CLIMATEWORX
MISSION CRITICAL CLIMATE CONTROL

# Series 8

## *Guide Specification – 60 Hz*

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## *1. General*

1.1 The intelligent precision air-conditioning system shall be a **ClimateWorx Series 8** model _____ .

1.2 The unit shall be designed specifically for telecommunication, computer and critical equipment 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 (downflow) / (upflow) air delivery.

1.4 The system shall have a total 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.

## *2. Mechanical Parts*

### *2.1 Housing*

2.1.1 The housing of the unit shall be constructed based on a 14 gauge frame and 18 gauge panel principle with removable panels for maximum service access.

2.1.2 The housing shall be a modular design, which allows multiple units to be installed side by side.

2.1.3 All components shall be accessible through the front panels. **(Standard Units ONLY).**

2.1.4 All panels shall be formed and welded from 18 gauge steel and insulated with 25mm (1") thick, 24kg/m³ (1.5 lb/ft$^3$) density fiber-glass insulation.

2.1.5 Service panels shall have gasket, be hinged and locked with ¼-turn captive fasteners to facilitate quick and easy access.

2.1.6 The entire unit shall be finished with epoxy powder paint to ensure proper surface adhesion. The panel colour shall be ClimateWorx standard off-white.

### *2.2 Blower and Motor*

2.2.1 The unit shall have a double inlet, double width, forward curve, centrifugal type blower operating at a speed below 950 rpm to deliver_____ m³/h (cfm) of air at 75 Pa (0.3" w.g.) external static pressure.

2.2.2 The blower shall be statically and dynamically balanced.

2.2.3 All parts of the fan shall be painted, galvanized or corrosion treated.

2.2.4 The fan bearings shall have a minimum life span of 100,000 hours.

2.2.5 The fan shall be belt driven by dual drive belts that are sized for minimum 200% of the motor horsepower.

2.2.6 The speed of the fan shall be adjustable by means of a variable pitch motor pulley.

2.2.7 The fan motor shall be totally enclosed fan cooled type having class F insulation, IP55 standard.

### *2.3 Filter*

2.3.1 The filter chamber shall be an integral part of the system, located at the entrance of return air path and should be serviceable from the top of the unit for downflow configuration and from the front for upflow configuration.

2.3.2 The filters shall be standard capacity, 100mm (4") deep, pleated type having 25-30% efficiency, >95% arrestance to ASHRAE 52.1 **(MERV 8)**.

2.3.3 The filters shall be listed by Underwriters' Laboratories as class 2.

2.3.4 The filter chamber shall have the provision to house 152mm (6") high efficiency filters.

### *2.4 Heater*

2.4.1 Electric resistance heaters shall be provided to offset the sensible cooling effect brought about during dehumidification mode.

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

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

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.

### *2.5 Humidifier*

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

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

2.5.3 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.

2.5.4 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.

## *3. Refrigeration Parts- DX Systems*

### *3.1 Refrigeration System*

3.1.1 The refrigeration circuit shall be available for operation on non-ozone depleting R407C refrigerant.

3.1.2 The refrigeration circuit shall have the following components:

- **Thermal expansion valve with external equalizer**
- **Refrigerant distributor**
- **Liquid line solenoid valve**
- **Liquid line sight glass**
- **Access valve**
- **Liquid line filter-drier**
- **Liquid line shut-off valve**
- **Low pressure cut-out switch**

- **High pressure cut-out switch**

3.1.3 The refrigeration circuit shall be pre-piped and leak tested ready for field connection.

3.1.4 All refrigerant piping shall be of type L copper pipe.

3.1.5 All units shall be factory run tested using refrigerant to verify operation prior to shipping.

### *3.2 Compressor*

3.2.1 The compressor shall be of the scroll type. Compressor casing shall have no gaskets or seals to eliminate the possibility of refrigerant or oil leakage into the facilities.

3.2.2 The compressor shall be equipped with the following items:
- **Suction rotolock valve**
- **Discharge rotolock valve**
- **Gauge ports**
- **Internal thermal overload**
- **Vibration isolators**

3.2.3 Compressor positive start feature shall be provided to avoid compressor short cycling and low pressure lockout during winter start-up.

### *3.3 Direct Expansion Evaporator Coil*

3.3.1 The coil shall be of 3/8" OD copper tubes expanded into aluminium fins.

3.3.2 The coil shall have a face area _____ $m^2$ ($ft^2$) and _____ rows deep in the direction of the airflow and have a maximum face velocity of _____ m/s (fpm).

3.3.3 A stainless steel corrosion free condensate drain pan shall be provided under the coil.

### *3.4 Air-Cooled Condenser (Air-Cooled System only)*

3.4.1 The air-cooled condenser shall be low-profile and the cabinet will be constructed of heavy gauge galvanized steel.

3.4.2 The condenser shall be factory matched for _____ °C (°F) ambient.

3.4.3 The condenser shall be constructed of aluminum fins and copper tubes staggered in direction of airflow and arranged for vertical / horizontal air discharge.

3.4.4 The winter control system for the air cooled condenser shall be variable speed control / refrigerant head pressure control.

3.4.5 The winter control system shall utilize **ORI and ORD head pressure control (HPC) valves** to flood the condenser. This system shall include a receiver which is factory piped, heat traced, insulated and adequately sized to hold the charge of the condenser and the indoor unit.

3.4.6 The air cooled condenser shall be suitable for _____ V _____ ph _____ Hz power supply.

### *3.5 Water-Cooled Condenser (Water/Glycol-Cooled system)*

3.5.1 The water/glycol-cooled condensers shall be unit mounted and piped.

3.5.2 Each condenser shall be complete with the following items:

- **Two-way pressure actuated water regulating valve. (Three-way optional)**
- **Receiver**

3.5.3 The unit shall require _____ l/s (US gpm) of 29.4°C (85°F) condensing water and have a maximum pressure drop of _____ kPa (psi).

### ***3.6 Glycol Cooler*** *(Glycol-Cooled System only)*

3.6.1 The glycol cooler shall be low-profile, constructed of heavy gauge galvanized steel.

3.6.2 The glycol cooler shall be factory matched for _____ °C (°F) ambient.

3.6.3 The cooler shall be constructed of copper tubes expanded into aluminum fins and pressure tested to 425 psi.

3.6.4 The fan motor shall be drip-proof with permanently lubricated ball bearings and inherent overload protection.

3.6.5The cooler shall be suitable for_____V_____ ph _____ Hz power supply.

## ***4. Mechanical Parts*** *- (Chilled-water system)*

### ***4.1 Chilled-water valve***

4.1.1 The chilled-water valve shall be a two-way modulating valve with pressure rating of _____kPa (psi) (Three way valve Optional).

4.1.2 The valve actuator shall be of an electric type with a totally enclosed dust and water proof enclosure.

4.1.3 The valve actuator shall have a manual operation facility and position indicator.

### ***4.2 Cooling Coil***

4.2.1 The coil shall be of 3/8” OD copper tubes expanded into aluminum fins.

4.2.2 The coil shall have a face area of _____ $m^2$ ($ft^2$) and _____ rows deep in the direction of the airflow and have a maximum face velocity of _____ m/s (fpm).

4.2.3 A stainless steel corrosion free condensate drain pan shall be provided under the coil.

4.2.4 The coil shall require _____ l/s (US gpm) of 7.2°C (45°F) chilled-water and the pressure drop across the coil shall not exceed _____ kPa (psi).

### ***4.3 Dual Cooling – Optional – Consult Factory***

4.3.1 Dual cooling unit shall consist of a chilled-water cooling coil as in 4.2.1 with the DX coil as in section 3.3.

4.3.2 Dual cooling shall automatically switch between the chilled water circuit and the DX circuit when commanded by remote chiller interlock.

4.3.3 Dual cooling units are available with any regular condenser option as detailed in section 3.4, 3.5 and 3.6.

## 5. Control System

### *5.1 System*

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

5.1.2 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.

5.1.3 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 functions.

5.1.4 The control system shall display simultaneously the following information:

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

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

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

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

5.1.8 The system shall be capable of communicating with a Building Management System (BMS) via an RS485 serial link through a BMS Interface (Communications Bridge) for remote monitoring function.

5.1.9 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.

### *5.2 Control Features*

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

5.2.2 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**
- **Temperature integral action time**
- **Humidity set point**
- **Humidity high limit**
- **Humidity low limit**
- **Humidifying proportional band**
- **Dehumidifying proportional band**

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

5.2.3 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 switch input**
- **"Timer" mode allows 4 event/day weekly automatic on/off/relax control**

5.2.4 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.

5.2.5 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.

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

5.2.7 The accumulated runtime of the following components shall be logged for energy analysis and planned maintenance:

- **Fan**
- **Compressor**
- **Heaters**
- **Humidifier**

5.2.8 Components shall be scheduled to activate sequentially to minimize inrush current.

5.2.9 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.

### *5.3 Alarms*

5.3.1 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**
- **Compressor low pressure**
- **Heater overheat**
- **Boiler dirty**
- **Fire**
- **Loss of Sensor**
- **Loss of EX1 (DX only)**
- **Liquid Detection (Optional)**
- **Liquid High Limit (Optional)**
- **Custom Fault 1 and 2 (Optional)**
- **Filter Drier Dirty (Optional DX only)**
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5.3.2 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**

5.3.3 Alarm messages, when programmed, shall comprise text description and occurrence time. Messages shall be ranked in the sequence of occurrence for fault analysis.

5.3.4 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.

5.3.5 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**

### *5.4 Co-Work, Multiple unit configurations*

5.4.1 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 units to form a local area network without the need for external hardware.

5.4.2 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.

5.4.3 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.

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

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

5.4.6 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.

5.4.7 To avoid hunting among multiple units, the units shall have a control value averaging algorithm that 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 average temperature and humidity or individual unit temperature and humidity.

## *6.0 Optional Accessories*

### *6.1 Capacity Control*

6.1.1 Capacity control shall consist of pressure regulated hot gas by pass valve. The valve shall be factory set to bypass below 58 psig suction pressure. A solenoid activated shut off valve shall be used for positive shut off.

6.1.2 Each compressor shall have hot gas by pass to preserve the lead/lag functionality.

### *6.2 Reheat Options*

6.2.1 Hot Gas Reheat

6.2.1.1 The unit shall have hot gas reheat activated by a three way refrigerant reclaim valve. This option shall provide reheat during dehumidification mode to offset the cooling effect.

6.2.1.2 Each compressor shall have hot gas reheat to allow maximum energy savings and preserve lead/lag functionality.

6.2.2 Hot Water/Steam Reheat

Hot water/ steam coil provides reheat during dehumidification mode or heating in heating mode. Unit is complete with two way modulating valve.

### *6.3 Liquid Detection*

6.3.1 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.

6.3.2 Liquid detection 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 feet of sensing cable shall be supplied with the unit for field placement.

### *6.4 Floor Stand*

6.4.1 Floor stand shall be a welded steel frame with corrosion resistant finish from 8 to 24 inches ( in 2 inch increments) in height. The stands shall have adjustable legs for leveling with ± 1.5 inch of adjustment. Turning vanes are available for down discharge units. (**Minimum height for a floor stand c/w Turning Vane is 12 inches)** For floor stands greater than 24 inches please consult factory.

### *6.5 Discharge Plenum*

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

### *6.6 Firestat*

6.6.1 Factory mounted and wired firestat will shut the unit down in the event of high heat detection.

### *6.7 Smoke Detector*

6.7.1 Smoke detector is factory mounted and wired to shut unit down in the event of the presence of smoke.

### *6.8 Condensate Pump*

6.8.1 Condensate pump shall remove condensate from evaporator and humidifier when a drain is not available nearby. Pump is shipped loose for field installation. Pump shall be capable of 40GPH at 20ft (optional 126 GPH at 40 ft.) of head.