CLIMATEWORX
MISSION CRITICAL CLIMATE CONTROL

Series 7

Guide Specification – 60 Hz

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1. General

1.1 The intelligent precision air-conditioning system shall be a ClimateWorx Series 7 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 front 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 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 front panels.

2.1.3 Major components shall be located out of the air-path so as to avoid interrupting unit operation during routine service.

2.1.4 The cabinet and panels shall be formed and welded from 16 gauge steel and insulated with 25mm (1") thick, 24kg/m³ (1.5 lb/ft^3) density fiber-glass insulation.
2.1.5 Front panels shall be hinged 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 Tangential Blower and Motor

2.2.1 The unit shall have a tangential type blower operating to deliver _____ m³/h (cfm) of air.

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

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 front of the unit.

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

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

2.4 Heater – (Optional)

2.4.1 Electric resistance heaters shall be able 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.

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 –Indoor Unit

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**

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 –Condensing Unit

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:

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

3.2.3 The compressor shall be located in the condensing unit.

3.2.4 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 condensate drain pan shall be provided under the coil.

3.4 Air-Cooled Condensing Unit (Air-Cooled System only)

3.4.1 The air-cooled condenser shall be low-profile and constructed of heavy gauge aluminum.

3.4.2 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)**

3.4.3 The condensing unit shall be constructed for outdoor use.

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

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

3.4.6 The winter control system for the air cooled condenser shall be refrigerant head pressure control (heated insulated receiver).

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

***3.5 Water-cooled Condensing Unit** (Water/Glycol-cooled system)*

3.5.1 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.

3.5.2 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**
- **Pressure actuated water regulating valve**
- **Receiver (optional)**

3.5.3 The unit shall require _____ l/s (USgpm) of 29.4°C (85°F) condensing water and have a maximum pressure drop of _____ kPa (ft H_2O).

***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).
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.

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

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 (USgpm) of 7.2°C (45°F) chilled-water and the pressure drop across the coil shall not exceed _____ kPa (ft H_2O).

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- with Optional M52

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 (Optional)**
- **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 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 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 set points, 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.