



RTXA 209 - 212

Air-cooled liquid chillers with reversible circuits and screw compressors

- 4 Sizes - Nominal cooling capacities, from 240 to 350 kW (R22, 50Hz).
- TRANE twin-rotor semi-hermetic direct drive screw compressors.
- 2 separate cooling circuits.
- "Adaptive Control™" microprocessor control logic.
- Tested in factory before being shipped.
- Designed, manufactured and marketed according to a quality assurance system certified in conformity with ISO 9001.



Quality Management System Approval

E30 CA 001 GB

Reversible air-cooled liquid chillers with screw compressors.
RTXA 240 to 350 kW R22, 50 Hz.

The TRANE air-cooled liquid chillers with reversible circuits: the combination of mechanical components and control devices using the latest technology

The RTXA liquid chillers produce hot or chilled water using the same heat exchanger. Only one hydraulic connection is required; the same system of distribution and blower units can be used for air-conditioning and heating.

The RTXA liquid chillers are designed to occupy as little floor space as possible. The short compact unit facilitates handling on the work site and access to the different components.

The RTXA liquid chillers comprise 2 completely separate cooling circuits making it possible to defrost one circuit by cycle reversal (in heating mode), while the second circuit continues to produce hot water.

The TRANE semi-hermetic screw compressor: Unrivalled reliability

The TRANE semi-hermetic screw compressors have been designed, tested and built to satisfy the same strength criteria as the other families of rotary compressors which have established TRANE's reputation and success :

- centrifugal compressors
- 3D® -SCROLL compressors
- RTHA units screw compressors

Ever since air-cooled chillers were launched on the market, TRANE screw compressors have demonstrated their unfailing reliability: their combined failure rate is less than 0.5%. The reliability of screw compressors is without doubt better than that of reciprocating compressors which generally have a failure rate of 2 to 4% from the very first year of operation.

Simple design with few moving parts

There are only four moving parts in the CHNN screw compressor: the two rotors, a control slide and a control stage valve, i.e. approximately 30 times less parts than a unit comprising several reciprocating compressors. This greatly reduces the potential wear and breakdowns.

The RTXA air-cooled liquid chillers with reversible circuits use two CHHN TRANE twin-rotor screw compressors, each operating on its own circuit.

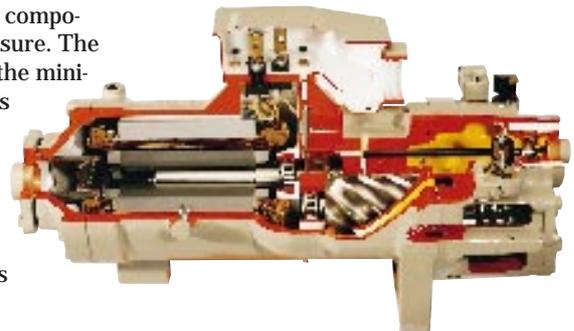
The capacity of the TRANE screw compressors is adjusted by a slide component controlled by the oil pressure. The system is always started with the minimum load, to reduce the stress applied to the rotating components. Thanks to continuous modulation of the cooling capacity the chiller always supplies exactly the required capacity, no more no less, thus reducing operating costs.

Strong structure

No fragile components (valves or springs). The class 5 bearings (the same type as those used in aero engines) do not require any maintenance work during the chiller's operating life. The service provided is far superior to that supplied by reciprocating compressors using bearings, or even the service provided by screw compressors existing on the market which require regular overhaul of the bearings.

Exclusive rotor shape

5 and 7 lobe design developed and patented by TRANE. The latest developments make it possible to offer a wider range of capacity modulation.



More efficient energy use

Precision machining

The extremely strict machining tolerances make it possible to reduce play between the components, and therefore leakage between the high and low pressure parts during compression. This high quality machining is achieved by using machine tools that implement the latest technology in the field of machining and dimensional and geometric electronic control.

Optimisation of part shapes

Optimised shaping of rotors and control components as a result of computer simulation of behaviour under partial load. These shapes have been optimised to satisfy the requirements of air-conditioning applications.

Screw compressor = more efficient with partial load

The TRANE screw compressor liquid chillers are extremely efficient with a partial load. The CHHN screw compressor control system uses the slide for the majority of partial load operation, and the regulation stage acts as a complement when the chiller is operating with minimum load.

Electronic expansion valve

The electronic expansion valves used on the RTXA offer the possibility of additional actions to control operation of the machine in cooling mode or heating mode. The electronic expansion valve constantly optimises filling of the evaporator. A sensor measures overheating at the evaporator outlet to adjust the flow of refrigerant fluid during operation. By means of the "Adaptive Control™" control logic, the electronic expansion valve ensures more stable operation when the load or pressure in the cooling circuit undergoes variations. This is much more difficult to achieve using thermostat expansion valves.

Precision and reaction speed

Commercially available thermal actuator expansion valves are characterised by very long reaction times and relatively imprecise degrees of opening. In contrast, the actuator integrated into the TRANE expansion valve is a step motor, so that the module is constantly informed of the degree of opening of the expansion valve. It's reaction time is also faster; the valve can be completely opened or closed in less than 30 seconds.

Enhanced hermetic design

When closed the electronic expansion valve is perfectly hermetic and makes it possible to eliminate the solenoid valve from the liquid line, thereby reducing the number of components.

Design guaranteeing more stable operation

Not only is the electronic expansion valve actuated by an oversize step motor and insensitive to the presence of particles in the circuit, it is also equipped with a self-diagnosis function. Each time the chiller starts, the expansion valve undergoes a series of tests to ensure it operates correctly.

The electronic module pre-positions the expansion valve for each new operating state, so as to anticipate modifications of operating parameters in a transient operating state.



Microprocessor control module

"Adaptive Control™" control logic: safe operation

Maximum availability

Control of more parameters

Since more parameters are controlled, it is possible to anticipate overshooting of the authorised thresholds and undertake corrective action to remain within the required limits.

Greater possibility of action

The "Adaptive Control™" control logic can intervene in the compressor's capacity control function to ensure the chiller operates to the maximum of the available capacity.

In a large number of situations, it can ensure continuous supply of chilled or hot water depending on the operating

mode, when a standard chiller would stop due to a fault.

The "Adaptive Control™" control logic makes it possible to keep the chiller in operation and provide the maximum available capacity to rapidly satisfy demand.

Enhanced protection of the unit and compressor

The control module constantly monitors 3 amp signals emitted by the 3 motor power phases to perform the following safety functions:

- Protection of temperature or pressure of water, oil and refrigerant circuits.
- Motor excess current at start-up and during operation.
- Power line disturbance or phase disconnection.

- Phase reversal and unbalance
- Contactors fault.

In the event of a fault a message is displayed on the display unit screen.

Programmable functions

The control module makes it possible to reset the set point for water (cooling mode and/or heating mode), depending on the return water or ambient temperature, without having to make use of an external adjustment.

Communication

The RTXA's control module with clear language display unit (UCM-CLD) provides several levels of communication thereby facilitating remote control of the unit.

Operator interface

The UCM-CLD is equipped in its standard version with a 2-line 40-character display unit and a 16-key keyboard. The messages can be displayed in 6 different languages.

This interface makes it possible to see the chiller's operating status, the value of the analogue parameters, the number of hours of operation and start-ups. It is also used to modify set point values and perform operating tests on the chiller components.

Remote monitoring by parallel link

In applications where the unit is not integrated into a BMS, the UCM-CLD standard version is equipped with dry contacts in order to obtain running and fault information about each circuit. Full load reached (to put an additional chiller into operation).

On/off inputs are available to disable total operation of the machine or one of the 2 circuits to limit the power take-up.

Remote display module

The RTXA chillers can be equipped on request with a remote display module. This module is linked to the chiller by a bifilar cable with a maximum length of 1500 metres. It is used to:

- display operation of the machine,
- modify set points,
- schedule chiller starting and stopping.

The remote display module constitutes the simplest way to carry out remote monitoring or remote management of the chiller.

Technical characteristics (50Hz)

Model	RTXA	209	210	211	212
Nbr of circuits/compressors		2/2	2/2	2/2	2/2
Control range		continuous 100 - 17 %			
Maximum amps (1)	(A)	90	90/106	106	128
Start-up amps (2)	(A)	398	445	469	575
Fan motor power	(kW)	6 x 1.7	5 x 1.7	6 x 1.7	8 x 1.7
Rotation speed	(rps)	15.2	15.2	15.2	15.2
Water heat exchanger capacity	(l)	145	143	143	118

(1) By compressor in 400/50/3 - Should be considered when dimensioning the power supply cables.

(2) Start-up amps for the circuit comprising the biggest compressor plus the nominal amps of the second circuit, plus the nominal amps of the fans and the control circuit amps.

Cooling capacities and power inputs to the compressors (50Hz) (1) (2)

Model RTXA	Chilled water leaving temp. (°C)	Ambient air temperature (°C)							
		25		30		35		40	
		Cooling cap. (kW)	Power input (kW)	Cooling cap. (kW)	Power input (kW)	Cooling cap. (kW)	Power input (kW)	Cooling cap. (kW)	Power input (kW)
209	5.0	250.6	60.3	238.2	65.5	225.5	71.3	212.3	77.7
	7.0	266.8	62.3	253.9	67.4	240.3	73.2	226.4	79.6
	9.0	283.7	64.2	269.9	69.4	255.6	75.2	240.9	81.5
210	5.0	283.2	72.4	269.4	78.0	254.8	84.4	239.7	91.6
	7.0	300.9	74.7	286.2	80.3	270.9	86.7	254.9	93.9
	9.0	319.2	77.2	303.7	82.8	287.4	89.1	270.6	96.3
211	5.0	314.6	82.4	299.8	88.3	283.9	95.2	267.2	103.0
	7.0	334.0	85.0	318.2	90.9	301.4	97.7	283.8	105.5
	9.0	353.9	87.7	337.2	93.6	319.5	100.4	300.9	108.2
212	5.0	368.0	96.3	350.7	103.3	332.2	111.4	312.6	120.5
	7.0	390.7	99.4	372.2	106.3	352.6	114.3	332.0	123.4
	9.0	414.0	102.5	394.4	109.4	373.8	117.4	352.0	126.5

Heating capacities and power inputs to the compressors (50Hz) (1) (2) (3) (4)

Model RTXA	Outdoor air temp. (DB/WB)	Hot water leaving temperature (°C)							
		35		40		45		50	
		Heating cap. (kW)	Power input (kW)	Heating cap. (kW)	Power input (kW)	Heating cap. (kW)	Power input (kW)	Heating cap. (kW)	Power input (kW)
209	13.5/12.0	300.0	70.9	294.6	76.7	290.3	83.1	287.1	90.2
	7.0/6.0	256.6	68.1	253.0	73.7	250.2	79.9	248.0	86.5
	0/-1	212.4	63.7	210.7	69.3	209.5	75.3	208.7	81.8
	-8.0/-8.4	169.4	57.4	169.6	62.9	170.1	69.1	171.0	75.8
210	13.5/12.0	330.8	76.3	324.9	82.3	319.9	89.1	316.3	96.6
	7.0/6.0	282.4	73.0	278.5	79.0	275.1	85.5	272.6	92.6
	0/-1	233.4	68.1	231.6	74.1	230.1	80.6	229.1	87.5
	-8.0/-8.4	186.1	61.2	186.1	67.2	186.5	73.8	187.4	80.9
211	13.5/12.0	361.9	82.7	355.5	89.2	350.1	96.4	346.0	104.4
	7.0/6.0	309.0	78.9	304.7	85.3	301.0	92.3	298.1	99.8
	0/-1	255.3	73.4	253.2	79.8	251.5	86.8	250.2	94.2
	-8.0/-8.4	203.4	65.8	203.3	72.2	203.6	79.3	204.4	87.0
212	13.5/12.0	412.8	95.7	406.1	103.0	400.4	111.2	395.8	120.2
	7.0/6.0	352.7	90.9	348.2	98.2	344.3	106.1	341.1	114.7
	0/-1	291.6	84.3	289.4	91.6	287.6	99.5	286.3	108.0
	-8.0/-8.4	232.3	75.2	232.3	82.6	232.9	90.7	233.8	99.6

Notes

- (1) To obtain the total electricity consumption, add the fans' electricity consumption.
- (2) Interpolations between the possible values, extrapolations not permitted.
Values given for $\Delta T = 5^\circ\text{C}$ and clogging factor = 0.044 m²K/kW.
- (3) Interpolation with a wet bulb in air if the humidity is greater than 70% and with the dry bulb in air if the relative humidity is less than 70%.
- (4) DB/WB: dry bulb/wet bulb

Water circuit pressure losses (kPa)

Flowrate (l/s)	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
RTXA 209	11	15	18	22	27	32	37	42	49	55	60						
RTXA 210		11	14	18	21	25	29	34	38	43	49	55	61				
RTXA 211		11	14	18	21	25	29	34	38	43	49	55	61				
RTXA 212			9	11	13	16	19	22	25	28	32	35	39	44	48	52	57

Dimensions and weights (1) (2) (3)

Model RTXA	Length (mm)	Width (mm)	Height (mm)	Water connections	Weight of unit in working order	R22 operating charge (kg)
209	3700	2200	2200	DN 125	3000	2 x 35
210	4600	2200	2200	DN 125	3250	2 x 41
211	4600	2200	2200	DN 125	3300	2 x 41
212	4600	2200	2200	DN 125	3400	2 x 43

- (1) Clearance for air inlet: coil side = 1800 mm, between 2 units = 2400 mm.
It is recommended to allow 1700 mm at the end of the unit (side opposite the electric cabinet) so the evaporator tube can be removed if necessary.
- (2) The dimensions are specified subject to modification. Submittals are available on request.
- (3) Weights with aluminium fin condenser.

Technical specifications

TRANE air-cooled liquid chillers with reversible circuits, RTXA series, equipped with two TRANE direct drive semi-hermetic screw compressors, with separate cooling circuits, a multi-tube water heat exchanger, an air heat exchanger, a microprocessor control module and a starter mounted and wired in the factory.

Compressor-motor assemblies

Two direct drive 2950 rpm semi-hermetic TRANE compressors. Rotors mounted on high precision bearings lubricated by pressurised oil. Gradual power control provided by hydraulically controlled sliding command component.

Squirrel cage bipolar motor, cooled by the suction gases. Oil filter built into the compressor.

Water heat exchanger

Multi-tube heat exchanger with two separate cooling circuits. Copper tubes with inner grooves, rolled in tubular plates. Refrigerant fluid inside the tubes and water circulating in the shell. Maximum pressure on refrigerant side 2.8 MPa, water side 1.4 MPa. Thermal insulation by alveolated foam. Anti-frost protection by electric heater.

Air heat exchanger

Four condensing coils in a W arrangement with sub-cooler and oil cooler tested at 3.5 MPa before assembly. Depending on the operating mode, the top part is used either as an air condenser or a direct expansion coil. Aluminium fins mechanically crimped onto copper tubes without welding. Low speed axial fans with protection grilles.

Cooling circuits

Each cooling circuit comprises an oil separator, a liquid stop valve, a safety valve, a drier filter, two electronic expansion valves (one for each mode) minimising evaporator overheating and enabling the machine to

operate at lower condensing temperatures in cooling mode, distributor, sliding cycle reversal valve.

Control panel

UCM "Adaptive Control™" micro-processor control module providing the control and automatic protection functions including starting and stopping of the compressors, control of the water leaving temperature by P.I.D. action, control of compressors and electronic expansion valves, separate defrosting of each circuit, starting and stopping of fans, equalisation of the number of compressor start-ups and operating times, load limitation.

The unit is protected in the event of cut-off of chilled water flow, loss of refrigerant, low and high pressure, excess current at start-up and during operation, phase unbalance, reversal or loss, low oil flow. Clear language display unit mounted on front panel, giving up to 20 operation parameters such as the set point values, current limitation, water leaving temperature, evaporation and condensing pressure and temperature. More than 60 diagnosis messages are displayed, making it possible to analyse abnormal operating situations.

Start-up panel

Starter mounted on the unit, protection rating IP 55. Part-winding start-up, equipped with three current transformers for each compressor to protect the motors.

Construction

Base constructed from welded steel bars, structural components and panels made from galvanised sheet steel protected by a coat of polyurethane finishing paint.

Accessories and options

- Star - delta start-up of compressors.
- Air heat exchanger with copper fins.
- Discharge stop valves.
- Communication interface.
- Vibration isolators.
- Main disconnect switch.
- Sound-proofing hood on the compressors and sound-proofing of the oil separators.
- Air exchanger protection grilles.
- Protection grilles for water heat exchanger/compressor.
- Remote clear language display unit (for installation at a distance of up to 1,500 m).

Factory test

All the machines are tested on test stands before being shipped. Operation of the unit and the settings of the control and safety devices are checked.

Shipping

All the units are shipped completely assembled and wired in the factory, ready for immediate start-up. On-site connections are limited to connections to electricity and water supplies. The units are shipped with their operating charge of refrigerant fluid and their oil charge.

Quality assurance

The TRANE factories have obtained ISO 9001 approval. This quality standard guarantees:

- Conformity to the technical specifications,
- Compliance with manufacturing procedures,
- Verification of performance in factory.

Trane reserves the right to alter any information without prior notice.

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