

AIR COOLED MODULAR CHILLER
Manhattan Gen II

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Work Included:
The air-cooled modular chiller system shall consist of individual chiller modules that are assembled on site. Each chiller module shall be completely factory wired, and tested prior to shipment. Each module shall include a compressor, evaporator, air-cooled condenser, and controls. Controls shall be designed to allow the master controller to operate remaining slave modules in the event of a malfunction of any slave controller. The controls shall also be designed to allow each individual slave microprocessor to operate on its own temperature sensor if there is a failure of the master microprocessor.
- B. Related Work Specified Elsewhere: General Requirements of Division One and Section 15010 "Basic Mechanical Requirements" pertain to and are hereby made part of the work of this Section of the specifications.

1.02 QUALITY ASSURANCE

- A. Unit shall be constructed in accordance with the UL 1995 and NEC standards and be UL or ETL listed.
- B. Unit shall be rated and tested in accordance with ARI 550/590 – Standard for Water Chilling Packages.
- C. Unit shall meet the safety standards of ANSI/ASHRAE 15 – Safety Standard for Refrigerated Systems.

1.03 SUBMITTALS

- A. Submit complete drawings including cabinet dimensional details and anchor point locations, required clearances, location and sizes of field connections, performance data, electrical wiring diagrams, dry and operation weights, and all required electrical data.
- B. Submit manufacturer's installation instructions, including any remote panel installation instructions.
- C. Operating and Maintenance manuals: provide two copies of current commercial manuals.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

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- B. Protect units on site from physical damage after unloading.

PART 1 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Arctic (Basis of Design)
- B. Engineer Approved Equal (provide complete submittal, listing all exceptions to specification, to Engineer for evaluation prior to bid, per Substitution Request requirements)

2.02 CHILLER

- A. General:

Each module shall be assembled on a powder coated, formed galvanized sheet metal frame and relevant panels. The unit shall be shipped as individual modules and assembled on site. Each module shall be fully charged with refrigerant and factory tested for capacity and controller functions prior to shipment. The electrical distribution panel shall incorporate overload protection for each chiller module. Electrical supply to each module shall consist of flexible conduit. No electrical connection to a module shall carry the load of more than that module. Bus bar electrical power distribution is unacceptable. The electrical supply connections for each module shall be factory assembled and shipped with each module for field connection into the electrical distribution panel.
- B. Frame:

Frame shall be constructed of a powder coated, formed galvanized sheet metal frame and panels.
- C. Cabinet:

Powder coated formed galvanized sheet metal panels on frame. The cabinet enclosure shall include easily removable access panels for service. Access panels shall be removable via stainless steel fasteners and retaining clips.
- D. Compressors:

Hermetically sealed scroll compressors with rotalock connections, crankcase heaters, oil level sight glasses, suction gas-cooled motor with solid-state sensors in the windings for overload protection, and in-line fusing. There shall be two, independent compressors and refrigerant circuits per module. Compressors shall be mounted to the base frame with rubber-in-shear isolators.
- E. Evaporators:

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Dual circuit brased plate heat exchangers. Isolation valves to allow servicing of each module individually, while the remaining modules continue to operate. The water connections to each evaporator shall utilize Victaulic rolled groove couplings and neoprene gasket, for service convenience and ease of installation. Evaporators shall be insulated with ¾” closed cell insulation.

- F. Electronic control valves, (Optional):
Each evaporator branch line shall include an electronic isolation valve that allows system flow to the active module to match the cooling requirements to the system load. The valves shall be the slow opening type to minimize the sudden change in flow to the previously active modules. The valves shall have a minimum opening cycle time of 60 seconds between the fully closed and open position.
- G. Filters:
A 40-mesh industrial grade filter strainer shall be factory installed between the header system and each evaporator and condenser inlet. The strainer shall be serviceable by individual manual isolation valves that permit each strainer to be removed and cleaned without shutting down fluid flow or power to the entire system and allowing the remaining modules to continue to operate. In-line strainers that require complete system shutdown for service and isolation are not acceptable
- H. Condenser fans:
The condenser fans shall be of variable speed type for better pressure control, smooth operation and low sound level.
- I. Condenser Coil:
Aluminum fins mechanically bonded to coppers tubes with integral subcooling circuits. Fin spacing shall not exceed 14. The coils shall be factory tested to a minimum of 600 psig.
- J. Refrigerant piping:
Piping shall be Type L seamless copper, and shall have an insulated suction line using closed cell pipe insulation, (optional hot gas bypass capacity control,) compressor rotalock service valves, solenoid valves for compressor pumpdown, and Schrader service valves in the suction, discharge, and liquid lines.
- K. Water Piping:
- L. The water piping shall be Schedule 10 steel, and be insulated using closed cell pipe insulation to prevent condensation. The chiller shall have service valves for the independent isolation of each evaporator, without affecting the water flow to the remaining evaporators. Each chiller module shall connect to the adjacent module using Victaulic rolled groove steel couplings and neoprene gaskets. Any type of module-to-module connection external to the modules is unacceptable.
- M. Controls:

The Master chiller module shall incorporate the Master microprocessor controller. The Master microprocessor shall communicate with the remaining Slave microprocessors in each module via a local network communications protocol. Each microprocessor shall include; operational switches for each compressor; high and low refrigeration pressure switches; low pressure pump down switches; anti-short cycling compressor timers; minimum compressor run timers; and phase monitor to protect against low voltage, phase unbalance, phase loss, and phase reversal conditions. A water-flow safety switch shall be provided by the chiller manufacturer, for field installation and wiring to the Master microprocessor controller. To facilitate connection to Building Automation System and Remote Monitoring System, the Master controller shall read all analog and fault port values from all Slave module controllers. The Master controller shall be capable of passing values, compatible with the Modbus protocol, to the Building Automation System.

- N. Microprocessor: The microprocessor shall provide the following minimum functions and alarms:
- a. Adjustable fluid temperature set point
 - b. Multiple stage compressor control, including compressor rotation to provide even compressor usage and wear.
 - c. High and low fluid temperature alarm set points
 - d. Water inlet and outlet temperature
 - e. Suction and discharge refrigeration pressures
 - f. Compressor run status
 - g. Current alarm status
 - h. Demand load
 - i. Compressor run hours
 - j. Alarm logging with minimum of previously 100 logged alarms with time and date of each occurrence
 - k. Remote start stop input
 - l. Dry contact for general alarm
- O. Interface Panel:
An operator 7" touch screen interface panel with graphical display shall be installed on the master module to allow chiller operation monitoring, adjustment of user set points, and alarm monitoring.