CLIMATEWORX
MISSION CRITICAL CLIMATE CONTROL

Series P

Guide Specification – 60 Hz

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1. General

1.1 The intelligent precision air-conditioning system shall be a ClimateWorx P Series model _____ .

1.2 The unit shall be designed specifically for telecommunication, computer and critical room environmental control with automatic monitoring and control of cooling, heating, humidifying, dehumidifying and air filtration functions.

1.3 The unit shall be self-contained, factory assembled and tested, arranged for (down flow)/(up flow) air delivery.

1.4 The system shall have a total NET cooling capacity of _____ kW(Btu/h) and a sensible cooling capacity of _____ kW(Btu/h) rated at an entering air temperature of ___°C (___°F) dry bulb and ___% relative humidity.

1.5 The system shall be designed to operate on a _____ V _____ ph _____ Hz electricity supply.

1.5.1 The 575 volt machines require the use of a transformer which is factory mounted and wired. The transformer adds 18-3/4" to the overall length of the machine. Other options such as humidifiers may share this extra compartment.

2. Mechanical Parts

2.1 Cabinet

2.1.1 The cabinet of the unit shall be constructed based on a frame and panel principle with removable panels for maximum service access. Unit shall be 100 % front accessible for service and maintenance (Chilled Water units only).

2.1.2 The framework shall be fabricated by 14 gauge cold-formed steel to provide maximum strength.

2.1.3 All panels shall be formed and welded from 18 gauge steel and insulated with 25mm (1") thick, 24kg/m³ (1.5 lb/ft3) density fiber-glass insulation.

(Optional) Double-Skin Panels

2.1.4 The panels shall be internally lined with 20 gauge sheet metal, for ease of cleaning.

2.1.5 All service panels shall be hinged and locked with ¼-turn captive fasteners to facilitate quickly and easily internal access.

2.1.6 The entire unit shall be finished with epoxy powder paint to ensure proper surface adhesion. The color of the panels shall be ClimateWorx standard off-white.

2.1.7 The cabinet is arranged for right hand side pipe access (when facing unit).

2.1.8 (Optional) The cabinet shall be arranged for left hand pipe access (when facing unit)

2.1.9 The pipe access shall be from the bottom on down flow units and top for up flow units.

2.1.10 (Optional) The pipe access shall be from the top on down flow units and from the bottom for up flow units. Bottom pipe access on up flow units requires a floor stand.

2.2 Blower and EC Motor

2.2.1 The BACKWARD INCLINED Direct Drive Plenum Fan, single inlet, single width, centrifugal wheel with an ELECTRICALLY COMMUTATED external rotor motor, shall have a static and dynamic balance of the complete assembly. The fan shall operate from within the floor stand for optimum floor pressurization and energy efficiency. The fans shall ship in a raised up position inside the cabinet of the machine and shall PIVOT into the floor stand in the field after the machine is installed. The minimum floor height shall be 18". The fan must be operable in the raised position for test purposes.

2.2.2 A floor stand with OSHA guards is required and the OSHA guard shall not exceed 18" when the floor stand is higher to allow pipes to run under the floor stand without special modifications.

2.2.3 No jacks or lifting rigs shall be required to raise and lower the fans.

2.2.4 (Optional) Fans shall be housed within the machine and shall slide out the front of the machine where raised floor height is less than 18".

2.2.5 The complete wheel and motor assembly shall be mounted on resilient neoprene mountings for vibration isolation.

2.2.6 Electronic commuted motors (EC motors) are DC motors with shunt characteristics. Contrary to the conventional DC motors with mechanical commutation, no wear and tear elements such as collectors and carbon brushes are required. They are substituted by maintenance-free electronic circuitry in the EC controller. EC motors are characterized by their high efficiency and optimal open- /closed-loop control. An electronic reversal of the motor's direction of rotation is possible.

2.2.7 Rotor - A rotor with permanent magnets replaces the short-circuit armature. An external electronic commutating unit, the so-called EC-Controller, provides for the electronic commutation. The EC-Controller provides the windings with electrical current so that, the motor rotates continuously and quietly.

2.2.8 Speed control - Method of fan speed control shall be attained by an analog signal from 0 to 10 volts DC. The speed control offers continuously variable control through the Microprocessor.

2.3 Filters

2.3.1 The filter section shall be an integral part of the system, located at the entrance of return air path, except PCD180 and should be serviceable from the top (down flow) and bottom (up flow) of the unit. Face velocity shall not exceed _____ FPM. PCD180 requires an external Plenum and Filter Box on top of the machine. This Plenum and Filter Box is factory assembled and shipped loose for field installation. See 2.3.5

2.3.2 The filter section shall have the provision to house 102 mm (4") high efficiency filters on Down Flow units and 51 mm (2") efficiency filters on Up Flow units. Standard pleated filter shall be MERV 8. (30-45% ASHRAE 52.1)

2.3.3 (Optional) High efficiency pleated filter is 4" deep, MERV 11, (60-65% ASHRAE 52.1)

2.3.4 (Optional) Plenum and Filter Box extends the top of the machine by 36". The Plenum and Filter box shall accept up to six inches of filters and shall have hinged access doors for filter access that match the appearance of the front doors of the machine. The Plenum and Filter Box improves the overall unit efficiency by improving the box losses by allowing more room for air to transition within the machine. The Plenum and Filter Box is factory assembled and shipped loose for field installation

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2.3.6 (Optional) Plenum and Filter Box Extensions are available in six inch increments. These extensions mount on top of the Plenum and Filter Box. The extensions are shipped knocked down and require field assembly and installation. The Extensions match the finish of the machine.

2.4 (Optional) Reheat

2.4.1 An electric resistance heater shall be provided to offset the sensible cooling effect during dehumidification mode.

2.4.2 The heating element shall have a total heating capacity of _____ kW_____(Btu/h).

2.4.3 The electric heaters shall be Silicon Controlled Rectifier (SCR) controlled, with an extruded aluminum heat sink, to prevent room temperature gradient from exceeding 1.5□C (2.7□F) in 10 minutes.

2.4.4 The heating element shall be of low density, tubular finned construction with a non-corrosive metal sheath.

2.4.5 The heating element shall be electrically and thermally protected.

2.4.6 Heater shall hinge out of the way for shipping on units with fans that are to be lowered into the floor stand. Once fans are lowered, heaters are rotated up and hooked into normal operating position. A locking screw holds the heaters in the normal position.

(Optional) Hot Water Reheat

2.4.7 The hot water reheat coil shall have copper tubes and aluminum fins. The hot water coil shall be factory pre-piped with a two way modulating control valve

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(Optional) Steam Reheat

2.4.8 The steam reheat coil shall have copper tubes and aluminum fins. The steam coil shall be factory pre-piped with a two way modulating control valve.

2.4.9 The steam reheat coil shall be low pressure steam (14 psig)

2.5 (Optional) Humidifier Adds 18-3/4" to Unit Length in Down Flow units

2.5.1 The optional humidifier shall be housed in a separate compartment which allows it to be serviced without disturbing the air flow. Humidifiers mounted in the air stream are not acceptable and humidifiers that disrupt air flow for routine inspection and service are not acceptable.

2.5.2 Units with humidifiers shall be 100% front serviceable.

2.5.3 The humidifier shall be a self-contained electrode boiler type complete with water level control and auto-drain functions.

2.5.4 The humidifier shall have a team generation capacity of _____ kg/h _____(lbs/h).

2.5.5 The humidifier shall be designed to operate on ordinary tap water and shall be equipped with automatic water supply and flushing system to reduce mineral precipitation.

2.5.6 The humidifier shall have an Auto-Adaptive control system to optimize water conductivity, control automatic drain/flush cycles, minimize energy waste and maximize cylinder life.

2.6 Chilled Water Coil

2.6.1 The chilled water coil shall be of A-frame configuration in a down flow configuration and a V-frame configuration in a up flow configuration (except PCD180 which shall be a split slab configuration) with galvanized steel end plates and 3/8", 1/2" or 5/8" OD copper tubes expanded into aluminum fins. The coil shall be circuited for optimum pressure drop.

2.6.2 The coil shall have a face area _____ m² _____(ft²) and _____ rows deep in the direction of the airflow and have a maximum face velocity of _____ m/s _____(fpm).

2.6.3 The coil shall be mounted over a stainless steel, corrosion free condensate drain pan.

2.6.4 The coil shall require _____ l/s ____(USgpm) of 7.2°C (45°F) chilled-water and the pressure drop across the coil shall not exceed _____ kPa _____(ft-H2O).

2.6.5 The unit chilled water hydronic system shall be rated for 150 psig.

2.6.6 (Optional) The unit chilled water hydronic system shall be rated for 400 psig.
Chilled-Water Valve

2.6.7 The chilled-water valve shall be a Characterized Control Valve, CCV, ball type with a permanent, parabolic shaped insert that provides equal percentage flow over the entire valve stroke. Two-way is standard and is rated for 580 psig, PN40. The valve has a 200 psig close off pressure rating.

2.6.8 (Optional) The three-way chilled-water valve shall be a Characterized Control Valve, CCV, ball type with a permanent, parabolic shaped insert that provides equal percentage flow over the entire valve stroke. The by-pass has a manual ball valve for balancing flow. The valve is rated for 580 psig, PN40. The valve has a 200 psig close off pressure rating.

2.6.9 (Optional) The chilled water valve shall be a Pressure Independent Characterized Control Valve, PICCV with a permanent, parabolic shaped insert that provides equal percentage flow over the entire valve stroke as well as maintaining flow regardless of the hydronic system pressure. Two-way is standard and is rated for 580 psig, PN40. The valve has a 200 psig close off pressure rating. PT ports are provided on the internal piping system across the valve for setting the flow rate.

2.6.10 The valve actuator shall be of an electric, non-spring type with a totally enclosed dust and water proof enclosure. The actuator shall modulate on a 0-10vdc signal where 0 volts the valve is closed and 10 volts the valve is open. The actuator is powered to open and closed. On power failure the valve will remain in the last position. The valve shall be fail-closed meaning that a loss of the 0-10 vdc signal will cause the valve to drive closed. The actuator shall have a manual operation function that allows the valve to be opened by hand and the valve position shall be indicated by a pointer on the actuator. The stroke time of the valve shall be 60 to 90 seconds.

2.6.11(Optional) The valve actuator shall be of an electric, spring type with a totally enclosed dust and water proof enclosure. The actuator shall modulate on a 0-10vdc signal where 0 volts the valve is closed and 10 volts the valve is open. The actuator is powered to open and closed. On power failure the valve will drive closed by the internal spring. The valve shall be fail-closed meaning that a loss of the 0-10 vdc signal will cause the valve to drive closed. The actuator shall have a manual operation function that allows the valve to be opened by hand and the valve position shall be indicated by a pointer on the actuator. The stroke time of the valve shall be 60 to 90 seconds.

2.6.12(Optional) The chilled water system shall incorporate two chilled water coils for connection to two separate chilled water sources. Not all sizes are available in dual chilled water arrangement. The machine shall switch between sources based on information supplied via the BMS based on water temperature and flow status. The change over temperature is adjustable via the unit mounted microprocessor and the BMS. There is an adjustable time delay that allows both chilled water coils to be active when switching from one source to the other. The system shall allow the choice of which chilled water source is the primary source. When the primary system is restored the system will switch back automatically.

3. Control System

3.1 Microprocessor

3.1.1. The unit shall have a microprocessor based control system with automatic control and monitoring capability.

3.1.2. The control system shall use Proportional + Integral + Derivative (PID) control algorithm to maintain the temperature and humidity to a close tolerance of ±0.5°C (0.9°F) and 3%RH.

3.1.3. The control system shall have a fascia with 240x128 dot resolution touch screen, graphical LCD display located on the front panel of the unit for the display and programming of functions.

3.1.4. The control system shall display simultaneously the following information on the fascia.

- **Room temperature in °C or °F**
- **Room humidity in %RH**
- **Unit no.**
- **On/Off mode indicator**
- **Operating status**
- **Active alarms**
- **Date & time**

3.1.5. System configuration and setting shall be stored in non-volatile memory and safeguarded in the event of power failure.

3.1.6. The system shall have at least three levels of programmable password access to prevent unauthorized changes of the system configuration and settings.

3.1.7. The control system shall have a built-in testing routine to simplify field testing and troubleshooting.

3.1.8. The system shall be capable of communicating with a Building Management System (BMS) via an RS485 serial link through an Optional BMS Interface (Communications Bridge) for remote monitoring function. The resident protocol shall be MODBUS RTU. Other popular open protocols are available and require an optional external gateway.

3.1.9. The system shall have a manual disconnect switch of the locking type, which can be accessed outside of the unit while the door is closed. High voltage electrical components will not be accessible unless the switch is off.

3.2 Control Features

3.2.1. System set points and configuration shall be programmable only when access is gained by entering the correct password.

3.2.2. The following programmable control parameters shall be provided for fine tuning the system to suit the site conditions and requirements:

- **Temperature set point**
- **Temperature high limit**
- **Temperature low limit**
- **Cooling proportional band**
- **Heating proportional band**
- **Temperature dead band**
- **Relax temperature dead band**
- **Temperature integral action time**
- **Temperature Derivative function**
- **Humidity set point**
- **Humidity high limit**
- **Humidity low limit**
- **Humidifying proportional band**
- **Dehumidifying proportional band**
- **Humidity derivative function**

- **Humidity dead band**
- **Relax humidity dead band**
- **Humidity integral action time**

3.2.3. The control system shall have the following programmable On/Off control mode options:
- **“Local” mode allows unit on/off control via the “I/O” key on the display**
- **“Remote” mode allows unit On/Off control via a switched input**
- **“Timer” mode allows 4 event/day weekly automatic on/off control**

3.2.4. A “Standby unit enable” input shall be provided to force the unit to start irrespective of the current On/Off status and On/Off mode setting.

3.2.5. For energy saving and extended system life, a “Relax” feature shall be provided in the “Timer” On/Off mode to allow wider temperature and humidity tolerances when the room is not operational.

3.2.6. The system shall have programmable, manual, or automatic restart option. A programmable startup delay shall be provided for the automatic restart option which allows multiple units to restart progressively when power resumes after a power failure.

3.2.7. The accumulated runtime of the following components shall be logged for energy analysis and planned maintenance:
- **Fan**
- **Compressor**
- **Heaters**
- **Humidifier**

3.2.8. Components shall be scheduled to activate sequentially to minimize inrush current.
3.2.9. The system shall have a temperature and humidity graph which shows the main temperature and humidity variation in the latest 7 Days. The data for the graph shall be logged in 15 minutes interval.

3.3 Alarms

3.3.1. The control system shall have the following standard alarms:
- **High/Low temperature**
- **High/Low humidity**
- **High/Low voltage**
- **Filter dirty**
- **Fan fault**
- **Low airflow**
- **Compressor high pressure, 1/2**
- **Compressor low pressure, 1/2**
- **Compressor overload 1/2 (only available on select compressors)**
- **Heater overheat (with Optional Heater)**
- **Humidifier Service (with Optional Humidification)**
- **Fire**
- **Loss of Sensor**
- **Loss of EX1, EX2 (DX only)**
- **Liquid Detection (Optional)**
- **Liquid High Limit (Optional)**
- **Custom Fault 1 and 2 (Optional)**
- **Filter Drier Dirty, 1/2 (Optional DX only)**

3.3.2. All alarms shall have programmable reporting / response options which include:
- **Polling enable / disable**
- **Unit shutdown**
- **Activate standby unit**
- **Activate common alarm output**

- **Log alarm event**
- **4 warning sound selection**

3.3.3. Alarm messages, when programmed, shall comprise text description and occurrence time.

3.3.4. Messages shall be ranked in the sequence of occurrence for fault analysis.

3.3.5. When a programmed alarm condition exists, the audible alarm shall sound and the common alarm output shall close until acknowledged. Active alarm record shall remain until the alarm condition is cleared.

3.3.6. A historical event log which maintains the latest 50 system events shall be provided. The text description and occurrence time of the following events shall be logged:

- **Power failure**
- **Power restore**
- **Unit start**
- **Unit stop**
- **Alarm raised**
- **Alarm acknowledged**
- **Alarm cleared**

3.4 Co-Work, Multiple Units Configuration

3.4.1. The units shall have built-in master and slave inter-networking capability, Co-Work which allows a combination of a maximum of 16 master or slave circuits to form a local area network.

3.4.2. Co-Work operates on I2C protocol over a field installed communication bus separate from the BMS RS 495 network.

3.4.3. To achieve the tightest control tolerance and minimize component on/off, the units shall have a built in control step expansion algorithm which uses a multi-step control scheme to coordinate the on/off of cooling, heating, humidifying and dehumidifying steps in multiple units.

3.4.4. The units shall have a sequential load activation control algorithm to minimize the inrush current when components among multiple units are activated at the same time.

3.4.5. The control of a slave circuit shall not be limited to any particular master unit controller redundancy. Any master unit can control any slave. In case of a master unit failure or scheduled service, the remaining master units in the same network shall automatically take over the control.

3.4.6. The units shall have a duty sharing control algorithm which helps maintain the required number of duty units and balancing runtime by automatically coordinating units on/off and providing time based auto-changeover.

3.4.7. The units shall have a data synchronization feature. Operation data such as set points, time schedule, and alarm status shall be automatically synchronized among all the units under the same local area network.

3.4.8. To avoid hunting among multiple units, the units shall have a control value averaging algorithm which allows units to exchange sensor readings and control the room based on the common desired average values. Units shall be capable of displaying the network temperature and humidity or the individual unit's temperature and humidity.

4. Optional Accessories

4.1. Auto Transfer Switch (ATS) with Dual Primary Power Sources Option

4.1.1. The Auto Transfer Switch (ATS) monitors the availability of power from either source to the unit using phase monitor devices and automatically switches to the secondary source of power when the primary source fails using mechanically and electrically interlocked contactors.

4.1.2. A selector switch is provided in the electrical panel to allow the operator to choose either A grid as primary and B grid as secondary or B grid as primary and A grid as secondary. Once the primary source of power is restored the ATS will automatically switch back to primary power (i.e. Automatic transfer switch shall auto reset on a return to normal/clean power). Independent and interlocked timing relays ensure the components in the unit shut down during the changeover. They allow the microprocessor to perform the normal component sequencing to minimize the load on the power sources during the times of transfer and limit the stress on the components normally associated with transferring power under load.

4.1.3. The Auto Transfer Switch, (ATS) feature of the Canatal unit must be powered from two separate independent sources to function properly.

4.1.4. There are two non-fused disconnect switches in the electrical panel of the unit, one for the primary power source A and one for primary power source B.

4.1.5. 208 volt units may require side access when combined with other options. Please consult factory.

4.2. Liquid Detection Options

4.2.1. Liquid detection shall consist of a single point liquid sensor. Sensor wires directly into the microprocessor and includes 10 feet of wire for field placement.

4.2.2. Liquid detector shall consist of liquid cable sensor. Cable wires directly into the microprocessor and includes 10 feet of wire to extend to the bottom of the unit and 15 or 30 or 50 or 75 feet of sensing cable shall be supplied with the unit for field placement.

4.2.3. Remote liquid detection shall consist of Single Zone Liquid Detection with discrete alarm. Single Zone Liquid Detection shall detect and report the presence of water or any other conductive liquids. Unit shall be supplied with 15 feet of sensing cable.

4.3. Floor Stand Options

4.3.1. Floor stand with OSHA guard shall be a welded steel frame with corrosion resistant finish in heights from 18 to 24 inches (other heights available). The stands shall have adjustable legs for leveling with +/- 1 inch of adjustment. OSHA guard shall allow for the lowering of the fans into the floor stand and shall prevent anyone from touching the fans. Guards are factory installed and have access holes for water piping and power to pass through the guard. The OSHA guard shall not exceed 18” when the floor stand is higher which allow pipes to run under the floor stand without special modifications. No jacks or lifting rigs shall be required to raise and lower the fans.

4.3.2. Floor stand shall be a welded steel frame with corrosion resistant finish in heights from 12 to 24 inches (other heights available). The stands shall have adjustable legs for leveling with +/- 1 inch of adjustment.

4.3.3. A turning vane shall be provided for down discharge units. Turning vane shall incorporate a stiffening hem at the front and shall be insulated with ¼” foam insulations.

4.3.4. The floor stand shall be enclosed on three sides and shall have front discharge grilles to all for air distribution over the floor. The floor stand shall have cosmetic covers on each end which match the finish of the unit panels and are removable for pipe and power access. Floor stand shall be a welded steel frame with corrosion resistant finish in heights from 12 to 24 inches (other heights available). The stands shall have adjustable legs for leveling with +/- 1 inch of adjustment. A turning vane shall be incorporated to reduce the air

side pressure drop. Turning vane shall incorporate a stiffening hem at the front and shall be insulated with ¼" foam insulations.

4.4. Discharge Plenum Option

4.4.1. Factory plenum matches unit and allows up flow units to supply air directly to space. Plenum has front double deflection grilles and is internally insulated.

4.5. Firestat Option

4.5.1. Factory mounted and wired firestat will shut the unit down in the event of high heat detection. If programmed it shall generate a fire alarm on the microprocessor.

4.6. Smoke Detector Option

4.6.1. Smoke detector is factory mounted and wired to shut unit down in the event of the presence of smoke. If programmed it shall generate a fire alarm on the microprocessor.

4.7. Condensate Pump Options

4.7.1. Condensate pump shall remove condensate from evaporator and humidifier when a drain is not available nearby. Pump is shipped loose for field installation. Optional factory mounted and wired pumps are available. Pump shall be capable of 40 GPH at 20' of head.

4.7.2. Condensate pump shall remove condensate from evaporator and humidifier when a drain is not available nearby. Pump is shipped loose for field installation. Optional factory mounted and wired pumps are available. Pump shall be capable of 126 GPH at 40' of head.

4.8. Isolation Damper Option

4.8.1. Gravity operated isolation dampers shall be available for units with drop down fans to prevent back flow from the floor when the unit is off or to prevent short circuiting of air in the unlikely event that a fan stops. Dampers are shipped loose and field installed after fans are lowered into positions.