

**Guide Specifications**

###### Air-cooled Helical Rotary Liquid Chillers

Model RTAF SE / HE / XE / HSS / HSE G

330 -1720 kW





January 2021 **RLC-PRG035B-GB**

**General**

Chilled water production will be made by a factory-assembled and tested, air-cooled liquid chiller, Trane type RTAF SE G / HE G / XE G / HSS G / HSE G. Chiller will have two refrigerant circuits with one or 2 compressors per circuit, will be shipped with a full operating charge of **R1234ze** refrigerant and lubrication oil, screw compressors and electronic expansion valve.

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)
* Eurovent Class :
* Part load energy efficiency, SEER 12/7 (kW/kW) :
* Part load energy efficiency, SEPR HT 12/7 (kW/kW) :
* Part load energy efficiency, SEPR MT -8/-4 (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 and ISO14001 standards.

Chiller is factory-tested according standard EN14511, and performances are certified by Eurovent\*. All chillers follow a production quality plan to ensure proper construction and operation before being shipped to job site.

Unit construction will be in accordance with follow European directives:

* 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

**Construction Characteristics**

Unit panels, frames and exposed steel surfaces will be constructed of galvanized steel, painted and have a corrosion resistance of 675 hours to salt spray test.

Electrical panel will be built of galavanized steel and rated IP54.

**Compressors and Motors**

The helical-rotary compressor is semi-hermetic, direct drive, 3000 rpm or up to 4200 rpm on overspeed models, differential refrigerant pressure oil circulation system without oil pump, and with oil heater.

On series Trane RTAF HSE G and HSS G, Capacity control is done through the AFD to optimize performances at partial load allowing reduction of capacity down to 15% of the maximum value.

On series Trane RTAF SE G, HE G and XE G capacity control will be made through a slide valve allowing reduction of capacity down to 15% of the maximum value. Compressor will start always unloaded.

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.

**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 separator, oil filter with particles retention capacity of at least 5µm.

An oil heater is installed to avoid startup with low oil temperature.

An optional oil cooler is installed when the unit is used for high condensing temperature or low evaporator temperature conditions.

**Unit-Mounted Star-Delta Starter (RTAF SE G, HE G and XE G)**

The compressor starters shall be Star-Delta configuration closed transition, factory-mounted and fully pre-wired to the compressor motor and control panel. Starter will reduce the inrush current by 33%.

**Trane Adaptive Frequency™ Drive (AFD) mounted on RTAF HSE G and HSS G**

Compressors of RTAF HSE G and HSS G shall be equipped with a Trane Adaptive Frequency™ drive, factory mounted, tested and wired. Compressor frequency converter will drive the chiller start, chiller ramp up and the partial load operation.

AFD enclosure is IP55 as standard, with integrated air cooling system consisting of a fan below the AFD frame.

**Evaporator**

The evaporator is a tube-in-shell heat exchanger design constructed from carbon steel shells and tube sheets with internally and externally finned seamless copper tubes mechanically expanded into the tube sheets. Tubes are cleanable with dismountable water boxes. Tubes diameter is 19mm. . Each tube is individually replaceable.

The evaporator is designed, tested and stamped in accordance with PED 97/23/CE Pressure Vessel Code for a refrigerant side working pressure of 14 bars (200 psig). The evaporator is designed for a water side working pressure of 10.5 bars (150 psig). Standard water connections are grooved for Victaulic type pipe couplings. Waterboxes are available in 2 passes configurations and include a vent, a drain and fittings for temperature control sensors. Evaporator is insulated with Armaflex II or equivalent of 19 mm (3/4 inches) thickness and K factor of 0,26 W/m²°K.

**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 25.0 bars. Condensers are factory proof and leak tested at 45 bars.

Direct-drive vertical-discharge airfoil condenser fans are dynamically balanced.

Standard units will start and operate from -10°C to 46°C (14°F to115°F) ambient.

RTAF SE G and RTAF HE G units standard ambient or high ambient, standard sound level or low sound level are equipped with three-phase condenser fan motors with permanently lubricated ball bearings and external overload protection are provided. Fans are class F, IP55.

Standard units units low ambient, RTAF XE G, RTAF HSE G and RTAF HSS G units are equipped with EC condenser fan motors motors with permanently lubricated ball bearings and external overload protection are provided. Fans are class F, IP55.

**Refrigerant Circuit**

Each unit has two refrigerant circuits, with one screw compressor per circuit. Each refrigerant circuit includes compressor discharge service valves, motorized suction valve, liquid line shut off valve, removable core filter, charging port, high pressure and low pressure safety valves and electronic expansion valve.

**Electrical Panel**

Single point connection with disconnect switch and fuses.

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 UC800 module power. All the starter elements are enclosed in an IP54 panel, with hinged door.

**Unit Controls (Trane Tracer™ UC800)**

The microprocessor-based control panel is factory-installed and factory-tested. The control system is powered by a control power transformer. It loads and unloads the chiller through adjustment of the compressor slide valve on models RTAF SE G / HE G / XE G and through an Adaptive Frequency™ Drive on the model RTAF HSE G and RTAF HSS G.

Microprocessor-based chilled water reset based on return water is standard. The UC800 utilizing the “Adaptive ControlTM” microprocessor 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. Controller includes machine protection shutdown requiring manual reset for:

* Low evaporator refrigerant temperature and pressure
* High condenser refrigerant pressure
* Low oil flow
* Critical sensor or detection circuit fault
* Motor current overload
* High compressor discharge temperature
* Communications lost between modules
* Electrical distribution faults: phase loss, phase imbalance, phase reversal
* External and local emergency stop
* Starter transition failure.

The panel includes machine protection shutdown with automatic reset when the condition is corrected for:

* Momentary power loss
* Over / under voltage
* Loss of evaporator water flow.

Over 100 diagnostic checks is made and are displayed when a fault is detected. The 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.

**Human interface with touchscreen display Trane TD7**

* Factory-mounted above the control panel door
* UV Resistant touchscreen
* -40C to 70°C operating temperature
* IP56 rated
* CE certification
* Emissions: EN55011(Class B)
* Immunity: EN61000 (Industrial)
* 7” diagonal
* 800x480 pixels
* TFT LCD @ 600 nits brightness
* 16 bit color graphic display

Display features:

* Alarms
* Reports
* Chiller settings
* Display settings
* Graphing
* Support for 15 languages

**Dry contacts**

UC800 provides a flexible alarm or chiller status indication to a remote location through a hard wired interface to a dry contact closure. Four relays are available for this function.

**Options**

**Application options**

**Ice making**

The ice making option provides special control logic to handle low temperature brine applications (less than 4.4°C (40°F) leaving evaporator temperature) for thermal storage applications.

**Low temperature brine**

Low temperature option provides special control logic and oil cooler is installed to handle low temperature brine applications including part load conditions below 4.4°C (40°F) leaving evaporator temperature.

**Low ambient**

The low ambient option adds unit controls to allow start and operation down to ambient temperatures of -20°C (-7.2°F). High side of ambient range remains at 46°C (115°F)

**High ambient**

The high ambient option adds unit controls, oil coolers and oversized electrical components to allow start and operation up to ambient temperatures of 55°C (131°F) operation. Low side of ambient range remains at -10°C (14°F).

**Integrated Variable Primary Flow**

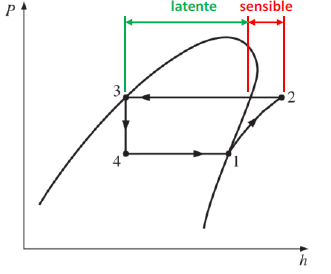
Integrated within the chiller controller, a variable primary flow option will allow control of the water flow through the evaporator. This will be based on a proven algorithm modulating the flow rate to minimize pump consumption at full and partial load.

Two options of operating modes will be available:

* **Constant speed pump – Variable frequency drive adjustment,** The unit is equipped with a pump package driven by a speed inverter, without providing continuous modulation of the speed. The water flow is fixed during commissioning. The goal of this alternative is to provide the appropriate fl ow rate and hydraulic balance, without the need for a mechanical balancing valve, and by taking advantage of the energy consumption optimization of the pump.Water flow is adjusted through parameter 204 of the speed inverter (TR200), when having the dual pump option, the active pump arbitration is based on pump equalization time and pump failure status.
* **Constant Differential Pressure (DP),** acting continuously on the pump speed to ensure a constant outlet pressure. This solution is recommended on installations with 2 way valves on the water coils. This method ensures that each branch of the water loop has a uniform supply, without unnecessary energy consumption. This system will ensure that each water terminal has the appropriate differential pressure supply. In order to manage chiller minimum evaporator water flow, a hydronic package will include water pressure transducers to intellingently monitor water flow rate in real time within AdaptiView™ chiller control. Chiller will deliver the control signal for system by-pass valve actuator. System differential pressure is measured by supplied differential pressure transducer.
* **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. This solution can be applied on water loops with 3 way valve systems, and can deliver higher energy savings than precedent logic (constant DP) in the majority of comfort applications.

**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 around 20% of the Gross Heat Rejection value and 50% for the option PHR+ (only on sizes 101/141/191). 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 63°C.



**Total Heat Recovery**

Chiller can be supplied with a factory mounted 3 way valve and a parallel fitted brazed plate heat exchanger with condenser refrigerant circuit (2), to fulfil heat recovery up to 130% 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.

**Free-cooling Control**

Chiller controller could supply a control option for an externally supplied dry cooler to implement free-cooling strategy, allowing as per pre-fixed ambient temperature set point, switch from chiller operation to dry cooler operation. Control algorithm will be based on PID logic, return temperature and cooling capacity demand.

**Free-cooling**

Chiller can be supplied with option for water based free-cooling, built with all aluminum flat channel dry cooler exchanger, installed in parallel with refrigerant microchannel condenser coil, and a water valve to control the free-cooling capacity. The following options should be available:

* Partial Free-cooling with water on customer water loop (primary/secoundary heat exchanger will be unit mounted)
* Partial Free-cooling with glycol on customer water loop
* Total Free-cooling with water on customer water loop (primary/secoundary heat exchanger will be unit mounted)
* Total Free-cooling with glycol on customer water loop

**E-coating**

An option to supply MCHE 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 jacket on the oil separators and a pre-formed ‘sound box’ encapsulating each compressor.

**Low noise with NNSB**

Night noise set back allow to reduce the sound level of the chiller by reducing the speed of EC fans controlled with an external on/off contact.

**Extra low noise**

Extra low noise units are equipped with a jacket on the oil separators,a pre-formed ‘sound box’ encapsulating each compressor and EC fans with diffusers.

**Extra low noise-AC**

Extra low noise-AC units are equipped with a jacket on the oil separators, a pre-formed ‘sound box’ encapsulating each compressor and low speed AC fans without diffusers.

**Hydraulic module option**

Hydraulic module includes the following components: water strainer, 80 l expansion vessel, pressure relief valve set at 5 bars, twin pump low head allowing a pressure drop in the water circuit up to 120 kPa or twin pump high head allowing a pressure drop in the water circuit up to 220 kPa, balancing valve and anti freeze protection.

**Electrical options**

* Under/over voltage protection
* IP20 internal protection
* Flow switch: the flow switch is sent as an accessory and must be installed on site.

**Control options**

**BACnet™ communications interface**

Allows the user to easily interface with BACnet via a single twisted pair wiring to a factory installed and tested communication board.

**LonTalk™ (LCI-C) Communications Interface**

Provides the LonMar chiller profile inputs/outputs for use with a generic building automation system via a single twisted pair wiring to a factory installed and tested communication board.

**ModBus™ Communications Interface**

Allows the user to easily interface with ModBus via a single twisted pair wiring to a factory installed and tested communication board.

**External chilled water setpoint**

UC800 accepts either a 2-10 VDC or a 4-20mA input signal, to adjust the chilled water setpoint from a remote location.

**External current limit setpoint**

UC800 accepts either a 2-10VDC or a 4-20mA input signal to adjust the current limit setpoint from a remote location.

**Ice making contact**

UC800 provides an output contact closure that can be used as a signal to the system that ice building is in operation. This relay will be closed when ice building is in progress and open when ice building has been terminated by either UC800 or the remote interlock. It is used to signal the system changes required to convert to and from ice making.

**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**

**Relief valves**

Dual relief valve plus 3-way valve on high and low pressure side.

**High performance insulation.**

Evaporator is insulated with 2 layers of Armaflex II or equivalent of 19 mm (3/4 inches) thickness and K factor of 0,26 W/m²°K.

**Evaporator without insulation**

Evaporator is not insulated and a specific insulation can be done on site.

**Coated condensing coils**

Condensing coils are protected with a cathodic epoxy electrodeposition coating UV resistant

**Neoprene pads**

Neoprene pads avoids a direct contact of the base of the unit with the ground

**Neoprene isolators**

Isolators provide isolation between chiller and structure to help eliminate vibration transmission and have an efficiency of 95% minimum

**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.

**Export shipping package**

Metallic clogs are fixed on the base frame of the unit. They prevents direct contact between the chiller and the container during loading and unloading from the container.

\* Trane RTAF SE/HE/XE/HSE/HSS G in SN/LN/XLN/XLN-AC versions up to 1500 kW are Eurovent certified.

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RLC-PRG035B-GB\_0121

Supersedes RLC-PRG035A-GB\_0918

