MISSION CRITICAL Air Conditioning Systems

# Series 11

## *Guide Specification – 60 Hz*

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## *1. General*

1.1 The intelligent precision air-conditioning system shall be a **ClimateWorx Series 11** 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 and single stage heating (humidifying, dehumidifying and air filtration functions require M52 optional controller).

1.3 The unit shall be factory assembled and tested.

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 Indoor Cabinet*

2.1.1 The cabinet shall be constructed based on a frame and panel principle with removable panels for maximum service access.

2.1.2 All components shall be accessible through the panels.

2.1.3 The cabinet and panels shall be formed and welded from 16 gauge steel and insulated with 12.7mm (1/2") thick, 94.7kg/m³ (5.9 lb/ft$^3$) density foam insulation.

2.1.4 Side panels shall be removable to facilitate quick and easy access.

2.1.5 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 Fan and Motor*

2.2.1 The unit shall have a plenum fan operating to deliver _____ m³/h (cfm) of air.

2.2.2 The fan 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 shall be direct driven.

2.2.5 The fan motor shall be an open permanent split capacitor type.

2.2.6 The fan motor shall be ECM on 4 ton and 5 ton units.

### *2.3 Filter*

2.3.1 The filter chamber shall be located in the hinged return grille for a spot cooling model to facilitate maintenance.

2.3.2 The filter chamber shall slide out from a filter rack for ducted models.

2.3.3 The filters shall be standard capacity, 25mm (1") deep pleated type having an average of 20-25% efficiency, >90% average arrestance to ASHRAE 52.1 (**MERV 7**).

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

### *2.4 Heater - Optional*

2.4.1 Electric resistance heaters shall be provided to offset the sensible cooling effect brought about 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 single stage control. (Optional SCR)

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 -Optional*

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.

## *3. Refrigeration Parts- DX Systems*

### *3.1 Refrigeration System*

3.1.1 The refrigeration circuit shall be designed 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**
- **Sight glass**
- **Filter drier**
- **High pressure cut-out switch**
- **Low 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.

### *3.2 Compressor*

#### *3.2.1 Compressor – Indoor Unit*

3.2.1.1 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. (The 1 ton unit shall use a reciprocating compressor)
3.2.1.2 The compressor shall be equipped with the following items:

- **Internal thermal overload**
- **Vibration isolators**
- **Crankcase heater**

3.2.1.3 The compressor shall be located in a separate compartment out of the air path so it can be serviced without disturbing the operation of the unit.

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

### *3.2.2 Compressor –Condensing Unit*

3.2.2.1 The compressor shall be scroll type. (The 1 ton unit shall use the reciprocating compressor.)

3.2.2.2 The compressor shall be equipped with the following items:

- **Internal thermal overload**
- **Vibration isolators**
- **Crankcase heater**

3.2.2.3 The compressor shall be located in the condensing unit

3.2.2.4 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 aluminum 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).

3.3.4 A stainless steel corrosion free, double slope condensate drain pan shall be provided under the coil.

3.3.5 A safety float switch shall shut the system off if it senses high water level in the condensate drain pan.

### *3.4 Spot Cooling Model*

3.4.1 Spot cooling models shall be ductless.

3.4.2 Spot cooling models shall be installed in a standard 2' x 4' grid.

3.4.3 The supply and return of evaporator air shall be through the factory provided supply and return filter grille located on the bottom of the unit.

### *3.5 Ducted Model*

3.5.1 Ducted models shall include supply and/or return air duct connections.

3.5.2 Ducted models shall have a right-angled air pattern.

### *3.6 Outdoor Air-Cooled Condensing Unit (Air-cooled system only)*

3.6.1 The air-cooled condensing unit shall be constructed of heavy gauge aluminum.

3.6.2 Each condensing unit shall be complete with the following items:

- **Liquid line sight glass**
- **Access valve**

- **Liquid line filter drier**
- **Low pressure cut-out switch**
- **High pressure cut-out switch**
- **Receiver ( Optional )**

3.6.3 The condensing unit shall be constructed for outdoor use.

3.6.4 The condensing unit shall be factory matched for _____ °C (°F) ambient.

3.6.5 The condensing unit shall use a direct drive propeller fan operating to deliver ____ $m^3$/h (cfm) of air.

3.6.6 The condensing coil shall be constructed of aluminum fins and copper tubes, arranged for horizontal air discharge.

3.6.7 The low ambient control system for the air cooled condensing unit shall be flooded condenser. (Optional)

3.6.8 The air cooled condensing unit shall be suitable for _____ V _____ ph _____ Hz power supply.

### ***3.7 Indoor Air-Cooled Condensing Unit*** *(Air-cooled system only)*

3.7.1 The air-cooled condensing unit shall be constructed of mild steel.

3.7.2 The condensing unit shall be constructed for indoor use.

3.7.3 The condensing unit shall be factory matched for _____ °C (°F) ambient.

3.7.4 The condensing unit shall use a plenum fan operating to deliver ____ $m^3$/h (cfm) of air.

3.7.5 The condensing coil shall be constructed of aluminum fins and copper tubes, arranged for horizontal air discharge.

3.7.6 The low ambient control system for the air cooled condensing unit shall be variable fan speed control. (Optional)

3.7.7 The air cooled condensing unit shall be suitable for _____ V _____ ph _____ Hz power supply.

### ***3.8 Water-Cooled Condensing Unit*** *(Water/Glycol-cooled system)*

3.8.1 The water/glycol-cooled condensing unit shall be housed in a separate module so as to allow the module to be mounted out of the room to eliminate the risk of fluid leakage.

3.8.2 The condensing unit shall be constructed for indoor use.

3.8.3 Each condensing unit shall be complete with the following items:
- **Liquid line sight glass**
- **Access valve**
- **Liquid line filter drier**
- **Low pressure cut-out switch**
- **High pressure cut-out switch**
- **Pressure actuated water regulating valve**
- **Receiver**

3.8.4 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).

3.8.5 The regulating valves shall be rated at 150psi water pressure.

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

***4.1 Chilled-water valve (standard)***

4.1.1 The valve shall be the slowly opening and slowly closing 2-way type to control cooling capacity. (3-way valve Optional)

***4.2 Chilled-Water Valve** (With M52 Controller option)*

4.2.1 The chilled-water valve shall be a two-way modulating valve with pressure rating of_____kPa (psi). (3-way valve Optional)

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

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

4.2.4 The valve and actuator will be supplied loose for field installation.

***4.3 Cooling Coil***

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

4.3.2 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).

4.3.3 A stainless steel, double slope corrosion free condensate drain pan shall be provided under the coil.

4.3.4 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).

4.3.5 A safety float switch shall shut the system off if it senses high water level in the condensate drain pan.

***5. Control System***

***5.1 Standard System***

5.1.1 The unit shall use a single stage, heat/cool, remote wall-mounted 7 day programmable thermostat.

5.1.2 The control system shall display simultaneously the following information on the fascia:

- **Room temperature in °C/°F**
- **12 hour or 24 hour clock**
- **Heat/Cool Mode**

5.1.3 The control shall have a temporary temperature override.

***6. Control System (M52) - Optional***

***6.1 Optional System***

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

6.1.2 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.

6.1.3 The control system shall have a fascia with 240x128 dot resolution touch screen graphical LCD display located in a wall mounted panel for the display and programming functions in the space.

6.1.4 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**

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

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

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

6.1.8 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.

### *6.2 Control Features*

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

6.2.2 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**

6.2.3 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 control**

6.2.4 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.

6.2.5 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.

6.2.6 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.

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

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

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

6.2.9 The system shall have a temperature and humidity scatter 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.

### *6.3 Alarms-Optional*

6.3.1 The control system shall have the following standard alarms:

- **High/Low temperature**
- **High/Low humidity**
- **High/Low voltage**
- **Filter dirty (Optional)**
- **Low airflow (Optional)**
- **Compressor high pressure**
- **Compressor low pressure**
- **Heater overheat (with Heater option)**
- **Boiler dirty (with Humidification option)**
- **Fire**
- **Loss of Sensor**
- **Loss of EX1 (DX only)**
- **Liquid Detection (Optional)**
- **Liquid High Limit**
- **Custom Fault 1 and 2 (Optional)**
- **Filter Drier Dirty (Optional DX only)**

6.3.2 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**

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

6.3.4 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.

6.3.5 A historical event log which maintain 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 on**
- **Unit off**
- **Alarm raised**
- **Alarm acknowledged**
- **Alarm cleared**

### *6.4 Co-Work™, Multiple Unit Configuration- Optional*

6.4.1 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.

6.4.2 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.

6.4.3 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.

6.4.4 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.

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

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

6.4.7 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.

## *7.0 Optional Accessories*
## *7.1 Capacity Control*

7.1.1 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 manual shut off valve shall be used for positive shut off.

### *7.2 Liquid Detection*

7.2.1 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.

7.2.2 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**.**

### *7.3 Remote Supervisory Panel*

7.3.1 ClimateWorx M52 remote monitoring and supervisory panel allows monitoring and control of units on a 1 to 1 basis or up to 16 units in a Co-work network**.** Panel is connected by way of communication cable.

### *7.4 Firestat*

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

### *7.5 Smoke Detector*

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

### *7.6 Condensate Pump*

7.6.1 Condensate pump shall remove condensate from evaporator and humidifier when a drain is not available near by. Pump is factory mounted and wired (for heat/cool units only). Pump shall be capable of 1.3 GPH at 13' of head.

### *7.7 Spring Isolators*

7.7.1 Spring isolators shall be factory selected for vibration isolation.

### *7.8 Power Supply 277V/1PH/60Hz*

7.8.1 A 277V to 208V main power step-down transformer (field installed and field wired) shall be provided for all 277V/1PH/60Hz applications. For split systems, only **one transformer** shall be used for the **indoor unit** and the **condenser/condensing unit.**