



# Guide Specifications

Sintesis™ Advantage  
Air-cooled Scroll Chillers

*Model CGAF SE / HE / XE*

*260 - 700 kW*



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TRANE  
TECHNOLOGIES

## General

Chilled water production will be made by a factory-assembled and tested, air-cooled liquid chiller, Trane type CGAF SE/ HE/ XE. Chiller will have two refrigerant circuits with two to three compressor per circuit, will be shipped with a full operating charge of HFC-based R410A 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 environmental management system certified in accordance with ISO 9001:2008 and ISO14001 standards.

Chiller is factory-tested according standard EN14511, 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:

- 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, painted and have a corrosion resistance of 675 hours to salt spray test.

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

## 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. Water pipe extensions with insulation go from the evaporator to the edge of the unit. 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 outdoor air temperature up to 52°C 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.

- Standard units will start and operate from -10°C to 46°C (14°F to 115°F) ambient
- Low ambient unit will start and operate from -20°C to 46°C (4°F to 115°F) ambient
- High ambient unit will start and operate from -10°C to 52°C (14°F to 131°F) ambient
- Wide ambient unit will start and operate from -20°C to 52°C (4°F to 131°F) ambient

## Refrigerant Circuit

Each unit has two refrigerant circuits, with two to three scroll compressor per circuit. Each refrigerant circuit includes removable hard-core 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 UC800 module power. All the starter elements are enclosed in an IP54 panel, with hinged door.

## Unit Controls

### Tracer UC800

The microprocessor-based control panel is factory-installed and factory-tested. The control system is powered by a control power transformer.

Microprocessor-based chilled water reset based on return water is standard. The UC800 utilizing the "Adaptive Control™" 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
- Critical sensor or detection circuit fault
- High compressor discharge temperature
- High Suction temperature
- Communications lost between modules
- External and local emergency stop

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

- Loss of evaporator water flow
- Loss of BAS communication
- Electrical distribution faults

\*Please note that these lists are not exhaustive and only include some of the most common diagnostics.

Over 100 diagnostic checks are 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 Touchable Display Trane TD7

- Factory-mounted above the control panel door
  - UV Resistant touchscreen
  - -40°C 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

#### 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) down to -12°C (10.4°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) for standard efficiency units and 52°C (126°F) for high efficiency units

#### 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 52°C (126°F) operation. Low side of ambient range remains at -10°C (14°F).

#### Wide ambient

The wide ambient option adds unit control box ventilation and extended coil face area to allow start and operation up to ambient temperatures of 52°C (126°F) operation with low side of ambient range down to -20°C (4°F) by means of 2 speed fans or EC fan motor and compressors which have the capability to reach down to 10°C condensing temperature.

## 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. The operating modes available are the Constant Differential Temperature (DT) and Adjustable Fixed Speed:

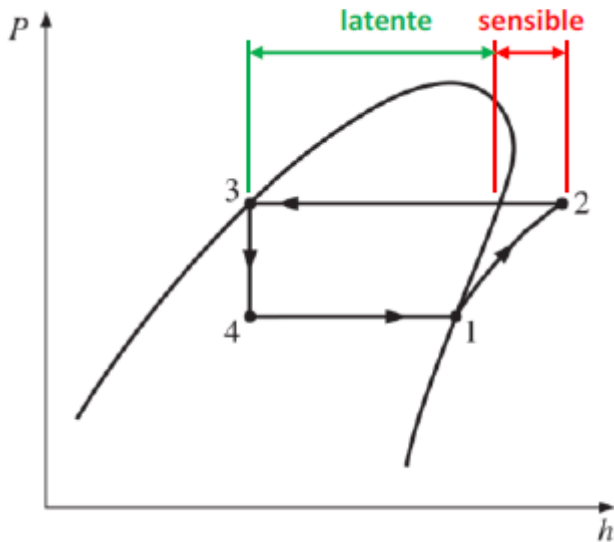
- **Constant Differential Temperature (DT)**, in this case the chiller controller algorithm will maintain a constant difference in between entering and leaving temperature at the chiller plant (DT), regardless the load, reducing the water flow rate

when necessary up to the minimum allowed. This solution can be applied on water loops with 3 way valve systems, and can deliver high energy in the majority of comfort applications.

- **Adjustable Fixed Speed**, in this case the pump is running at a fixed speed which can be set at a desired value through a 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 outlet, 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

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.

### Dry cooler 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

Chiller can be supplied with option for free-cooling, built with a brazed plate heat exchanger or decoupling bottle, installed in series with refrigerant microchannel condenser coil, and a water valve to control the free-cooling capacity. The following option will be available: Total Free-cooling with glycol on customer water loop, and glycol-free free cooling.

### 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 compressor sound box encapsulating all compressors with sound attenuation 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**

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
- Under/over voltage protection and ground fault protection
- IP20 internal 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
- Energy meter

### **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 Demand Limit Setpoint**

The number of compressors allowed to operate is being limited to less than the available number of compressors

#### **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.

The ice making option provides special control logic to handle low temperature brine applications from 20°C (68°F) down to -7°C(19.4°F) leaving evaporator temperature) for thermal storage applications.

### **Run test report**

Run test report gives the results of the performance 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**

### **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.

### **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.

### **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 CGAF SE/HE/XE in SN/LN/XLN versions up to 700 kW are Eurovent certified.

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