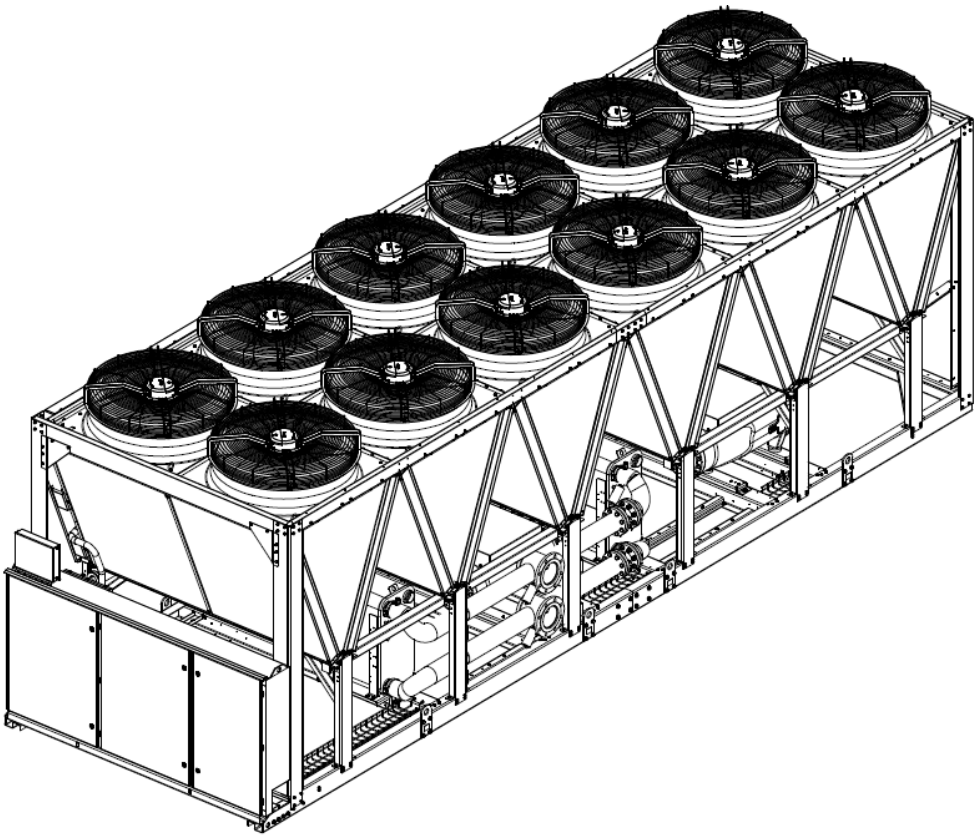
Installation, Operation and Maintenance

RTMG series Air-Cooled Screw Four-Pipe Chiller Heat Pump



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⚠ SAFETY WARNING

Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and require specific knowledge and training. Improperly installed, adjusted, or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.

April 2024

RTMG-SVX003A-EN

Warnings, Cautions, and Notices

This document is customer property and is to remain with this unit. Only trained and qualified service personnel should install, repair, or service air-conditioning equipment. Read this manual thoroughly before startup and follow installation and service requirements to ensure the unit's reliable operation. This manual does not contain all service procedures necessary for the continued successful operation of this equipment. For more information, contact your local agent.

Warnings, Cautions, and Notices appear in appropriate sections throughout this literature. Read and follow these carefully.

⚠WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠CAUTION	Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It may also be used to alert against unsafe practices.
NOTICE	Indicates a situation that could result in equipment or property damage only accidents.

Important

Environmental Concerns

Scientific research has shown that certain man-made chemicals can affect the earth's naturally occurring stratospheric ozone layer when released into the atmosphere. In particular, several of the identified chemicals that may affect the ozone layer are refrigerants that contain Chlorine, Fluorine, and Carbon (CFCs) and those containing Hydrogen, Chlorine, Fluorine, and Carbon (HCFCs). Not all refrigerants containing these compounds have the same potential impact on the environment. Trane advocates the responsible handling of all refrigerants, including industry replacements for CFCs such as HCFCs and HFCs.

Responsible Refrigerant Practices

Trane believes that responsible refrigerant practices are important to the environment, our customers, and the air conditioning industry. All technicians who handle refrigerants must be certified. Know and follow the applicable laws for handling, reclaiming, recovering, and recycling certain refrigerants and the equipment used in these service procedures.

⚠WARNING

Contains Refrigerant!

The system contains oil and refrigerant under high pressure. Recover refrigerant to relieve pressure before opening the system. See unit nameplate for refrigerant type. Do not use non-approved refrigerants, refrigerant substitutes, or refrigerant additives. Failure to follow proper procedures or the use of non-approved refrigerants, refrigerant substitutes, or refrigerant additives could result in death, serious injury, or equipment damage.

⚠WARNING

Personal Protective Equipment (PPE) Required!

Always refer to appropriate guidelines when handling refrigerants. Use proper breathing, eye, and body protection during the handling of refrigerants. Failure to follow proper handling guidelines could result in death or serious injury.

⚠WARNING

Live Electrical Components!

During installation, testing, servicing, and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

Literature History

1. RTMG-SVX003A-EN (April 2024), New Manual for PED/CE products.

Installation Completion and Request for Trane Service

Important: A copy of this completed form must be submitted to the Trane Service Agency that will be responsible for the start-up of the equipment. Start-up will NOT proceed unless applicable items listed in this form have been satisfactorily completed.

TO: _____
Trane SERVICE OFFICE: _____
S.O. NUMBER: _____
SERIAL NUMBERS: _____
JOB/PROJECT NAME: _____
ADDRESS: _____

The following items are being installed and will be completed by:

Important: Start-up must be performed by Trane, or an agent of Trane specifically authorized to perform start-up and warranty of Trane® products. The contractor shall provide Trane (or an agent of Trane specifically authorized to perform the start-up) with notice of the scheduled start-up **at least two weeks** prior to the scheduled start-up. **Equipment not started by Trane is not warranted by Trane.**

Check the box if the task is complete or if the answer is "yes".

Unit location

☐ Provide enough space around the unit to allow unobstructed airflow

☐ Unit mounting placed on a rigid and level foundation

☐ Isolator installed and fully tightened

☐ Secure no external vibration transmitted to the unit

☐ Provide enough space around the unit for installation and service personnel unrestricted access

Wiring

☐ Wiring size per all national or local codes and equipped with the remote fused disconnect switches

☐ Inspect all wiring connections to ensure correct and tight

☐ Ground all customer-supplied power wires as required by applicable codes

☐ Distance between low voltage line and power wiring meet required

☐ Check wiring connections are corrected and tightened before powering on

☐ Provide separate power for the anti-freeze heaters of the evaporator, BPHE, or water pipes

Piping

☐ Water system designed by professional designers, such as piping diameter, etc.

☐ Water pump head matches actual water-side resistance

☐ Water strainer installed before the inlet of the unit and cleaned prior to connection

☐ Water pressure gauges installed with shutoff valves to monitor evaporator pressure drop

☐ Vibration eliminators equipped to prevent vibration transmission through the water pipes

☐ Air vent, drain, and feed valve at the right position of the water system

☐ Meet minimum water loop volume of 12 liter/kW to stable leaving water temperature for comfort cooling

☐ Thoroughly flush all external water piping before final piping connecting to the unit

☐ Pass water system pressurization test and no water leakage is identified

☐ Water system filled and air bled from the system

☐ Anti-freeze protection active after the water system is filled in winter

☐ Flow switch installed (if not factory-provided)

☐ External interlocks (flow switch, pumps auxiliary, etc.) per Wiring Schematics of the manual

☐ Water piping insulated and fixed

☐ Evaporator bypass valve installed as required (if installed)

Installation Completion and Request for Trane Service

Power Supply

☐ Voltage must be within the utilization range of the unit nameplate and imbalance must not exceed 2%

☐ Power supply should not be temporarily provided

☐ Power phase sequence correct

☐ The owner or representative should participate in the commissioning

☐ Enough equipment support, like ladders, elevating platforms, etc. for the commissioning personnel

☐ Oil sump heaters operated at least 12 hours before starting

☐ Measure and check the oil sump level within the allowable range before startup (if necessary)

Test

☐ Dry nitrogen available for pressure testing (if necessary)

Refrigerant

☐ Refrigerant on the job site and in close proximity to the unit (if shipped separately)

Note: After commissioning is complete, it is the installer's responsibility to transport empty refrigerant containers to an easily accessible point of loading to facilitate container return or recycling.

System

☐ Systems can be operated under all design selection points to verify proper operation.

Note: Additional time required to properly complete the start-up and commissioning, due to any incompleteness of the installation, will be invoiced at prevailing rates.

This is to certify that the Trane equipment has been properly and completely installed and that the applicable items listed above have been satisfactorily completed.

Checklist Completed by

(Print Name):

SIGNATURE:

DATE:

In accordance with your quotation and our purchase order number _____, we therefore require the presence of Trane service on this site, for the purpose of start-up and commissioning, by _____ (date).

Note: A minimum of two-week advance notification is required to allow for scheduling of unit start-up.

ADDITIONAL COMMENTS/INSTRUCTIONS

Note: A copy of this completed form must be submitted to the Trane Service Agency that will be responsible for the start-up of equipment.

Contents

Model Number Descriptions

R	T	M	G	1	2	0	E	H	E	A	0	1	D	N	N	N	A	N	N	N	S	N	S	X	P	F
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27

Digit 1-4 **Unit Model**

RTMG Four-Pipe Screw Heat Pump

Digit 5-7 **Nominal Tonnage**

120 = 120 tons 280 = 280 tons
140 = 140 tons 310 = 310 tons
170 = 170 tons 340 = 340 tons
200 = 200 tons 370 = 370 tons
220 = 220 tons 400 = 400 tons
240 = 240 tons 420 = 420 tons
260 = 260 tons 440 = 440 tons

Digit 8 **Unit Power Supply**

D = 380V/50Hz/3Ph*
E = 400V/50Hz/3Ph

Digit 9 **Efficiency**

H = High Efficiency

Digit 10 **Fan Type**

E = EC Fan
A = AC Fan*

Digit 11-12 **Design Sequence**

A0 = Factory Assigned

Digit 13 **Incoming Power Line**

1 = Single Point Power Connection
2 = Dual Point Power Connection

Digit 14 **Power Line Connection Type**

T = Terminal Block Connection*
C = Circuit Breaker
D = Mechanical Disconnect Switch

Digit 15 **BAS Communication Interface**

N = No Remote Interface
B = BACnet Communication Interface
M= Modbus Communication Interface
L = Lon Talk Communication Interface

Digit 16 **External Water & Current Limit Setpoint**

N = No External Setpoint Input
R = External Leaving Water Temp Setpoint
C = External Current Limit Setpoint
B = External Leaving Water Temp & External Current Limit Setpoint

Digit 17 **External Operation Mode Setpoint**

N = No Operation Mode Setpoint
M = With Operation Mode Setpoint

Digit 18 **Programmable Relays**

A = With Programmable Relays
N = No Programmable Relays

Digit 19 **Installation Accessories**

N = None
R = Neoprene Isolators
S = Spring Isolators

Digit 20 **Flow Switch**

N = None
F = Field Installed Flow Switch

Digit 21 **Heater Buzzer Box**

N = No Heater Buzzer Box
A = With Heater Buzzer Box*

Digit 22 **Relief Valve Option**

S = Single Relief Valve
D = Dual Relief Valve With 3 Way Valve

Digit 23 **Water Bypass Valve Control**

0 = No Bypass Control
A = With Bypass Control Function

Digit 24 **Sound Attenuator Package**

S = Standard Noise

Digit 25 **Special**

X = None
S = Special Order

Digit 26 **Pressure Vessel Code**

G = GB Code*
P = PED Code (combined with CE)

Digit 27 **Refrigerant Type**

D = R134a Refrigerant*
F = R513A Refrigerant

Note: *** is not available for European Distribution.**

General Information

Preface

This manual includes RTMG air-cooled four-pipe screw chiller heat pump installation, operation, and maintenance. Related services shall be done by qualified professional and technical personnel.

Warranty

The warranty is based on the general terms and conditions of Trane. The warranty is void if the equipment is repaired or modified without the written approval of the manufacturer if the operating limits are exceeded or if the control system or the electrical wiring is modified. Damage due to misuse, lack of maintenance, or failure to comply with the manufacturer's instructions or recommendations is not covered by the warranty obligation. If the user does not conform to the rules of this manual, it may entail cancellation of warranty and liabilities by the manufacturer.

Unit Description

RTMG air-cooled four-pipe screw chiller heat pump includes 14 unit sizes 120, 140, 170, 200, 220, 240, 260, 280, 310, 340, 370, 400, 420 and 440. The 120, 140, 170, 200, and 220 models are independent units; the 240, 260, 280, 310, 340, 370, 400, 420, and 440 models are installed by the customer on-site.

The 240, 260, 280, 310, 340, 370, 400, 420, and 440 models are formed by a combination of two units as follows:

Unit Name	240	260	280	310	340	370	400	420	440
Unit 1 (Master)	120	140	140	170	170	200	200	220	220
Unit 2 (Slave)	120	120	140	140	170	170	200	200	220

The unit features twin-rotor screw compressors, a high-efficiency fin-tube air-side heat exchanger, a Trane patented falling film water-side heat exchanger, a BPHE for hot water, a BPHE sub-cooler and economizer, and a Trane exclusive Symbio 800 controller. The 120, 140, 170, 200, and 220 models have already completed all the assembly and test work before shipment to ensure each unit provides chilled /heated water efficiently and reliably. The 240, 260, 280, 310, 340, 370, 400, 420, and 440 models will be installed by the customer on-site for parallel connection of water pipes, as well as the electric control wiring and setting, refer to "Master-Slave Unit Wiring Connection" part of this manual.

Reception

To protect against loss due to damage incurred in transit, complete the following checklist upon receipt of the unit.

- When the unit is delivered, verify that it is the correct unit and that it is properly equipped. Compare the information that appears on the unit nameplate with the ordering and submittal information. Check if the model number of the unit nameplate is consistent with the order. Refer to "Nameplate".
- Inspect all exterior components for visible damage. Report any apparent damage or material shortage to the carrier and make a "unit damage" notation on the carrier's delivery receipt. Specify the extent and type of damage found and notify the appropriate Trane Sales Office.
- Inspect the unit for concealed damage as soon as possible after delivery and before it is stored. Concealed damage must be reported within 15 days.
  - If concealed damage is discovered, stop unpacking the shipment. Do not remove damaged material from the receiving location. Take photos of the damage, if possible. The owner must provide reasonable evidence that the damage did not occur after delivery.
  - Notify the carrier's terminal of the damage immediately, by phone and by mail. Request an immediate, joint inspection of the damage with the carrier and the consignee. Notify the Trane sales representative and arrange for repair. Do not repair the unit, however, until the damage is inspected by the carrier's representative. Do not proceed with the installation of a damaged unit without Trane's sales office approval.

- Check all the accessories and loose parts that are shipped with the unit against the original order. Included in these items will be water vessel drain plugs, rigging diagrams, electrical diagrams, and service literature, which are placed inside the control panel for shipment. Also check for optional components, such as flow switches and isolators. If optional isolators are ordered, they are shipped mounted on the base of the unit. Notify any apparent damage or material shortage to the carrier and Trane's local offices.

Storage

Extended storage of the unit prior to installation requires the following precautions:

Store the unit in a ventilated, dry, and secure area. Allowed environmental temperature to range from -20°C to 60°C.

At least every three months, attach a gauge and manually check the pressure in the refrigerant circuit to verify no refrigerant charge leakage. If the refrigerant leakage occurs, call a qualified service organization and the appropriate Trane's sales office.

Note: *Pressure will be approximately 200kPa gauge (29 psig) if shipped with a refrigerant "waiting charge."*

Nameplate

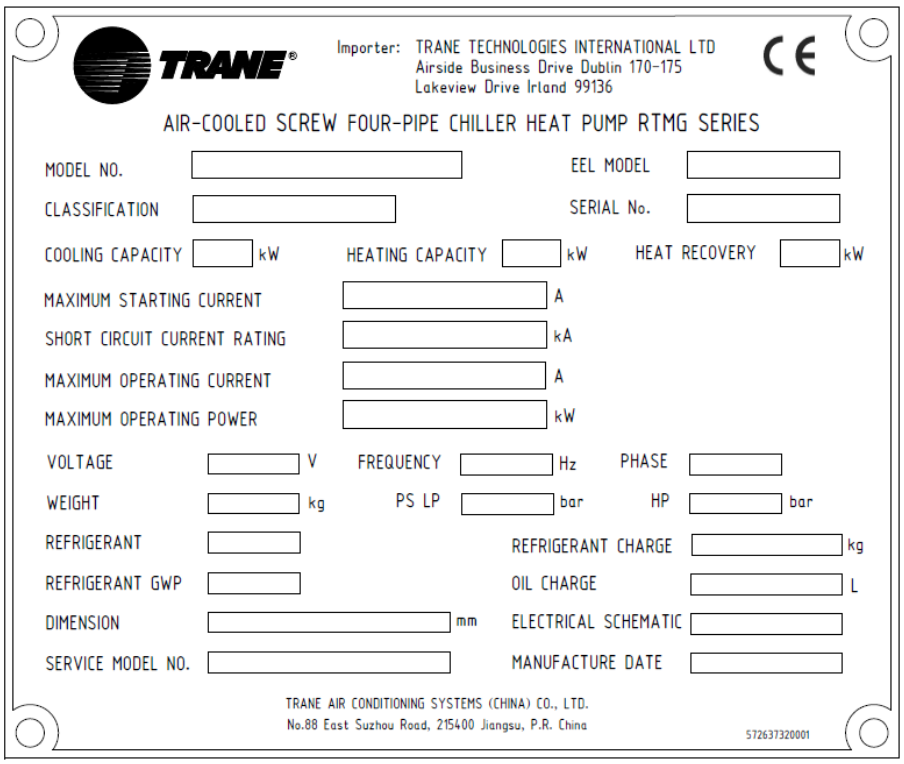
The RTMG unit nameplates are applied to the exterior surface of the control panel door. A compressor nameplate is located on each compressor. The evaporator nameplate is located on the shell. And the insulation over the nameplates is intentionally left unglued, for ease in viewing the nameplate. The receiver and oil separator nameplates are on their shells respectively.

Unit Nameplate

The unit nameplate provides the following information:

- Unit model number
- Unit serial number
- Unit nominal cooling, heating, and heat recovery capacity
- System design pressures
- Unit electrical requirements and input power
- Correct operating charges of refrigerant and oil
- Unit shipping weight
- Unit dimension

Figure 1. Unit Nameplate



General Data

Table 1. General Data – 120-260Ton 50Hz Unit-High Efficiency

		120	140	170	200	220	240	260
Cooling (1)								
Total Cooling Capacity	kW	416.1	486.5	583.9	688.6	752.5	832.2	902.5
Energy Efficiency Rating (EER)	-	3.23	3.14	3.17	3.23	3.11	3.23	3.18
Space Cooling Efficiency η,s,c	%	151	152	155	158	156	/	/
SEER	-	3.84	3.86	3.95	4.01	3.97	/	/
Heating (2)								
Total Heating Capacity	kW	417.7	482.0	586.3	689.8	759.4	835.3	899.7
Coefficient Of Performance (COP)	-	3.24	3.29	3.30	3.32	3.16	3.24	3.27
Pdesign, h	kW	278.6	276.4	362.0	459.3	480.0	/	/
Space Heating Efficiency η,s,h	%	127	132	130	131	128	/	/
SCOP	-	3.24	3.36	3.33	3.35	3.27	/	/
Heat Recovery (3)								
Total Cooling Capacity	kW	397.1	478.0	569.2	668.3	732.7	794.1	875.1
Total Heating Capacity	kW	519.4	622.2	741.8	868.7	966.6	1038.7	1141.6
TER	-	7.49	7.63	7.60	7.67	7.27	7.49	7.57
Compressor								
Type	-	Semi-Hermetic Twin Screw Compressor						
Startup Mode	-	Wye-Delta						
Number of Compressors	-	2	2	2	2	2	4	4
Minimum Load	%	15	15	15	15	15	8	8
Chilled Water Heat Exchanger								
Type	-	Shell & Tube (Falling Film)						
Water Flow Rate	l/s	19.8	23.2	27.8	32.8	35.8	39.6	43.0
Minimum Water Flow Rate	l/s	10.1	11.8	14.3	16.8	18.5	20.2	21.8
Pressure Drop	kPa	50.1	45.1	55.5	46.4	55.6	50.1	47.3
Water Pipe Connection	mm	DN150	DN150	DN150	DN150	DN150	DN150 + DN150	DN150 + DN150
Hot Water Heat Exchanger								
Type	-	BPHE						
Water Flow Rate	l/s	20.2	23.3	28.4	33.4	36.7	40.4	43.5
Minimum Water Flow Rate	l/s	10.3	11.9	14.6	17.1	18.9	20.6	22.1
Pressure Drop	kPa	23.9	21.2	28.3	35.6	38.6	23.4	22.4
Water Pipe Connection	mm	DN125	DN125	DN150	DN150	DN150	DN125 + DN125	DN125 + DN125
Airside Heat Exchanger								
Type	-	Copper Tubes & Aluminum Fins						
Fan Type	-	Low Noise EC Fan						
Numbers of Fans	-	8	8	10	12	14	16	16
Fan Speed	RPM	850	850	850	850	850	850	850
Electrical								
Max Starting Amps	A	382	450	581	655	661	382/382	450/382
Max Operating Amps	A	306	356	430	504	510	306/306	356/306

Refrigerant					**R513A**			
Refrigerant Charge / Circuit1	kg	100	108	115	155	155	100	108
/ Circuit2		100	108	150	155	185	100	108
/ Circuit3		-	-	-	-	-	100	100
/ Circuit4		-	-	-	-	-	100	100
Oil Charge / Circuit	kg				12.5			
Dimensions & Weight								
Length	mm	5000	5000	6180	7360	8540	11000	11000
Width	mm	2250	2250	2250	2250	2250	2250	2250
Height	mm	2500	2500	2500	2500	2500	2500	2500
Shipping Weight	kg	5870	5990	6450	7130	7670	11740	11860
Operating Weight	kg	6010	6130	6590	7290	7830	12020	12140
Sound Level (4)								
Sound Power (1m)	dB(A)	99.4	99.4	100.4	101.3	104.2	102.5	102.5
Sound Pressure (1m)	dB(A)	79.0	79.0	79.5	80.0	82.5	80.0	80.0

(1). According to EN 14511:2022 & EN 14825:2022, Outdoor air temperature 35°C – Chilled water temperature 12/7°C.

(2). According to EN 14511:2022. Outdoor air temperature 7°C with 6°C wet (87% RH) - Hot water temperature 40/45 °C.

(3). According to EN 14511:2022. Chilled water temperature -/7°C(water flow rate is determined by water temperatures at the rated cooling capacity), Hot water temperature -/45 °C (water flow rate is determined by water temperatures at the rated heating capacity).

(4). According to ISO 9614:2009. Eurovent conditions, with 1pW reference sound power.

Table 2. General Data – 280-440 Ton 50Hz Unit-High Efficiency

		280	**310**	**340**	**370**	**400**	**420**	**440**
Cooling (1)								
Total Cooling Capacity	kW	973.1	1070.3	1167.9	1272.4	1377.2	1441.4	1505.0
Energy Efficiency Rating (EER)	-	3.14	3.16	3.17	3.20	3.23	3.17	3.11
Space Cooling Efficiency $\eta_{s,c}$	%	/	/	/	/	/	/	/
SEER	-	/	/	/	/	/	/	/
Heating (2)								
Total Heating Capacity	kW	964.1	1068.4	1172.6	1276.1	1379.7	1449.4	1518.8
Coefficient Of Performance (COP)	-	3.29	3.30	3.30	3.31	3.32	3.24	3.16
Pdesign, h	kW	/	/	/	/	/	/	/
Space Heating Efficiency $\eta_{s,h}$	%	/	/	/	/	/	/	/
SCOP	-	/	/	/	/	/	/	/
Heat Recovery(3)								
Total Cooling Capacity	kW	956.1	1047.0	1138.5	1237.0	1336.5	1401.3	1465.3
Total Heating Capacity	kW	1244.5	1363.9	1483.7	1610.0	1737.2	1835.7	1933.0
TER	-	7.63	7.61	7.60	7.63	7.67	7.45	7.27
Compressor								
Type	-				Semi-Hermetic Twin Screw Compressor			
Startup Mode	-				Wye-Delta			
Number of Compressors	-	4	4	4	4	4	4	4
Minimum Load	%	8	8	8	8	8	8	8
Chilled Water Heat Exchanger								
Type	-				Shell & Tube (Falling Film)			
Water Flow Rate	l/s	46.4	51.0	55.6	60.6	65.6	68.7	71.7
Minimum Water Flow Rate	l/s	23.5	26.0	28.6	31.1	33.6	35.3	37.0
Pressure Drop	kPa	45.2	50.3	55.5	50.3	46.4	51.0	55.6
Water Pipe Connection	mm	DN150 + DN150	DN150 + DN150	DN150 + DN150	DN150 + DN150	DN150 + DN150	DN150 + DN150	DN150 + DN150

Hot Water Heat Exchanger								
Type	-	BPHE						
Water Flow Rate	l/s	46.6	51.7	56.7	61.7	66.7	70.1	73.5
Minimum Water Flow Rate	l/s	23.7	26.4	29.1	31.7	34.2	36.0	38.0
Pressure Drop	kPa	21.2	24.7	28.3	31.9	35.6	37.1	38.6
Water Pipe Connection	mm	DN125 + DN125	DN150 + DN125	DN150 + DN150	DN150 + DN150	DN150 + DN150	DN150 + DN150	DN150 + DN150
Airside Heat Exchanger								
Type	-	Copper Tubes & Aluminum Fins						
Fan Type	-	Low Noise EC Fan						
Numbers of Fans	-	16	18	20	22	24	26	28
Fan Speed	RPM	850	850	850	850	850	850	850
Electrical								
Max Starting Amps	A	450/450	581/450	581/581	655/581	655/655	661/655	661/661
Max Operating Amps	A	356/356	430/356	430/430	504/430	504/504	510/514	510/510
Refrigerant		**R513A**						
Refrigerant Charge / Circuit1	kg	108	115	115	155	155	155	155
/ Circuit2		108	150	150	155	155	185	185
/ Circuit3		108	108	115	115	155	155	155
/ Circuit4		108	108	150	150	155	155	185
Oil Charge / Circuit	kg	12.5						
Dimensions & Weight								
Length	mm	11000	12180	13360	14540	15720	16900	18080
Width	mm	2250	2250	2250	2250	2250	2250	2250
Height	mm	2500	2500	2500	2500	2500	2500	2500
Shipping Weight	kg	11980	12440	12900	13580	14260	14800	15340
Operating Weight	kg	12260	12720	13180	13880	14580	15120	15660
Sound Level (4)								
Sound Power (1m)	dB(A)	102.5	102.8	103.6	103.8	104.1	105.8	107.1
Sound Pressure (1m)	dB(A)	80.0	80.0	80.5	80.5	80.5	82.0	83.0

(1). According to EN 14511:2022 & EN 14825:2022, Outdoor air temperature 35°C – Chilled water temperature 12/7°C.

(2). According to EN 14511:2022. Outdoor air temperature 7°C with 6°C wet (87% RH) - Hot water temperature 40/45 °C.

(3). According to EN 14511:2022. Chilled water temperature -/7°C(water flow rate is determined by water temperatures at the rated cooling capacity), Hot water temperature -/45 °C (water flow rate is determined by water temperatures at the rated heating capacity).

(4). According to ISO 9614:2009. Eurovent conditions, with 1pW reference sound power.

Installation Requirements

Contractor Responsibilities

Table 3. Contractor Responsibilities

Type of Requirement	Trane Supplied Trane Installed	Trane Supplied Field Installed	Field Supplied Field Installed
Foundation			• Meet foundation requirements
Rigging			• Safety chains, Clevis connectors, Lifting beam
Isolation		• Neoprene Isolators (Optional) • Spring Isolators (Optional)	
Electrical	• Mechanical Disconnect Switch or Circuit Breaker • Unit-mounted starter	• Master-slave communication link wires (240, 260, 280, 310, 340, 370, 400, 420, 440 units applicable)	• Circuit breakers or fusible disconnects (optional) • Electrical wiring to the evaporator, BPHE, or water pipe heater • Wiring sizes per submittal and local codes • Terminal lugs • Ground connection(s) • BAS wiring (optional) • Control voltage wiring • Chilled/hot water pump contactor and wiring, including interlock • Option relays and wiring(optional) • Evaporator water bypass valve and wiring (optional)
Water piping	• Vents and drain valves on the waterbox and BPHE	• Flow switches (Optional) • Strainer (attached for hot water side)	• Pressure gauge and coupling on water piping • Thermometers • Strainers (chilled water side) • Vibration eliminators • Globe valves and balancing valves on water piping • Water piping insulation • Water piping support
Relief valve	• Single relief valve • Dual relief valves (Optional)		
Insulation	• Standard insulation		• External water piping insulation
Others		• Cover plates for units (240, 260, 280, 310, 340, 370, 400, 420, 440 units applicable)	• Antifreeze for water system • Refrigerant (as needed) • Dry nitrogen (as needed)

Location Requirements

Noise Considerations

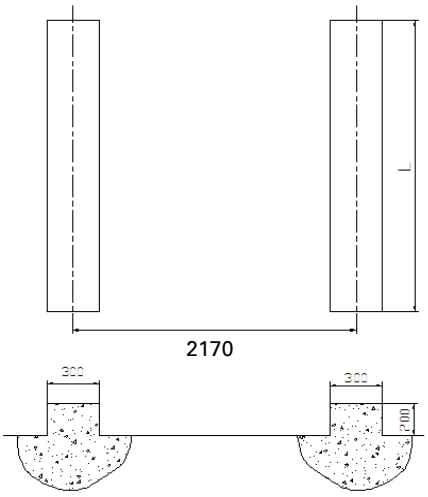
- Locate the unit away from sound-sensitive areas.
- Install the isolation under the unit. Refer to "Isolator Installation".
- Install vibration isolators in all water piping.
- Use soft materials for all electrical hoses/wiring to the starter/control panel.
- Seal all wall penetrations.

Note: *Consult an acoustical engineer for critical applications.*

Foundation

Provide a concrete foundation of sufficient strength and mass to support the applicable operating weight (i.e., including completed piping, and full operating charges of refrigerant, oil, and water), as shown in Figure 2 and Refer to Table 1 or Table 2 for unit operating weights. Once in place, the unit must be level within 6 mm over its length and width. Trane is not responsible for equipment problems resulting from an improperly designed or constructed foundation.

Figure 2. Foundation Diagram



Model	L (mm)
RTMG120/140	4980
RTMG170	6160
RTMG200	7340
RTMG220	8520
RTMG240/260/280	11000
RTMG310	12180
RTMG340	13360
RTMG370	14540
RTMG400	15720
RTMG420	16900
RTMG440	18080

NOTICE

The foundation is necessary for the convenience of unit service and maintenance.

Clearances

Locate the unit so that the condenser airflow is unrestricted both above and on the sides of the unit. Provide enough space around the unit to allow the installation and maintenance personnel and parts unrestricted access to all service points. See Figure 3 for required clearances. Local codes for clearances take precedence over the manufacturer's recommendations when local codes call for greater clearances.

Figure 3. Acceptable Minimum Clearances

Figure 3-1. Installation Clearance – RTMG120/140

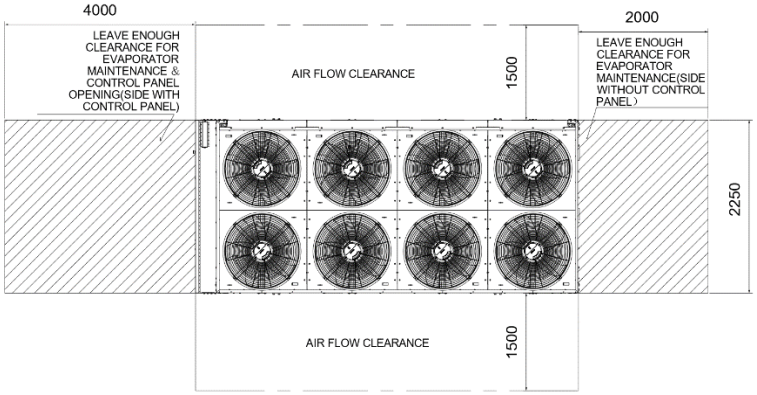


Figure 3-2. Installation Clearance – RTMG170

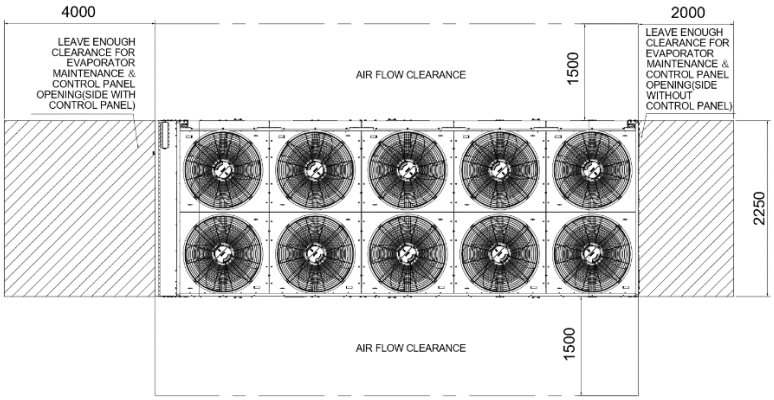


Figure 3-3. Installation Clearance – RTMG200

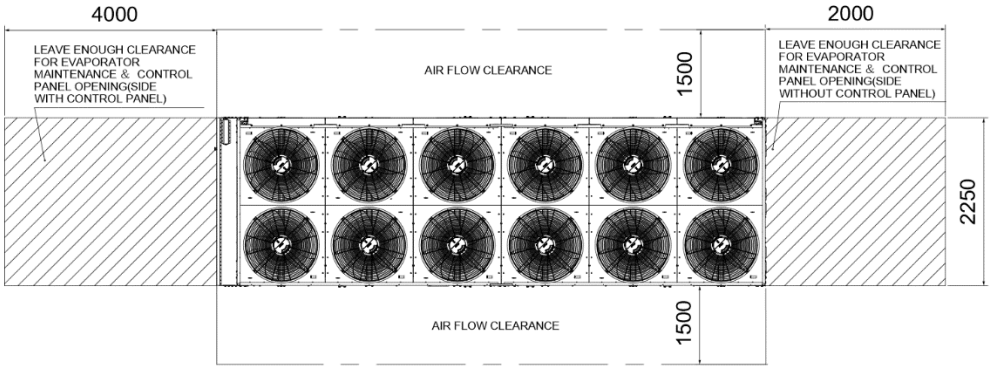


Figure 3-4. Installation Clearance – RTMG220

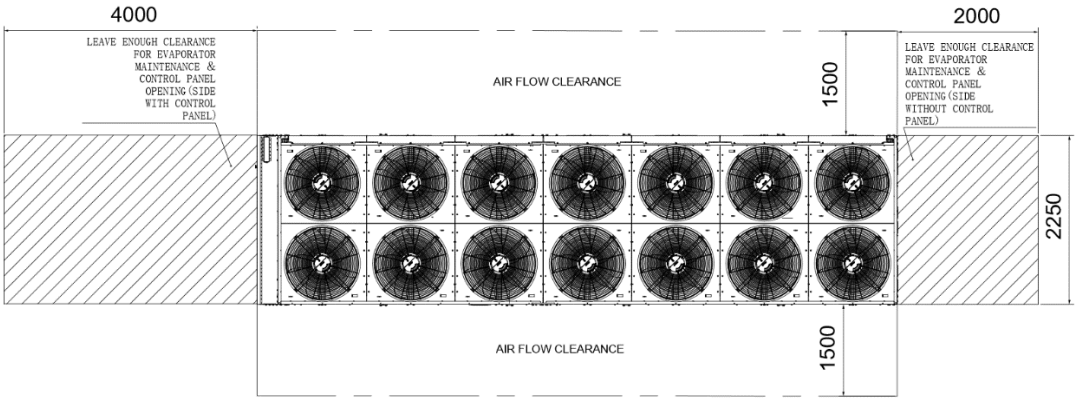
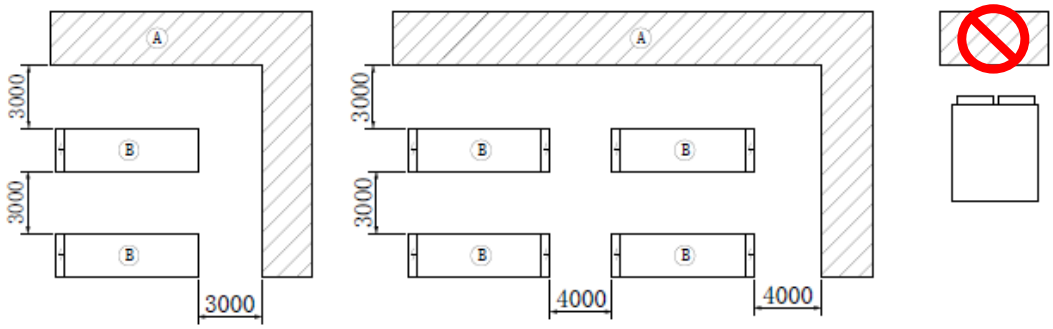


Figure 3-5. Installation Clearance – Multi-Unit



Note: *In case the height of the enclosure around the unit is higher than 1.1m, contact Trane's local office.*

NOTICE
No obstructions to the outdoor fan airflow exit, including ductwork.

If the unit location requires a variance to the clearance dimensions or any walls or enclosure around the unit, contact your Trane sales office representative.

Drainage

Locate the unit near a large capacity drain for water drain from the evaporator during shutdown or repair, or the condensate water generated by the coil during defrost. A drain connection is located at the bottom of the evaporator waterbox. Also, remove the vent plugs at the top of the waterbox to facilitate complete drainage. All local and national codes apply.

⚠WARNING

Hazardous Voltage!

No stagnant water should be on the installation site and the water drainage pipes must be ensured to prevent water from entering the electric control box.
Failure to do so may result in equipment damage, electricity leakage, personal injury, or death.
On installations where low ambient temperature application is intended and snow accumulations are expected, additional elevation must be provided to ensure electrical safety.

Rigging

Refer to the lifting instruction label on the unit, a specific lifting method is recommended as follows:

1. The equipment should be moved by lifting. Do not use a forklift truck to move or lift the unit.
2. The cables, chains, slings, and Lifting beam crossbars must be provided by the crane operator and attached to the lifting points. As Figure 4. RTMG Rigging and Table 4. Unit lifting weights and center of gravity dimensions.

NOTICE

Fin-tube coil damage!

Use properly sized lifting beam crossbars to avoid crushing the fin-tube coils of the unit with lifting chains.

3. Each of the cables, chains, or slings used to lift the unit must be capable of supporting the entire weight of the unit. See Table 4.
4. Keep cables or chains clear of unit sides. As further protection, plywood sheets may be placed against the sides of the unit, behind cables or chains.
5. After the test lift unit at a minimal height to verify the even level lift, raise and set the unit down carefully. Avoid shocks or rolling while handling.
6. Remove the lifting tools after the unit on place.

NOTICE

Alignment and Spacing between Master and Slaver Units!

Keep units level and aligned and guarantee 1005mm distance on the length direction between Master and slaver units of 240, 260, 280, 310, 340, 370, 400, 420, and 440.

Figure 4. RTMG Rigging

Figure 4-1. Rigging – RTMG120/140

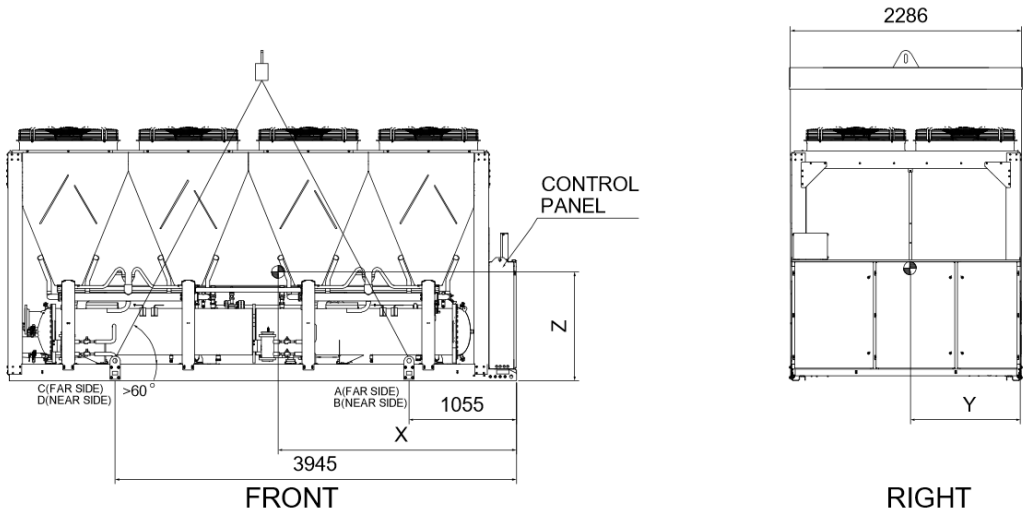


Figure 4-2. Rigging – RTMG170

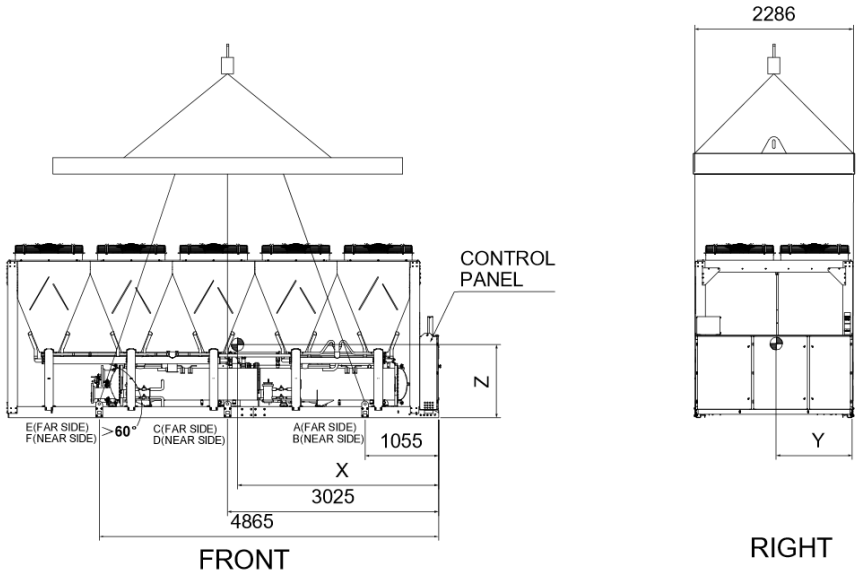


Figure 4-3. Rigging – RTMG200

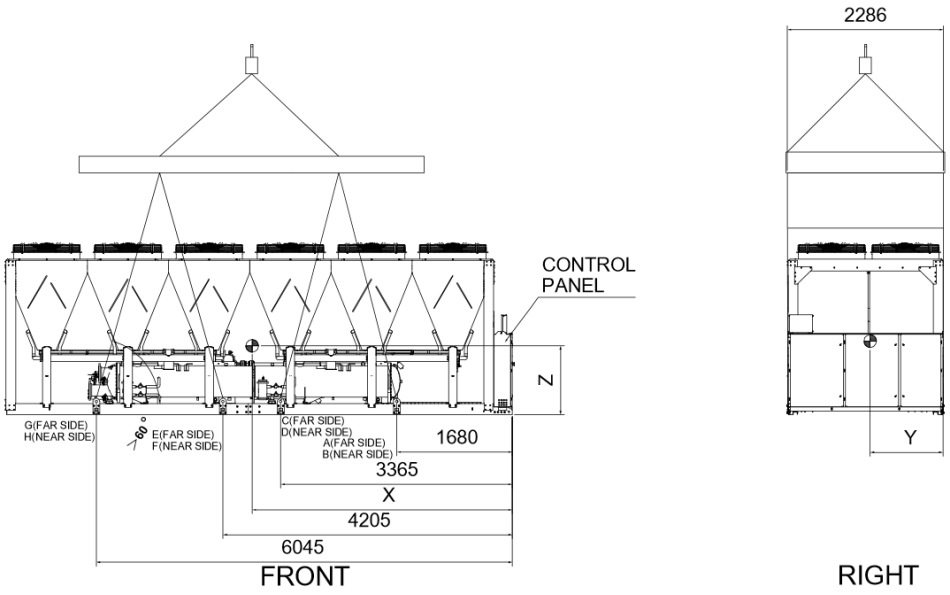


Figure 4-4. Rigging – RTMG220

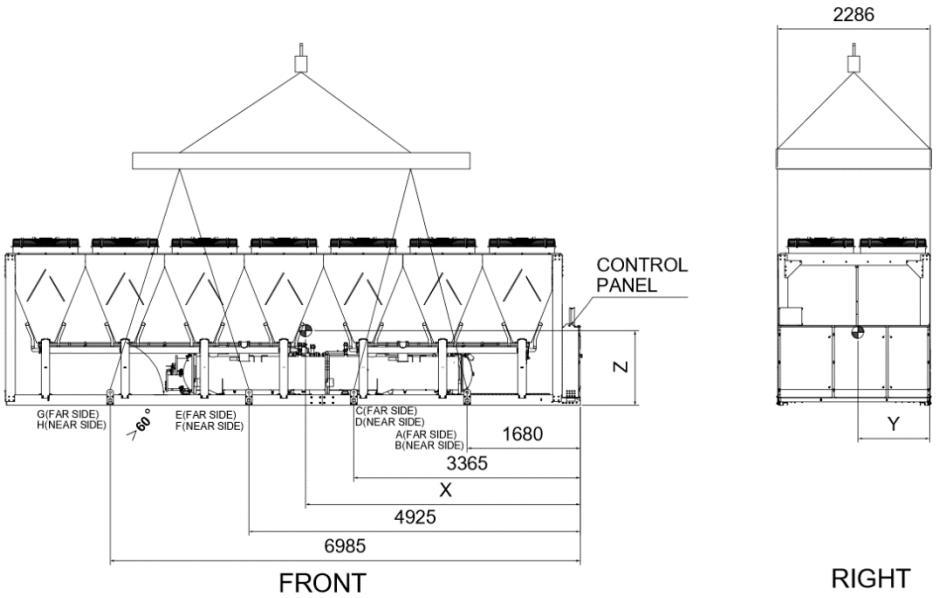


Table 4. Unit lifting weights and center of gravity dimensions

Model	A (kg)	B (kg)	C (kg)	D (kg)	E (kg)	F (kg)	G (kg)	H (kg)	Shipping Weight (kg)	Xcg (mm)	Ycg (mm)	Zcg (mm)
RTMG120	1538	1192	1801	1338	-	-	-	-	5870	2604	957	822
RTMG140	1570	1217	1838	1366	-	-	-	-	5990	2604	957	822
RTMG170	1289	1021	1267	980	1066	826	-	-	6450	2858	973	883
RTMG200	1014	885	1128	885	838	574	1015	791	7130	3731	976	922
RTMG220	977	853	1331	1011	1193	896	758	651	7670	4055	989	955

Isolator Installation

Isolators are ready to install. Mountings have to be placed on a rigid and level foundation. External equipment should not transmit additional vibration to the unit. The position of the neoprene/spring isolator and weight per point are given in the handbook with the unit. Wrong placement along the unit may result in excessive deflection.

1. Refer to Table 5. Isolator Selection, install the optional neoprene/spring isolators at each mounting location.
2. Figure 5. Isolator Placement. Isolators are identified by part number and color.
3. Secure the isolators to the mounting surface, using the mounting slots in the isolator base plate, as shown in Figure 6. Neoprene Isolator and Figure 7. Spring Isolator. Do not fully tighten the isolator mounting bolts at this time.
4. Align the mounting holes in the base of the unit, with the threaded positioning pins on the top of the isolators.
5. Lower the unit onto the isolators and secure the isolator to the unit with a nut. Maximum isolator deflection should be approximately 6mm.
6. Level the unit carefully. Fully tighten the isolator mounting bolts.

NOTICE

Guarantee Alignment and Spacing of Isolators!

RTMG240/260/280: The isolator distance between the master unit (W5/W6) and the slave unit (W5/W6) is 2258mm.
RTMG310: The isolator distance between the master unit (W5/W6) and the slave unit (W5/W6) is 2708mm.
RTMG340/370: The isolator distance between the master unit (W7/W8) and the slave unit (W5/W6) is 3158mm.
RTMG400: The isolator distance between the master unit (W7/W8) and the slave unit (W7/W8) is 3158mm.
RTMG420: The isolator distance between the master unit (W7/W8) and the slave unit (W7/W8) is 3828mm.
RTMG440: The isolator distance between the master unit (W7/W8) and the slave unit (W7/W8) is 4498mm.

Figure 5. Isolator Placement

Figure 5-1. Isolator Placement – RTMG120/140

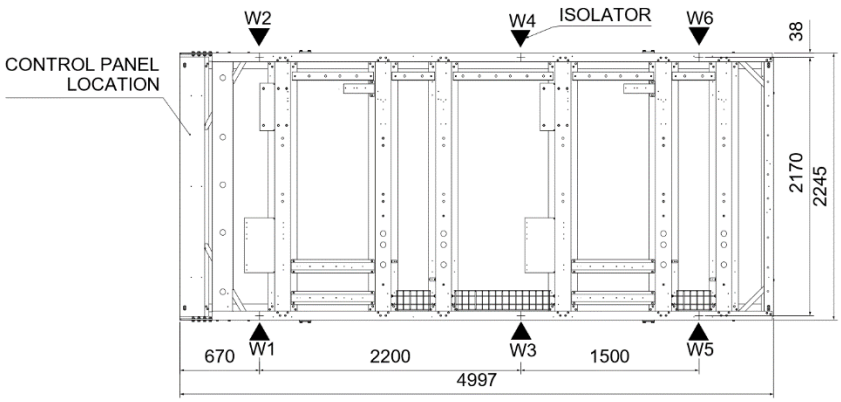


Figure 5-2. Isolator Placement – RTMG170

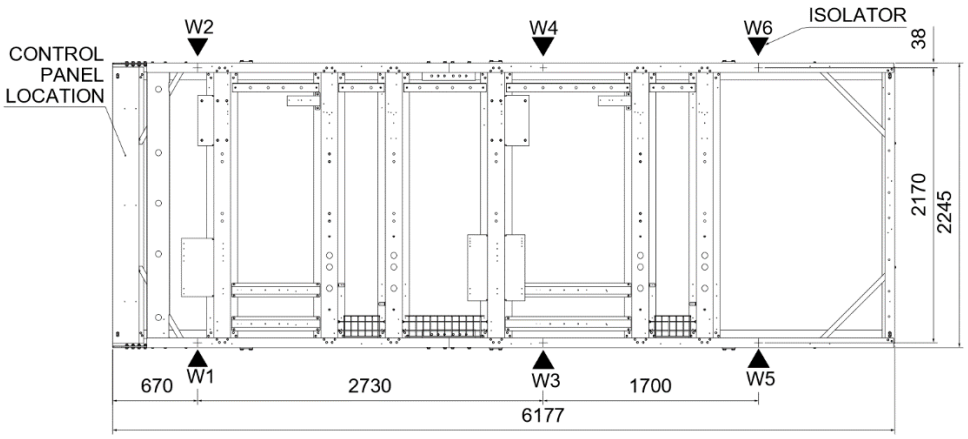


Figure 5-3. Isolator Placement – RTMG200

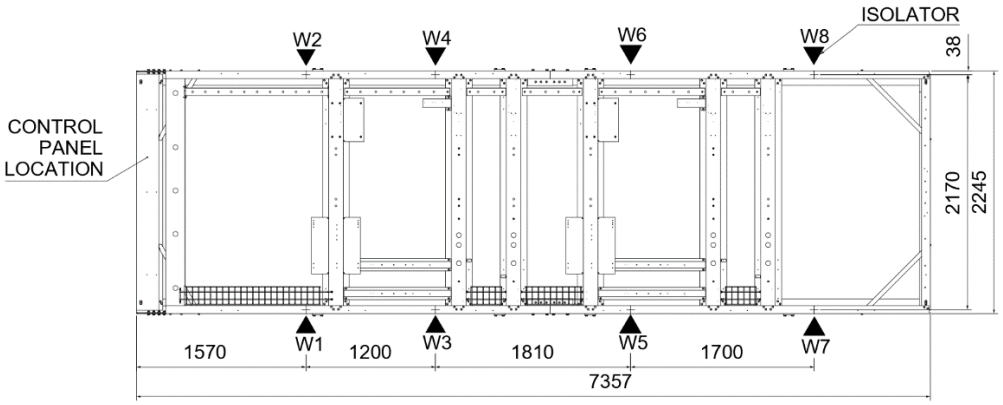


Figure 5-4. Isolator Placement – RTMG220

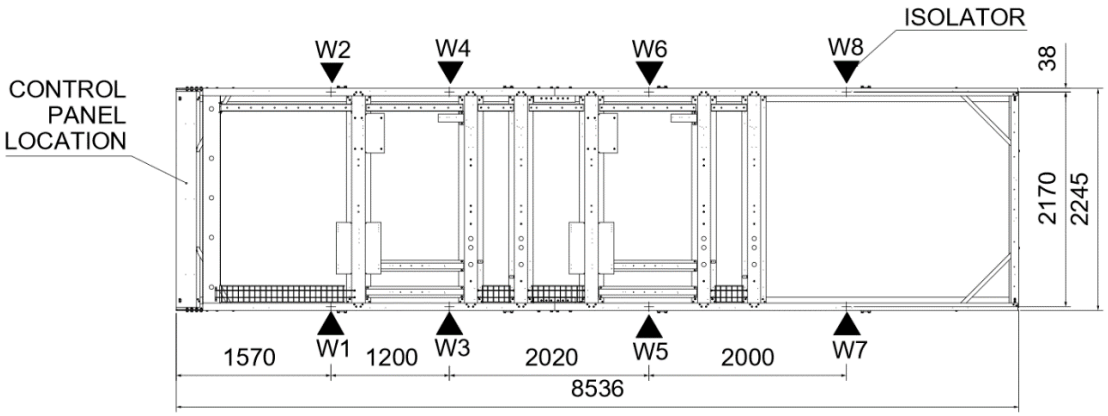
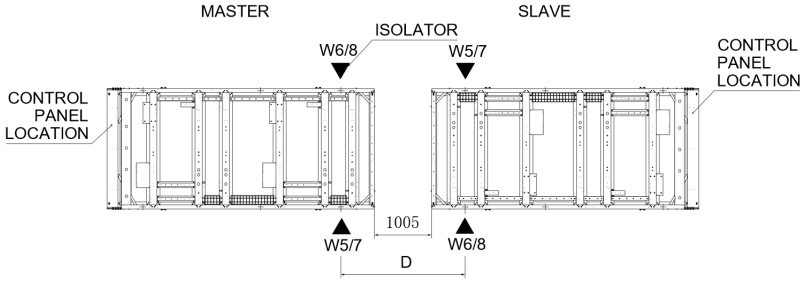


Figure 5-5. Isolator Placement – RTMG240 ~ 440

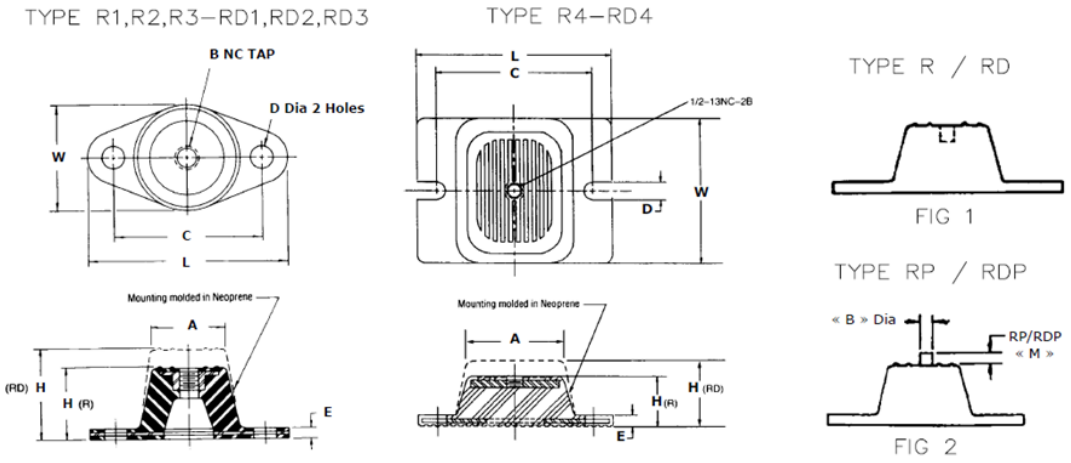


Model	D (mm)
240/260/280	2258
310	2708
340/370/400	3158
420	3828
440	4498

Table 5. Isolator Selection

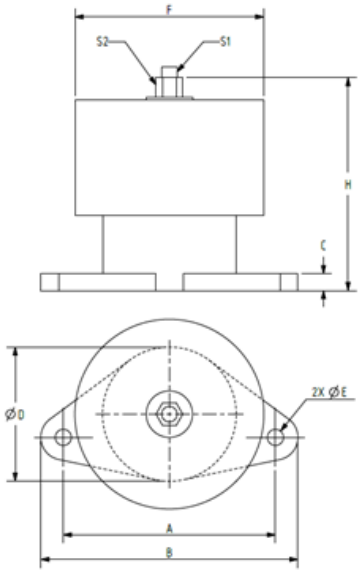
Unit Model	Location	Neoprene Isolator			Spring Isolator		
		Part Number	Qty	Maximum load weight per isolator (kg)	Part Number	Qty	Maximum load weight per isolator (kg)
RTMG120	W1-6	X10140305630	6	1361	X10140836130	6	1650
RTMG140	W1-6	X10140305630	6	1361	X10140836130	6	1650
RTMG170	W1-4	X10140305640	4	1814	X10140836130	4	1650
	W5-6	X10140305620	2	1021	X10140836100	2	1200
RTMG200	W1-2 W7-8	X10140305620	4	1021	X10140836100	4	1200
	W3-6	X10140305630	4	1361	X10140836130	4	1650
RTMG220	W1-2 W7-8	X10140305620	4	1021	X10140836100	4	1200
	W3-6	X10140305630	4	1361	X10140836130	4	1650

Figure 6. Neoprene Isolator



Part Number	Fig	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	H (mm)	L (mm)	M (mm)	W (mm)	Type	Colour
X10140305620	2	76.2	12.7	127.0	14.2	9.7	69.9	158.8	40.6±6.35	117.6	RDP4-WR	Brick-red
X10140305630												Stone-grey
X10140305640												Dark-grey

Figure 7. Spring Isolator



Part Number	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	H (mm)	S1 (mm)	S2 (mm)	MODEL
X10140836100	165	200	13	104	12.5	147	165	M12X25	M20X60	MHD-1200
X10140836130										MHD-1650

Water Piping

Piping connection

⚠CAUTION

Evaporator Damage!

The water connections to the evaporator are to be flange-type. Do not attempt to weld these connections, because the heat generated from welding can cause microscopic and macroscopic fractures on the cast iron water boxes that can lead to premature failure of the water box.

⚠CAUTION

Water Strainer!

To prevent evaporator damage, pipe strainers must be installed in the water supplies to protect components from water-borne debris. Trane is not responsible for equipment - only - damage caused by water born debris.

⚠CAUTION

Equipment Damage!

Thoroughly flush all the water piping before making the final piping connections to the unit after external water piping installation and leakage test. Construct a temporary bypass around the unit for flushing to prevent damage to internal components of the evaporator.

Proper system design and installation procedures should be followed closely. The system must be constructed with pressure-tight components and thoroughly tested for installation leaks. Typical chilled water piping system, as Figure 8.

1. The water piping system should be designed by professionals, including selections of water piping sizes, water pumps, and water valves.
2. Chilled water piping and hot water piping are both independent water circuits. Chilled water piping connects to a shell-tube heat exchanger and hot water piping connects to a brazed plate heat exchanger. The hot water provided by the unit is not applicable for potable water. A field-supplied in-between heat exchanger is necessary to provide potable water.
3. Install field-supplied pressure gauges in the water inlets and outlets of the evaporator and the hot water brazed plate heat exchanger.
   Note: *for combined units, install pressure gauges in the water inlets and outlets of each unit.*
4. Use vibration eliminators to prevent vibration transmission through the water lines.
5. Install thermometers in the water piping to monitor entering and leaving water temperatures.
6. A field-supplied water strainer with a minimum size of 18 mesh must be installed close to the chilled and hot water inlets to prevent debris from damaging the internal tubes of the heat exchangers.
7. Install balancing valves in the leaving chilled water and hot water lines to control water flow balance. Install shutoff valves on both the entering and leaving water lines so that the evaporator or the hot water brazed plate heat exchanger can be isolated for service.
8. Install flow switches in the water outlets of the evaporator and the hot water brazed plate heat exchanger with pump interlock to prove system water flow.

⚠CAUTION

Dual Water Flow Switch!

For assembly unit RTMG 240/260/280/310/340/370/400/420/440, install appropriate water flow switches at the outlets of the evaporator and the hot water brazed plate heat exchangers for both master and slave units.

9. A vent is provided on the top of the evaporator waterbox and the hot water brazed plate heat exchanger water piping. The evaporator and the hot water brazed plate heat exchanger can be drained by removing the drain plugs from the bottom. Field-supplied drainage pipes installed should apply to all local and national codes.
10. Be sure to provide additional vents at the highest points in the piping to bleed air from the water system.

11. When installing external main water piping, set up flanges according to **Figure 9** to reserve maintenance clearances.
12. Insulate all water piping after leakage test and flushing and provide proper support for the piping.

⚠ CAUTION

Equipment Damage!

To prevent damage to chilled water and hot water components, do not allow the pressure to exceed the water-side maximum working pressure indicated on the nameplates of the evaporator and the hot water brazed plate heat exchanger.
During the water system leakage check, ensure the valves near the evaporator and the hot water brazed plate heat exchanger are closed to prevent debris from entering the system as Figure 8 shows.

13. The external water piping should be cleaned before the unit is connected to prevent damage to the internal components of the evaporator. Construct a temporary bypass around the unit during piping cleaning to prevent damage to the internal components of the evaporator.
14. If needed, add antifreeze to the water piping system with proper solution type and concentration.

⚠ CAUTION

Equipment Damage!

After the water system clean and leakage test, fully drain the water from the heat exchangers and the piping system. Use pressurized air or nitrogen to blow out and ensure that no water stays in the evaporator and piping in winter.

⚠ CAUTION

Equipment Damage!

Do not add water to the heat exchangers in winter before completing the power supply to the unit, water pumps, electrical heaters of the heat exchangers; and proper unit commissioning.

⚠ CAUTION

Equipment Damage!

All inlet and outlet shutoff valves shown in Figure 8 should be always open to enable water to circulate by Symbio 800 controlled pump to avoid freezing when the units are in operation or standby condition.

⚠ CAUTION

Potable Water!

The hot water provided by the unit is not applicable for potable water. A field-supplied in-between heat exchanger is necessary to provide potable water.

Figure 8. Typical chilled water piping system design

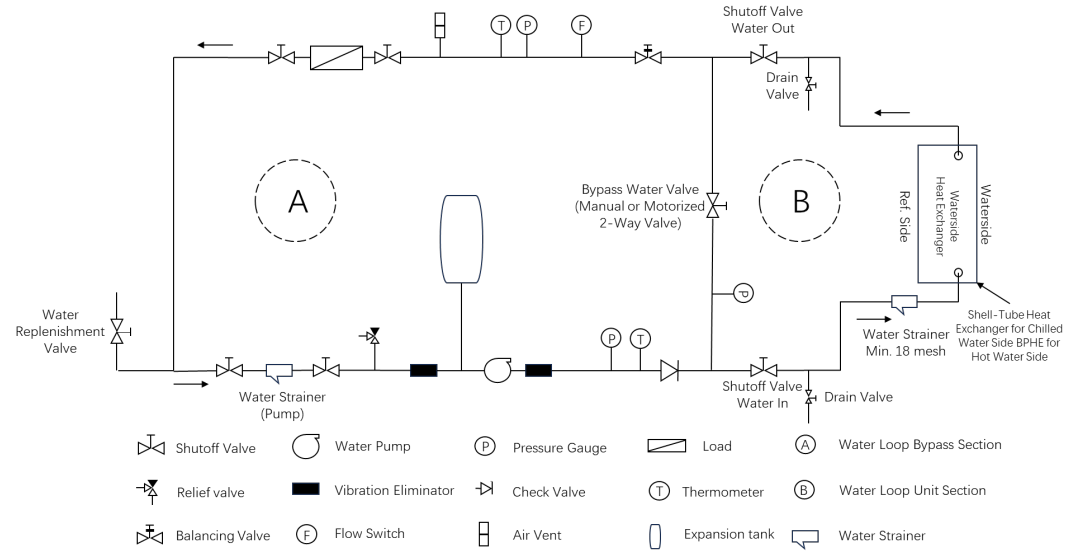
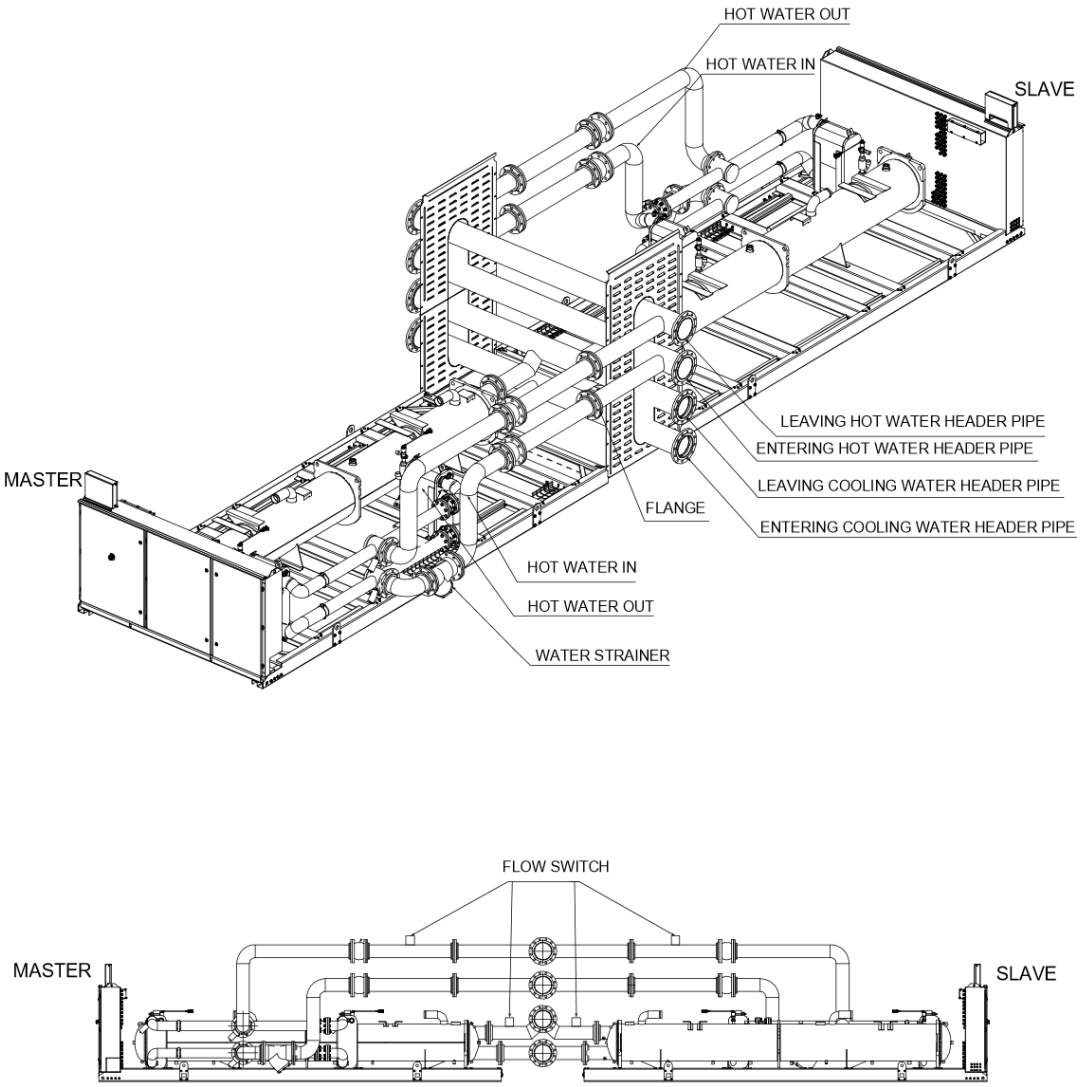


Figure 9. Master-slave unit's external main water piping maintenance clearance



Entering Water Piping

- Water strainer
- Vibration eliminators
- Water pressure gauges with shutoff valves

- Thermometers
- Shutoff (isolation) valves
- Drain valve

Leaving Water Piping

- Drain valve
- Shutoff (isolation) valves
- Vibration eliminators
- Balancing valve
- Thermometers
- Flow switch
- Water pressure gauges with shutoff valves
- Air vents (to bleed air from the system)

Minimum Water Loop Volume

In order to obtain leaving water temperature stability for comfort cooling and heating applications, a minimum water loop volume of 12 liters per kW is recommended on all unit sizes for the chilled water system and the hot water system. If the total water system volume is lower than required, including the water volume of heat exchangers, water piping, and indoor units, it may be necessary to add a tank or increase pipe sizes to provide sufficient liquid volume. Any storage tank that is placed in the water loop should have internal baffles to allow thorough mixing of the fluid.

Flow Switch

To provide protection, install and wire flow switches in series with the water pump interlocks as required in wiring diagrams. Flow switches must prevent or stop compressor operation if either system water flow drops off below the required minimum shown in Table 1 and Table 2. General guidelines for flow switch installation are outlined below in Figure 10. Flow Switch Installation.

- Mount the flow switch upright on a horizontal pipe. Or install on a vertical pipe if the flow is in the upward direction.
- Do not install close to elbows, orifices, or valves. Ensure a minimum of 5 pipe diameters straight on each side of the flow switch.
- Refer to Table 6. Paddle Size of Water Flow Switch, select and trim the paddle to the correct length.
- Ensure the paddle arm extends into the main run of the pipe and the arrow on the switch must point in the direction of the water flow after the switch is tighten to the final position.
- To prevent switch fluttering, remove all air from the water system.
- Adjust the switch to open when water flow falls below the required minimum shown on the pressure drop curves in Figure 11 and Figure 12. Flow switch contacts are closed on proof of water flow.
- Wire flow switches in series with the water pump interlocks as in Trane wiring diagrams.

Note: *Dual flow switches for combined units RTMG 240/260/280/310/340/370/400/420/440, install appropriate water flow switches at the water outlets of each unit, refer to Section of Master - slave unit.*

Figure 10. Flow Switch Installation

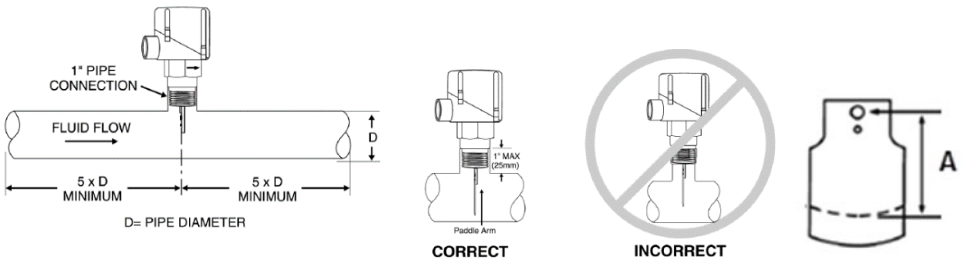


Table 6. Paddle Size of Water Flow Switch

Model		Evaporator Chilled Water			BPHE Hot Water		
		Water Pipe Size	Main Water Pipe Size	Trim to Length A (mm)	Water Pipe Size	Main Water Pipe Size	Trim to Length A (mm)
RTMG120		DN150	≥ DN150	80	DN125	≥ DN125	75
RTMG140		DN150	≥ DN150	70	DN125	≥ DN125	65
RTMG170		DN150	≥ DN150	65	DN150	≥ DN150	51
RTMG200		DN150	≥ DN150	51	DN150	≥ DN150	45
RTMG220		DN150	≥ DN150	41	DN150	≥ DN150	41
RTMG240	RTMG120	DN150	≥ DN200	80	DN125	≥ DN200	75
	RTMG120	DN150		80	DN125		75
RTMG260	RTMG140	DN150	≥ DN200	70	DN125	≥ DN200	65
	RTMG120	DN150		80	DN125		75
RTMG280	RTMG140	DN150	≥ DN200	70	DN125	≥ DN200	65
	RTMG140	DN150		70	DN125		65
RTMG310	RTMG170	DN150	≥ DN200	65	DN150	≥ DN200	51
	RTMG140	DN150		70	DN125		65
RTMG340	RTMG170	DN150	≥ DN200	65	DN150	≥ DN200	51
	RTMG170	DN150		65	DN150		51
RTMG370	RTMG200	DN150	≥ DN200	51	DN150	≥ DN200	45
	RTMG170	DN150		65	DN150		51
RTMG400	RTMG200	DN150	≥ DN200	51	DN150	≥ DN200	45
	RTMG200	DN150		51	DN150		45
RTMG420	RTMG220	DN150	≥ DN200	41	DN150	≥ DN200	41
	RTMG200	DN150		51	DN150		45
RTMG440	RTMG220	DN150	≥ DN200	41	DN150	≥ DN200	41
	RTMG220	DN150		41	DN150		41

Figure 11. Evaporator Water Pressure Drop Curves

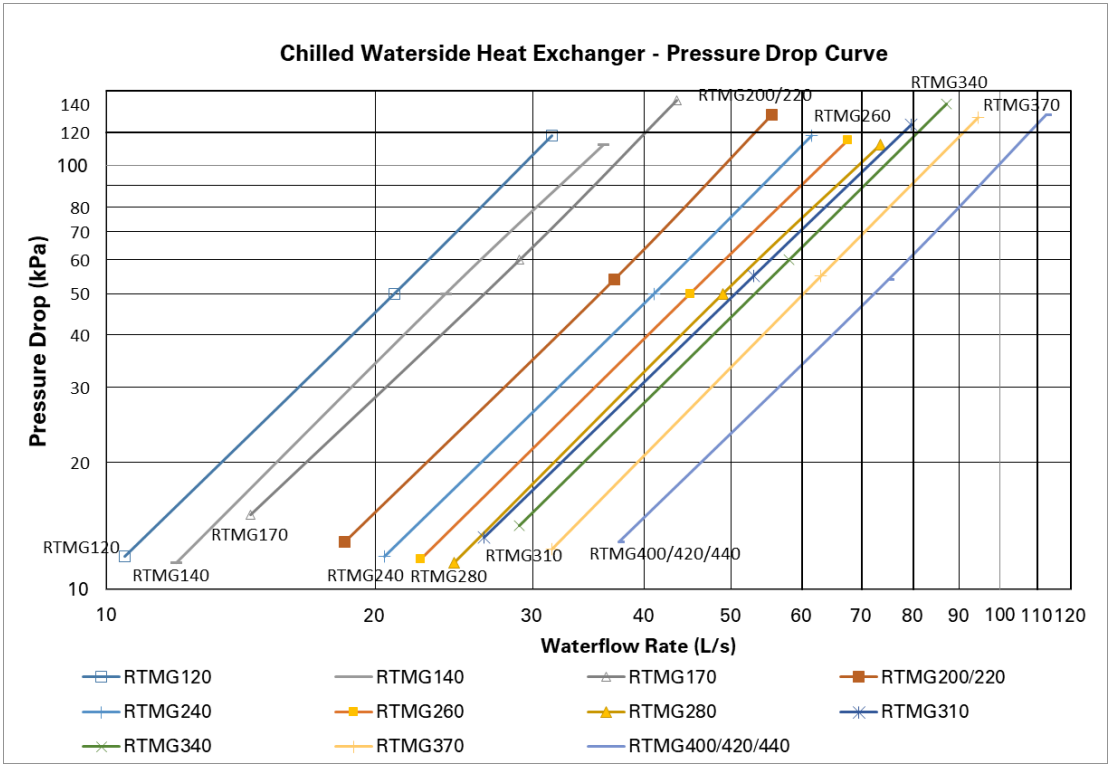
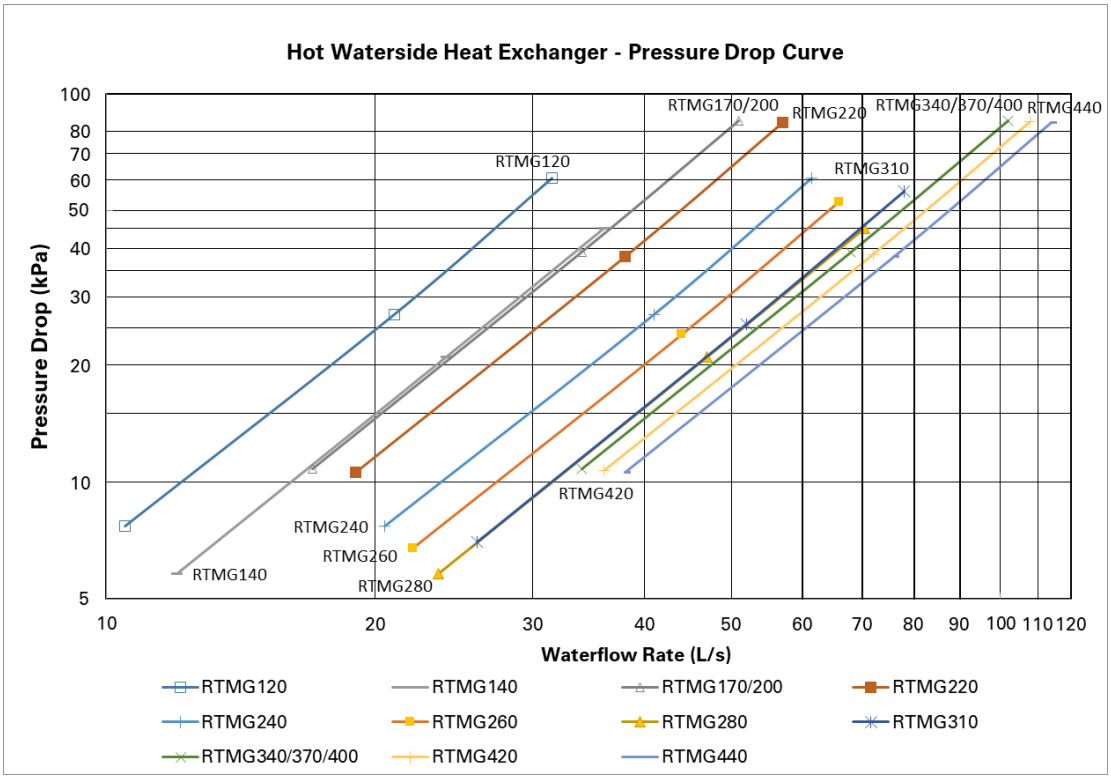


Figure 12. Hot Water Brazed Plate Heat Exchanger Water Pressure Drop Curves



NOTICE

Water Flow Protection!

The Symbio 800 provides a 6-second time delay on the flow switch input before shutting down the unit on a Loss of flow diagnostic. Contact a qualified service organization if nuisance machine shutdowns persist.

Pump Self-checking

The water pump will be self-checking every time the unit is required to start by the leaving water temperature. During the process, the TD7 will display "evaporator water pump self-check" or “condenser water pump self-check”. If the water pump self-check fails, the TD7 will alarm “evaporator water pump self-check failure” or “condenser water pump self-check failure”.

Water Pressure Gauges

Install field-supplied pressure gauges (with manifolds, whenever practical) in the water inlet and outlet of the evaporator.

Locate pressure gauges or taps in a straight run of pipe, avoid placement near elbows, etc. Be sure to install the gauges at the same elevation. Provide shutoff valves in lines to the gauges to isolate them from the system when they are not in use.

To read manifold pressure gauges, open one valve and close the other (depending upon the reading desired). This eliminates errors resulting from differently calibrated gauges installed at unmatched elevations.

Air Vents

Air in the water system can cause not only noise but also unstable water flows, and lead to frequent unit start and stop, or even damage to water pumps and units. Air vents must be set up at the highest point of the water system. Before unit commissioning, the air in the water system must be exhausted and make the system full of water. Exhaust the air from the water system when there is an unstable water pressure or irregular noise during daily use.

Heat Exchangers Water Drains

The heat exchangers can be drained by removing the drain plugs from the bottom of the waterbox or brazed plate heat exchanger. Field-supplied drainage pipes installed should apply to all local and national codes.

Coil Drains

Field-supplied drainage pipe installed for the condensate water generated by coil during defrost. All local and national codes apply.

Water Treatment

Using untreated or improperly treated water in these units may result in inefficient operation and possible tube damage. Ensure the water quality is within the range shown in Table 7. Consult a qualified water treatment specialist to determine whether treatment is needed.

Table 7. Water Quality Requirements

Water Property	Requirements
NH_3	< 2 ppm
NH^{4+}	< 2 ppm
Cl_2	< 1 ppm
Cl^-	< 300 ppm
H_2S*	< 0.05 ppm
SO_4^{2-}	< 70 ppm
CO_2^+	< 5 ppm
Fe^{2+}/Fe^{3+}	< 0.2 ppm
O_2	< 5 ppm
NO_3	< 100 ppm
Si	< 0.1 ppm
Al	< 0.2 ppm
Mn	<0.1 ppm
Hardness	71.2 <...< 151.3 mg/l $CaCO_3$
Resistance	> 3000 ohm.cm
Conductivity	200 <...< 600 µS/cm
pH	7.5 <...< 9

⚠ CAUTION

Proper Water Treatment!

The use of untreated or improperly treated water may result in scaling, erosion, corrosion, algae, or slime. It is recommended that the services of a qualified water treatment specialist be engaged to determine what water treatment, if any, is required. Trane assumes no responsibility for equipment failures that result from untreated or improperly treated water, or saline or brackish water.

Freeze Protection

For unit operation in a low environment temperature of 0°C or below, multiple measures for freeze protection must be taken against freezing.

1. Heaters are factory installed on the waterboxes, the evaporator shell, and the hot water brazed plate heat exchanger as well as insulations to protect the evaporator, the hot water brazed plate heat exchanger, and the water pipes from freezing damage in low ambient temperature. Field-supplied 230VAC single-phase power supply for heater should apply to local and national codes.
2. The Symbio 800 control does not check the operation status of electrical heaters. Qualified technicians are required to wire the electric heater power supply, and inspect, and confirm the status of electric heaters to avoid catastrophic damage to the evaporator or the hot water brazed plate heat exchanger.
3. Field-supplied heaters and insulation are necessary for external water piping, pumps, and other components that may be damaged if exposed to freezing temperatures.
4. Water pumps must be controlled by the Symbio 800 to prevent the evaporator tubes and the hot water brazed plate heat exchanger from freezing by refrigerant migration after the unit stops. When no unit operation is possible and the pump is already off, the Symbio 800 anti-freeze protection function will command the pump to circulate water to avoid freezing in low ambient temperature conditions.
5. When the unit is operating below an environment temperature of 0°C, add antifreeze to the water system based on the local lowest annual temperature. Select the proper concentration of antifreeze according to Table 8.

a. Monitor the concentration of antifreeze regularly to avoid concentration decreasing.
b. The viscosity of antifreeze can impact unit efficiency and water pump power consumption. The unit configuration and piping resistance characteristics calculation should be corrected.
c. Zinc can have chemical reactions with ethylene glycol. Water piping is not allowed to use galvanized steel pipes.
d. Antifreeze might be poisonous. Follow local and national codes when using it.

⚠ CAUTION

The water pump Must be controlled by the Symbio 800!

The water pump and heater operation combination can protect the heat exchangers down to low ambient temperature when the power is available to all the pumps, Symbio 800 controller, and heaters. This option will NOT protect the heat exchangers in the event of power failure to the unit unless backup power is supplied to the necessary components.

⚠ CAUTION

Equipment Damage!

All inlet and outlet shutoff valves shown in Figure 8 should be always open to enable water to circulate by Symbio 800 controlled pump to avoid freezing when the units are in operation or standby condition.

NOTICE

Equipment Damage!

The electrical heater of the water side should be a field-supplied independent 230V single-phase AC power source.

NOTICE

Electrical Heater of Water Side Damage!

Failure to connect power after filling the water or remove power before draining will result in heat exchanger heater failure.

NOTICE

Equipment Damage!

During unit storage and installation, ensure the water in the heat exchangers is drained. After installation of external water pipes and before applying power for commissioning, do not add water to heat exchangers to avoid freezing damage due to low environmental temperatures.

NOTICE

Antifreeze Protection!

When the unit is operating below an environment temperature of 0°C, add antifreeze with proper concentration to the water system based on the local lowest annual temperature.

Table 8. Common Antifreeze Mass Concentration – Freezing Temperature Corresponding Table

Ethylene Glycol Concentration	Freezing Temperature °C	Propylene Glycol Concentration	Freezing Temperature °C
0	0	0	0
2	-0.6	2	-0.6
4	-1.3	4	-1.2
5	-1.7	5	-1.5
6	-2.0	6	-1.8
8	-2.8	8	-2.5
10	-3.6	10	-3.1
12	-4.5	12	-3.8
14	-5.4	14	-4.6
15	-5.9	15	-5.0
16	-6.3	16	-5.4
18	-7.4	18	-6.2
20	-8.4	20	-7.1
22	-9.6	22	-8.0
24	-10.8	24	-9.0
25	-11.4	25	-9.6
26	-12.1	26	-10.1
28	-13.5	28	-11.3
30	-15.0	30	-12.6
32	-16.5	32	-14.0
34	-18.2	34	-15.5
35	-19.0	35	-16.3
36	-19.9	36	-17.1
38	-21.8	38	-18.8
40	-23.8	40	-20.7

Electrical Controls

General Recommendations

In order to ensure the normal operation of the unit's electrical components, do not place the unit in dust, corrosive gas, or high humidity environment. If these situations exist, corrective measures must be taken.

⚠WARNING

Hazardous Voltage!

Disconnect all electrical power, including remote disconnects before servicing. Follow proper lockout / tagout (LOTO) procedures to ensure the power cannot be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

All wiring must comply with local codes. The installation (electrical) contractor must provide and install system interlock wiring and power wiring. Specific electrical wiring diagrams are in Trane wiring diagrams.

⚠CAUTION

Use Copper Conductors Only!

Unit terminals are not designed to accept other types of conductors. Failure not to use copper conductors may result in equipment damage.

Do not allow conduits, cables, and wires to interfere with other components, structural members, or equipment. All conduits, cables, and wires must have sufficient length to fit the location adjustment of compressors and starters. Refer to the below table for the recommended wire sizes.

	Unit Size	**120**	**140**	**170**	**200**	**220**	**240**	**260**
RTMG	Rated Voltage (V/Hz/Ph)	400±10%/50/3						
	Refrigeration Circuit Qty.	2	2	2	2	2	4	4
	Compressor Qty.	2	2	2	2	2	4	4
	Condensing Fan Qty.	8	8	10	12	14	16	16
	Condensing Fan Power (kW)	1.8						
Compressor Motor Data	RLA (Rated Load Amps, A)	117	138	138	195	195	117	138
		117	138	195	195	195	117	138
		-	-	-	-	-	117	117
		-	-	-	-	-	117	117
	LRA (Locked Rotor Amps, A)	217	259	259	385	385	217	259
		217	259	385	385	385	217	259
		-	-	-	-	-	217	217
		-	-	-	-	-	217	217
Condensing Fan Motor Data	FLA (Full Load Amps, A)	2.8						
Field Wiring	Single/Dual Point Power	Single	Single	Single	Single	Single	Dual	Dual
	Power Supply Wire Size (Max) (mm^2)	2*300	2*300	2*300	2*300	2*300	2*300 / 2*300	2*300 / 2*300
Heat Exchanger Heater Wiring	Recommended Wire Size (mm^2)	2.5						

	Unit Size	280	310	340	370	400	420	440
RTMG	Rated Voltage (V/Hz/Ph)	400±10%/50/3						
	Refrigeration Circuit Qty.	4	4	4	4	4	4	4
	Compressor Qty.	4	4	4	4	4	4	4
	Condensing Fan Qty.	16	18	20	22	24	26	28
	Condensing Fan Power (kW)	1.8						
Compressor Motor Data	RLA (Rated Load Amps, A)	138	138	138	195	195	195	195
		138	195	195	195	195	195	195
		138	138	138	138	195	195	195
		138	138	195	195	195	195	195
	LRA (Locked Rotor Amps, A)	259	259	259	385	385	385	385
		259	385	385	385	385	385	385
		259	259	259	259	385	385	385
		259	259	385	385	385	385	385
Condensing Fan Motor Data	FLA (Full Load Amps, A)	2.8						
Field Wiring	Single/Dual Point Power	Dual	Dual	Dual	Dual	Dual	Dual	Dual
	Power Supply Wire Size (Max) (mm^2)	2*300 / 2*300	2*300 / 2*300	2*300 / 2*300	2*300 / 2*300	2*300 / 2*300	2*300 / 2*300	2*300 / 2*300
Heat Exchanger Heater Wiring	Recommended Wire Size (mm^2)	2.5						

NOTICE

Control Fault!

To prevent control malfunctions, do not run low voltage wiring (<30V) in conduit with conductors carrying more than 30 volts.

Starter Panel

All control components and motor starters are wired and functionally tested in the factory. The starter panel enclosure is designed per environmental rating IP54 and is suitable for outdoor use. The starter panel includes the controls for two compressors and a disconnect switch (or a circuit breaker) with a handle as the power supply connecting point. The starter panel is divided into the power section for compressors and associated condensing fans, solenoid valve, heater, etc. controls, and the control section of the Symbio 800 control system.

The power section provides the Wye-Delta starter for each compressor. The Symbio 800 system acquires the compressor motor current of each phase by current transformers, to avoid the damage of running under an unbalanced current, under/over current, phase loss, or phase reversal. The Symbio 800 system also monitors the line voltage by potential transformer, to avoid the motors running under abnormal voltage.

A control power transformer is offered to provide the 110Vac and 24Vac power supply to the unit control system. The control section includes I/O modules, power supply modules, starter modules, and the user interface.

Power Supply Wiring

All wiring must comply with local codes. The entrance of incoming power for wiring is located on the lower right side of the starter panel. The wiring is connected to the disconnect switch or circuit breaker.

Unit Water Pump Control

NOTICE

Equipment Damage!

Trane only allows the customer to select either one of the offered schemes for chilled water pump control and evaporator antifreeze protection. Failure to do so may result in equipment damage and the loss of related guaranteed rights without authorization or approval from Trane.

Single Unit Chilled Water Pump Control

For a single unit, the Symbio 800 system offers 2 relay contacts respectively for the chilled water pump control and the hot water pump control, total 2 control schemes are provided.

Scheme 1 –

When the chilled water pump corresponds with a specific unit and is controlled by this unit, the relay contact J2-4 and J2-6 of module 1A20 controls the chilled water pump running and stop, when the unit receives the running command, the relay contact will close.

When the hot water pump corresponds with a specific unit and is controlled by this unit, the relay contact J2-4 and J2-6 of module 1A34 controls the hot water pump running and stop, when the unit receives the running command, the relay contact will close.

In most cases of the unit fault diagnostics appear, these contacts will open to shut the chilled water pump and hot water pump, to avoid the pumps to thermally overheat.

Scheme 2 –

When the chilled water pump is controlled by the customer, the relay contact J2-1 and J2-3 of module 1A20 needs to be connected to the customer's chilled water pump control circuit, as part of the evaporator antifreeze protection, or when entering the oil return protection, the contact needs to close to activate the pump.

When the hot water pump is controlled by the customer, the relay contact J2-1 and J2-3 of module 1A34 needs to be connected to the customer's hot water pump control circuit, as part of the hot water brazed plate heat exchanger antifreeze protection, the contact needs to close to activate the pump.

Master-Slaver Unit Chilled Water Pump Control

For a Master-Slave unit, the Master section and Slave section Symbio 800 systems offer 2 relay contacts respectively for chilled water pump control and hot water pump control separately, total 2 control schemes are provided.

Scheme 1 –

When the chilled water pump corresponds with a specific unit and is controlled by this unit, the relay contact J2-4 and J2-6 of Master section module 1A20 controls the chilled water pump running and stop, when the unit receives the running command, this relay contact will close. The relay contact J2-1 and J2-3 of Slave section module 1A20 needs to be connected to the chilled water pump control circuit with Master section water pump control relay 1A20-J2-4 and 1A20-J2-6 in parallel, as part of the evaporator antifreeze protection, or when entering the oil return protection, the contact needs to close to activate the pump.

When the hot water pump corresponds with a specific unit and is controlled by this unit, the relay contact J2-4 and J2-6 of Master section module 1A34 controls the hot water pump running and stop, when the unit receives the running command, the relay contact will close. The relay contact J2-1 and J2-3 of Slave section module 1A34 needs to be connected to the hot water pump control circuit with Master section water pump control relay 1A34-J2-4 and 1A20-J2-6 in parallel, as part of the hot water brazed plate heat exchanger antifreeze protection, the contact needs to close to activate the pump.

In most cases of the unit fault diagnostics appear, these contacts will open to shut the chilled water pump and hot water pump, to avoid the pumps over thermal.

Scheme 2 –

When the chilled water pump is controlled by the customer, the relay contacts J2-1 and J2-3 of Master and Slave section modules 1A20 need to be connected to the customer's chilled water pump control circuit in parallel, as part of the evaporator antifreeze protection, or when entering the oil return protection, the contacts need to close to activate the pump.

When the hot water pump is controlled by the customer, the relay contacts J2-1 and J2-3 of Master and Slave section modules 1A34 need to be connected to the customer's chilled water pump control circuit in parallel, as part of the hot water brazed plate heat exchanger antifreeze protection, the contacts need to close to activate the pump.

Chilled Water Flow (Pump) Interlock

The Symbio 800 system offers the binary input ports for the contact of the flow detection device (chilled water and hot water flow switches).

For single units –

When the chilled water pump and the hot water pump correspond with a specific unit and are controlled by this unit, the customer shall connect the chilled water flow switch and the dry contact of the chilled water pump running feedback in series, then connect to terminals 1X5-39 and 1A6-J3-2. Connect the hot water flow switch and the dry contact of the hot water pump running feedback in series, then connect to terminals 1X5-39 and 1A6-J2-2.

When the chilled water pump and the hot water pump are controlled by the customer, the chilled water flow switch needs to be connected to terminals 1X5-39 and 1A6-J3-2, the hot water flow switch needs to be connected to terminals 1X5-39 and 1A6-J2-2.

For Master-Slave units –

When the chilled water pump and the hot water pump correspond with a specific unit and are controlled by this unit, the customer shall connect the chilled water flow switch and the dry contact of the chilled water pump running feedback in series, then connect to the Master section terminals 1X5-39 and 1A6-J3-2. And connect the chilled water flow switch to the Slave section terminals 1X5-39 and 1A6-J3-2. Connect the hot water switch and the dry contact of the hot water pump running feedback in series, then connect to the Master section terminals 1X5-39 and 1A6-J2-2. Connect the hot water flow switch to the Slave section terminals 1X5-39 and 1A6-J2-2.

When the chilled water pump and the hot water pump are controlled by the customer, the chilled water flow switch needs to be connected to the Master section and the Slave section terminals 1X5-39 and 1A6-J3-2 separately. The hot water flow switch needs to be connected to the Master section and the Slave section terminals 1X5-39 and 1A6-J2-2 separately.

NOTICE

Important!

Do not start/stop the unit by activating/deactivating the chilled water pump and the hot water pump, this will lead the compressor(s) to full load and then shut down. Utilize the External Auto/Stop input for unit start/stop operation.

Alarm and Status Relay Outputs (Programmable Relays) – Optional

The Symbio 800 system provides a programmable relay concept for the enunciation of certain events or states of the unit. Total four relays are provided (generally with a Quad Relay Output LLID) as part of the Alarm Relay Output Option.

The list of events/states that can be assigned to the programmable relay LLID 1A21 can be found in the below table.

Events/States	Description
Alarm - Latching	This output is true whenever there is any active diagnostic that requires a manual reset to clear, that affects the unit or the Circuit. This classification does not include informational diagnostics.
Alarm – Auto Reset	This output is true whenever there is any active diagnostic that could automatically clear, that affects the unit or the Circuit. This classification does not include informational diagnostics.
Alarm	This output is true whenever there is any diagnostic affecting any component, whether latching or automatically clearing. This classification does not include informational diagnostics.
Unit Limit Mode	This output is true whenever the unit has been running in any unloading types of limit modes continuously for a certain time period (default is 10 minutes).
Maximum Capacity	This output is true whenever the unit has reached maximum capacity for a certain time period (default is 10 minutes); whenever the unit has quit the maximum capacity for a certain time period, this output is false.
Compressor Running	This output is true whenever the compressor is running on the unit.
Heating/Cooling Mode	This output is true whenever the unit is running under heating mode (including warm-up and defrost); This output is false whenever chiller is running under cooling mode.

Symbio 800 Service Tool (Tracer TU) is used to install the Alarm and Status Relay Option package and assign any of the above list of events or statuses to each of the four relays provided with the option.

The default assignments for the four available relays are:

LLID Naming	Assignment	Contact Terminal	Default Setting
Unit Status Programmable Relay	Relay 1	1A21, J2-10,11,12	Maximum Capacity
	Relay 2	1A21, J2-7,8,9	Compressor Running
	Relay 3	1A21, J2-4,5,6	Alarm
	Relay 4	1A21, J2-1,2,3	Unit Limit

The relay will be energized when the event/state occurs.

Emergency Stop

Symbio 800 provides auxiliary control for a customer-specified/installed latching trip out. When this customer-furnished remote contact is provided, the unit will run normally when the contact is closed. When the contact opens, the unit will trip on a manually resettable diagnostic. This condition requires a manual reset at the TD7 display. When this function is required, remove the jumper W2, which is on terminals 1X5-55 and 1X5-56, then connect to the emergency stop device contact. Dry contact is acceptable only.

For Master-Slave units, remove the jumpers W2, which are on Master section and Slave section terminals 1X5-55 and 1X5-56, then connect to the emergency stop device contacts, the contacts shall derive from one single emergency stop switch.

External Auto/Stop

If the unit requires the external Auto/Stop function, the installer must remove the jumper W1 which is on J2-1 and J2-2 of module 1A14, and then connect to the remote contact. Dry contact is acceptable only. The unit will run normally when the contacts are closed. When either contact opens, the compressor(s), if operating, will go to the RUN: UNLOAD operating mode and cycle off. The unit operation will be inhibited. Closure of the contacts will permit the unit to return to normal operation. For Master-Slave units, no action is needed for the Slave section.

Cooling/Heating/Heat Recovery Mode Setting

The unit cooling/heating/heat recovery mode can set via the "Setting" button on the display screen. Symbio 800 also provides auxiliary control for running modes. Connect remote device contacts to module 1A19 to realize these functions. The closure of the contact connected to the J2-3 and J2-4 of module 1A19 activates the "Heating" mode. Otherwise, the open of the contactor activates the "Cooling" mode. Closure of the contact connected to the J2-1 and J2-2 of module 1A19 activates the "Heat Recovery" mode. Dry contacts are acceptable only. For Master-Slave units, no action needs for the Slave section.

External Current Limit Setpoint – Optional

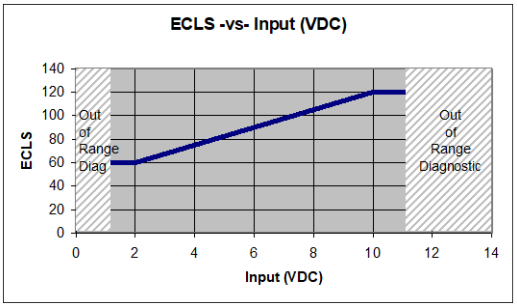
The Symbio 800 provides inputs (J2-2 and J2-3 of module 1A22) that accept either 4-20 mA or 2-10 VDC signals to set the External Current Limit Setpoint. The 4-20 mA or 2-10 VDC signals correspond with unit 60%~120% RLA range.

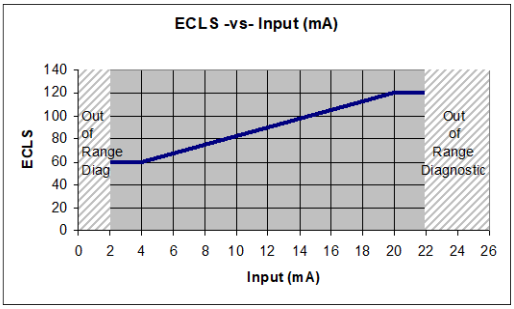
For the 2-10 VDC signal:

External current limit setpoint=7.5*Input signal + 45.0%

For the 4-20 mA signal:

External current limit setpoint=3.75*Input signal + 45.0%





Tracer TU Service Tool is used to set the input signal type from the factory default of 2-10 VDC to that of 4-20 mA. Tracer TU is used to install or remove the External Current Limit Setpoint option and adjust the maximum or minimum value setting.

External Chilled/Hot Water Setpoint

The Symbio 800 provides inputs (J2-5 and J2-6 of module 1A22) that accept either 4-20 mA or 2-10 VDC signals to set the External Chilled/Hot Water Setpoint.

When the unit is running under the cooling mode, the external water setpoint(EWS) will be set as the chilled water temperature setting. The external chilled water temperature setpoint(ECWS) shall have the configuration with maximum and minimum values.

When the unit is running under the heating mode, the external water setpoint(EWS) will be set as the hot water temperature setting. The external hot water temperature setpoint(EHWS) shall have the configuration with maximum and minimum values.

For the 2-10 VDC signal:

External water temperature setpoint = Minimum Value + (Maximum Value - Minimum Value) * (Input signal - 2) / 8

For the 4-20 mA signal:

External water temperature setpoint = Minimum Value + (Maximum Value - Minimum Value) * (Input signal - 4) / 16

Tracer TU Service Tool is used to set the input signal type from the factory default of 2-10 VDC to that of 4-20 mA. Tracer TU is used to install or remove the External Chilled/Hot Water Setpoint option and adjust the maximum or minimum value setting.

Building Automation Control System Communication Interface

Modbus Communications Interface (MODB)

Symbio 800 provides an optional Modbus Communication Interface (MODB) between the unit and a Building Automation System (BAS). This communication is conducted by the RS-485 connection with RTU protocol.

BACnet Communications Interface (BCI-C)

Symbio 800 provides an optional BACnet Communications Interface (BCI-C) between the unit and a Building Automation System (BAS).

See Trane wiring diagrams for details.

Master-Slave Unit Wiring Connection

(RTMG 240/260/280/310/340/370/400/420/440 units)

RTMG units have installed the modules of unit status. The Master-Slave unit operation is conducted by the wired connection among Unit Running/Stop Output module 1A26, External Auto/Stop module 1A14, Cooling/ Heating Mode Setting module 1A19, and Heat Recovery Mode Setting module 1A38.

- Connect the 1A26-J2-6 of Master unit to 1A19-J2-3 of Slave unit.
- Connect the 1A26-J2-4 of Master unit to 1A19-J2-4 of Slave unit.
- Connect the 1A26-J2-3 of Master unit to 1A14-J2-1 of Slave unit.
- Connect the 1A26-J2-1 of Master unit to 1A14-J2-2 of Slave unit.
- Connect the 1A38-J2-6 of Master unit to 1A19-J2-1 of Slave unit.
- Connect the 1A38-J2-4 of Master unit to 1A19-J2-2 of Slave unit.

Remove the jumpers W3 which are on terminal 1X5-59 and 1X5-60 for both Master and Slave units.

- Connect the terminal 1X5-57 of Master unit to terminal 1X5-59 of Slave unit.
- Connect the terminal 1X5-58 of Master unit to terminal 1X5-60 of Slave unit.
- Connect the terminal 1X5-59 of Master unit to terminal 1X5-57 of Slave unit.
- Connect the terminal 1X5-60 of Master unit to terminal 1X5-58 of Slave unit.

See Trane wiring diagrams for details.

Master-Slave unit setpoints notes:

1. Configure the same chilled/hot water setpoint for both Master and Slave units.
2. Set the Slave unit to Auto and Cooling mode.

***Important:** When setting the Master unit to Auto mode, the Slave unit still can operate independently.*

Operator Interface Controls

Symbio800 Overview

This section covers information pertaining to the Symbio ™ 800 controller hardware. The Symbio™ 800 controller is a factory-installed, application-specific, and programmable controller designed to control chillers and large packaged HVAC equipment. A 7-inch user interface features a touch-sensitive color screen that provides facility managers with at-a-glance operating status, performance monitoring, scheduling changes, and operating adjustments. Other advanced features include automated controller backup, and optional features such as secure remote connectivity, wireless building communications, mobile device connectivity, and custom programming with expandable I/O.

For more information, see Symbio 800 Installation, Operation, and Maintenance manual BAS-SVX080*- EN.

Figure 13. Front View of Symbio 800

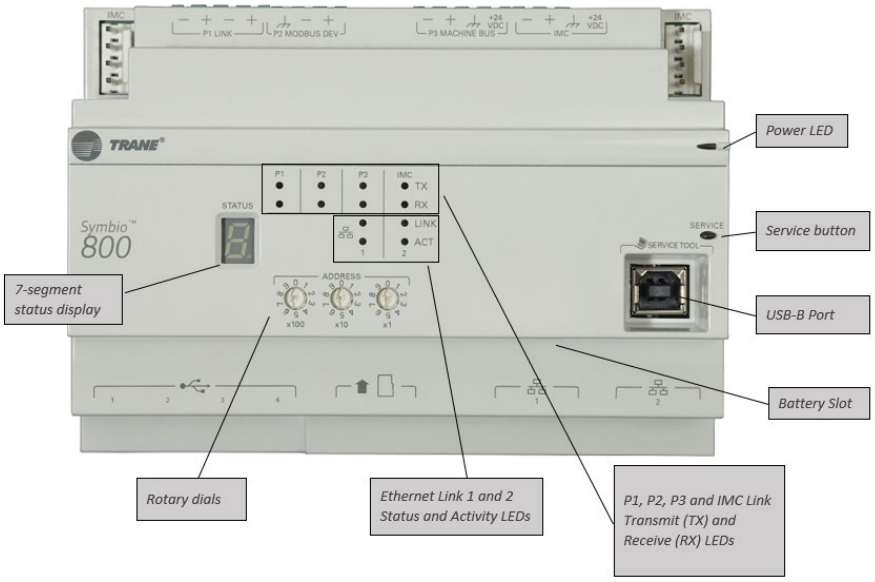
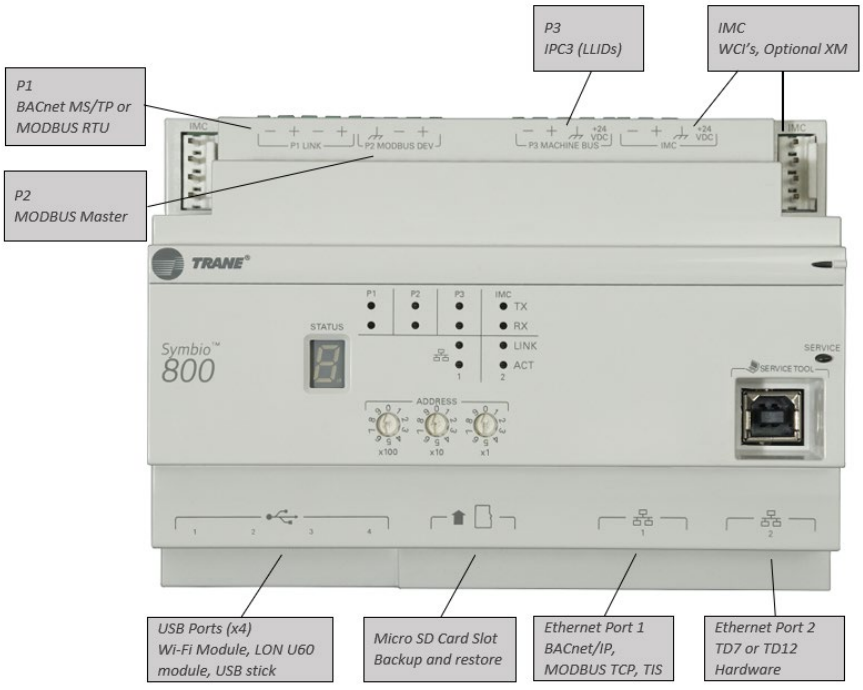


Figure 14. Wiring Locations and Connection Ports



Tracer TU

The AdaptiView™ TD7 operator interface allows for daily operational tasks and setpoint changes. However, to adequately service chillers, the Tracer® TU service tool is required. (Non-Trane personnel, contact your local Trane office for software purchase information.) Tracer TU adds a level of sophistication that improves service technician effectiveness and minimizes chiller downtime. This portable PC-based service-tool software supports service and maintenance tasks and is required for software upgrades, configuration changes, and major service tasks.

Tracer TU serves as a common interface to all Trane chillers and will customize itself based on the properties of the chiller with which it is communicating. Thus, the service technician learns only one service interface.

The panel bus is easy to troubleshoot using LED sensor verification. Only the defective device is replaced.

Tracer TU can communicate with individual devices or groups of devices.

All chiller status, machine configuration settings, customizable limits, and up to 100 active or historic diagnostics are displayed through the service-tool software interface.

LED and their respective Tracer TU indicators visually confirm the availability of each connected sensor, relay, and actuator.

Tracer TU is designed to run on a customer's laptop, connected to the Tracer AdaptiView control panel with a USB cable. Your laptop must meet the following hardware and software requirements:

- 1 GB RAM (minimum)
- 1024 x 768 screen resolution
- CD-ROM drive
- Ethernet 10/100 LAN card
- An available USB 2.0 port
- Windows 7 Enterprise or Professional operating system (32-bit or 64-bit)

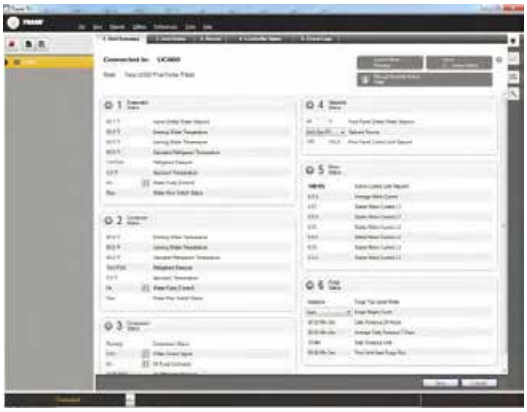
  Note: *Tracer TU versions 8.6 and earlier will also support Microsoft® Windows® XP Professional operation system with Service Pack 3 (SP3).*

- Microsoft .NET Framework 4.0 or later

  Note:

  1. *Tracer® TU is designed and validated for this minimum laptop configuration. Any variation from this configuration may have different results. Therefore, support for Tracer TU is limited to only those laptops with the configuration previously specified.*
  2. *For more information, see TTU-SVN01*-EN Tracer® TU Getting Started Guide.*

Figure 15. Tracer TU



Tracer AdaptiView TD7 Display

Operator Interface

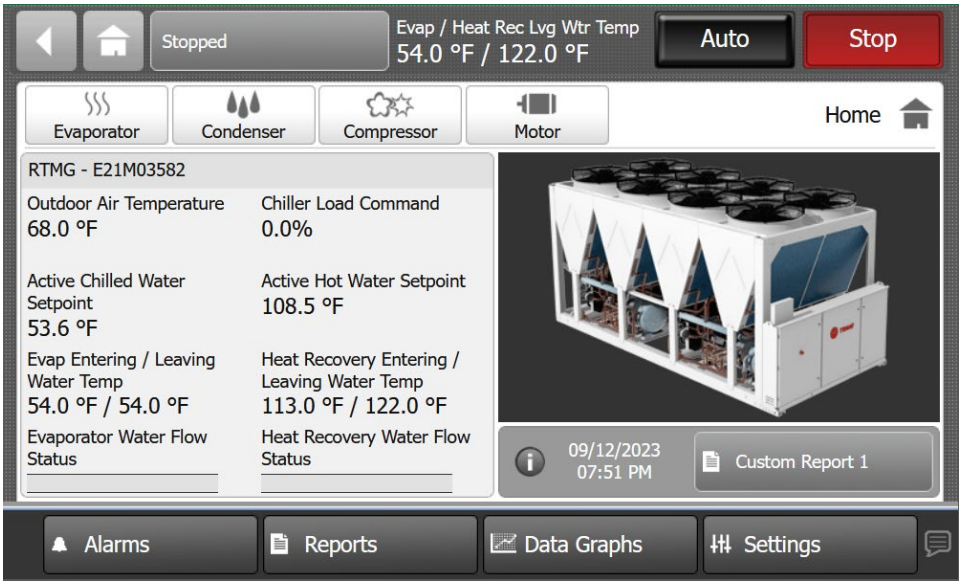
Information is tailored to operators, service technicians, and owners. When operating a chiller, there is specific information you need on a day-to-day basis – setpoints, limits, diagnostic information, and reports. Day-to-day operational information is presented at the display. Logically organized groups of information – chiller modes of operation, active diagnostics, settings, and reports put information conveniently at your fingertips.

Figure 16. TD7 Screens

Home Screen

The home screen (Figure 17) provides the most frequently needed chiller status information on "touch targets" (the entire white rectangular areas) for each chiller component. Touching any touch target displays a screen containing more chiller status information related to each component.

Figure 17. Home Screen



Control Mode

RTMG 4-pipe units support three control modes: cooling only, heating only, and auto. In cooling only control mode, chillers provide chilled water only. In heating only mode, chillers provide hot water only. In auto mode, chillers can provide both chilled water and hot water, and the operating modes can be switched between cooling only, heating only, and heat recovery based on the leaving chilled and hot water temperature.

Operating in which control mode was determined by the active heat recovery command and active hot water command shown below.

Command		Control Mode
Active Heat Recovery Command = 0	Active Hot Water Command = 0	Cooling Only
	Active Hot Water Command = 1	Heating Only
Active Heat Recovery Command = 1	Active Hot Water Command = 0	Auto
	Active Hot Water Command = 1	

Active Heat Recovery Command and Active Hot Water Command have three setpoint sources: front panel, external, and BACnet (Figure 18). Active Heat Recovery Command and Active Hot Water Command depend on the setting value of setpoint sources.

Figure 18. Setpoint Source

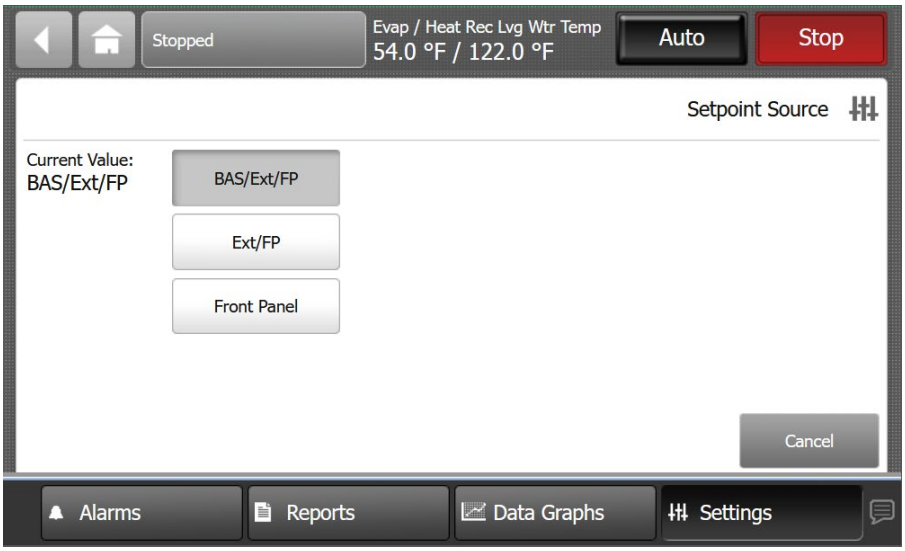


Figure 19. Active Heat Recovery Command

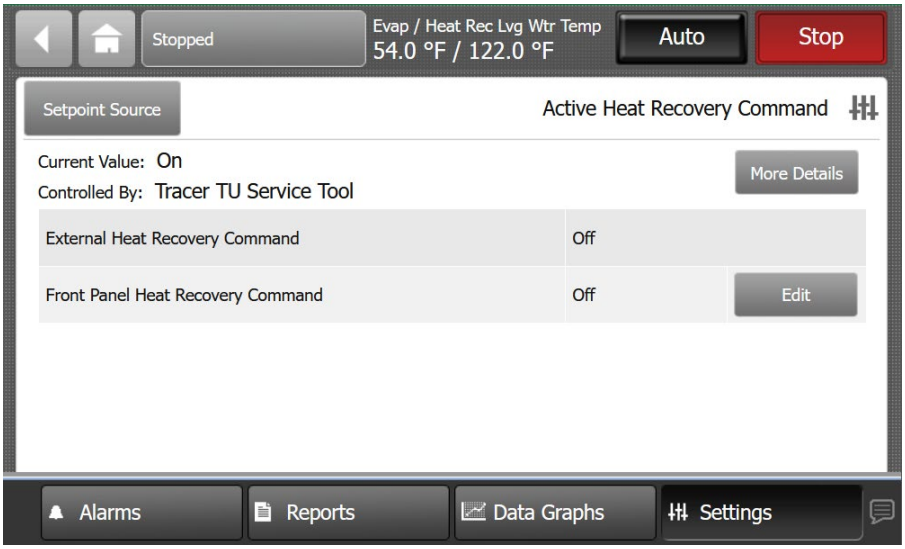
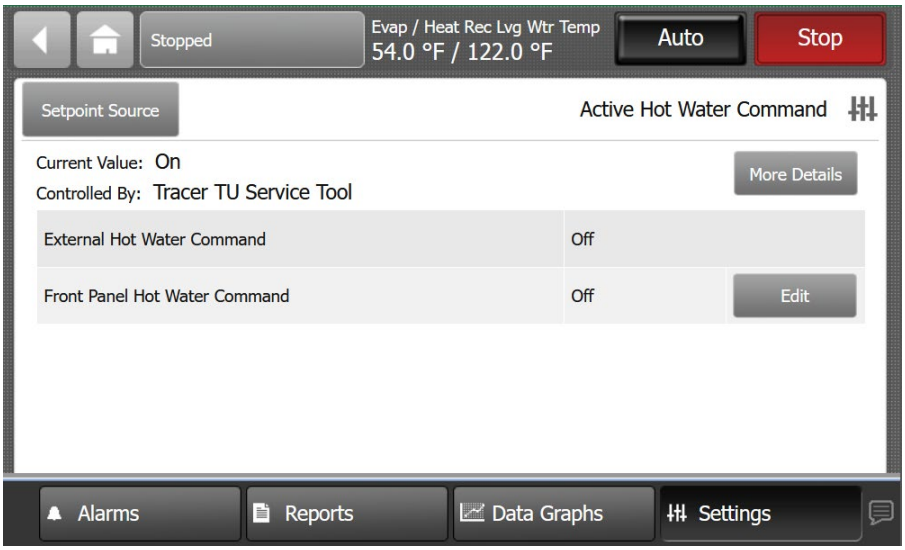


Figure 20. Active Hot Water Command



Language Support

Tracer® AdaptiView™ TD7 supports English and 26 other languages (total 27 languages). Touch the Language button that identifies the language you prefer to view and change.

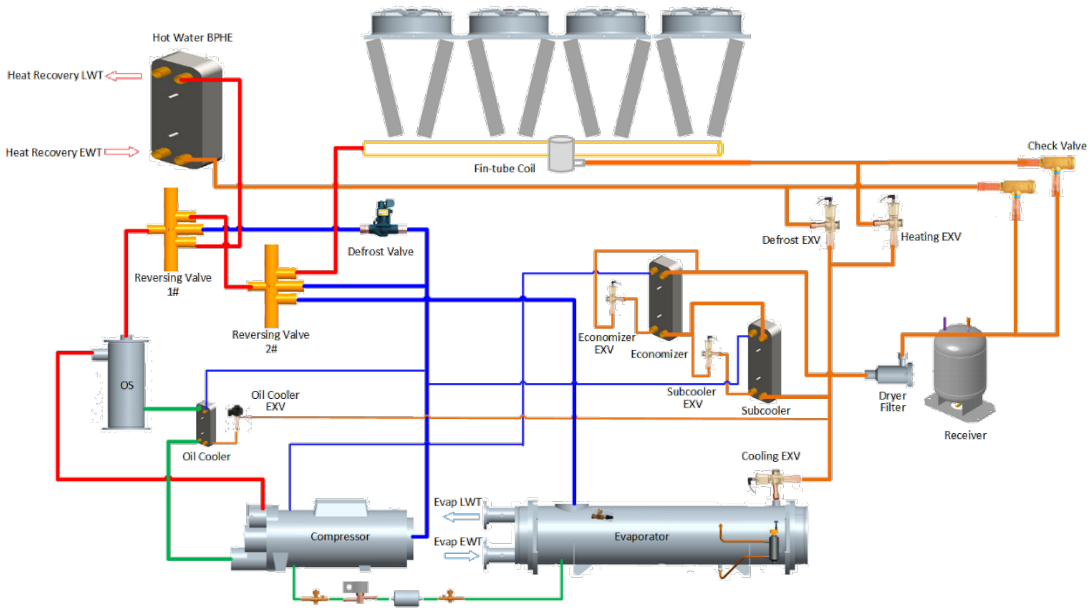
Note: *Currently, RTMG supports English and Simplified Chinese only.*

Operating Principles

General

The refrigeration cycle of RTMG added the hot water section based on other Trane air-cooled screw heat pumps, including dual refrigerant circuit units, and assembly units with master-slave control system. RTMG120/140/170/200/220 units use dual refrigerant circuits with two compressors with economizer, one chilled water loop, and one hot water loop. RTMG240/260/280/310/340/370/400/420/440 units are duplex units assembled by the customer on-site. Figure 21 shows the schematic of a single refrigerant circuit with the economizer.

Figure 21. RTMG Single Refrigerant Circuit



Refrigerant

Trane believes that responsible refrigerant practices are important to the environment, our customers, and the air conditioning industry. All technicians who handle refrigerants must be properly qualified. All local and international regulations in what handling, reclaiming, recovering, and recycling, must be followed.

NOTICE

Equipment Damage!

Use only refrigerants specified on the unit nameplate and Trane OIL00388.
Failure to do so may cause compressor damage and improper unit operation.

Compressor

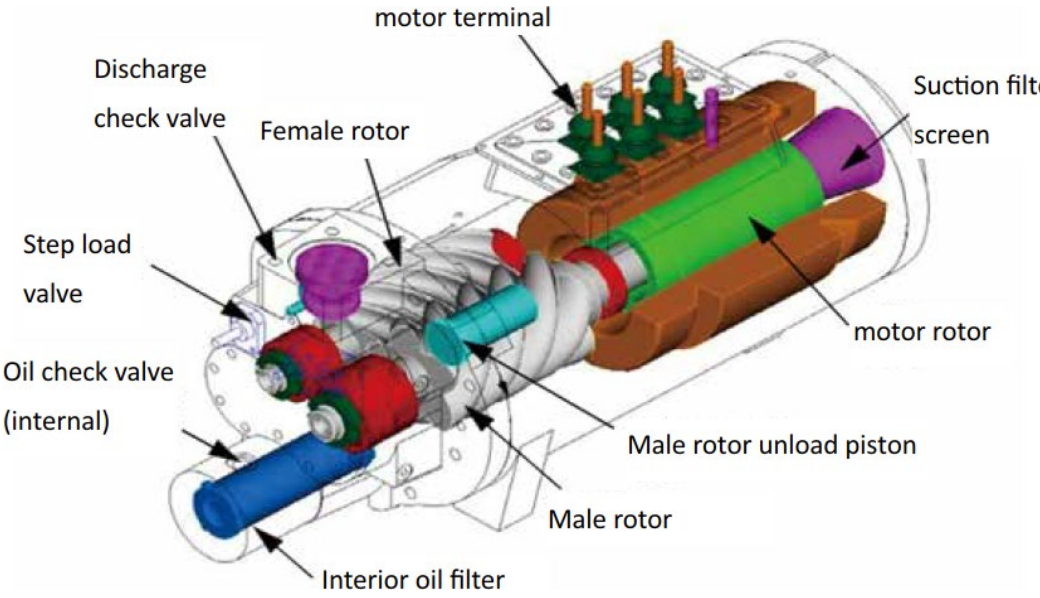
As shown in Figure 22, the compressor is of cast iron, semi-hermetic construction, twin screw type. Each compressor has two rotors - "male" and "female" - which provide compression. The male rotor is attached to, and driven by, the motor, and the female rotor is, in turn, driven by the male rotor. Separately housed bearing sets are provided at each end of both rotors. A two-pole, hermetic, induction motor drives the compressor rotors. The motor is cooled by suction refrigerant gas, entering the end of the motor housing through the suction line.

The female side port provides a capacity step from 30% to approximately 60% displacement. The sliding piston uncovers a series of radial ports in the top of the male rotor bore area of the housing, providing continuously variable unloading from 60% to approximately 100% of compressor suction flange volume flow rate.

Economizers can be used with the compressor to increase cycle capacity and in some cases improve cycle efficiency, depending on the port machined into the rotor housing for economizer

gas injection. The economizer should only be modulated once the compressor is running at 100% load and closed before the compressor shuts down.

Figure 22. Compressor Internal Structure



Oil Filter

As shown in Figure 22, each compressor is equipped with a replaceable element oil filter. The filter removes any impurities that could foul the solenoid valve orifices and compressor internal oil supply galleries.

Chilled Water Side Heat Exchanger

The chilled water side heat exchanger uses a falling film evaporator to exchange the heat of refrigerant in the shell side with water flow in tubes. In cooling mode and heat recovery, liquid refrigerant evenly drops on the external surface of the tube bundle and exchange heat with water flow in the tube, the specified liquid level in the falling film is maintained by the expansion valve to ensure high efficiency of the heat exchange, vapored refrigerant exit through the suction line, excessive refrigerant and oil left at the bottom of falling film through oil return valve back to the compressor.

Electrical heaters are embedded in both sides of the waterbox, and an electrical heat strip is twined on the outside surface of the shell beneath the insulation to prevent the heat exchanger from freezing in winter. An additional 230V field-provided single-phase power connection is required to power the heaters.

Hot Water Side Heat Exchanger

Hot water side heat exchange uses a brazed plate heat exchanger with the features of high heat exchanging efficiency, low heat loss, compact structure, small footprint, long life cycle, etc. In heating mode and heat recovery, it works as a condenser to provide hot water. In defrosting operation, it works with fan coil heat exchangers as an evaporator. Electrical heaters are attached to the heat exchanger covered by the insulation to prevent the heat exchanger from freezing in winter with the interlock control of the field-supplied water pump.

⚠ CAUTION

Equipment Damage!

The electrical heater of the water side should be field-supplied with an independent 230V single-phase AC power source.

Economizer/Sub-Cooler

The economizer/sub-cooler uses a brazed plate heat exchanger. A portion of liquid refrigerant through economizer/sub-cooler EXV to vaporize and create the additional sub-cooling to the major liquid refrigerant is injected into the compressor at a midway point of the compression process. The majority of liquid flow cooled down goes through the main EXVs. Therefore,

enhances cycle capacity and in some cases improves cycle efficiency by increasing compressor displacement and the degree of sub-cooling of the main refrigerant circuit.

Expansion Valve

The main refrigerant loop uses three electrical expansion valves for cooling, heating, and defrosting respectively. In cooling and heat recovery conditions, the cooling EXV is modulated according to the liquid level of the falling film monitored by the liquid level sensor. In heating conditions, the heating EXV is modulated according to the suction superheat of the compressor. In defrosting conditions, the defrosting EXV is modulated according to the discharge superheat of the brazed plate heat exchanger. The flows of refrigerant into the economizer/sub-cooler branches are also controlled by the EXV. The oil circuit uses the EXV to maintain the oil temperature and the suction superheat of the compressor by adjusting the refrigerant flow rate through the oil cooler.

Oil Separator

The compressor discharges refrigerant gas to the tangential entrance at the top of the oil separator and rotates along the cylinder, oil droplets are thrown out from the refrigerant gas by the centrifugal force and fall downward the cylinder into the oil sump at the bottom, then return to the compressor. The purified refrigerant gas exits from the top of the oil separator and flows into the condenser through the reversing valve.

Fan

In cooling conditions, all fans operate at high speed when ambient temperature is high, and automatically adjust fan speed when ambient temperature decreases. In heating conditions, all fans automatically adjust airflow volume based on saturated evaporating temperature.

Oil Circuit

As shown in Figure 21, the majority of the oil that is mixed with vapored refrigerant discharged from the compressor is separated and recollected at the bottom of the oil separator, minority rest oil enters the system with refrigerant discharge gas. The majority of oil in the sump flows through the oil cooler, shut-off valve, internal filter, and oil supply check valve back to the compressor then divides into two ways: one oil flow injects into rotors from top shell of compressor to lubricate rotors and seal the gaps between rotors and house, another oil flow injects into the bearing chamber to lubricate bearing then return to suction port of rotors through internal oil channel of compressor shell. All the two-oil flow mixed with refrigerant gas through rotors discharge back to the oil separator. In cooling and heat recovery mode, the minority of oil accumulated in the refrigerant liquid of the evaporator goes back to the bottom cavity of the compressor through the oil return solenoid valve of the oil return pipe; or in heating mode, the oil in the coil returns to the compressor with refrigerant suction gas while the oil return solenoid valve closed.

The oil supply check valve is pressure-activated. When the compressor operates, the discharge pressure generated opens the check valve to allow the oil to flow. When the compressor stops, the check valve is closed to isolate the oil in the oil separator from the compressor.

Receiver

The receiver is used to temporally store a larger volume of refrigerant liquid in a coil before the mode switch between cooling, heating, and heat recovery in order to avoid refrigerant liquid slugging to the compressor that may cause the compressor damage. The receiver can also provide proper refrigerant amounts as required in different modes and conditions.

Operating Map

Cooling Mode:

Chilled Water Side Heat Exchanger (Evaporator)	Min Temperature (°C)	Max Temperature (°C)
Entering Water Temperature (Startup)	-	45
Leaving Water Temperature (Running)	5	18
Air Side Heat Exchanger (Condenser)	**Min Temperature (°C)**	**Max Temperature (°C)**
Entering Air Temperature	-12	46

Heating Mode:

Hot Water Side Heat Exchanger (BPHE)	Min Temperature (°C)	Max Temperature (°C)
Entering Water Temperature (Startup)	10	55
Leaving Water Temperature (Running)	30	60
Air Side Heat Exchanger (Evaporator)	**Min Temperature (°C)**	**Max Temperature (°C)**
Entering Air Temperature	-15	40

Heat Recovery Mode:

Hot Water Side Heat Exchanger (Condenser)	Min Temperature (°C)	Max Temperature (°C)
Entering Water Temperature (Startup)	10	55
Leaving Water Temperature (Running)	30	60
Chilled Water Side Heat Exchanger (Evaporator)	**Min Temperature (°C)**	**Max Temperature (°C)**
Entering Water Temperature (Startup)	-	45
Leaving Water Temperature (Running)	5	18
Ambient Temperature	**Min Temperature (°C)**	**Max Temperature (°C)**
Entering Air Temperature	-12	46

NOTICE

Anti-Freeze Protection!

Failure to follow the anti-freeze protection of the manual when the unit operates at an ambient temperature of 0°C or below could result in equipment damage.

Pre-Start Checkout

Prestart Procedures

⚠WARNING

Hazardous Voltage!

Disconnect all electrical power, including remote disconnects before servicing. Follow proper lockout/tagout (LOTO) procedures to ensure the power cannot be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

When the installation is complete, but prior to putting the unit into service, the following prestart procedures must be reviewed and verified correctly. Fill in Table 10. RTMG Pre-Start Check List.

1. Inspect all wiring connections to be correct and tight.

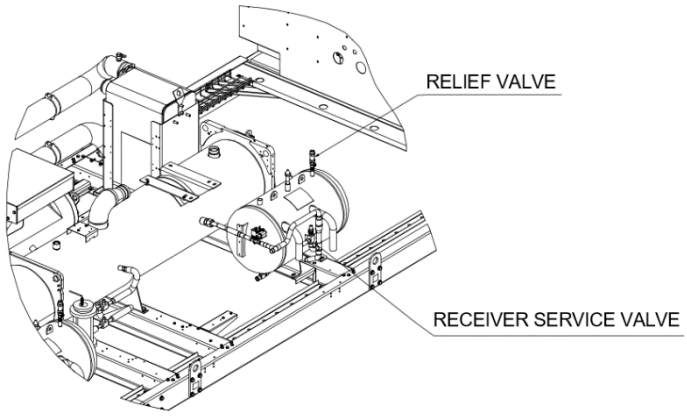
NOTICE

Equipment Damage!

Inspect and confirm all the terminal blocks and the power line connections (disconnects, terminal block, contactors, compressor junction box terminals, and so forth) clean and tight to avoid terminal connections overheating and compressor motor under voltage and eventually failing.

2. Verify that all valves are in the right position. Except for the service valve of the receiver should be closed (shown in Figure 23. Receiver Service Valve), all other valves should be fully opened prior to unit startup, including the angle valve of the compressor oil line (face to the valve stem, turning the stem clockwise to close, turning the stem counter-clockwise to open); liquid pipe and oil return ball valves (open/close status shown in Figure 24); maintenance valves of safety valve for oil separator and receiver (shown in Figure 23); and inlet and outlet field- supplied valves of water system.

Figure 23. Receiver Service Valve

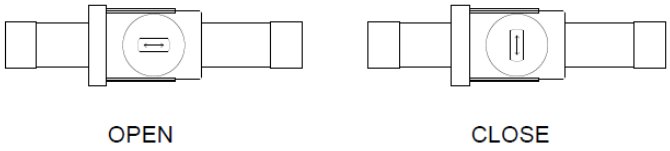


⚠ WARNING

Containing Refrigerant!

The service valve of the safety valve can only be closed when the safety valve needs to be removed for the annual check; otherwise, it should always be fully open.
The unit should be powered off during the safety valve annual check.

Figure 24. Ball Valve Open/Close Status



NOTICE

Equipment Damage!

Do not operate the unit when the oil line, liquid line service valves, and all the manual shutoff valves are not in the right positions. Failure to do so may cause serious compressor damage.

3. Check the power supply voltage to the unit at the main power fused-disconnect switch. Voltage must be within the voltage utilization range stamped on the unit nameplate. Voltage imbalance must not exceed 2%.
4. Check the unit power phase to be sure that it has been installed in an "ABC" sequence.

NOTICE

Compressor Damage!

Failure to follow application guidelines on electrical phase rotation may result in compressor damage for units.

5. Confirm all fans rotate freely.
6. Fill the chilled water and hot water circuits. Vent the system while the water is being filled. Open the vents on the top of the heat exchangers during filling and close when filling is completed.

⚠ CAUTION

Proper Water Treatment!

The use of untreated or improperly treated water in the unit may result in scaling, erosion, corrosion, algae, or slime. It is recommended that the services of a qualified water treatment specialist be engaged to determine what water treatment, if any, is required. Trane assumes no responsibility for equipment failures that result from untreated or improperly treated water or saline or brackish water.

7. Prove all interlocks are connected to the Symbio 800 controller as described in the manual, such as interlocks between water flow switches and chilled/hot water pumps.
8. Start the water pumps to circulate of the water to vent air in the water system. Inspect all piping for leakage and make any necessary repairs.
9. With water circulating through the system, refer to Figure 11 and Figure 12 to adjust water flow and check water pressure drop through the evaporator to meet the requirements of Table 1 and Table 2.
10. Adjust and confirm the chilled water flow switch for proper operation.
11. Stop the chilled water pump after venting air from the water system.
12. Power on the independent 230V single-phase AC power source for the water-side heat exchanger heaters.

NOTICE

Electric Heater Damage!

Failure to connect power after filling the water or remove power before draining will result in water-side heat exchanger electric heater failure.

NOTICE

Equipment Damage!

Ensure all the electric heaters, the unit, and the water pumps are powered on to prevent water side heat exchangers from freezing due to low ambient temperature and refrigerant migration while the unit is on standby.

13. Power the unit to keep the heaters of the compressor and the oil separator energized. Ensure the unit is in Stop mode.

NOTICE

Compressor Damage!

Ensure that the oil sump heaters have been operating for a minimum of 12 hours before the first startup after a long-time shutdown. Failure to do so may result in compressor damage.

14. Check the oil level of the oil separator sump when the compressors are stopped.

Note: *Never operate the compressor during the oil level check.*

NOTICE

Compressor Damage!

Check the compressor discharge superheat of each loop through the TD7 display. The compressor discharge superheat should be larger than 1°C after a 12-hour preheat of the compressor and the oil separator sump.

Unit Voltage Power Supply

⚠WARNING

Live Electrical Components!

During installation, testing, servicing, and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

Unit voltage must meet the criteria given in the installation Electrical Section. Measure each lead of the supply voltage at the main power fused-disconnect switch for the unit. If the measured voltage on any lead is not within the specified range, notify the supplier of the power and correct the situation before operating the unit.

⚠WARNING

Hazardous Voltage!

For variable frequency drives or other energy-storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for the discharge of capacitors. Verify with an appropriate voltmeter that all capacitors have discharged. Failure to disconnect power or failure to discharge capacitors before servicing could result in death or serious injury.

⚠CAUTION

Equipment Damage!

Inadequate voltage to the unit may cause control components to malfunction and shorten the life of relay contact, compressor motors, and contactors.

Unit Voltage Imbalance

Excessive voltage imbalance between the phases of a three-phase system can cause motors to overheat and eventually fail. The maximum allowable imbalance is 2%. Voltage imbalance is determined using the following calculations:

$$\%\text{Imbalance} = \frac{(V_x - V_{ave}) \times 100}{V_{ave}}$$

$$V_{ave} = \frac{(V_1 + V_2 + V_3)}{3}$$

$$Vx = \ phase\ with\ greatest\ difference\ from\ V_{ave}\ (without\ regard\ to\ sign)$$

For example, if the three measured voltages are 375, 389, and 388 volts, the average would be:

$$V_{ave} = \frac{375+389+388}{3} = 384\ V$$

The percentage of imbalance is then:

$$\frac{(375 - 384) \times 100}{384} = 2.34\%$$

This exceeds the maximum allowable (2%) by 0.34 percent.

Unit Voltage Phasing

It is important that proper rotation of the compressors must be established before the unit is started. Proper motor rotation requires confirmation of the electrical phase sequence of the power supply. The motor is internally connected for clockwise rotation when viewed from the motor end with the incoming power supply phases A-B-C. Catastrophic rotor and housing wear will occur if the compressor is driven in the reverse direction even for a very short time.

Basically, voltages generated in each phase of a polyphase alternator or circuit are called phase voltages. In a three-phase circuit, three sine wave voltages are generated, differing in phase by 120 electrical degrees. The order in which the three voltages of a three-phase system succeed one another is called phase sequence or phase rotation. This is determined by the direction of rotation of the alternator. When rotation is clockwise, the phase sequence is usually called "ABC", when counterclockwise, "CBA".

This direction may be reversed outside the alternator by interchanging any two of the line wires. It is this possible interchange of wiring that makes a phase sequence indicator necessary if the operator is to quickly determine the phase rotation of the motor.

Proper compressor motor electrical phasing can be quickly determined and corrected before starting the unit. Use a quality instrument, such as the Associated Research Model 45 Phase Sequence Indicator.

1. Check the unit in "Stop" mode from the TD7 display.
2. Open the electrical disconnect or circuit protection switch that provides line power to the line power terminal block(s) in the starter panel (or to the unit-mounted disconnect)
3. Connect the phase sequence indicator leads to the line power terminal, as follows:

Phase Sea. Lead	Terminal
Black (Phase A)	L1
Red (Phase B)	L2
Yellow (Phase C)	L3

4. Turn the power on by closing the unit supply power fused-disconnect switch.
5. Read the phase sequence on the indicator. The "ABC" LED on the face of the phase indicator will glow if the phase is "ABC".
6. If the "CBA" indicator glows instead, open the unit main power disconnect and switch two line leads on the line power terminal block(s) (or the unit mounted disconnect). Reclose the main power disconnects and recheck the phasing.

⚠ CAUTION

Equipment Damage!

Do not interchange any load leads that are from the unit contactors or the motor terminals.

7. Reopen the unit disconnect and disconnect the phase indicator.

Note: *The terminal connection of the compressor after maintenance must be consistent with the Trane wiring diagrams. Do not interchange any load leads that are from the unit contactors or the motor terminals to prevent the compressor from damage in a reverse rotation. Do not operate the compressor without the terminal box cover in place.*

Water System Flow Rates

Establish a balanced chilled/hot water flow through the heat exchangers within the allowable range in Table 1 and Table 2. The flow rates should fall between the minimum and maximum values. Water flow rates below the minimum values will result in laminar flow, which reduces heat transfer and causes either loss of EXV control or repeated nuisance, low-temperature cutouts. Flow rates that are too high can cause tube erosion.

Water System Pressure Drop

Measure water pressure drops through the water side heat exchangers at the field-installed pressure taps on the system water piping. Use the same gauge for each measurement. Do not include valves or strainer fittings in the pressure drop readings.

The water flow rate corresponding to the pressure drop readings must fall in the range of the flows shown in Table 1 and Table 2.

Unit Start-up and Shut-down Procedures

Important: Initial unit commissioning start-up must be performed by Trane, or an agent of Trane specifically authorized to perform start-up and warranty of Trane products. The contractor shall provide Trane (or an agent of Trane specifically authorized to perform the start-up) with notice of the scheduled start-up at least two weeks prior to the scheduled start-up.

Sequence of Operation

This section will provide basic information on unit operation for common events. With microelectronic controls, ladder diagrams cannot show today's complex logic, as the control functions are much more involved than older pneumatic or solid-state controls.

Adaptive control algorithms can also complicate the exact sequence of operations. This section illustrates common control sequences.

Unit Startup

If the pre-start checkout has been completed, the unit is ready to start.

1. Ensure the "STOP" key is displayed on the TD7. As necessary, adjust the setpoint values on the TD7 menus using TU and record in.
2. Close the fused-disconnect switches for the chilled and hot water pumps. Air is purged from chilled and hot water piping before unit startup.
3. Check all the service valves are open for each circuit. For example, valves on the liquid line, the oil line, and the receiver.

⚠ CAUTION

Compressor Damage!

Catastrophic damage to the compressor will occur if the oil line shut-off valve or the isolation valves are left closed on unit start-up.

4. Power on the electrical heater of chilled and hot water heat exchangers.
5. Ensure that the Uninterruptible Power Supply to the heaters of the compressor oil sump and oil separator has been operating properly for a minimum of 12 hours before starting. Failure to do so may result in compressor damage.
6. Select the MODE and press the AUTO key on TD7. If the unit control calls for operation and all safety interlocks are closed, the unit will start. The compressor(s) will load and unload in response to the leaving chilled water temperature.
7. Once the system has been operating for approximately 30 minutes and has become stabilized, complete the remaining start-up procedures, as follows:
   1) Check the discharge pressure and the suction pressure under the Refrigerant Report on the TD7 display after the compressor is fully loaded. The approach temperature should be within the range of Table 9. Unit Operation Status.
   2) Check both the suction and discharge superheat of the compressor. The discharge superheat should be always above 10°C, while the suction superheat normally is in the range of 2°C ~ 6°C in heating mode.

Table 9. Unit Operation Status

Operation Mode	Chilled waterside approach temperature		Hot water side approach temperature		Airside approach temperature	
	Range (°C)	Calculation Method	Range (°C)	Calculation Method	Range (°C)	Calculation Method
Cooling	2~4	LWT - SST	-	-	15~20	SDT - OAT
Heating	-	-	4~8	SDT - LWT	8~12	OAT - SST
Heat Recovery	2~4	LWT - SST	4~8	SDT - LWT	-	-

Note:

- LWT = Leaving Water Temperature
- SST = Saturated Suction Temperature
- SDT = Saturated Discharge Temperature
- OAT = Outdoor Air Temperature

NOTICE

Equipment Damage!

Use only refrigerants specified on the unit nameplate and Trane OIL00388. Failure to do so may cause compressor damage and improper unit operation.

⚠CAUTION

Personal Injury!

Avoid breathing refrigerant vapor and any contact with liquid or gas.
Vaporizing refrigerant liquid causes rapid cooling and contact may cause cold burns, and frostbite, even through normal gloves.

NOTICE

Efficiency Decline!

Each unit is factory leak-tested, refrigerant-charged, and tested for proper operations prior to shipment. The shipment is made with a holding charge and should be completed by the refrigerant charge on-site. Identify and repair eventual leak points before field charge to avoid refrigerant overcharge and excessive power consumption.

Unit Shutdown

Temporary Shutdown and Restart

To shut down for a short time is used for control operation, maintenance or to repair the unit, use the following procedure.

1. Press the STOP key on the TD7. The compressors will continue to operate and, after unloading for 20 seconds, will stop all the compressors and the fans as well.
2. Stop the water circulation by turning off the chilled and hot water pumps at least one minute after the stop of the compressor.
3. Ensure that power is always available to the unit and Symbio 800 controlled chilled/hot water pumps, even during the off-season, to energize the pumps and circulate water to prevent heat exchangers from freezing during low ambient temperature and refrigerant migration. Heaters of the compressors and the oil separator should also be powered.
4. Make sure that the water side heat exchangers' anti-freeze heaters have the power supply available in winter.
5. Press the AUTO key to restart the unit in the previous mode.

NOTICE

Equipment Damage!

When the unit is in temporary shutdown, Symbio 800 controlled water pump and evaporator heater combination will protect the evaporator from freezing during low ambient temperature and refrigerant migration.
This option will NOT protect the evaporator in the event of any power failure to the unit, water pump, or evaporator heaters. The Trane warranty does not cover damage due to the freezing.

Extended Unit Shutdown

The following procedure is to be followed if the system is to be taken out of service for an extended period (i.e., seasonal shutdown):

1. Perform the normal unit stop sequence using the Stop key.
2. Open the electrical disconnect switches for the unit. Lock the switches in the "OPEN" position.
3. Remove the power of the electric heaters for heat exchangers to avoid heater burnout.
4. Open the electrical disconnect switches for the water pumps. Lock the switches in the "OPEN" position.
5. Drain the chilled and hot water system. Remove the drain and vent plugs to drain the water completely from the heat exchangers.

Note: *If the unit downtime is more than one month, recommend filling low-pressure nitrogen to avoid pipe and evaporator shell corrosion.*

6. At least every three months (quarterly), check the refrigerant pressure of the unit to verify the refrigerant charge integrity.

NOTICE
Water Side Electric Heater Damage! **To prevent water-side electric heater burnout, open the heater power disconnect switch before the water drain.**

Seasonal Unit Start-up

Pass through the Unit Prestart checkup procedures 1~14, and follow the Startup to start the unit.

Periodic Maintenance

Perform all maintenance procedures and inspections at the recommended intervals. This will prolong the life of the unit and minimize the possibility of costly failures.

An important aspect of the unit maintenance program is the regular completion of an operating log, an example of this log is provided in this manual, through the TD7 interface shown in Figure 26 and Figure 27. When filled out properly the completed logs can be reviewed to identify any developing trends of operating conditions and prevent possible failure of the unit.

Weekly Maintenance and Checks

After the unit has operated for approximately 30 minutes and the system has stabilized, check the operating conditions, and complete the procedures below:

1. Log the unit.
2. Check compressor discharge and suction pressures with gauges and compare them to the reading on the TD7. Pressure readings should fall within the specified ranges listed in Table 9.
3. Observe and clean the air side fin-tube heat exchanger if blocked.
4. Observe the liquid line sight glass on EXV. If there are bubbles in the sight glass, please check the leakage source and repair it. Then, charge the refrigerant and avoid overcharge.
5. Record the water pressure drop across the evaporator. Clean water strainer if necessary.
6. Check the temperature differential between the two sides of the refrigerant filter and oil return filter. Replace the filter element if necessary.
7. Inspect the entire system for unusual conditions and repair if needed.

NOTICE

Each unit is factory leak-tested, refrigerant-charged, and tested for proper operations prior to shipment. Identify and repair the leak point before field charge to avoid refrigerant overcharge and excessive power consumption.

Monthly Maintenance and Checks

1. Review the operating log.
2. Perform all weekly maintenance procedures.
3. Measure and record the system subcooling.
4. Measure and record the system superheat.
5. Clean water strainers in the chilled water piping systems if needed.
6. Inspect power cables and connections, whether insulation is aging or worn, or the connection is loose.

Annual Maintenance

⚠WARNING

Hazardous Voltage!

Disconnect all electric power, including remote disconnects. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

1. Perform all weekly and monthly maintenance procedures.
2. Check the pressure drop of the built-in oil filter and the temperature difference on the liquid line.
3. Check the oil level of the oil separator while the unit is off.

Note: *Routine changing of the oil is not required. Contact your local Trane office to perform an oil analysis to determine system moisture content and acid level.*

4. Contact your local Trane office to leak-test the unit, check operating and safety controls, and inspect electrical components for deficiencies.

5. Clean and repaint any areas that show signs of corrosion.
6. Inspect all piping components for leakage and/or damage. Check the concentration of antifreeze. Clean all water strainers.
7. Inspect the heat exchangers. Clean if necessary.
8. Clean the condenser fans. Manually rotate the condenser fans to ensure all the fans can rotate freely.
9. Check and tighten all electrical connections as necessary.
10. Inspect the entire system for unusual conditions.

TD7 Log

Open the TD7 protection cover as shown in Figure 25. Refer to the following Figure 26 and Figure 27, Operator Log can be captured on TD7.

Figure 25. TD7 Display

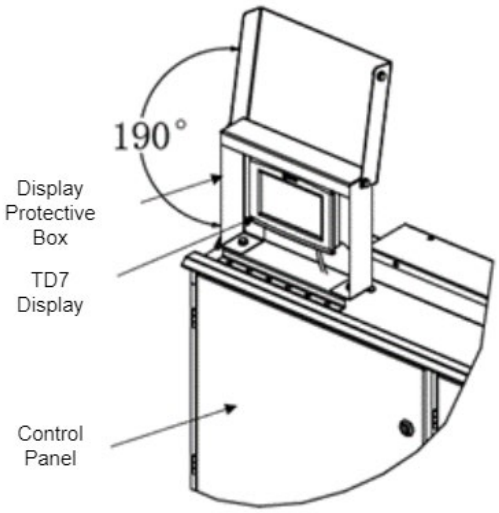


Figure 26. Report

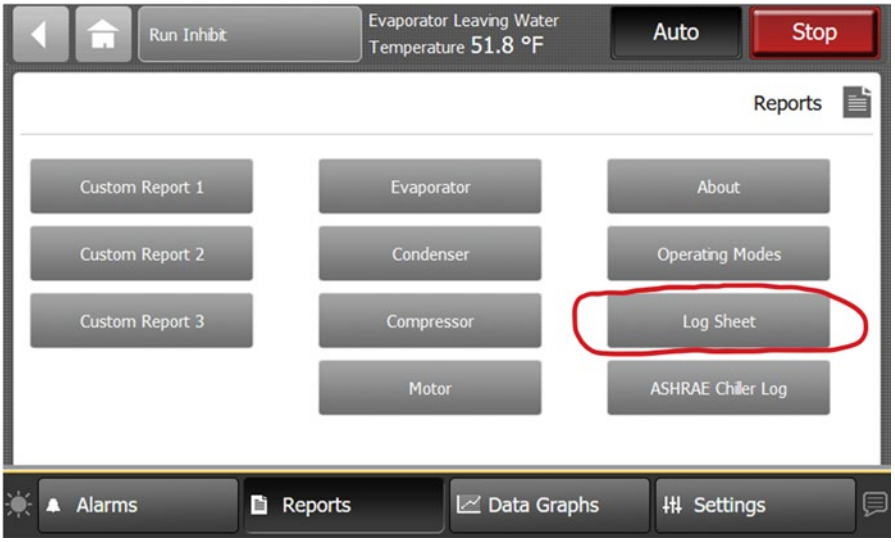


Figure 27. Log Sheet

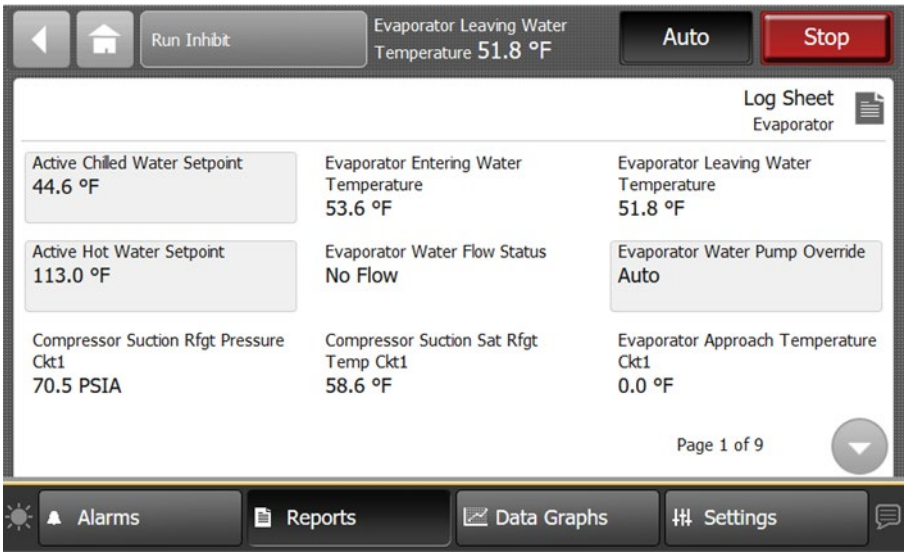


Table 10. Periodic Maintenance Items

Maintenance Items			Recommended Maintenance Frequency	Acceptable Criteria/Disposition
1	Routine Check	Noise	1 / week	If any irregular sounds
		Vibration	1 / week	If any obvious vibration on lines or components
		Power Supply	1 / week	Within ±10% of rating voltage
2	Unit Appearance	Cleanness	1 / week	Keep clean
		Corrosion	1 / week	Remove corrosion and apply antirust paint
		Loosening	1 / week	Tighten all screws
		Insulation Off	1 / week	Stick firmly by using adhesive
		Water Leakage	1 / month	Check if sealing leaks or drain piping blocks
3	Compressor	Noise	1 / week	Compressors start/run/stop without irregular sounds
		Insulation Resistance	1 / year	Insulation Resistance > 5 M ohm
		Vibration Isolator Aging	1 / year	Be elastic when touching
		Oil Level Inspection	1 / year	Check the oil level of the Oil Separator
		Built-in Oil Filter	1 / year	Refer to Figure 30 to replace the Oil Filter
		Protection Switch	1 / year	Confirm safety device and protection switch work properly
4	Coil	Fan	1 / week	Fixed properly and rotated freely
		Cleanness	1 / month	Within the range of Table 9
5	Water Side Heat Exchanger	Water Flow	1 / week	Within the range of Table 1 and Table 2
		Water Temperature	1 / week	Water temperature within the “Operating Map”
		Water Property	1 / year	Meet Table 7
		Drain Water	1 / year	For an extended period of shutdown, drain the water circuits without adding antifreeze including inside of heat exchangers and connecting water pipes. Disconnect the power supply of antifreeze protection switches to avoid electric heater damage.
		Antifreeze Concentration	1 / year	For water circuits with antifreeze, inspect antifreeze concentration regularly.
		Water Strainer	1 / year	Visual check and ensure there is no blocking.
		Oil Return Filter	1 / year	At a stable cooling running, there is no obvious temperature difference between the inlet and the outlet of the oil return filter.
		Safety Valves	1 / year	Confirm safety device and protection switch work properly
6	Pressure Transducer	Readings	2 / year	Use an accurate pressure gauge with high precision for comparison
7	Check Valves	Movements	1 / month	Check valves can open or close normally or not
8	Refrigerant Circulation	Refrigerant Leakage	3 / year	Use an electric leak detector to inspect
		Filter Drier	1 / year	At a stable running, check the temperature difference between the inlet and the outlet.
9	Electric Components	Insulation and Tightening of Wires	1 / month	No damage on the wire insulation, well contacting and tightening
		Contactors	1 / year	Acting normally, no erosion on contacts
		Solenoid Valves	1 / year	Solenoid valves act normally on reversing valves, receivers, and oil return piping

Table 11. RTMG Pre-Start Check List

<table>
<tr><th colspan="6">RTMG Start-Up Test Log</th></tr>
<tr><td colspan="3">Jobsite Name:</td><td colspan="3">Jobsite Location:</td></tr>
<tr><td colspan="3">Unit Model #:</td><td colspan="2">Unit Serial #:</td><td>Start Date:</td></tr>
<tr><td colspan="2">Sales Order #:</td><td>Ship Date:</td><td colspan="3">Jobsite Elevation (m. above sea level):</td></tr>
<tr><td colspan="3">Power Supply</td><td colspan="3">Unit Status (before Start-up)</td></tr>
<tr><td colspan="3">Voltage (V):</td><td colspan="3">Chiller Appearance at Arrival: Ckt1: Ckt2:</td></tr>
<tr><td colspan="3">Frequency (Hz):</td><td colspan="3">Pressure from TD7 (bar): Ckt1: Ckt2:</td></tr>
<tr><td colspan="3">Phase Imbalance Rate (%):</td><td colspan="3">R513A Charge (kg): Ckt1: Ckt2:</td></tr>
<tr><td colspan="6">Compressor Data</td></tr>
<tr><td rowspan="5">Circuit 1</td><td rowspan="5">Compressor 1A</td><td>Serial #:</td><td rowspan="5">Circuit 2</td><td rowspan="5">Compressor 2A</td><td>Serial #:</td></tr>
<tr><td>Model #:</td><td>Model #:</td></tr>
<tr><td>Series #:</td><td>Series #:</td></tr>
<tr><td>RLA (A)</td><td>RLA (A)</td></tr>
<tr><td>Power (kW)</td><td>Power (kW)</td></tr>
<tr><td colspan="3">Evaporator Design Conditions</td><td colspan="3">Evaporator Actual Conditions</td></tr>
<tr><td colspan="3">Water Flow Rate (m^3/h):</td><td colspan="3">Water Flow Rate (m^3/h):</td></tr>
<tr><td colspan="2">Entering Temp (°C):</td><td>Leaving Temp (°C):</td><td colspan="2">Entering Temp (°C):</td><td>Leaving Temp (°C):</td></tr>
<tr><td colspan="6">Options Installed</td></tr>
<tr><td colspan="6">Communications Interface Type:</td></tr>
<tr><td colspan="6">Other:</td></tr>
<tr><td colspan="6">Other:</td></tr>
<tr><td colspan="6">Owner Witness Signature:</td></tr>
</table>

Maintenance and Service

Refrigerant and Oil Charge Management

Proper oil and refrigerant charge is essential for proper unit operation, unit performance, and environmental protection. Only trained and licensed service personnel should service the chiller.

Symptoms of a unit with refrigerant undercharged:

- Lower subcooling
- Higher than normal discharge superheat
- Bubbles in EXV sight glass
- In cooling/heat recovery modes, low liquid-level fault
- In cooling/heat recovery modes, larger than normal water side heat exchanger approach temperatures(leaving water temperature – saturated evaporating temperature)
- Lower suction pressure; In cooling/heat recovery modes, low refrigerant temperature limit or diagnostic; In heating mode, frequent defrosting and low suction pressure limit or diagnostic
- A full open expansion valve
- A whistling sound coming from the liquid line (due to high vapor velocity)

Symptoms of a unit with refrigerant overcharged:

- Higher subcooling
- Lower discharge superheat
- In cooling/heat recovery modes, larger than normal water side heat exchanger approach temperatures(saturated condensing temperature- leaving water temperature)
- Discharge pressure limit
- High-pressure cutout diagnostic
- Higher than normal compressor power and current

Symptoms of a unit with oil undercharged:

- Oil loss diagnostic
- Compressor locked
- Low oil sump level after normal shutdown

Symptoms of a unit with oil overcharged:

- In cooling mode, low evaporator refrigerant temperature limit
- An unstable liquid-level
- Low cooling capacity
- High oil sump level after normal shutdown

Refrigerant Charge

⚠WARNING

Hazardous Voltage!

Disconnect all electrical power, including remote disconnects before servicing. Follow proper lockout/tagout (LOTO) procedures to ensure the power cannot be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

Vacuumizing Procedure

The unit is charged with Nitrogen when arriving at the site. Vacuumizing is needed before charging the refrigerant.

1. Ensure all EXVs, ball valves, and receiver service valves are open.
2. Disconnect all electrical power to the unit.
3. Complete the leak test and confirm no leak is found.

⚠WARNING

High Pressure Danger!

Refrigerant System is only allowed to use refrigerant or dry nitrogen to have leak detection. The leak detection pressure must be less than the shell-side allowable pressure of heat exchangers indicated on the unit nameplate. Failure to do so may result in equipment damage or personal injury.

4. Attach the vacuum hose to the service valves of the evaporator and oil separator, and open the service valves.
5. Power on the vacuum pump, close the service valves, and vacuum pump in sequence after the vacuum gauge shows the pressure is less than 67 Pa.
6. Let the unit stand for at least 1 hour. The pressure rise should be less than 20 Pa. If the pressure rise exceeds 20 Pa, the unit still has leakage or moisture inside the system. Repeat steps 3 to 6 above.
7. Remove the vacuum hose.

Refrigerant Field Charge Procedure

Once the system is deemed leak and moisture-free, follow the procedures to add refrigerant charge. Refer to Figure 1. Unit Nameplate for refrigerant charge information.

1. The unit is empty of all refrigerant and under vacuum.
2. Attach the charge hose to the liquid line service valve and purge the air in the hose by refrigerant prior to opening the service valve.
3. Start the chiller and hot water pumps. Charge the unit according to the refrigerant type and amount indicated on the unit nameplate.
4. Close the liquid line service valve and remove the charge hose after the charge.

⚠CAUTION

Equipment Damage!

Constant water flows within the allowed range through the heat exchangers are strictly necessary during the whole charge process to prevent the heat exchangers from freezing damage.

NOTICE

Equipment Damage!

Ensure that the oil sump heaters have been operating for a minimum of 12 hours before starting the unit and that the power of electric heaters and pumps is always on. Failure to do so may result in equipment damage.

Refrigerant Field Charge to an Undercharged Unit

This procedure should be followed when adding refrigerant to an undercharged unit.

1. Refer to Figure 21, loosely attach the charge hose to the service valve of the suction side of the unit with the refrigerant tank.
2. Open the valve of the refrigerant tank to evacuate the air in the charging hose.
3. Add no more than 4.5kg gas refrigerant into the circuit each time during compressor operation.
4. After the unit has operated for approximately 30 minutes and the system has stabilized, check the subcooling and approach temperature. Repeat from Step 3 till subcooling or approach temperature back to normal.
5. Close the service valve and remove the hose.

NOTICE

Insufficient Subcooling!

Proper subcooling can be determined by operator log, service technician experience, or consulting Trane local service.

NOTICE

Gas Refrigerant Adding!

Add gas refrigerant only during operation to avoid compressor failure.

Refrigerant Recycling

Refrigerant used in any type of air-conditioning or refrigerating equipment should be recovered and/or recycled for reuse, and reprocessed (reclaimed). Recover the system refrigerant charge should use certified recycling equipment and approved storage containers for recycled refrigerant to follow proper procedure. Never release refrigerant into the atmosphere or discharge refrigerant into the container by compressor operation of the unit.

Recover the refrigerant through the service port of the liquid line and evaporator. The following information is to be noted for refrigerant recovery.

- Only trained and qualified service personnel should recover refrigerant with Personal Protective Equipment (PPE).
- The workplace shall be well-ventilated, away from inflammable and explosive materials, rain, and moisture.
- Disconnect all electric power of the unit and lockout before refrigerant recovery.
- Use only approved storage containers for recycled refrigerant. To prevent on-side overfilling, the safe filling level must be controlled by weight and must not exceed 80% of the container's gross weight rating. Comply with all applicable transportation standards when shipping refrigerant containers.

Refrigerant Filter Replacement Procedure

A dirty filter is indicated by a temperature gradient across the filter, corresponding to a pressure drop. If the temperature downstream of the filter is 4.4°C lower than the upstream temperature, the filter should be replaced. A temperature drop can also indicate that the unit is undercharged. Ensure proper subcooling before taking temperature readings.

1. Stop the unit, and manually close all EXVs by TD7. Disconnect all electric power of the unit and lockout.
2. Manually close the liquid line isolation valve.
3. Attach the hose to the service port on the liquid line filter flange.
4. Evacuate refrigerant from the liquid line and store.
5. Depress the Schrader valve to equalize pressure in the liquid line with atmospheric pressure.

Note: *Continue with the next steps unless confirmed that the pressure of the liquid line is equalized with atmospheric pressure, otherwise the refrigerant of the whole system should be recovered before the next steps.*

6. Remove bolts that retain the filter flange.

⚠WARNING

Contains Refrigerant!

The system contains oil and refrigerant under high pressure. Recover refrigerant to relieve pressure before opening the system.
Failure to follow proper procedures could result in death or serious injury or equipment damage.

7. Remove the old filter element.
8. Inspect the replacement filter element and lubricate the O-ring with Trane OIL00388.

Note: *Do not use mineral oil. It will contaminate the system.*

9. Install the new filter element in the filter housing.
10. Inspect the flange gasket and replace it if damaged.
11. Install flange and torque bolts to 19-22 Nm (14-16 lb-ft).
12. Attach the vacuum hose and evacuate the liquid line.
13. Remove the vacuum hose from the liquid line and attach the charging hose.
14. Replace stored charge in the liquid line.
15. Remove the charging hose.
16. Open the liquid line isolation valve.

Compressor Oil

⚠CAUTION

Compressor Damage!

Use only Trane OIL00388. Failure to do so may cause compressor damage and improper unit operation.

Trane Polyolester Oil is the approved oil for the RTMG units. Polyolester oil is extremely hygroscopic meaning it readily attracts moisture. The oil cannot be stored in plastic containers due to its hygroscopic properties. As with mineral oil, if water is in the system it will react with the oil to form acids. Use Table 12 to determine the acceptability of the oil.

Table 12. POE Oil Properties

Description	Acceptable Levels
Moisture Content	less than 300 ppm
Acid Level	less than 0.5 TAN (mg KOH/g)

Oil Separator Oil Level Check

⚠CAUTION

Oil Loss!

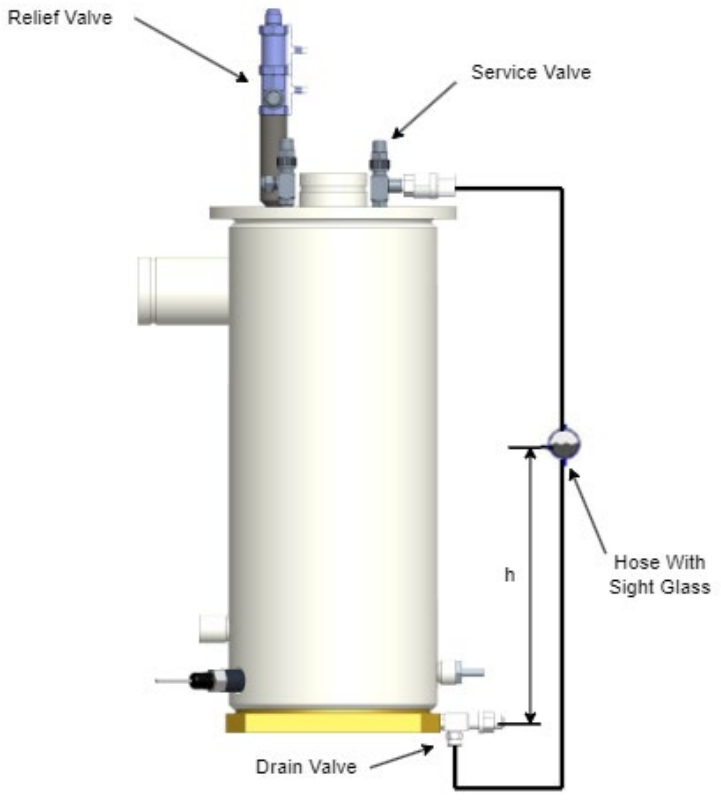
Never allow the compressor to operate with opened service valves connecting the sight glass during the oil level check, otherwise severe oil loss will occur. Close the valves after the check.

See Figure 28, follow the below procedures:

1. Run the unit under full load for more than 30 minutes.
2. Shut down the compressors.
3. Attach a charge hose with an integrated sight glass to the service valve (1/4" port) and oil drain valve (1/4" port) of the oil separator.

   Note: *Alternatively, a high-pressure resistance lucid hose with appropriate fittings can be used for measurement.*

Figure 28. Oil Level Measure of Oil Separator



4. Open both valves and move the sight glass up and down along the oil separator to confirm the height of the oil level. The height of the oil level (indicated as "h" in the figure) should be between 100mm and 200mm from the bottom.
5. If the oil level is too high, the additional oil may reside in other parts of the system and result in lower efficiency. Some oil can be removed till the level falls within a reasonable range.
6. If the oil level is too low, it possibly indicates oil migration to the evaporator or a system leak.
   Note: *If the oil accumulates in the evaporator, it needs to check whether the oil return solenoid valve is open and whether the filter on the oil return pipeline requires replacement. If a system leak is detected, repair the leakage before replenishing the oil.*
7. Close the service valves and remove the hose(with sight glass) after measurement.

Compressor Oil Charge

⚠ WARNING

Oil Loss Alarm!

The diagnostic of "low oil flow" will appear if oil lines are not fully charged during compressor start-up.

The diagnostic of "oil loss" will appear if the oil level sensor at the bottom of the oil separator does not detect oil during compressor start-up.

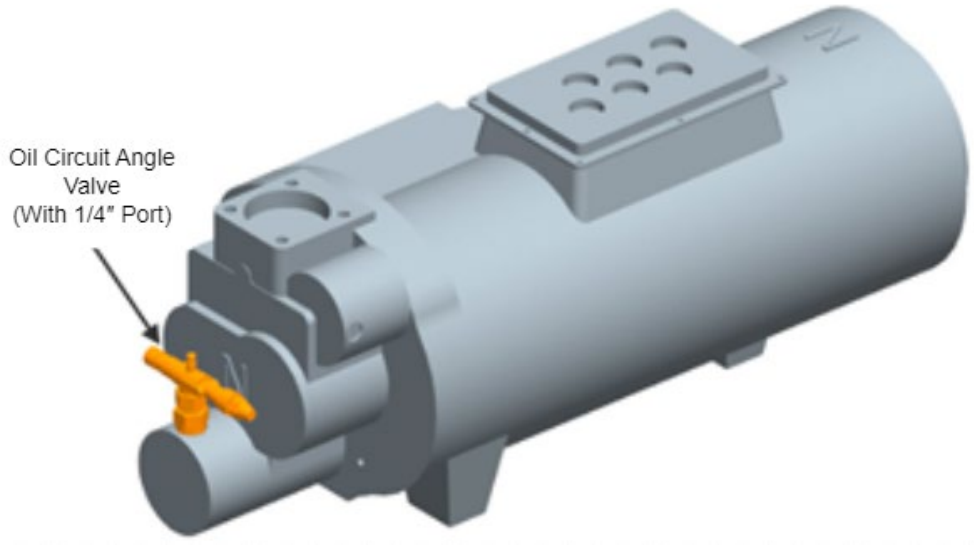
Whether the unit is needed to charge oil depends on the actual operation status of the unit. Oil level check and compressor oil charging are required if any of the following happens:

1. Oil Leak during maintenance such as oil sampling, element replacement of compressor internal filter, and pipe replacement of water side heat exchangers.
2. Component replacement such as replacement of compressor or coils.
3. Leakage in the system or oil loss caused by recovering refrigerant. These must be handled immediately.
   In general, there are two methods to charge compressor oil:
   a. Maintain a vacuum in the unit with a vacuum pump and draw the oil into the system.
      Note: *Required to recover the refrigerant in the unit system before vacuuming.*
   b. Pump the oil into the oil pipeline with an oil pump after the unit has stopped with uncharged pressure.
      Note: *The oil pump and hose need to have enough pressure resistance.*

Compressor oil charge procedure (after unit stops)

1. Loosely connect the oil hose to the 1/4" angel valve of compressor oil lines as Figure 29.
2. Pour with the oil tank or run the oil pump. Once the oil has emptied the air in the hose, tighten the connector of the hose.
3. Open the angle valve of the compressor oil lines to charge the required amount of oil.
   Note: *Adding the oil at the oil charging port of the compressor angle valve can ensure the oil filter cavity and oil pipe following the oil separator are filled with oil, and an internal check valve can prevent oil from entering the compressor rotor cavity.*

Figure 29. Oil Charge of Compressor



Draining Compressor Oil

NOTICE

POE Oil!

Due to the high hygroscopic properties of POE oil, all oil must be stored in metal containers, not plastic containers.

Compressor oil draining can only begin after the compressor has run for 30 minutes and stopped for 10 minutes. Follow the procedure below:

1. Attach the pipe to the bottom of the drain valve of the oil separator.
2. Open the valve to discharge and weigh the oil.
3. Close the valve after draining a certain amount of oil.

Oil Loss Troubleshooting

When the unit has an oil loss diagnostic, follow the below procedures:

1. Conduct an "Oil Separator Level Check" after the unit is stopped.
2. Once a low oil level is confirmed, 2kg of oil needs to be added to the oil separator when the unit is stopped. Then, start the unit and keep running for 2 hours. After stopping the unit again, drain 2kg of an oil mixture from the oil separator by following "Draining Compressor Oil".
3. If the oil level is normal, check whether the oil level sensor and its wiring are correct.
4. If the oil level is normal and the oil level sensor and its connection are right, the issue is possibly caused by too much liquid refrigerant in the oil separator. Then, the unit should be prohibited from running, and the heaters of the compressor and oil separator should be powered on for more than 12 hours, then conduct an "Oil Separator Level Check" again.

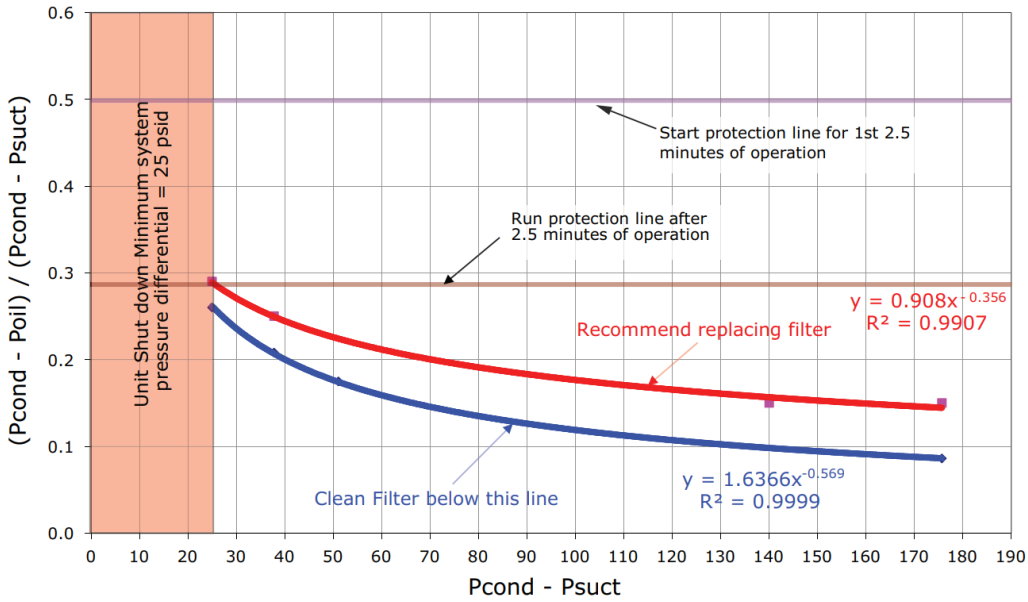
NOTICE

Bypassing the protection of the oil level sensor is prohibited!

When an Oil Loss diagnostic appears, check the oil level of the oil separator first. In order to avoid compressor damage, DO NOT bypass the protection of the oil level sensor.

Internal Oil Filter Replacement

Figure 30. Oil Filter Replacement



Under normal operating conditions, the compressor's internal filter element should be replaced after the first year of operation. After that, the filter must be replaced if the operating pressure meets the replacement condition shown in Figure 30, the "Low Oil Flow" diagnostic frequently occurs, or the oil quality cannot meet requirements. Follow the below procedure:

1. With the unit off, disconnect and lock all power supplies.
2. Recover the refrigerant in the unit and release the system pressure.
3. Close the maintenance valves on the compressor oil return pipeline.
4. Open the release plug on the cover plate of the oil filter to ensure the pressure of the internal filter has been released before the next step.
5. Prepare a container to collect and weigh the leaked oil from replacing the filter.
6. Unscrew the bolts on the cover plate of the oil filter and remove the plate to take out the filter.
7. Replace with a new filter.
8. Replace the seal ring and lubricate it with a small amount of compressor oil.
9. Install the cover plate, screw and tighten the bolts, then open the maintenance valves of compressor oil lines.
10. Perform leak test with pressurized Nitrogen, then vacuumize.
11. Charge an equal amount of new compressor oil compared to the leaked oil, in the method referring to the "Compressor Oil Charge".
12. Charge a rated amount of refrigerant.

Evaporator Oil Return Pipe Filter Replacement

When there is an obvious temperature difference between the upstream and downstream of the filter, suggest replacing it with the following procedures:

1. Close both ball valves at the two ends of the filter.
2. Discharge the oil and refrigerant inside the filter pipe with the pin valves on the top of the ball valves.
3. Replace with a new oil filter.
4. Perform leak test with pressurized Nitrogen, then vacuumize.
5. Open both ball valves and let the pipe be filled with liquid.

Fin-tube Coil Cleaning

Clean the fin-tube coils at least once a year or more frequently if the unit is in a "dirty" environment. A clean coil will help to maintain unit operating efficiency. Follow the detergent manufacturer's instructions to avoid damaging the coils.

To clean the coils, use a soft brush and a sprayer such as a garden pump type or a high-pressure type. A high-quality detergent such as Trane Coil Cleaner (Part No. CHM-00255) is recommended. See RTAC-SVG01B-EN for maintenance and cleaning procedures.

Note: *If the detergent mixture is strongly alkaline (pH value greater than 8.5, an inhibitor must be added).*

⚠ WARNING

Hazardous Chemicals!

Coil cleaning agents can be either acidic or highly alkaline and can burn severely if contact with the skin occurs. Handle chemicals carefully and avoid contact with the skin. ALWAYS wear Personal Protective Equipment (PPE) including goggles or face shields, chemical-resistant gloves, boots, apron, or suit as required. For personal safety refer to the cleaning agent manufacturer's Materials Safety Data Sheet and follow all recommended safe handling practices. Failure to follow all safety instructions could result in death or serious injury or equipment damage.

Water Side Heat Exchanger Maintenance

⚠ CAUTION

Proper Water Treatment!

The use of untreated or improperly treated water in the unit may result in scaling, erosion, corrosion, algae, or slime. It is recommended that the services of a qualified water treatment specialist be engaged to determine what water treatment, if any, is required. The Trane Company assumes no responsibility for equipment failures that result from untreated or improperly treated water, saline, or brackish water.

The water-side heat exchanger is maintained based on the following requirements:

- Since the water side heat exchanger is typically part of a closed circuit, it does not accumulate appreciable amounts of scale or sludge. In the comfort application, when the chilled water side approach temperature(leaving chilled water temperature – saturated evaporating temperature) exceeds 5.6°C, or the hot water side approach temperature(saturated discharge temperature - leaving hot water temperature), or the water pressure drop is more than 130% of the rating value, the heat exchanger needs to be cleaned. Generally, the chilled water side heat exchanger should perform chemical cleaning first, and then mechanical cleaning; the hot water side heat exchanger is suggested to perform chemical cleaning only.

Note: *If antifreeze is added to the water circulation, the water pressure drop mentioned above should be enlarged.*

- Use a nondestructive tube test to inspect the evaporator tubes at 3-year intervals.

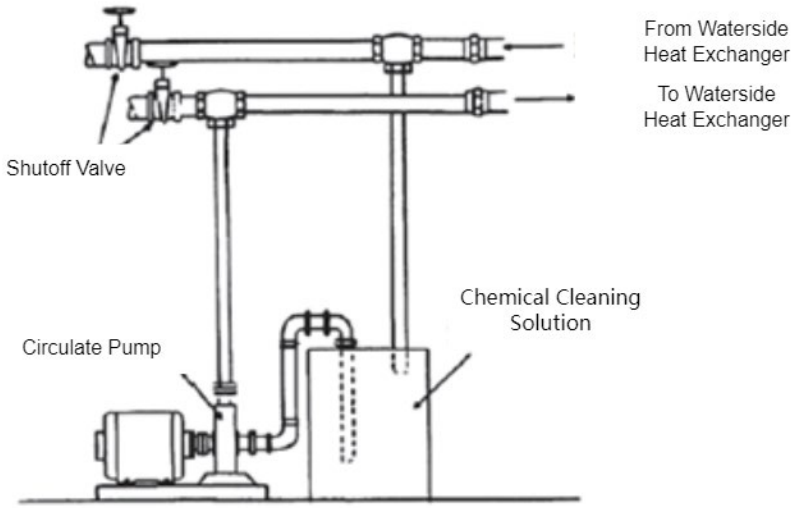
Note: *It may be desirable to perform tube tests on these components at more frequent intervals, depending upon unit application. This is especially true of critical process equipment.*

Chemical Cleaning Procedure

Scale deposits are best removed by chemical means. Consult a qualified water treatment specialist for a recommended cleaning solution. A standard chilled water circuit is composed solely of copper, cast iron, and steel. Improper chemical cleaning can damage tube walls. All the materials used in the external circulation system, the quantity of the solution, the duration of the cleaning period, and any required safety precautions should be approved by the company furnishing the materials or performing the cleaning. Figure 31 shows the typical backflushing unit of the evaporator.

Note: *Chemical tube cleaning should always be followed by mechanical tube cleaning.*

Figure 31. Chemical Cleaning



Mechanical Cleaning Procedure for Chilled Water Side Heat Exchanger

Mechanical tube cleaning method is used to remove sludge and loose material from smooth-bore tubes.

Review mechanical space limitations and determine the safest method or methods of rigging and lifting the Waterboxes.

1. Disconnect water pipes, if connected. Mind the temperature sensor and insulation.
2. Select the proper lift connection device from Table 13. The rated lifting capacity of the selected lift connection device must meet or exceed the published weight of the waterbox.
3. Ensure the lift connection device has the correct connection for the waterbox.
4. Remove the waterbox bolts and lift the waterbox away from the shell.

⚠ WARNING

Heavy Objects!

Failure to properly lift the waterbox could result in death or serious injury.

5. Store waterbox in a safe and secure location and position.

Note: *Do not leave the waterbox suspended from the lifting device.*

⚠ WARNING

OVERHEAD HAZARD!

Never stand below or in close proximately to heavy objects while they are suspended from, or being lifted by, a lifting device. Failure to follow these instructions could result in death or serious injuries.

6. Clean the heat exchanger tubes. Use a round nylon brush (1 inch) attached to a rod in and out of each of the water tubes to loosen the sludge. Do not use a steel wire brush to avoid tube damage. Thoroughly flush the condenser water tubes with clean water.

Note: *To clean internally enhanced tubes, use a bi-directional brush or consult a qualified service organization for recommendations.*

7. Reassembly. Once service is complete, the waterbox should be reinstalled on the shell following all previous procedures in reverse. Use new O-rings or gaskets on all joints after thoroughly cleaning each joint. Torque bolts in a star pattern to 88Nm(65ft-lbs).
8. Reconnect the external water pipes and water temperature sensors.
9. Perform a water piping leakage test and recover the insulation.

Note: *Do not allow pressure to exceed the waterside maximum working pressure indicated on the evaporator nameplate.*

Table 13. Main Components Weights

Model	Compressor (kg)	Oil Separator (kg)	Water Side Heat Exchanger (kg)	Coil (kg)	Fan (kg)	Reversing Valve (kg)	Receiver (kg)	Control Panel (kg)	Waterbox (kg)	
									Inlet	Return
RTMG120	599	86	767	116	54	90	75	215	41	15
RTMG140	599	86	818	116	54	90/125	75	215	41	15
RTMG170	599/692	86	841	116	5	90/125	75/100	215	41	15
RTMG200	692	86	930	116	54	125	100	215	41	15
RTMG220	692	86	930	116	54	125	100/115	215	41	15

Note: *all data is the weight of a single component.*

Tubes Replacement of Chilled Water Side Heat Exchanger

If the tubes of chilled water side heat exchanger require replacement, please follow the below steps:

1. With the unit off, disconnect and lock all power supplies.
2. Recover the refrigerant and confirm the pressure inside the heat exchanger has already been released before the next step.
3. Remove the waterboxes.
4. Refer to Figure 3, pull and replace the heat exchanger tubes in the correct pulling direction.
5. Perform leak test of refrigerant side.
6. Reinstall the waterboxes, connect external water pipes, and perform a leak test of the waterside.

NOTICE

Heat Exchanger Tubes Damage!

The heat exchanger tubes have protections at both ends and in the center. When replacing tubes, pay attention to ensure that the tubes are at the right locations, in order to prevent damage to the tubes or affecting system performance.

Compressor Replacement

If a compressor needs to be replaced, follow the procedure listed below:

1. Disconnect and lock the power to the chiller. Remove the electrical junction box cover and disconnect the wires, solenoid valve, high-pressure switch, and other components.

⚠WARNING

Hazardous Voltage!

Disconnect all electrical power, including remote disconnects before servicing. Follow proper lockout/tagout (LOTO) procedures to ensure the power cannot be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

2. Recover the refrigerant.
3. Disassemble the vertical pillars on the compressor side and move them to the position of dotted lines as shown in Figure 32.
4. After confirming the internal pressure of the compressor has been released, disassemble all parts connecting the compressor, including suction and discharge flanges, and angle valves of main oil pipes. Prepare a container to collect and weigh the oil drained from the compressor before unscrewing the return oil pipe connector at the bottom.
5. Dismantle the terminal box on top of the compressor. Remove the 3 fixing bolts at the bottom of the compressor, and steadily remove the compressor from the base frame with a forklift which should support the weight of the compressor (see Table 13).
6. Take samples of the collected oil for analysis. If the oil has deteriorated, completely drain and weigh the oil inside the oil separator and oil pipes.
7. Install the new compressor. Reinstall all pipelines, connections, wires, and screws/bolts. Open the maintenance (service) valves.
8. Reassemble the vertical pillars.
9. Vacuumize and recharge the oil and refrigerant after performing the leak tests.

Note: *The weight of oil charged = the weight of oil drained + 0.8 kg.*

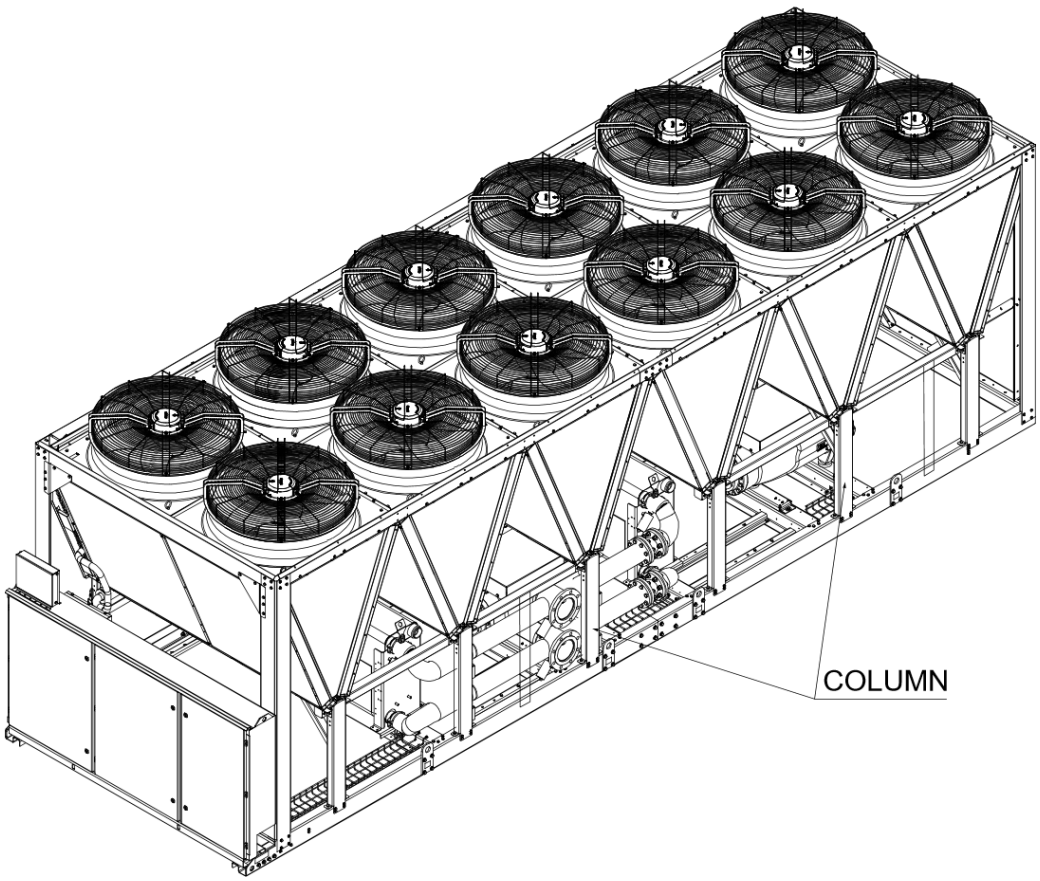
10. Power on for trial running. Check the suction and discharge pressure of the compressor whether within the range of Table 9 after the compressor has stabilized its operation.

⚠WARNING

Compressor Damage!

Incorrect wiring will result in the compressor rotating in reverse and damaging the compressor.

Figure 32. Compressor Replacement



Fan Replacement

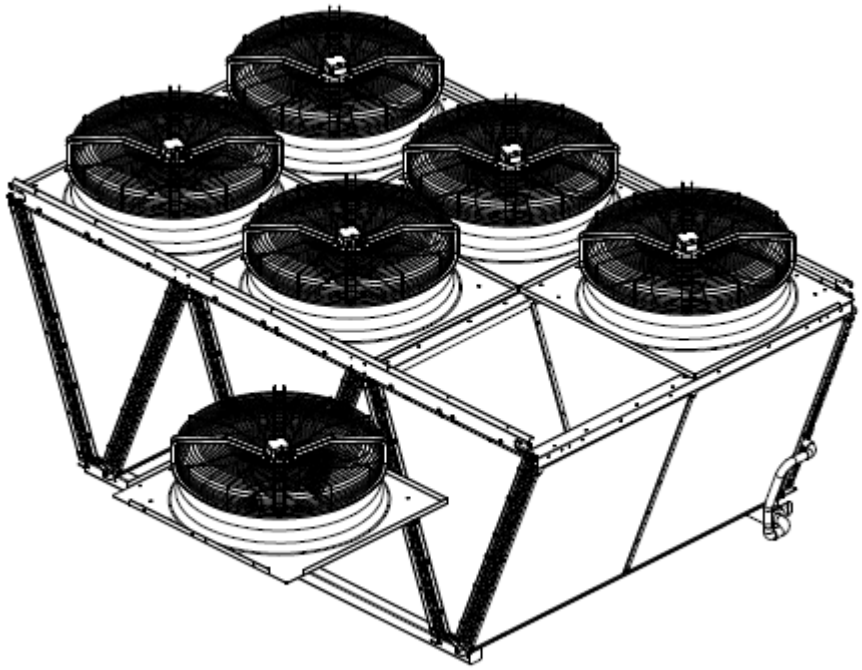
Fan replacement should follow the procedure listed below:

1. Disconnect and lock all power supplies.
2. Disconnect the wiring in the terminal box of the malfunctioned fan.
3. Remove the fixing bolts of the guard and orifice of the malfunctioned fan.
4. Dismantle the components of the malfunctioned fan, replace it with a new set, and tighten the surrounding fixing bolts of the guard.
5. Reconnect the electrical wirings. Ensure the line marks are correct and the seal ring should cover the electrical wirings without wrinkling. The wirings should be fixed on the guard with cable ties as shown in Figure 33.

Note: *The water-proof nuts of the fan terminal box should be tightened to prevent short circuits from moisture.*

6. Confirm the fan blades can freely rotate before powering on for trail running.
7. Confirm the correct fan rotation after running.

Figure 33. Fan Replacement



Reversing Valve Replacement

Reversing valve replacement should follow the procedure listed below:

1. Disconnect and lock all power suppliers.
2. Recover the refrigerant.
3. Disassemble the control coil of the malfunctioned reversing valve.
4. Cut off the four connection pipes of the valve as Figure 34.

⚠CAUTION

System Cleanness!

Prevent debris from entering the system when cutting off the connection pipes of the reversing valve.

5. Unscrew the fixing bolts of the reversing valves and remove the malfunctioned reversing valve.
6. Desolder the four connection pipes of the reversing valve.

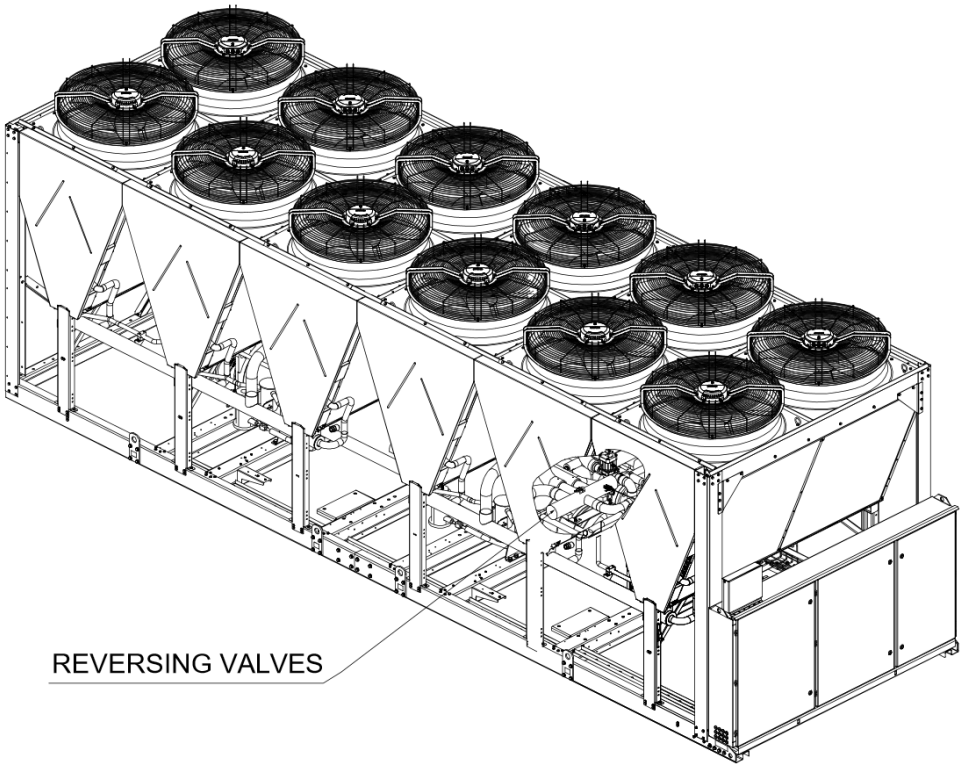
⚠CAUTION

Braze Precautions!

- **Only qualified personnel are allowed to braze with protective gloves and goggles.**
- **Provide adequate ventilation in enclosed or low-overhead areas. Inhalation of high concentrations of vapor is harmful and may cause heart irregularities, unconsciousness, or death.**
- **DO NOT USE TORCH to remove any component when the system contains oil and refrigerant under pressure. Refrigerant in contact with an open flame produces toxic gases. Oil can ignite when exposed to torch flame.**
- **Have a fire extinguisher available for all brazing operations.**
- **Nitrogen purge is required during the brazing.**

7. Install the new reversing valve. Connect the three connection pipes on the same side of the reversing valve at first, then the other side pipe.
8. Braze the connecting pipes, fix the valve body, and reinstall the coil after the refrigerant leak test.
9. Evacuate and recharge the refrigerant.
10. Unit power on and trial running to confirm the normal switching of the reversing valve.

Figure 34. Reversing Valve Replacement



Single Coil Replacement

Single coil replacement should follow the procedures below.

1. Disconnect and lock power supplies.
2. Recover the refrigerant.
3. Disassemble the fan assembly above the damaged coil.
4. Remove the sheet metal of the coil as Figure 35.

Note: *additional fixture needed before coil dismantling. For detailed information, contact the local Trane office.*

5. Completely release the system refrigerant pressure and disconnect the gas and liquid connection pipe of the coil.
6. Attach chains or cables to lift the coil. Refer to Table 13, each of the cables (chains or slings) used to lift the unit must be capable of supporting the entire weight of the coil.
7. Adjust as necessary for an even level lift to remove and replace the coil.

⚠ WARNING

Heavy Objects!

Failure to properly lift the waterbox could result in death or serious injury.

8. Braze the connecting pipes of the new coil, and reinstall the sheet metal covers after the leak test.

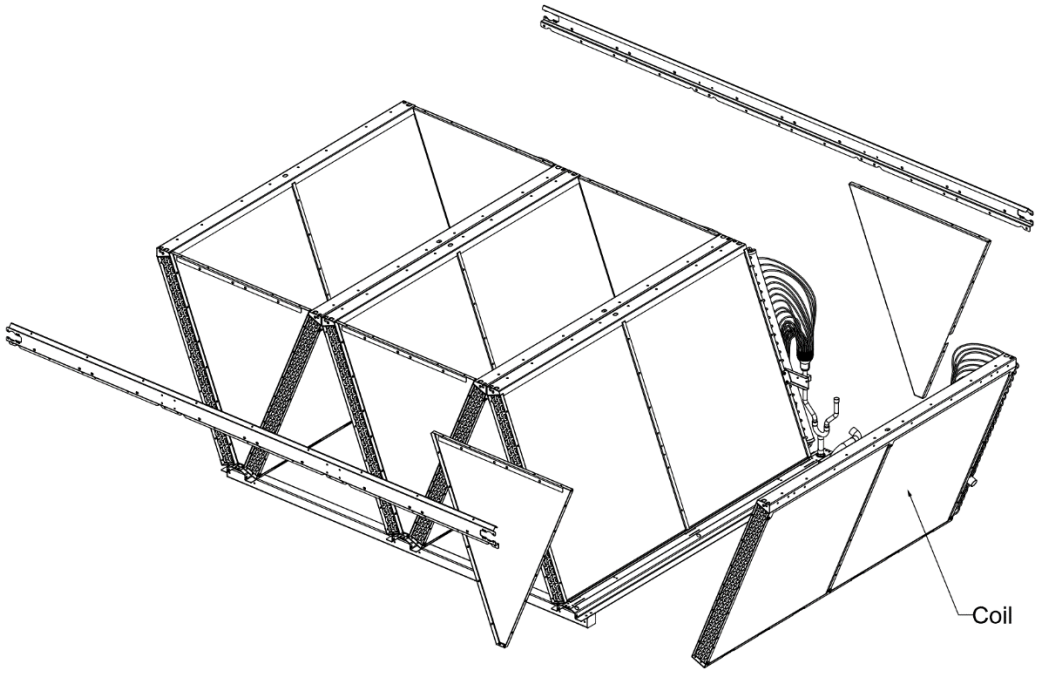
⚠ CAUTION

Braze Precautions!

- **Only qualified personnel are allowed to braze with protective gloves and goggles.**
- **Provide adequate ventilation in enclosed or low-overhead areas. Inhalation of high concentrations of vapor is harmful and may cause heart irregularities, unconsciousness, or death.**
- **DO NOT USE TORCH to remove any component when the system contains oil and refrigerant under pressure. Refrigerant in contact with an open flame produces toxic gases. Oil can ignite when exposed to torch flame.**
- **Have a fire extinguisher available for all brazing operations.**
- **Nitrogen purge is required during the brazing.**

9. Evacuate and recharge the refrigerant.
10. Unit power on and trial running to verify the suction and discharge pressure of the compressor within the range of Table 9 after the compressor runs steadily.

Figure 35. Single Coil Replacement



Troubleshooting

Diagnostic	Possible Causes	Resolution
Fan Not Working	Circuit fuse blown or poorly contacted	Inspect and replace the fan fuses
	Fan AC contactor coil burnt or poorly contacted	Identify and replace the failed contactor
	Motor internal thermal protection cutoff	Wait for the motor to cool down and for protection automatic reset
	Voltage too low	Check and fix the unit power supply
	Broken or short circuit of motor wiring	Check and fix/replace the motor
	Broken or short circuit of terminals	Check and fix/replace the terminals
	Phase loss of motor	Check the wiring of the motor
Fan Reverse Rotation	Reverse wire connection of motor	Check the wiring of the motor
Compressor Not Working	Water flow switch open	Low water flow rate, water pump not working, or waterside shut-off valve closed
	Alarm not reset	Manual reset to clear
	Contactor coil malfunction	Replace the contactor
	Terminal connection loosen	Polish and tighten connections of the terminals
	Refrigerant overcharged	Adjust the refrigerant charge
Compressor Cannot Stop	Contactor adhesion	Replace the contactor
Compressor Cannot Load/Unload	Compressor load/unload solenoid valve body failure	Replace the solenoid valve
	Compressor load/unload solenoid valve coil failure	Replace the coil of the solenoid valve
	Wrong wiring of the compressor load/upload solenoid valves	Check the solenoid valve wiring
Oil Loss	Compressor internal oil filter blocked	Replace the filter element
	Electrical heater fault of oil separator or compressor	Replace the electrical heater
	Oil sump without a preheat before startup after a long-time shutdown	The oil sump preheats for at least 12 hours before unit startup after a long-time shutdown
	Receiver Fill/Discharge solenoid valve failure	Check and replace the solenoid valve
	Oil sump level sensor failure	Check and replace the oil level sensor
	Economizer electric expansion valve fails to close	Check and replace the EEV
Unable to Switch Modes between Cooling, Heating, and Heat Recovery	Reversing valve coil failure	Replace the reversing valve coil
	Reversing valve body failure	Replace the reversing valve body
	Low refrigerant differential pressure	Check the refrigerant differential pressure during the switch
	Revering valve slider blocked	Replace the reversing valve body
Poor Heating Capability	Low ambient temperature	Lower ambient temperature, less heating capacity
	Outdoor fan failure	Check and replace the fan
	Refrigerant filter blocked	Check and replace the filter element
	Hot water BPHE fouling	Clean the hot water BPHE
	Fin-tube Coil blocked	Clean the air side heat exchanger
	Refrigerant undercharge	Leak check and add refrigerant
	Compressor cannot run at full load	Check the compressor step valve and load/unload the solenoid valve and the wiring
Poor Cooling Capacity	High ambient temperature	Higher ambient temperature, less cooling capacity
	Refrigerant undercharge	Leak check and add refrigerant
	Refrigerant filter blocked	Check and replace the filter element
	Partial fan(s) failure	Check and replace the fan
	Fin-tube Coil blocked	Clean the air side heat exchanger
	Chilled water heat exchanger fouling	Clean the tube inner surface of the falling film tube

High Discharge Pressure	Refrigerant overcharge	Adjust refrigerant charge
	(Cooling) Fin-tube coil blocked	Check and clean the air-side heat exchanger
	(Cooling) Fan motor failure	Check the fan and wiring
	(Heating) Hot water BPHE fouling	Clean the water side of BPHE
	(Heating) Low water flow rate of falling film	Check and clean the water strainer
	Non-condensable gases in the refrigerant system	Refrigerant recover, evacuate, and recharge refrigerant
Low Suction Pressure	Refrigerant leakage	Leakage check and supplement refrigerant
	Refrigerant filter blocked	Check and replace the filter element
	(Cooling) Low water flow rate of evaporator	Check and clean the water strainer
	(Heating) Fan motor failure	Check and replace the fan
	(Heating) Fin-tube Coil blocked	Check and clean the air-side heat exchanger
	Reversing valve slider is not in place	Check the reversing valve
Chiller Cannot Startup after Power Recovery	12 hours oil heat waiting function active after power-on reset	Waiting for oil preheat or contact TRANE local service
Loss/Reverse Phase Diagnostics of Power Supply	Power supply or wiring failure	Check the power supply and phase sequence
	Low unit startup current	Check the startup module and transformers

EC Declaration of Conformity

For the following equipment-

Product:	Air-Cooled Screw Four-Pipe Chiller Heat Pump
Type Designation/Trademark:	RTMG series
Manufacturers Name:	Trane Air Conditioning Systems (China) Co., Ltd.
Manufacturers Address:	No. 88 East Suzhou Road, Taicang, 215400 Jiangsu, P.R. China

Refer to in this declaration conforms to the following directive(s)/standards:

Machinery Directive 2006/42/EC

EN ISO 12100:2010, EN ISO 13857:2008, EN 60204-1:2006+A1+AC, EN 378-1:2016,

EN 378-2:2016

EMC Directive 2014/30/EU

EN 61000-6-2:2005, EN 61000-6-4:2007+A1:2011

The company named above will keep on file for review the following technical documentation:

- Operating and maintenance instructions
- Technical drawings
- Description of measures designed to ensure conformity
- Other technical documentation ,e.g., quality assurance measures for design and production

Name and address of the person (established in the Community) complied the technical files:

SOCIETE Trane 1 rue des Amériques F 88190 GOLBEY

Responsible for making this declaration is the:

Manufacturer ■ Authorized representative established within the EU □

Authorized representative established within the EU (if applicable):

Company Name : .....

Company Address : .....

Person responsible for making this declaration

Name, Surname : Wendy Wen

Position/Title : Quality Manager

Taicang **Jan.19.2024** _____

(place) (date) (company stamp and legal signature)

Trane - by Trane Technologies (NYSE: TT), a global climate innovator - creates comfortable, energy efficient indoor environments for commercial and residential applications. For more information, please visit trane.com or tranetechnologies.com.

RTMG-SVX002A-EN April 2024

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