Guide Specifications

CWC
Water-to-water chillers with
R410A or R454B refrigerant

Model CWC EA/ CWC XEA
Sound versions std / L / S

52 - 695 kW

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Instructions

Black part = standard
Blue part = to be adpted according to unit selected

General

Chilled water production will be made by a factory-assembled and tested, water-cooled liquid chiller, Thermocold type CWC EA/ XEA. Chiller will have one/two refrigerant circuits with two to three compressors per circuit, will be shipped with a full operating charge of HFC-based *R410A / R454B* refrigerant and lubrication oil, scroll compressors, brazed plate heat exchanger, with microprocessor-based control.
Documentation including installation-operation-maintenance manual, user guide, wiring diagram and submittal is placed in the control panel.

Performances summary

- Cooling capacity at full load:….. (kW)
- Unit power input at full load:……(kW)
- Operating conditions: Evaporator entering/leaving temperature: …./…..(°C).
  Condenser entering/leaving temperature: …./…..(°C).
- Energy efficiency at full load EER:……. (kW/kW)
- Seasonal Energy Efficiency Ratio SEER:……. (kW/kW)
- Sound power level:……. dB(A)

Quality assurance

Chiller will be designed and manufactured under a quality assurance system and enviromental management system certified in accordance with ISO 9001:2008 and ISO14001 standards.

It will be factory-tested according standard EN14511 (last revision), and performances are certified by Eurovent. All units are compliant with all applicable EU Ecodesign Regulations under the ErP framework Directive 2009/125/EC of the European Parliament.
It will follow a production quality plan to ensure proper construction and operation.

Unit construction will be in accordance with follow European directives (and following updates):

- Pressure Equipment Directive (PED) 97/23/CE
- Machinery Directive (MD) 2006/42/CE
- Low Voltage Directive (LV) 2006/95/CE
- ElectroMagnetic Compatibility Directive (EMC) 2004/108/CE
- Electrical Machinery Safety Standard EN 60204-1
- EcoDesign Directive 2009/125/CE

Construction Characteristics

Unit panels, frames and exposed steel surfaces will be constructed of galvanized steel, and if painted will have following features:
• C4-M classification (ISO 12944-2)
• COLOR RAL 7035 smooth opaque or orange peel, single or double-sided.
• Polyester powder coating with a minimum thickness of 60 µm
• Resistance to salt spray according to ISO 9227 at least 500h
Metal parts will be suitable for C3 class corrosion.

Electrical panel will be built of galvanized steel and rated IP44.

Compressors and Motors

The unit is equipped with two or more hermetic, direct-drive, 3000 rpm 50 Hz with Intermediate Discharge Valves (IDVs) scroll compressors. The Intermediate Discharge Valve adapts the energy consumption to the varying load and pressure conditions in the system.

Motor is suction gas cooled, hermetically sealed, two poles, squirrel cage induction type, with four pressure lubricated rolling elements, bearing groups shall support the rotating assembly. Motor bearings will be designed for the whole life of the chiller.
The compressor operating map allow condensing down to 10°C and up to 68°C saturated discharge temperature

Oil Management

The chiller is equipped with an oil management system without oil pump that ensures proper oil circulation throughout the unit. The key components of the system include an oil filter with particles retention capacity of at least 5µm.
An oil heater is installed to avoid startup with low oil temperature.

Evaporator

Braze plate heat exchanger is made of stainless steel with copper as the braze material. It is designed to withstand a refrigerant side working pressure of 44.5 bars and a waterside working pressure of 10.0 bars. Evaporator is tested at 1.1 times maximum allowable refrigerant side working pressure and 1.5 times maximum allowable water side working pressure. It has one water pass. Blanket heater secures the evaporator from freezing to an ambient of -20°C.
The evaporator is covered with factory-installed 0.75 inch (19.05 mm) Armaflex II or equal (k=0.28) insulation. Foam insulation is used on the suction line.
All evaporators will be tested and stamped in accordance with PED.

Condenser

Braze plate heat exchanger is made of stainless steel with copper as the braze material. It is designed to withstand a refrigerant side working pressure of 44.5 bars and a waterside working pressure of 10.0 bars. Condenser is tested at 1.1 times maximum allowable refrigerant side working pressure and 1.5 times maximum allowable water side working pressure. It has one water pass. All condensers will be tested and stamped in accordance with PED.

Refrigerant Circuit

Each unit has two refrigerant circuits, with two to three scroll compressor per circuit. Each refrigerant circuit includes removable hardcore filter, charging port, and electronic expansion valve.

Electrical Panel

Single point connection with disconnect switch and circuit breaker on every motor.
The disconnect switch is mechanically interlocked to disconnect line power from the starter before the starter doors are open.
All components and control cables are numbered in accordance with CEI 60750.
A factory-installed, factory-wired control power transformer provides all unit control power and Thermologic module power. All the starter elements are enclosed in an IP44 panel, with safety locked main switch.
The unit is equipped with FG7 cables, which have a strong resistance to UV exposure.
All wires are numbered.

Thermologic unit controller

All units are equipped with a Thermologic microprocessor-based controller which is factory-installed and factory-tested. The control system is powered by a control power transformer, provided with the unit.

Microprocessor-based chilled water reset based on return water is standard. The unit controller automatically takes action to prevent unit shutdown due to abnormal operating conditions associated with low evaporator refrigerant temperature, high condensing temperature, and motor current overload. If abnormal operating condition continues and protective limit is reached, the refrigerant circuit will be shut down.

Thermologic provides a flexible alarm or unit status indication to a remote location through a hard-wired interface to a dry contact closure. Four relays are available for this function.
Thermologic includes machine protection shutdown requiring manual reset for:

- Low evaporator refrigerant temperature and pressure
- High condenser refrigerant pressure
- Critical sensor or detection circuit fault
- High compressor discharge temperature
- High Suction temperature
- Communication lost between modules
- External and local emergency stop
- Loss of evaporator water flow
- Loss of BAS communication
- Electrical distribution faults

The above list is not exhaustive and only includes some of the most common diagnostics.

Several other key features are:

- Embedded schedule allows the controller to operate in stand-alone scheduled operation (without BMS)

- SD card for local back-up and peace of mind in case of equipment failures
- Expandable I/O which make the controller field programmable. This feature can reduce project costs and enables customized sequence of operations
- Optional WIFI module to enable wireless communication
- Remote connectivity: used in conjunction with Thermocold Connect, you can get equipment data at anytime, anywhere independently from the BMS system

Alarms and diagnostics

Over 100 diagnostic checks are made and are displayed when a fault is detected. The TD7 display indicates the fault, the type of reset required, the time and date the diagnostic occurred, the mode in which the machine was operating at the time of the diagnostic, and a help message. A diagnostic history displays the last 20 diagnostics with the time and date of their occurrence. Alarms and diagnostics are displayed in chronological order, with a color/symbol code: red octagon for immediate shutdown, yellow triangle for normal shutdown and blue circle for warning.

Communication and control sources

All necessary settings and setpoints are programmed into the microprocessor-based controller via the TD7 operator interface. The controller is capable of receiving signals simultaneously from a variety of control sources, in any combination, and priority order of control sources can be programmed.

The control source with priority determines active setpoints via the signal it sends to the control panel.
Optional WIFI module to enable wireless communication

Unit shall be able to support the following control sources:

- Local operator interface (standard)
- Hard-wired dry contact and 4-20 mA or 2-10 Vdc signal from an external source (interface optional; control source not supplied)
- Time of day scheduling (available from local operator interface)
- BACnet interface
- Modbus Interface
- Thermocold Tracer™ systems (interface optional; control source not supplied)

BACnet Interfaces

Thermologic integrates build-in communication interfaces for BACnet MS/TP and BACnet IP.
The Building Automation and Control Network (BACnet and ANSI/ASHRAE Standard 135-2004) protocol is a standard that allows building automation systems or components from different manufacturers to share information and control functions. BACnet provides building owners the capability to connect various types of building control systems or subsystems together for a variety of reasons. In addition, multiple vendors can use this protocol to share information for monitoring and supervisory control between systems and devices in a multi-vendor interconnected system.
The BACnet interface identifies standard objects (data points) called BACnet objects. Each
object has a defined list of properties that provide information about that object. BACnet also defines a number of standard application services that are used to access data and manipulate these objects and provides a client/ server communication between devices. The Web UI is a good way to get all active BACnet points linked with the unit configuration. A complete BACnet detailed list is present in the BAS point list document.

BACnet Testing Laboratory (BTL) Certification
All Thermologic controllers are designed to support BACnet Smart Com Protocol.

ModBus Interfaces
Thermologic integrates build-in communication interfaces for Modbus RTU and Modbus TCP.
Modicon Communication Bus (Modbus) is an application layer-messaging protocol that, like BACnet, provides client/server communication between devices over a variety of networks. During communications on a Modbus network, the protocol determines how each controller will know its device address, recognize a message addressed to its device, determine what action to take, and extract any data or other information contained in the message.
Controllers communicate using a master/slave technique, whereby, only one device (master) can initiate transactions (queries). Other devices (slaves) respond by supplying the requested data to the master or by taking the action requested in the query. The master can address individual slaves or it can initiate a broadcast message to all slaves. In turn, the slaves respond to queries that are addressed to them individually or broadcasted. The Modbus Interface establishes the format for the master's query by placing into it the device address, a function code defining the requested action, any data to be sent, and an error-checking field.
The Web UI is a good way to get all active Modbus points linked with the unit configuration.
A Modbus registers detailed list is present in the BAS point list document.

Thermocold TD7 user interface

Factory-mounted to the control panel door, the operator interface has a 7” LCD 16-bit color touch-screen display for operator input and information output. Display shall be UV-resistant and able to withstand ambient air temperatures between -40°C to 70°C.

This interface provides access to the following information: operating setpoints, evaporator report, condenser report, compressor report, operator settings, service settings, service tests, and diagnostics.
Additionally, the following data will be provided the reports:

- Water and air temperatures
- Refrigerant pressures and temperatures
- Flow switch status
- EXV position
- Compressor starts and run-time

The following ratings shall apply:

- IP56
- CE certification
- Emissions: EN55011(Class B)
- Immunity: EN61000 (Industrial)

Options

Application

Process application
Low temperature option provides special control logic and oil cooler is installed to handle low temperature brine applications including part load conditions below 0°C down to -7°C leaving evaporator temperature.

Integrated Variable Primary Flow (evaporator)

Integrated within the chiller controller, a variable primary flow option will allow control of the water flow through the evaporator. This will be based on a proven algorithm modulating the flow rate to minimize pump consumption at full and partial load.
The operating modes available are the Constant Differential Temperature (DT) and Adjustable Fixed Speed:

- **Constant Differential Temperature (DT),** in this case the chiller controller algorithm will maintain a constant difference in between entering and leaving temperature at the chiller plant (DT), regardless the load, reducing the water flow rate when necessary up to the minimum allowed.

Condensing water flow control

- Condensing control / without Valves. The unit will be provided with a pressure transducer with an output analogue signal (2-10V) to be used for an external condensing control.

Sound level options

Low noise (L)

Low noise units will be equipped with a compressor jacket encapsulating each compressor.

Super low noise (S)

Extra low noise units will be equipped with a compressor sound box encapsulating all compressors with sound attenuation foam and compressor jackets.

Hydraulic module option

The units will be equipped with an hydro kit, supplied loose, with its proper electrical cabinet, characterized by complete kits of all major hydraulic components for an easier installation, with reduced time, cost and space. Hydraulic kit will be with ON-OFF and/or Inverter pump.

It will be provided for user side:

- 1 water pump (with Low / High available static pressure) , safety valve, relief valve, shut off valve, drain valves.
- 2 water pumps (with High available static pressure) , safety valve, relief valve, check valves, shut off valves, drain valves.

It will be provided for source side:
- 1 water pump (with Low / High available static pressure) , safety valve, relief valve, shut off valve, drain valves.
- 2 water pumps (with High available static pressure) , safety valve, relief valve, check valves, shut off valves, drain valves.

All above combinations can be provided with or without water tank on user side, with 120 / 200 / 500 liters capacity .

Pump
The Centrifugal pumps have 2 poles, axial suction bowls and radial delivery; they have cast iron body and impeller entirely welded using laser technology. Mechanical seal with ceramic components, coal and EPDM elastomers. Three phase electric motor with IP55 protection and insulation class F, suitable for continuous service.
Series motors with higher efficiency IE3 technology

The automatic changeover will be provided for double pump version. The pumps will operate with the balance of the related working hours. In case of failure of one pump the controller in automatic will switch on the additional pump. The control panel of the hydro kit will be equipped with fuses and contactor with thermal protection. The control of the pumps will be managed by the controller of the unit (Symbio 800).

Electrical options

- Under/over voltage protection and phase failure protection relay
- Flow switch (evaporator and condenser): the flow switch is sent as an accessory and must be installed on site.
- Across-the-Line Starter/Direct on Line: it is unit mounted with an IP-54 gasketed enclosure
- Solid-State Soft Starter: this option unit mounted starter has an IP-54 gasketed enclosure. To extend starter life contactors bypass current from the silicon control rectifies (SCRs) after startup
- Energy meter
- External control package: the unit will be provided with a series of input and output useful for unit management, that includes: Demand limit input (4-20 mA or 2-10 V), Auxiliary Set point digital activation, Chilled and Hot Water set point Inputs, Percentage colling or heating capacity output.

Refrigerant leak detector
(Refrigerant leak detector is available only on R454B units)
To detect a refrigerant leak, which avoids the risk of the flammability and to ensure safety for the customer by taking appropriate actions in the case of the leak, one or two refrigerant leak detectors will be placed in the middle of the unit, close to the compressors. Final position must be determined according several test and CFM simulations in factory.

Freeze protection
Thanks to Thermologic controller, the anti-freeze protection is possible with the pump activation using external temperature sensor. As standard, all units are provided with an heater cable wrapped around the evaporator plate heat exchanger, under the insulation layer.

Other Options

Water strainer
To increase the life of heat exchanger and isolation valves, the unit will be provided with “Y” water strainer, that consists of a body and stainless-steel mesh, with a Victaulic type connection from 2” to 4” according to unit size, with replaceable filter through the inspection cap. It will be installed at customer care.
Water strainers will be provided both for source than on user side

Unit isolators
Isolators provide isolation between chiller and structure to help eliminate vibration transmission and have an efficiency of 95% minimum. Neoprene type are available.

Victaulic kit

The unit will be provided with a flange adapter victualic type to help unit connection.

Grooved pipe with coupling and flange adapter

Kit to convert both water connections from grooved pipe to flanged connections. This includes: grooved couplings, pipe offsets, and grooved to flange adapters.

Water gauges

The unit will be provided with water gauges To monitor water pressure

Gas gauges

The unit will be provided with High- and low-pressure gauges to quickly check the pressure of each refrigerant circuit

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