

Guide Specifications

POLYTHERM WATER SOURCE MODULAR SIMULTANEOUS HEATING AND COOLING SYSTEM *Revision 1*

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Work Included
The water-source modular simultaneous heating and cooling chiller system (PolyTherm) shall consist of individual modules that are assembled on site. Each PolyTherm module shall be completely factory wired and tested prior to shipment. Each module shall include a compressor, brazed plate evaporator, brazed plate condenser, geo source/sink fluid brazed plate heat exchanger, and controls. The controls shall also be designed to operate on a distributed master control system which allows each individual slave microprocessor to operate on its own temperature sensors 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. PolyTherm modules shall be constructed in accordance with the UL 1995 and NEC standards and be UL or ETL listed.
- B. PolyTherm modules 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 modules.
- B. Protect simultaneous heating and cooling chiller modules on site from physical damage after unloading.

1.05 WARRANTY

- A. Entire unit: one-year parts. Compressor: five years parts.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. ArctiChill PolyTherm (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 POLYTHERM MODULAR SIMULTANEOUS HEATING and COOLING SYSTEM

- A. General
Each PolyTherm module shall be assembled on an integral white painted bent sheet metal steel frame. The module shall be shipped individually and assembled on site. Each module shall be fully charged with refrigerant and factory tested for capacity and controller functions prior to shipment. PolyTherm modules bank must be built for single point power supply connection to a central distribution block inside an electrical power distribution panel and shall incorporate circuit breaker overload protection for each PolyTherm module. Electrical supply to each module shall consist of flexible conduit from the power distribution panel. No electrical connection to a module shall carry the load of more than that module. The electrical supply conduit shall be factory assembled and shipped with each module for field connection into the power distribution panel

The Polytherm modular simultaneous heating and cooling system is designed to have individual modules to independently operate in a heating mode, cooling mode or simultaneous heating and cooling based on the system demand. The modular system contains independent fluids loops that are never mixed for hot and cold load fluids and the source/sink fluid. The cold load fluid has a dedicated evaporator, the hot load fluid has a dedicated condenser and the source/sink fluid has a dedicated heat exchanger that operates as an evaporator or condenser depending on the

operating mode. The single refrigeration circuit includes a set of check valves and solenoid valves and actuated ball valve that directs flow to relevant evaporator, condenser and/or source/sink heat exchanger.

B. Frame

Frame shall be constructed of bent sheet metal externally coated with white painted finish and internally coated in black.

C. Cabinet

Cabinet panels are made of sheet metal externally coated with white painted finish and internally coated in black. The cabinet enclosure shall include easily removable access panels for service. Access panels shall be removable via stainless steel fasteners and retaining clips. Module shall not require access via sheet metal screws or protruding threaded fasteners.

D. Compressors

Hermetically sealed scroll tandem compressor set on a single refrigeration circuit, oil level sight glass, suction gas-cooled motor with solid-state sensors in the windings for overload protection, and in-line circuit breaker protection. There shall be two compressors per tandem set and one refrigerant circuit per module. Compressors shall be mounted to the steel frame with rubber-in-shear vibration isolators.

E. Evaporators, Condensers and Source/Sink Heat Exchanger

Each single circuit, brazed plate evaporator, condenser and source/sink heat exchanger is constructed of 316 stainless steel plates and copper brazing and shall be insulated with ¾" closed cell insulation. The fluid piping to each module shall have an electronic two-way valve for selecting geothermal fluid or load hot or cold fluid depending on the building heating or cooling demands. The return fluid piping from each evaporator and condenser shall include an electronic valve for servicing each module individually while the remaining modules continue to operate, to allow for variable flow and, on each source/sink heat exchanger operating as a condenser, to control refrigeration head pressure. The fluid connections to each heat exchanger shall use roll grooved couplings for service convenience and ease of installation.

F. Strainers

A compact design suction diffuser with stainless steel 40 mesh strainer shall be factory installed on the branch line to each evaporator and condenser inlet.

G. Isolation valves

The strainers and flow switch shall be serviced by manually closing the isolation valves on each evaporator, condenser and source/sink heat exchanger branch line. With these components isolatable, they can be removed/ replaced if required and the strainer cleaned without shutting down the fluid flow to the entire system and allow the remaining modules to continue to operate.

- H. Refrigerant piping
Piping shall be Type K seamless copper and shall have an insulated suction line using closed cell pipe insulation, solenoid valves, check valves and actuated ball valves in the suction, discharge, and liquid lines.
- I. Fluid piping
The fluid piping shall be 6" Schedule 10 steel and shall be insulated using closed cell pipe insulation to prevent condensation and retain heat and cold. The header pipe in each heat recovery module shall connect to the adjacent module using roll grooved steel couplings and neoprene gaskets on all fluid piping.
- J. Controls
The master PolyTherm 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. The master module shall include a phase monitor to protect against low voltage, phase unbalance, phase loss, and phase reversal conditions. The master controller shall read all analog, binary values and faults from all slave module controllers and shall pass these values to the Building Automation System via BACnet, Modbus or Lonworks protocols

Each chiller control system shall include operational digital switches for each compressor; high- and low-pressure transmitters to provide indication of refrigeration pressures in each circuit; high and low refrigeration pressure alarms including shutting down the responsible compressor(s); anti-short cycling compressor timers; minimum compressor run timers; connection to Building Automation System.

- K. Programmable Logic Controller (PLC)
The PLC shall provide the following minimum functions and alarms:
1. Adjustable fluid temperature set point
 2. Multiple stage compressor control, including compressor rotation to provide even compressor usage and wear.
 3. Reset temperature control set point based on decreased load
 4. High and low fluid temperature alarm set points
 5. Fluid inlet and outlet temperature
 6. Suction and discharge refrigeration pressures on each refrigeration circuit
 7. Compressor run status
 8. Current alarm status
 9. Demand load
 10. Compressor run hours
 11. Number of compressors starts
 12. Alarm logging with minimum of previously 100 logged alarms with time and date of each occurrence
 13. Remote start stop input

14. Dry contact for general alarm
15. 'Smart' compressors demand distribution algorithm across chiller bank, which allows to automatically put unavailable modules out of sequence and put available modules back into sequence seamlessly
16. Provide BAS with the information for automatic variable flow control
17. Keeping minimum flow for chilled water and hot water loops even with no compressors running
18. 'Smart' compressors rotation algorithm inside a module, which accounts for compressors availability, safety timers etc.
19. Stand-alone fail-safe mode for each module should Master module fail, so chiller bank keeps functioning

L. Interface Panel

A smart operator touch screen interface panel with graphical display shall be installed on the master PolyTherm module to allow operator operation monitoring, adjustment of user set points, alarm monitoring and controlled temperatures trending

M. Remote Connection

The controls system is capable of remote monitoring of chiller operation by viewing the same interface screens if the connection options are provided by the end user. This is available as an optional feature.