

ControlAIR Series PW – Packaged Water Cooled A/C Unit

1.0 GENERAL

- 1.1 This specification covers the design and manufacture of AIR's ControlAIR Series PW packaged, water cooled DX air conditioning unit.
- 1.2 The ControlAIR Series PW is a vertical package unit configuration with a fan section and compressor/water cooled condenser section.
- 1.3 This specification is also applicable to the following ControlAIR Series configurations:
 - 1.3.1 ControlAIR Series SW: Unit is split into an air handling unit (fan section) and remote compressor/water cooled condenser section.
 - 1.3.2 ControlAIR Series TW: Unit is split into an air handling unit (fan section), remote water cooled condenser section, and remote skid mounted compressors.
 - 1.3.3 ControlAIR Series CW: Unit is split into an air handling unit (with fan section and water cooled condenser section) and remote skid mounted compressors.
- 1.4 ControlAIR units are recommended for rooms which demand the highest degree of reliability and have temperature/humidity control requirements down to 72°F and 40% relative humidity.
- 1.5 Features described herein are AIR's standard. However, AIR offers customization of our standard designs to our Customers, upon request.
- 1.6 AIR selects each mechanical component to specifically meet the required conditions of each unit. Where deviations between this specification and AIR's detailed technical proposal offered to the Customer exist, the proposal shall take precedence.

2.0 UNIT CASING

- 2.1 Units shall be a vertical configuration with upblast supply air discharge and rear return.
- 2.2 Unit panels shall be fabricated from 18 gauge, 304 stainless steel and include fasteners that allow for easy removal and replacement without alignment issues. Panels shall not be used to support any internal equipment. Access doors shall be gasketed, removable lift-off hinges, and have toolless compression latches.
- 2.3 Fan section panels shall be 2" thick double wall construction with 1.5" thick closed cell elastomeric foam insulation, non-condensing at ambient conditions of 90°F and 80%RH.
- 2.4 Compressor section panels shall be single wall construction and uninsulated.
- 2.5 Upon request, Series PW units may have the fan section and compressor section shipped split to facilitate installation where adequate space is not available to transport the fully assembled unit to the final install location. Unit sections shall be reconnected in the final

install location by the Customer with all refrigerant brazing provided by AIR's factory certified technician.

3.0 SUPPLY FANS

- 3.1 Units 6 tons and above shall be furnished with two variable speed, double width, double inlet (DWDI) fans, each with a dedicated motor.
- 3.2 Fan wheels shall be forward curved for units below 20 tons. For units 20 tons and above, fan wheels shall be either forward curved or backward inclined.
- 3.3 Fans shall be balanced per ANSI/AMCA 204-05, G6.3 level.
 - 3.3.1 Upon request, fans shall be balanced per ANSI/AMCA 204-05, G2.5 level.
- 3.4 Fans shall have pillow block bearings with an L10 life of minimum 100,000 hours.
- 3.5 All fan pulleys, sheaves and belts shall have a 1.5 service factor.
- 3.6 The fan speed of each fan shall be adjusted by a TEFC motor and dedicated VFD installed in the control panel.
 - 3.6.1 Upon request, motors shall be TEFC, IEEE 841 compliant.
- 3.7 For systems with two fans, each fan outlet shall include a unit mounted backdraft damper.
- 3.8 Standard allowance for external duct static pressure loss is 1.5" w.g.
 - 3.8.1 Static pressure loss through duct mounted heaters provided for field installation by AIR will be included within the internal static pressure allowance, provided the Customer provides the duct size for the heater installation at time of Request for Proposal.
 - 3.8.2 Customer shall advise if external duct static pressure required exceeds 1.5" w.g. at time of Request for Proposal.

4.0 EVAPORATOR COILS

- 4.1 Evaporator coils shall have copper tubes and aluminum fins. Fin spacing shall not exceed 10 fins per inch. Fin thickness shall not be less than 0.008". Tube thickness shall not be less than 0.025". Coils shall be in a vertical configuration.
 - 4.1.1 Upon request, evaporator coils and all exposed copper shall be coated with ElectroFin E-Coat or Blygold PoluAl XT polyurethane coating. Application shall be by a qualified technician per manufacturer's recommendations.
- 4.2 Condensate drain pans shall be stainless steel and shall be sloped. Drain pans shall be readily accessible.

5.0 REFRIGERANT SYSTEM

- 5.1 Compressors shall be semi-hermetic reciprocating design, furnished with cylinder unloading for capacity modulation.
- 5.2 Compressors shall be furnished with high and low pressure transducers, oil monitoring sensor, oil flow sensor, winding temperature sensor, and overload/short circuit protection.
- 5.3 System refrigerant shall be R-134a.
- 5.4 Each refrigerant circuit shall include suction and discharge service valves, liquid line filter-drier with service valves and removable cores, liquid sight glass moisture indicator, and liquid line solenoid valve.
- 5.5 Electronic expansion valves shall be provided to maintain superheat at low load conditions and mitigate the risk of flooding the compressor.
- 5.6 System shall be able to unload each compressor to at least 50% without using hot gas bypass.
- 5.7 ControlAIR Series SW, Series TW, and Series CW require external field refrigerant piping between the split components. Refrigerant piping shall be per AIR specification ENG-FieldPiping-01. The routing of the refrigerant piping shall be approved by the Customer to determine required piping length.

6.0 WATER COOLED CONDENSERS

- 6.1 Condensers shall be shell and tube design per Section VIII of the ASME pressure vessel code with removable heads for cleaning.
- 6.2 Condenser shells shall be carbon steel.
- 6.3 Condenser tubes shall be minimum 0.035" thickness copper.
 - 6.3.1 Upon request, cupro-nickel tubes are available as an option.
 - 6.3.2 Upon request, stainless steel tubes are available as an option, provided the condensers are mounted on a skid external to the unit due to the increased condenser size required.
- 6.4 Tube water velocity at design condition shall be 3 to 6 fpm (copper tubes) and 3 to 7 fpm (CuNi tubes).
- 6.5 Condenser heads shall be fully accessible for removal to facilitate tube cleaning.
- 6.6 Condenser water regulating valves shall be electronic NEMA 2, 2-way, automatically modulated to maintain system head pressure. A separate valve shall be provided for each refrigerant circuit, pre-piped integral to the A/C unit.

6.6.1 Upon request, NEMA 4X water regulating valves maybe provided for harsh environments.

6.7 Water regulating valves shall be NEMA 2 rated and shall have a field adjustable flush cycle to fully open upon a timed interval to flush debris from the condensers during periods of low load/condenser water usage.

6.7.1.1 Upon request, NEMA 4 rated water regulating valves shall be provided.

7.0 FILTERS

7.1 The filter rack shall be provided with a single track to house 2" deep or 4" deep filters.

7.2 Upon request, the filter rack shall have dual tracks to house both 2" deep and 4" deep filters simultaneously.

7.3 The filter rack shall be galvanized steel construction and fitted with filter tracks with felt edge seals. The filter access doors shall be gasketed, hinged, and compression latched with filter end seals. Filters shall be mounted in the rear of the unit and accessible from either side of the unit.

7.3.1 Upon request, stainless steel filter racks shall be provided.

7.4 Particulate filters sizes shall be 12"x24" or 24"x24". Filters shall be 4" thick and have a MERV 8 rating. Filters shall meet the requirements of the latest version of ASHRAE Standard 52.2.

7.4.1 Upon request, a differential pressure gauge shall be furnished across the filter bank, capable of displaying the filter pressure drop locally.

7.4.2 Upon request, a differential pressure switch shall be furnished across the filter bank, capable of displaying the filter pressure drop locally and outputting a signal to the unit controller indicating high filter pressure drop.

7.4.3 Upon request, filters shall be provided with a rating up to MERV 14.

7.5 A dirty filter pressure drop allowance of 0.5" shall be added to the clean filter pressure drop for the purpose of A/C unit fan selection.

8.0 ELECTRIC HEATERS

8.1 Electric heaters shall be finned tubular type with high quality alloy resistor wire centered and permanently encased within compacted refractory material, surrounded by a stainless steel sheath, furnished complete with all required safeties, including air flow differential pressure switch, primary over temperature protection, secondary over temperature protection, and over current protection.

8.2 Heaters shall be furnished with SCR controller for fine room temperature control.

8.3 Electric heaters shall be mounted within the unit casing.

8.3.1 Upon request, electric heaters shall be provided shipped loose for duct mounting by the Customer in the field.

8.3.2 Upon request, duct mounted heaters may be provided with a remote control panel.

9.0 HUMIDIFIERS

9.1 Upon request, humidification shall be provided with a remote electric generated humidifier and duct mounted dispersion tube, installed by the Customer.

9.2 Piping/hoses between the humidifier and duct mounted dispersion tube shall be furnished and installed by the Customer.

9.3 The Customer shall provide the duct size for installation of the duct mounted dispersion tube.

10.0 ELECTRICAL/CONTROLS

10.1 The unit control panel shall be NEMA 12 rated, mounted on the unit casing. Panel shall be hinged to allow access to the unit access panel behind the control panel.

10.1.1 Upon request, an option shall be offered for unit control panel to be shipped loose for remote installation by the Customer.

10.1.2 Upon request, an option shall be offered for power and control cables between remote control panels and the air handling unit, for field installation by the Customer.

10.1.3 Upon request, control panels shall be NEMA 4X rated for hazardous, exposed, or wet environments.

10.2 The unit shall be furnished with a Carel PLC, mounted in the control panel.

10.2.1 Upon request, an Allen Bradley CompactLogix PLC or Allen Bradley ControlLogix PLC shall be provided.

10.2.2 Upon request, the Customer's preferred controller shall be considered, if capable to meet the required service.

10.3 Motor VFD's shall be Allen Bradley Powerflex 525.

10.3.1 Upon request, the Customer's standard VFD manufacturer and model shall be provided.

10.4 Motor VFD's and control power transformers shall be installed within the unit control panel, such that the Customer needs only to bring a single power supply. Power supply

may be 208-230v/3ph/60hz, 480v/3ph/60hz, or 575v/3ph/60hz, as requested by the Customer.

- 10.4.1 Upon request, a locking non-fused disconnect switch mounted on the door of the panel.
- 10.5 All terminals in the control compartments shall be finger safe and torqued to the terminal manufacturer's specifications utilizing the appropriate WIHA or equivalent torque screwdriver. No energized conductors or circuit parts shall be exposed when the door is opened.
- 10.6 All system wiring shall be tinned copper.
- 10.7 The A/C unit control systems shall operate as follows:
 - 10.7.1 The unit controller shall stage the compressors to maintain a constant coil leaving air temperature based on maintaining the room design absolute humidity.
 - 10.7.2 The unit controller shall control the fan speeds to maintain the room temperature at set point.
 - 10.7.3 The unit controller shall send a 4-20 mA output to the electric heater SCR controllers to prevent the room temperature from dropping 2°F below set point with the fans at the minimum speed.
 - 10.7.4 The unit shall not automatically restart upon shutdown.
- 10.8 Instruments:
 - 10.8.1 A room mounted temperature/humidity sensor with digital display shall be furnished by AIR and installed within the room by the Customer.
 - 10.8.2 A unit mounted supply air temperature sensor shall be installed in the electric heater discharge.
 - 10.8.3 A unit mounted entering air temperature/humidity sensor shall be shipped loose for installation in the filter rack by the Customer.
 - 10.8.4 A unit mounted coil leaving air temperature sensor shall be installed within the unit casing.
- 10.9 Upon request, the unit shall be furnished with a smoke detector shipped loose for field mounting in the supply duct by the Customer.
 - 10.9.1 Power supply for the smoke detector shall be 120v, supplied by Customer independent of the A/C unit.
 - 10.9.2 Each smoke detector shall be provided with two (2) Form C dry contacts. One contact shall be interlocked to shutdown A/C unit upon detection of smoke.

10.9.3 The A/C unit shall be furnished with at least two (2) Form C dry contacts to provide remote output of unit shut down.

10.10 Upon request, the unit shall be capable of communicating with the Customer's control system via Ethernet.

11.0 ADDITIONAL SERVICES

11.1 AIR provides startup and commissioning support for all AIR equipment by a factory certified technician.

11.2 AIR offers additional services for a turnkey mechanical solution, upon request:

11.2.1 Detailed engineering of the design, including mechanical, structural, and electrical.

11.2.2 Demolition of existing equipment and/or ductwork (as required).

11.2.3 Rental equipment for temporary cooling.

11.2.4 Furnish and installation of new AIR equipment, including chillers, pump packages, air conditioning units, deep bed activated carbon filtration units, activated carbon recirculation units, etc.

11.2.5 Furnish and installation of additional equipment not manufactured by AIR, required for a complete system.

11.2.6 Fabrication and installation of new ductwork and piping.

11.2.7 Architectural/structural modifications.

11.2.8 Remote condition monitoring analysis and engineering support via the AIRbot system.

11.2.9 Web based parts supplier for all AIR and other HVAC equipment.

11.2.10 Permanent on-site maintenance contracts offering continuous support for AIR and other HVAC equipment.

END OF SPECIFICATION