Guide Specifications

Air-to-water chillers

Model AWA XEA / SEA
Sound versions L/E
Sizes 042-050-052-055-060-065-070-075-085-085-095-125

137 - 420 kW

September 2023 CG-PRG017D-GB

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, air-cooled liquid chiller, Trane type AWA XEA/ SEA. Chiller will have two refrigerant circuits with two to three compressor per circuit, will be shipped with a full operating charge of HFC-based 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).
  Air temperature:……...(°C).
- Energy efficiency at full load EER:……. (kW/kW)
- European Seasonal Energy Efficiency Ratio ESEER:……. (kW/kW)
- Sound power level:……. dB(A)

Quality assurance

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

Chiller is 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.

All chillers 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

Operating range

Units shall be suitable for comfort cooling and applications. It shall be capable of operating within the limits described in the table below.

	Leaving water temperature		Ambient air temperature	
	Min	Max	Min	Max
AWA XEA – cooling mode	-12°C	+20°C	-10°C	+50°C
AWA SEA – cooling mode	-12°C	+20°C	-20°C	+50°C

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 in standard option is standard covered with factory-installed 0.394 inch (10 mm) K-Flex elastomer roll. It can be coated with high performance insulation, 0.787 inch (20 mm) K-Flex elastomer roll.
All evaporators are tested and stamped in accordance with PED.

Condenser and Fans

The air-cooled Microchannel condenser coils use all aluminum brazed fin construction. The coil is composed of three components: the flat microchannel tube, the fins located between the microchannel tubes, and two refrigerant manifolds. Coils can be cleaned with high pressure water.
The condenser coil has an integral subcooling circuit. The maximum allowable working pressure of the condenser is 44.5 bars. Condensers are factory proof and leak tested at 45 bars.
Each condenser module is equipped with a refrigerant receiver in between the condenser section of the coil and the subcooler in order to balance the refrigerant charge for all operating conditions from (-20°C for HE with Low ambient kit, -10°C for SE units) outdoor air temperature up to 50°C (R454B) units and for leaving water temperature from -12°C up to 20°C. The location in between the condensing and subcooling part of the condenser coil is to keep refrigerant subcooling to maximize the chiller efficiency at any operating conditions
Direct-drive vertical-discharge airfoil condenser fans are dynamically balanced.

AWA SEA units mount electronic fans EC, which motors have IP 55 degree of protection.
AWA XEA units mount fans AC, which motors have IP 54 degree of protection .

Refrigerant Circuit

Each unit has two refrigerant circuits, with two to three scroll compressor for 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 hinged door.

Thermocold 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
- Trane 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.

Trane 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

Low leaving water temperature

Low temperature option provides special control logic and oil cooler is installed to handle low temperature brine applications including part load conditions below 4°C (39.2°F) down to -12°C (10.4°F) leaving evaporator temperature.

Ice making mode
A wide range of leaving water temperature between -7°C and 20°C can be provided by the chiller. This option can be applied when the chiller is used to make ice at night.

Low ambient air temperature
The low ambient option adds unit controls to allow start and operation down to ambient temperatures of -20°C (-4°F). High side of ambient range remains at 50°C (R454B)

Constant speed pump - VFD Adjustment
When the water flow has to be adjusted by a constant speed pump, no VPF application is possible with a chiller control, but with external control you can change pump's VFD speed. Variable Frequency Drive (VFD) is fitted on the unit.
For dual pump,there is only one VFD provided
It allows a constant speed drive

Partial Heat Recovery
Chiller can be supplied with a factory mounted brazed plate heat exchanger, fitted in series with condenser refrigerant circuit (2), in order to fulfill heat recovery from the compressor discharge (de-superheat) and partially from the condensing saturated temperature. On the water side of the heat recovery heat exchanger, hydraulic connection type Victaulic will be supplied. Heat to be recovered will be greater than 95% of the total compressor power input. Both BPHX will be connected in series on the water side, with temperature sensors in the water inlet and oulet, for monitoring purposes. The PHR HX will not have an impact on the cooling performances, and will allow production of hot water up to 55°C.

Total Heat Recovery (available from January 2024)
Chiller can be supplied with a factory mounted 3 way valve and a serial fitted brazed plate heat exchanger with condenser refrigerant circuit (2), to fulfil heat recovery up to 90% of the total heat rejected to the air condenser or 100% of the cooling capacity of the chiller. With "THR Full Package" option, hot water side 3 way valve, piping with insulation and freeze protection, flow switches are included to the THR package.

E-coating
An option to supply Micro Channel Heat Exchanger condenser coils with e-coating will be available. This e-coating will withstand the exposure to typical corrosive atmospheres, in shore or industrial locations, without sensible impact on coil performances in what heat transfer and air pressure drop is a concern.

Sound level options

Low noise
Low noise units are equipped with a compressor jacket encapsulating each compressor.

Extra low noise
Extra low noise units are equipped with a compressors with jacket with higher density foam.

Night noise setback
Night noise set back allow to reduce the sound level of the chiller by reducing the speed of EC speed fans controlled with an external on/off contact and for AC fan motor with all 2 speed fan motor running at low speed

Hydraulic module option
The units is equipped with multiple hydraulic versions, characterized by complete kits of all major hydraulic components for an easier installation, with reduced time, cost and space. Hydraulic kit are available for ON-OFF and/or Inverter pumps. The wide range of hydraulic versions available make the unit suitable for any type of installation.

Different combination can be provided:

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

- 2 water pumps (with Low / Medium / 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.

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 is also available for double pump version. The pumps operate with the balance of the related working hours. In case of failure of one pump the controller in automatic switches on the additional pump. The control panel is equipped with fuses and contactor with thermal protection.

Buffer tank

This is made from black steel sheet. Finishing with anti-corrosion treatment and painting. The thermal and condensation insulation is protected by a water and scratch-resistant external coating. The test carried out individually with a test pressure of 9 bar guarantees a working pressure up to 3,5 bar.

Electrical options

- Under/over voltage protection
- Under/over voltage protection and ground fault protection
- Flow switch: 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
- Power factor correction capacitor : To reduce the reactive power and therefore the electrical current. Units have in average a cosphi= 0,87; thanks to this accessory it moves to ≥0.91
- Energy meter

Refrigerant leak detector

To detect a refrigerant leak, which avoids the risk of the flammability. To ensure safety for the customer by taking appropriate actions in the case of the leak. A refrigerant detector is placed in the middle of the unit, close to the compressors.

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 plate heat exchanger, under the insulation layer ; as an option all hydraulic circuit (pumps, pipes and tank) can be wrapped with an heating cable.

Control options

Master Slave

Simple hard wired solution to enable operation of slave unit when master unit reach maximum capacity. When the master is at his full capacity, there is activation of the slave like that the master can decompress and they regulate together.

Run test report

Run test report gives the results of the perfomance test of the unit in the design conditions specified in the order write-up with water without glycol.
The data recorded are: cooling capacity, power input, air temperature, water entering temperature, water leaving temperature and water flow.

Other Options

Unit isolators

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

Grooved pipe plus weld coupling

Grooved pipes are connected on water inlet and outlet. The coupling allows connection between the grooved pipe and the evaporator water 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.

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