



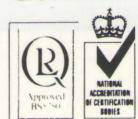
**TRANE™**

# RTHA Screw Compressor Liquid Chillers

- Packaged liquid chillers, water cooled, with nominal cooling capacities from 350 to 850 kW.
- Trane accessible-hermetic, screw compressor, direct drive, with integral oil separator and full economizer cycle.
- Refrigerant 22.
- Liquid refrigerant cooled motor.
- Latest design heat exchangers with most advanced heat transfer surfaces.
- Microprocessor-based control and protection system.
- Unit mounted motor starter.
- Fully factory run tested before shipment.



#### QUALITY ASSURANCE



APPROVALS  
B.S. 5750 Pt1  
ISO 9001  
NEN 2646

B20 CA 003 E

Liquid chillers, water cooled, with Trane screw compressor.  
Series RTHA. 350 to 850 kW.

# The Trane RTHA : The most advanced liquid chiller available, offering higher performance, better reliability and a lower life cycle cost.

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The new Trane screw compressor is the first large capacity, accessible - hermetic helical rotary compressor, specifically designed and optimized for comfort and process water chiller applications. It is not an adaptation of rotary air compression technology.

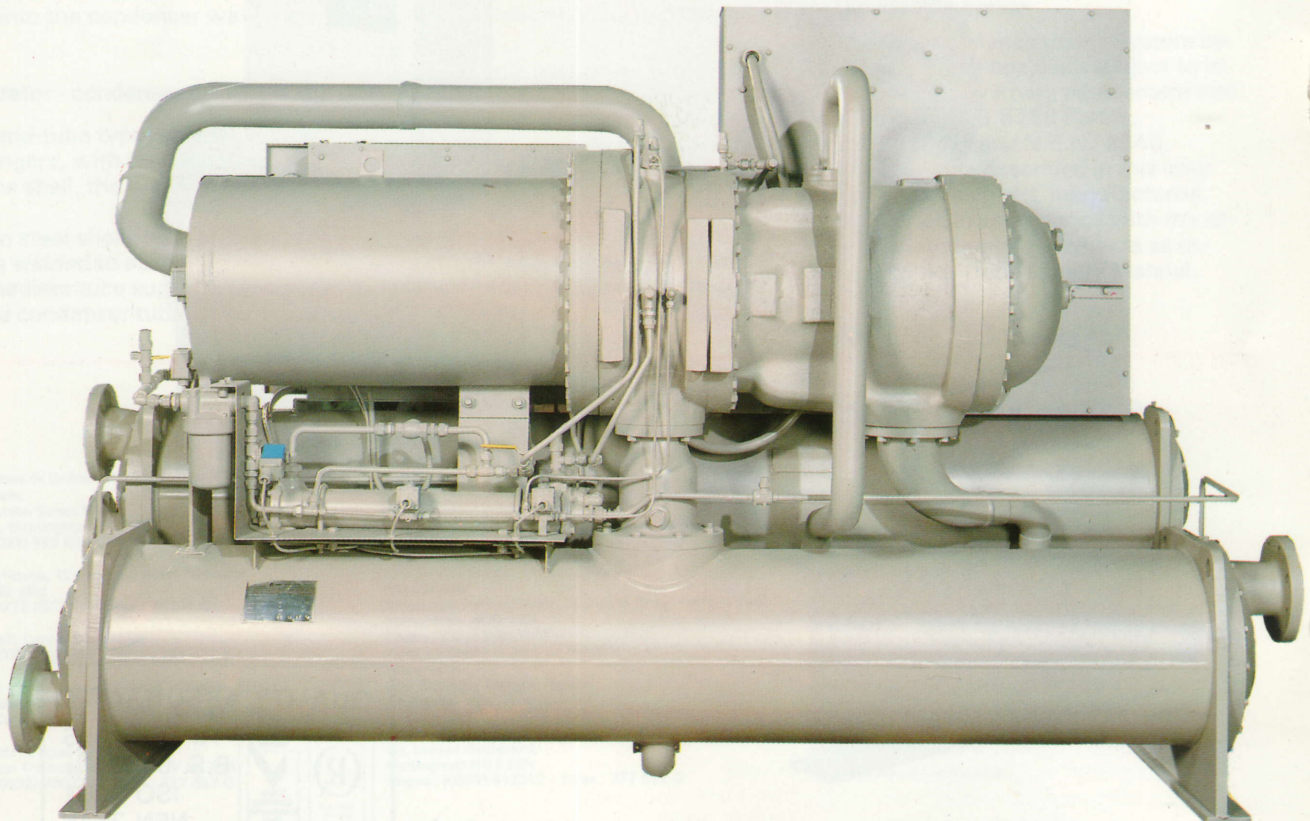
Helical rotary compressor technology is already proven in many industrial applications, in particular in low temperature refrigeration, air and gas compression.

Recent advancements in computer modeling and compressor design, as well as in machining technology now allow Trane to produce screw compressors which meet the highest efficiency and reliability requirements and by far exceed the performance of the best centrifugal and reciprocating chillers available today.

Trane has invested 15 years of research, development and testing to perfect the screw compressor design, optimizing efficiency and reliability. The new RTHA liquid chiller has been designed around the new Trane screw compressor and incorporates the latest advancements in heat exchange and microprocessor-based control technology, providing its future owners the best overall system value in the market.

The RTHA is a truly industrial product, reliable and efficient, built to the highest standards. It combines the advantages of existing reciprocating and centrifugal chiller designs, but avoids their weaknesses.

The RTHA represents an entirely new generation of chillers, different and better, which already today meets the requirements of the next decades.



# The Trane RTHA :

## Unmatched energy efficiency and reliability, ease of installation and utilization.

### Energy efficiency

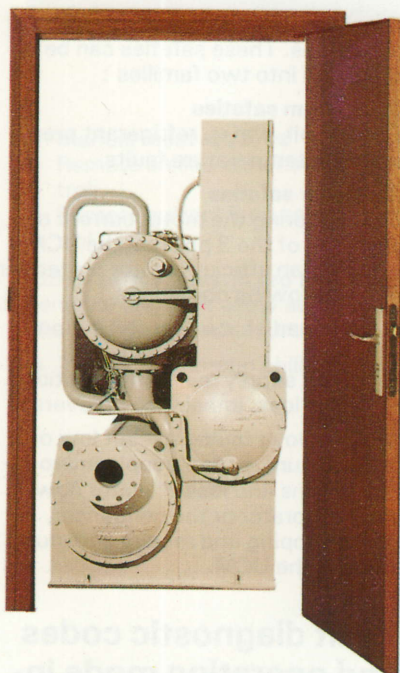
- **Excellent Energy efficiency of the RTHA** resulting in energy costs lower than any comparable chiller. Part load efficiencies are unmatched by any other manufacturer.
- **Precise rotor tip clearances**  
Reduces the leakage between high and low pressure cavities during compression. Achieved with the latest manufacturing and machining technology and automated electronic checking of parts during the production process.
- **Optimized rotor profiles**  
Rotors and unloader valves are unique designs, computer optimized for the pressure ratios typical for chiller applications both at full load and part load.
- **Direct drive**  
The motor drives directly the male rotor, eliminating losses from speed changing gear assemblies.
- **Economizer cycle**  
Full flow, in-line economizer cycle improves cycle efficiency an average of four percent and is comparable to the economizer cycle of the Trane two-stage centrifugal chillers.
- **Advanced heat transfer surfaces**  
Condenser and evaporator design and tube surfaces represent the latest heat transfer technology for increased efficiency.

### Reliability

- **Rugged Helical Rotary Compressor**  
Simple design with only two rotating compressor parts. Fewer moving parts means higher reliability. No valves, no highly stressed parts. The compressor housing and rotors are ruggedly constructed.
- **Direct Drive Low Speed Compressor**  
Direct drive means no maintenance or service problems associated with gear boxes. Lower speed means inherently higher reliability.
- **Premium Class 5 Bearings**  
Rotor and motor bearings are premium class 5 grade commonly used only for applications such as machine tool spindles and aircraft jet engines.
- **Patented Oil Separator**  
Part of the new Trane technology is a Trane-patented oil separator system that captures the oil leaving the compressor discharge and

keeps the oil where it should be: in the compressor.

- **Liquid Refrigerant Cooled Motor**  
This proven feature of Trane centrifugal chillers keeps the motor uniformly cooled at a lower temperature. Lower temperatures mean longer motor life.
- **Fixed Orifice Refrigerant Metering**  
Refrigerant metering system with calibrated orifice plates with no moving parts to fail.



- **Microprocessor Controls**  
These state-of-the-art microprocessor controls offer a higher level of protection than non-electronic controls. Over 35 parameters are monitored to prevent problems from becoming failures.
- **Years of Research and Testing**  
Trane has put more than ten years of research into helical rotary compressors. The new Trane screw compressor has undergone thousands of hours of testing, much of it as severe operating conditions beyond the normal air conditioning application. The result is a proven, reliable chiller.

### Ease of installation

- **Exceptionally compact design**  
Requires up to 40 % less floor space to install. RTHA units up to 500 kW fit through a 1000 x 2000 mm door and are

thus particularly well suited for replacement and renovation projects.

- **Unit mounted starter**  
Simplifies installation on site and places the responsibility for the starter and the power wiring with the chiller manufacturer.
- **Full factory run test**  
Virtually eliminates start-up problems on site. Unit arrives on site thoroughly run tested at the factory, with its full charge of refrigerant and oil.

### User-friendly controls

- **Microprocessor-based control system** controls, optimizes and monitors chiller operation. The programmed control logic anticipates and corrects potential operational problems and maintains the chiller in operation where traditional systems would shut down the machine.
- **Easy to use operator interface**, displays all control parameters, operating and diagnostic codes and provides chiller operating status information. In case of a problem the system provides detailed diagnostic information in addition to the latest operating status data.
- **System control panel**  
The optional, programmable system control panel SCP optimizes the control of a 2 or 3 - chiller installation including pumps and cooling towers. It provides sophisticated control strategies including 7-day scheduling of set points and current limitation and accepts analog inputs from a building management system.
- **Serial communication interface**  
This optional interface allows the integration of the RTHA chiller into a higher level building automation system and offers the possibility of binary transmission of operating and diagnostic data and operating commands via a RS 232 serial communication link.

# Unit Control Module : Advanced system control, protection and communication capabilities

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**T**he microprocessor based Unit Control Module (UCM) developed by Trane for its liquid chillers with rotary-type compressors combines 50 years of experience in chiller control with the most recent developments in micro-electronics. The UCM results from the same concerns for quality and technological advance which have always guided Trane development policy.

The UCM ensures a precise control, increased chiller protection and extended communication capabilities. Its user interface allows easy and quick access to :

- All the control settings
- All the information necessary to operate and trouble shoot the chiller.

## Optimized control algorithm for smooth operation

Trane has further improved and optimized the control algorithm used by this UCM.

The control logic of the P.I.D. type, still based on the leaving chilled water temperature now integrates :

- The compressor motor current.
- The evaporating temperature.
- The condensing pressure.

The UCM action on the capacity-control slide valve is corrected when one or more of these parameters are approaching their setpoints limit. The chiller will cut out on these safeties only if the correcting actions did not succeed to reestablish a safer mode of operation.

## Increased chiller and motor protection

The UCM integrates all the functions necessary to ensure safe operation of

the chiller in all applications and duty conditions. These safeties can be classified into two families :

### 1. System safeties

Such as oil, water, refrigerant pressure and temperature faults.

### 2. Motor safeties

By monitoring the motor current on each one of the 3 phases, the UCM provides an efficient motor protection in the following conditions :

- Overload at start-up and in operation.
- Power supply micro-interruptions.
- Phase loss, imbalance or reversal.

All the above faults, except low oil temperature, power supply micro-interruptions and loss of water flow in the evaporator or the condenser, cause tripping and require a manual reset of the UCM.

## Fault diagnostic codes and operating mode indicators

Over 50 diagnostic checks and operating mode indicators permit to analyse abnormal operating conditions and help to resolve potential problems. In case of a trip-out the diagnostic code is displayed together with the last operating code.

## Easy to use operator-interface

Most adjustments and control functions are accessible without opening the control panel door.

### Setting :

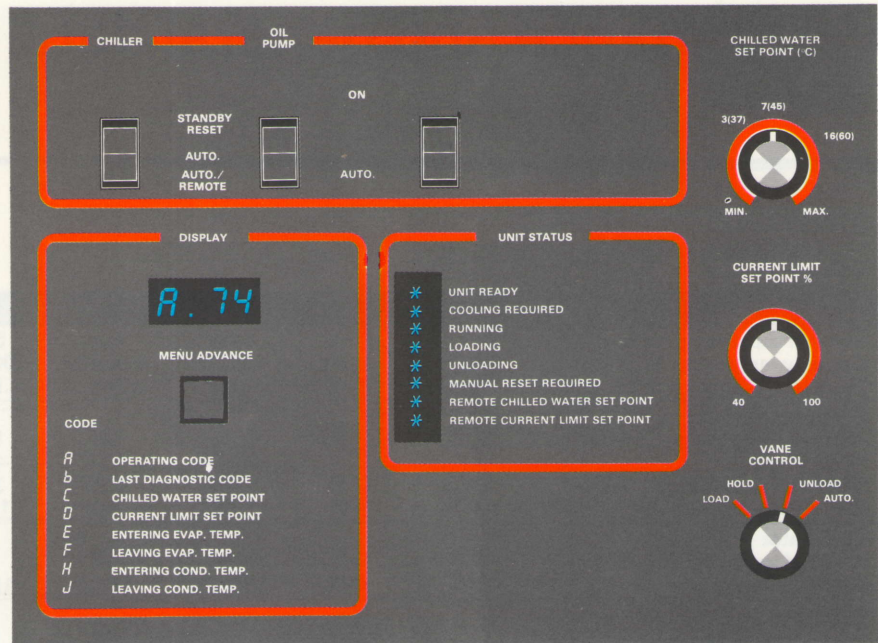
- Leaving chilled water temperature setpoint
- Motor current limit setpoint
- Slide valve control

A menu-type display gives access to the following information :

- Operating code
- Diagnostic code
- Leaving chilled water temperature setpoint
- Motor current limit setpoint
- Entering evaporator water temperature (option)
- Leaving evaporator water temperature
- Entering condenser water temperature (option)
- Leaving condenser water temperature (option).

**Chiller operating status** is reported by Light Emissive Diodes. The following status information can be indicated at any time :

- Chilled water flow established
- Cooling demand
- Operating
- Loading
- Unloading



- Manual reset required
- Remote chilled water setpoint control
- Remote current limit setpoint control

Other settings restricted to the maintenance engineer allow adjustment of the following control functions :

- Type of automatic chilled water

temperature setpoint reset (option) : as a function of the load determined by  $\Delta T$  on the chilled water or as a function of the ambient air temperature.

- The rest ratio
- The setting of : control response, start differential, condensing pressure limit, evaporating temperature limit.

## System Control Panel : Multiple chiller system management

The System Control Panel SCP has been developed to ensure the control and management of a complete chilled water plant including up to 3 chillers with associated water pumps and cooling tower.

The SCP offers all the benefits of a factory programmed and stand-alone system which optimizes the operation of the system and improves its reliability.

The SCP handles the successive start up of the chillers to ensure a system leaving chilled water temperature at the programmed set point while opti-

mizing the running hours of each chiller and considering the power demand peaks.

The SCP includes the following functions :

### Setpoints scheduling

Leaving chilled water and current limit setpoints and chiller running hours can be scheduled on a weekly basis and for inoccupancy periods.

### Control of auxiliaries

Six outlet contacts are available on the SCP to control the water pumps and the cooling tower fans. The cooling water pump of each chiller is controlled by the UCM.

### Fault diagnosis reports

Through its bidirectional communication link the SCP accesses and reports all the faults detected by each UCM addressed.

Every latching fault at the UCM level is signaled on the SCP by a flashing diode and the corresponding diagnostic code can be displayed by the SCP.

### Integration into a Building Management System

The SCP can receive analog signals from a Building Management System to reset the chilled water temperature and current limit setpoints of the system.

# Performance and general data

Model		RTHA	130	150	180	215	255	300
Nominal capacity	(1)	kW	337	405	508	584	737	805
Capacity range	(2)	kW	337/357	398/428	500/541	570/617	724/784	788/851
Full load efficiency	(3)	kW/kW	5.1/5.7	4.9/5.7	4.9/5.7	5.0/5.8	5.2/6.1	5.2/6.1
<b>Compressor motor</b>								
Nominal motor rating		kW	88	98	118	141	160	190
Rated load amps	(4)	A	137	151	182	218	247	294
Starting amps	(5)	A	245	233	323	395	455	544
Control power required		VA	1000	1000	1000	1000	1000	1000
<b>Evaporator</b>								
Water storage capacity		l	64	64	72	87	102	125
Min/Max flow rate		l/s	13/26	13/26	15/30	18/37	22/43	26/52
<b>Condenser</b>								
Water storage capacity		l	42	49	57	72	83	102
Min/Max flow rate		l/s	13/24	15/28	18/33	21/40	25/47	30/57
<b>Weights</b>								
R 22 operating charge		kg	118	118	118	141	141	200
Oil operating charge		l	19	19	21	21	27	27
Unit operating weight		kg	2450	2500	2560	2680	2800	3300
Unit shipping weight		kg	2370	2420	2480	2600	2720	3200

(1) At 7/12 °C chilled water, 27/32 °C condenser water, FF = 0.088 m<sup>2</sup>. K/kW, 415V/3/50Hz supply. Three-pass evaporator, two-pass condenser, R 22.

(2) Depending on selection of heat exchangers and pass arrangements.

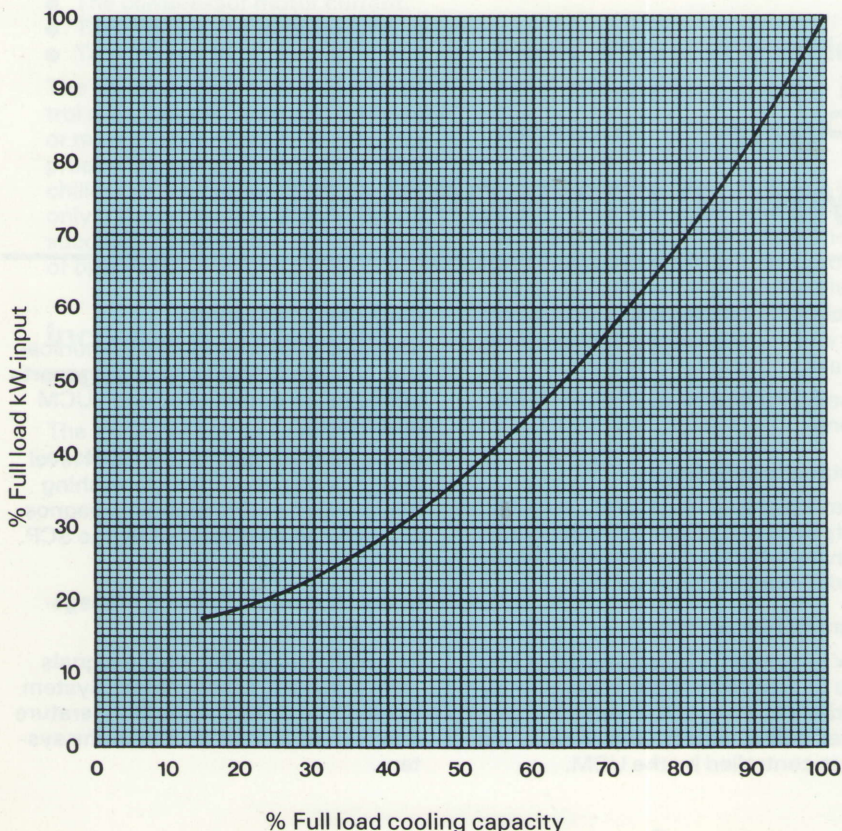
(3) Efficiency range, kW cooling per kW input, depending on selection of heat exchangers and pass arrangements.

(4) Based on maximum rated motor-kW. Cut-out amperage of motor protection system = Full load amps × 1.05. Power cables should be sized based on the applicable code requirements or based on full load amps × 1.15 minimum.

(5) Inrush current for star-delta starter.

## Part load performance

Typical RTHA part load performance per ARI-Standard 550



The RTHA chiller has excellent part load performance characteristics compared to both centrifugal and reciprocating type chillers.

Part load chiller operation is normally associated with reduced condenser water temperatures. At part load operation, the heat rejected to the cooling tower is less than at full load operation.

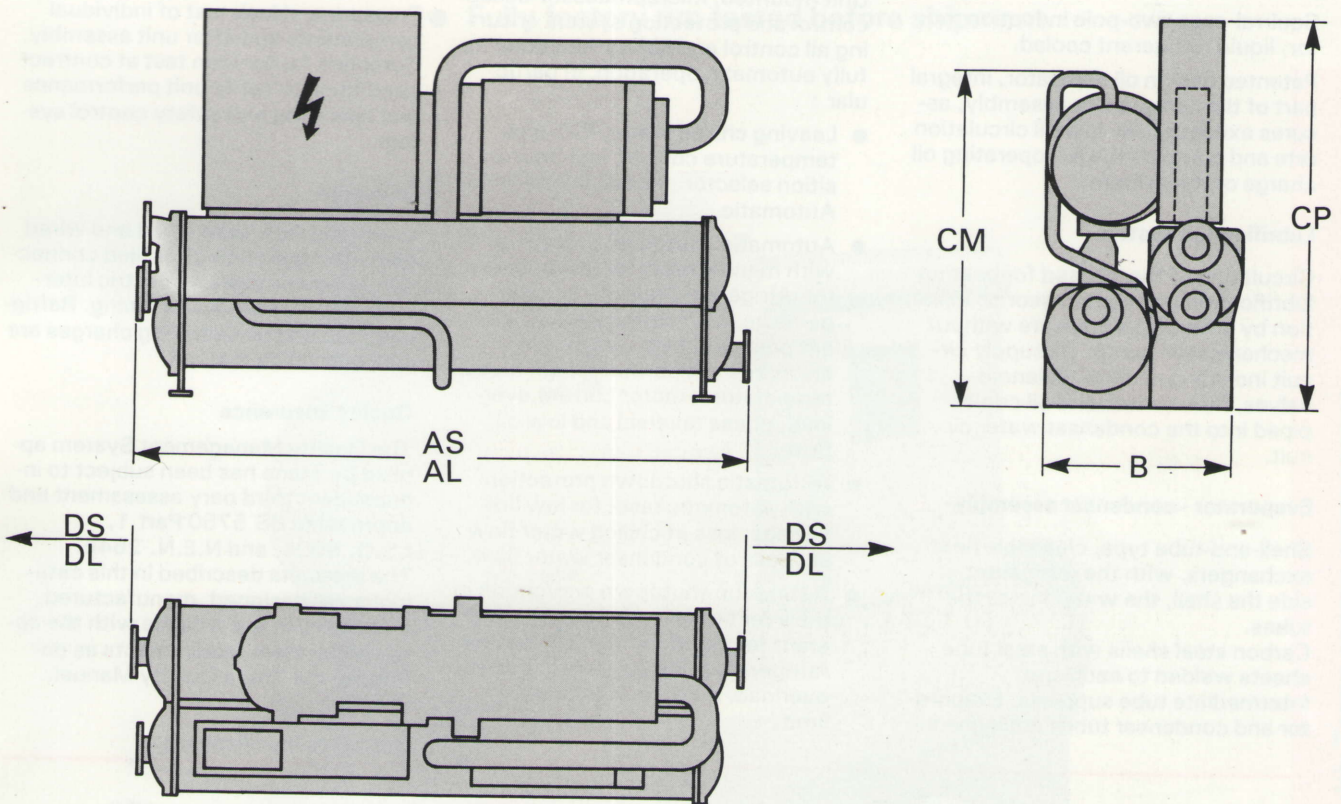
Also, part load operation is typically associated with reduced outside wet bulb temperatures, resulting in improved cooling tower performance. The net result of less heat rejection and lower wet bulb temperature is cooler condenser water entering the chiller and improved unit performance. A representative load line which takes into account condenser water relief per ARI Standard 550 (1,4 °C per 10 % unloading) is shown on this page. The specific unit part load performance depends on the specific operating conditions and the heat exchangers.

Minimum part load operation for extended periods of time is acceptable within the range of 30 to 15% of full load, depending on operating conditions and unit selection.

# Dimensions

Model		RTHA	130	150	180	215	255	300
Length	(mm)	AS (1)	2715	2715	2715	2775	2775	2795
		AL (2)	3475	3475	3475	3535	3535	3555
Width	(mm)	B	874	874	874	1081	1081	1202
Height	(mm)	CM	1557	1557	1695	1695	1695	1695
		CP	1743	1743	1743	1900	1900	2100
Clearance	(mm)	DS (1)(3)	2332	2332	2332	2332	2332	2332
		DL (2)(3)	3094	3094	3094	3094	3094	3094
<b>Connection sizes</b>		(4)						
Evaporator	(mm)		100	100	100	125	125	125
Condenser	(mm)		100	100	100	125	125	150

- (1) Standard length heat exchangers.
- (2) Long length heat exchangers.
- (3) Tube removal clearance, on either end of the machine.
- (4) Evaporator 3-pass, condenser 2-pass.
- (5) Dimensions are approximate. Certified drawings available upon request.



# Mechanical specifications

Trane series RTHA packaged rotary liquid chiller, consisting of an accessible hermetic, direct drive screw compressor, condenser, evaporator, microprocessor-based controls and a unit-mounted compressor motor starter, factory run tested and ready for operation.

## Compressor - Motor Assembly

Trane screw compressor, accessible-hermetic, direct drive, 2950 rpm. Separately-housed, pressure-lubricated rolling element bearing groups at each end of both rotors.

Continuous capacity control by use of a slide valve in the rotor section of the compressor, positioned by hydraulic action.

Integral economizer with no moving parts.

Squirrel-cage two-pole induction motor, liquid refrigerant cooled.

Patented design oil separator, integral part of the compressor assembly, assures exceptionally low oil circulation rate and contains the full operating oil charge of the system.

## Lubrication system

Circulation of the oil used for bearing lubrication and compressor oil injection by differential pressure without mechanical oil pump. Oil supply circuit including oil filter, solenoid valves, flow switch and oil cooler piped into the condenser water circuit.

## Evaporator - condenser assembly

Shell-and-tube type, cleanable heat exchangers, with the refrigerant inside the shell, the water inside the tubes.

Carbon steel shells with steel tube sheets welded to each end. Intermediate tube supports. Evaporator and condenser tubes are individu-

ally replaceable, externally finned, internally enhanced, seamless copper, mechanically expanded into tube sheets.

Cast iron, removable water boxes with flanged water connections. Maximum water side working pressure 10.5 bars (standard) or 21 bars (optional).

Evaporator factory insulated with closed-cell insulation material.

## Refrigerant expansion system

Two-stage multiple orifice refrigerant metering system with no moving parts, in-line, full-flow economizer.

## Control panel

Unit mounted, microprocessor-based control and protection system ensuring all control and safety functions for fully automatic operation, in particular :

- Leaving chilled water, PID-type temperature control, incl. four-position selector : Load-Unload-Hold-Automatic.
- Automatic shutdown protection with manual reset for low evaporator refrigerant pressure and temperature, high condenser refrigerant pressure, high compressor discharge temperature, high motor temperature, motor current overload, phase reversal and low oil flow.
- Automatic shutdown protection with automatic reset for low line voltage, loss of chilled water flow and loss of condenser water flow.
- Automatic shutdown prevention in the event of low evaporator refrigerant temperature high condenser refrigerant pressure, motor current overload, motor current setpoint limit.

- Menu-driven display of control parameters, operating and diagnostic codes.
- Chiller operating status indicating LED'S.
- Suction and discharge pressure gauges.

## Starter panel

Unit mounted starter panel, protection class IP 42.

Panel door mechanically interlocked with disconnect switch. Panel contains star-delta, closed transition type motor starter, disconnect switch with fuses, 3-phase current transformer for motor overload protection. Ammeter and voltmeter located on the panel door.

## Factory run test

Pressure and leak test of individual components and after unit assembly. Complete factory run test at contract conditions to verify unit performance and operating and safety control system.

## Shipment

Units ship fully assembled and wired ready for operation after filed connection of power supply, electric interlocks and system water piping. Refrigerant 22 and oil operating charges are supplied inside the unit.

## Quality assurance

The Quality Management System applied by Trane has been subject to independent third party assessment and approval to BS 5750 Part 1, I.S.O. 9001, and N.E.N. 2646. The products described in this catalogue are designed, manufactured, and tested in accordance with the approved system requirements as defined in the Trane Quality Manual.

Subject to modifications.

Sales offices in United Kingdom and Eire  
**Birmingham**  
24, New John Street West,  
Newtown, Birmingham B19 3NB  
Phone : (021) 359 6354/6 - Telex : 336 995 G  
**Bristol**  
Dockgate House, 151 Hotwell Road, Hotwells,  
Bristol BS8 4RU  
Phone : 0272 297761 - Telex : 44241 G  
**Dublin**  
8, The Mall, Lucan, Co. Dublin  
Phone : (0001) 282965 - Telex : 721 472 E  
**Glasgow**  
10 Napier Court, Wardpark North Industrial Estate,  
Cumbernauld G68 0LG  
Phone : Cumbernauld (02367) 36927 - Telex : 779 361 G  
**London**  
162, Windmill Road West,  
Sunbury on Thames, Middlesex TW 16 7HB  
Phone : (0932) 780321 - Telex : 927 357 G

**Manchester**  
Enterprise Trading Estate, Guinness Road, Trafford Park  
Manchester M17 1SD  
Phone : (061) 848 0491 -  
Telex : 937400 G (Ref. 29768001)  
**Newcastle**  
218 Rothbury Terrace, Heaton  
Newcastle Upon Tyne NE6 5DF  
Phone : (091) 276 2000 - Telex : 537 259 G  
**Nottingham**  
60, Lenton Boulevard,  
Nottingham NG7 2EN  
Phone : (0602) 412212 - Telex : 377 552 G



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