), multi-stage (3H/2C), automatic or manual changeover with HEAT-OFF-COOL-AUTO-EM HEAT system settings and fan ON-AUTO settings. Thermostat shall have a blue backlit dot matrix LCD display with temperature, setpoints, mode, and status indication. The temperature indication shall be selectable for ºF or ºC. Time display shall be selectable for 12 or 24 hour clock. Fault identification shall be provided (when used with ClimateMaster CXM2 or DXM2.5 controls) to simplify troubleshooting by providing specific unit fault at the thermostat with red backlit LCD during unit lockout. The thermostat shall provide permanent memory of setpoints without batteries. Thermostat shall provide heating setpoint range limit, cooling setpoint range limit, temperature display offset, keypad lockout, dead-band range setting, and inter-stage differential settings. Thermostat shall provide progressive recovery to anticipate time required to bring space temperature to the next programmed event. Thermostat shall provide an installer setup for configuring options and for setup of servicing contractor name and contact information. Thermostat shall allow the use of an accessory remote and/or outdoor temperature sensor (AST008). Thermostat navigation shall be accomplished via five buttons (up/down/right/left/select) with menu-driven selections for ease of use and programming.

e. Multistage Automatic or Manual Changeover Programmable 7 Day with Humidity Control (ATP32U04C)

 Thermostat shall be 7 day programmable (with up to 4 setpoints per day), multi-stage (3H/2C), automatic or manual changeover with HEAT-OFF-COOL-AUTO-EM HEAT system settings and fan ON-AUTO settings. Separate dehumidification and humidification setpoints shall be configurable for discreet outputs to a dehumidification option and/or an external humidifier. Installer configuration mode shall allow thermostat dehumidification mode to operate with ClimaDry® II reheat or with ECM fan dehumidification mode via settings changes. Thermostat shall have a blue backlit dot matrix LCD display with temperature, relative humidity, setpoints, mode, and status indication. The temperature indication shall be selectable for ºF or ºC. Time display shall be selectable for 12 or 24 hour clock. Fault identification shall be provided (when used with ClimateMaster CXM2 or DXM2.5 controls) to simplify troubleshooting by providing specific unit fault at the thermostat with red backlit LCD during unit lockout. The thermostat shall provide permanent memory of setpoints without batteries. Thermostat shall provide heating setpoint range limit, cooling setpoint range limit, temperature display offset, keypad lockout, dead-band range setting, and inter-stage differential settings. Thermostat shall provide progressive recovery to anticipate time required to bring space temperature to the next programmed event. Thermostat shall provide an installer setup for configuring options and for setup of servicing contractor name and contact information. Thermostat shall allow the use of an accessory remote and/or outdoor temperature sensor (AST008). Thermostat navigation shall be accomplished via five buttons (up/down/right/left/select) with menu-driven selections for ease of use and programming.

f. CM100 - Multi-stage Automatic or Manual Changeover digital thermostat (ATA32V01)

Multi-stage (3H/2C), automatic or manual changeover with HEAT-OFF-COOL-AUTO-EM HEAT system settings and fan ON-AUTO settings. Thermostat shall have a green backlit LED display with temperature, setpoints, mode, and status indication via a green (cooling) or red(heating) LED. The temperature indication shall be selectable for ºF or ºC. Time display shall be selectable for 12 or 24 hour clock. The thermostat shall provide permanent memory of setpoints without batteries. Thermostat shall provide heating setpoint range limit, cooling setpoint range limit, temperature display offset, keypad lockout, dead-band range setting, and inter-stage differential settings. Thermostat shall provide progressive recovery to anticipate time required to bring space temperature to the next programmed event. Thermostat shall provide an installer setup for configuring. Thermostat navigation shall be accomplished via four buttons (Mode/fan/down/up) with menu-driven selections for ease of use and programming.

g. CM300 – Multi-stage, Automatic or Manual Changeover, 7-day Programmable with Wi-Fi and Humidity Control (AVB32V02C)

Residential version shall be 7 day programmable with up to 4 setpoints per day. Commercial version shall be 7 day programmable with 4 occupied/unoccupied periods per day with up to 4-hour override. Multi-stage (3H/2C), automatic or manual changeover with HEAT-OFF-COOL-AUTO-EM HEAT system settings and fan ON-AUTO settings, Wi-Fi, pre-occupancy purge fan option, night time control of display backlight, bi-color LED indicates a heating or cooling demand, keypad lock, title 24 compliant, openADR2.0b certified with Skyport web portal. Compatible with condensate overflow warning systems – lockout compressor with message on.

h. CM500 – Color Touchscreen Display, Multi-stage, Automatic or Manual Changeover, 7-day Programmable with Wi-Fi and Humidity Control (AVB32V03C)

Thermostat shall have color resistive touchscreen display with space temperature, relative humidity, setpoints, mode, status indication and local weather (if connected to Wi-Fi). Residential version shall be 7 day programmable with up to 4 setpoints per day. Commercial version shall be 7 day programmable with 4 occupied/unoccupied periods per day with up to 4-hour override. Multi-stage (3H/2C), automatic or manual changeover with HEAT-OFF-COOL-AUTO-EM HEAT system settings and fan ON-AUTO settings, Wi-Fi, pre-occupancy purge fan option, customizable screen saver and background displays, indicator on display indicates a heating or cooling demand, set-point lock, title 24 compliant, openADR2.0b certified with Skyport web portal. Compatible with condensate overflow warning systems – lockout compressor with message on the display. Capable of being monitored by 3rd party software. Compatible with AST014 Wi-Fi remote sensor. Configurator mobile app or web portal for easy setup. Separate dehumidification and humidification setpoints shall be configurable for discreet outputs to a dehumidification option and/or an external humidifier. The temperature indication shall be selectable for ºF or ºC. Time display shall be selectable for 12- or 24-hour clock. The thermostat shall provide permanent memory of setpoints without batteries. Thermostat shall provide heating setpoint range limit, cooling setpoint range limit, temperature display offset, dead-band range setting, and inter-stage differential settings. Thermostat shall provide progressive recovery to anticipate time required to bring space temperature to the next programmed event. Thermostat shall provide access to a web portal and mobile app for installer setup for configuring options. Thermostat shall have menu-driven selections for ease of use and programming.