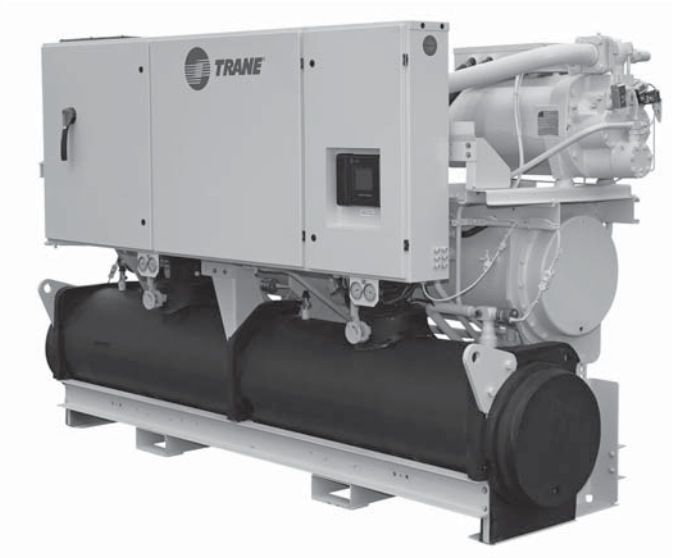
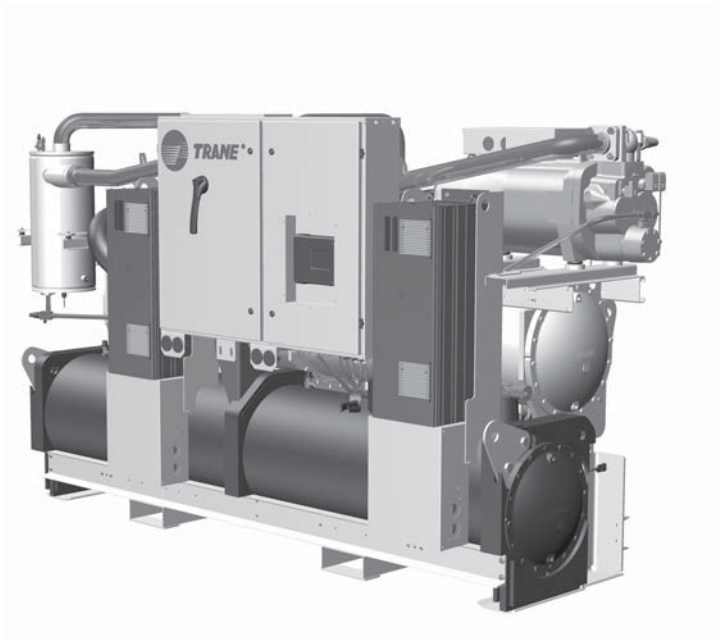




# Installation Operation Maintenance

**Series R™ Helical Rotary Water-Cooled Liquid  
and Compressor Chillers  
Models RTWD (R134a-R1234ze) and RTUD (R134a)**



**RLC-SVX14H-GB**  
Original instruction

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# General information

## Foreword

These instructions are given as a guide to good practice in the installation, start-up, operation, and maintenance by the user, of Trane RTWD/RTUD chillers. They do not contain full service procedures necessary for the continued successful operation of this equipment. The services of a qualified technician should be employed through the medium of a maintenance contract with a reputable service company. Read this manual thoroughly before unit start-up.

Units are assembled, pressure tested, dehydrated, normally charged with refrigerant for RTWD or nitrogen for RTWD-G 51234ze)/RTUD and tested in accordance with factory standard before shipment.

## Warnings and cautions

Warnings and Cautions appear at appropriate sections throughout this manual. Your personal safety and the proper operation of this machine require that you follow them carefully. The constructor assumes no liability for installations or servicing performed by unqualified personnel.

**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, may result in minor or moderate injury. It may also be used to alert against unsafe practices or for equipment or property-damage-only accidents.

## Safety recommendations

To avoid death, injury, equipment or property damage, the following recommendations should be observed during maintenance and service visits:

1. The maximum allowable pressures for system leak testing on low and high pressure side are given in the chapter "Installation". Insure to do not exceed test pressure by using appropriate device.
2. Disconnect all power supplies before any servicing on the unit.
3. Service work on the refrigeration system and the electrical system should be carried out only by qualified and experienced personnel.
4. To avoid any risk, it is recommended to place the unit on an area with restricted access.

## Reception

On arrival, inspect the unit before signing the delivery note. Specify any visible damage on the delivery note, and send a registered letter of protest to the last carrier of the goods within 7 days of delivery.

Notify the local TRANE sales office at the same time. The delivery note must be clearly signed and countersigned by the driver.

Any concealed damage shall be notified by a registered letter of protest to the last carrier of the goods within 7 days of delivery. Notify the local TRANE sales office at the same time.

Important notice: No shipping claims will be accepted by TRANE if the above mentioned procedure is not respected.

For more information, refer to the general sales conditions of your local TRANE sales office.

**Note: Unit inspection in France. Delay to send registered letter in case of visible and concealed damage is only 72 hours.**

## Loose Parts Inventory

Check all the accessories and loose parts that are shipped with the unit against the shipping list. Included in these items will be the water vessel drain plugs Water Flow Switch (optional), rigging and electrical diagrams, service literature, which are placed inside the control panel and/or starter panel for shipment.

Also check for optional components, such as flow switches and isolators. The isolators' location and distribution weight diagram is placed with the service literature inside the starter/ control panel.

## Warranty

Warranty is based on the general terms and conditions of the manufacturer. 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.

## General information

### Refrigerant

The refrigerant provided by the manufacturer meets all the requirements of our units. When using recycled or reprocessed refrigerant, it is advisable to ensure its quality is equivalent to that of a new refrigerant. For this, it is necessary to have a precise analysis made by a specialized laboratory. If this condition is not respected, the manufacturer warranty could be cancelled.

Consult the addendum to Manuals for units with refrigerant, for conformity to the Pressure Equipment Directive (PED) 97/23/EC and Machinery Directive 2006/42/EC and for specific caution with R1234ze.

### Maintenance contract

It is strongly recommended that you sign a maintenance contract with your local Service Agency. This contract provides regular maintenance of your installation by a specialist in our equipment. Regular maintenance ensures that any malfunction is detected and corrected in good time and minimizes the possibility that serious damage will occur. Finally, regular maintenance ensures the maximum operating life of your equipment. We would remind you that failure to respect these installation and maintenance instructions may result in immediate cancellation of the warranty.

### Training

To assist you in obtaining the best use of it and maintaining it in perfect operating condition over a long period of time, the manufacturer has at your disposal a refrigeration and air conditioning service school. The principal aim of this is to give operators and technicians a better knowledge of the equipment they are using, or that is under their charge. Emphasis is particularly given to the importance of periodic checks on the unit operating parameters as well as on preventive maintenance, which reduces the cost of owning the unit by avoiding serious and costly breakdown.

### Unit Description

The RTWD units are helical-rotary type, water-cooled, liquid chillers, designed for installation indoors. The units have 2 independent refrigerant circuits, with one compressor per circuit. The RTWD units are packaged with an evaporator and condenser.

Note: Each RTWD unit is a completely assembled, hermetic package that is factory-piped, wired, leak-tested, dehydrated, charged and tested for proper control operations prior to shipment. The chilled water inlet and outlet openings are covered for shipment.

The RTWD series features Trane's exclusive Adaptive Control logic with CH530 controls. It monitors the control variables that govern the operation of the chiller unit. Adaptive Control logic can correct these variables, when necessary, to optimize operational efficiencies, avoid chiller shutdown, and keep producing chilled water. Compressor loading/unloading is provided by:

- Slide valve solenoid activated on RTWD SE, HE and XE versions
- AFD (Adaptive Frequency drive) coordinated with slide valve operation on RTWD HSE

Each refrigerant circuit is provided with filter, sight glass, electronic expansion valve, and charging valves on the RTWD.

The evaporator and condenser are manufactured in accordance with Pressure Equipment Directive standards. The evaporator is insulated according the option ordered. Both evaporator and condenser are equipped with water drain and vent connections.

The RTUD units are helical-rotary type compressor chillers. The RTUD unit consists of an evaporator, two helical rotary compressors (one per circuit), oil separators, oil coolers, liquid line service valves, sight glasses, electronic expansion valves and filter. The discharge line leaving the oil separator and liquid line entering the filters are capped and brazed. The unit ships with a nitrogen holding charge but without oil charge.



# Model number

## Digits 01, 02, 03, 04 – Chiller Model

RTWD = Water Cooled Chiller Series R™

RTUD - Compressor Chiller Series R™

## Digit 05, 06, 07 – Unit Nominal Tonnage

060 = 60 Nominal Tons

070 = 70 Nominal Tons

080 = 80 Nominal Tons

090 = 90 Nominal Tons

100 = 100 Nominal Tons

110 = 110 Nominal Tons

120 = 120 Nominal Tons

130 = 130 Nominal Tons

140 = 140 Nominal Tons

160 = 160 Nominal Tons

170 = 170 Nominal Tons

180 = 180 Nominal Tons

190 = 190 Nominal Tons

200 = 200 Nominal Tons

220 = 220 Nominal Tons

250 = 250 Nominal Tons

260 = 260 tons Nominal  
(RTWD With AFD Only)

270 = 270 tons Nominal  
(RTWD With AFD Only)

## Digit 08 – Unit Voltage

E = 400/50/3

## Digit 09 – Manufacturing Plant

1 = Epinal, France

## Digit 10, 11 – Design Sequence

increment when parts are affected for service purposes

## Digits 12 – Unit Type

1 = Standard Efficiency

2 = High Efficiency

3 = Extra Efficiency

## Digit 13 – Agency Listing

B = CE Listing

## Digit 14 – Pressure Vessel Code

5 = PED

6 = DLI

## Digit 15 – Unit Application

A = Std Condenser  $\leq 35^{\circ}\text{C}$  Entering Water Temperature (RTWD only)

B = High Temperature Condenser  $> 35^{\circ}\text{C}$  Entering Water Temperature (RTWD only)

C = Water-to-Water Heat Pump (RTWD only)

D = Remote Condenser by Trane (RTUD only)

E = Remote Condenser by Others (RTUD only)

## Digit 16 – Pressure Relief Valve

1 = Single Relief Valve

2 = Dual Relief Valve with 3-Way Isolation Valve

## Digit 17 – Water Connection Type

A = Grooved Pipe Connection

## Digit 18 – Evaporator Tubes

A = Internal and External Enhanced Evap Tube

## Digit 19 – Number of Evap Passes

1 = 2 Pass Evaporator

2 = 3 Pass Evaporator

## Digit 20 – Evaporator Water Side Pressure

A = 10 bar Evaporator Water Pressure

## Digit 21 – Evaporator Application

1 = Standard Cooling

2 = Low Temperature

3 = Ice Making

## Digit 22 – Condenser Tubes

A = Enhanced Fin - Copper (RTWD only)

B = Enhanced fin - Cupro Nickel 90/10 tubes

X = Without condensor (RTUD)

## Digit 23 – Condenser Water Side Pressure

0 = without condenser

1 = 10 Bar Condenser Water Pressure

## Digit 24 – Compressor Starter Type

Y = Wye-Delta Closed Transition Starter

B = Adaptive Frequency Drive (HSE Version)

## Model number

### Digit 25 – Incoming Power Line Connection

1 = Single Point Power Connection

### Digit 26 – Power Line Connection Type

A = Terminal Block Connection for Incoming Lines

C = Disconnect Switch Wired to Fuses

D = Circuit Breaker

### Digit 27 – Under/Over Voltage Protection

0 = No Under/Over Voltage Protection

1 = Under/Over Voltage Protection

### Digit 28 – Unit Operator Interface

A = English

B = Spanish

D = French

E = German

F = Dutch

G = Italian

J = Portuguese

R = Russian

T = Polish

U = Czech

V = Hungarian

W = Greek

X = Romanian

Y = Swedish

### Digit 29 – Remote Interface (Digital Comm)

1 = LonTalk/Tracer Summit Interface

2 = Time of Day Scheduling

4 = Unit Level BACnet

5 = Modbus interface

### Digit 30 – External Water & Current-Limit Setpoint

0 = No External Water & Current-Limit Setpoint

A = External Water & Current-Limit Setpoint - 4–20 mA

B = External Water & Current-Limit Setpoint - 2–10 Vdc

### Digit 31 – Ice Making

0 = No Ice Making

A = Ice Making with Relay

B = Ice Making without Relay

### Digit 32 – Programmable Relays

0 = No Programmable Relays

A = Programmable Relays

### Digit 33 – Condenser Refrigerant Pressure Output Option

0 = No Condenser Refrigerant Pressure Output

1 = Condenser Water Control Output

2 = Condenser Pressure (%HPC) Output

3 = Differential Pressure Output

### Digits 34 – Outdoor Air Temp Sensor

0 = No Outdoor Air Temp Sensor (RTWD only)

A = Outdoor Air Temp Sensor-CWR/Low Ambient

### Digit 35 – Condenser Leaving Hot Water Temp Control

0 = No Condenser Leaving Hot Water Temp Control

1 = Condenser Leaving Hot Water Temp Control

### Digit 36 – Power Meter

0 = No Power Meter

P = Power Meter

### Digit 37 – Motor Current Analog Output (%RLA)

0 = No Motor Current Analog Output

1 = Motor Current Analog Output

### Digit 38 - A/C Fan Control

0 = No Fan control (RTWD)

A = Fan Control by others (RTUD)

B = Integral Fan Control (RTUD)



## Model number

### Digit 39 – Low Ambient Fan Control Type

- 0 = No Low Ambient Fan Control Type (RTWD)
- 1 = Two-speed fans (RTUD)
- 2 = Variable Speed Fan with Analog Interface (RTUD)

### Digit 40 – Installation Accessories

- 0 = No Installation Accessories
- A = Elastomeric Isolators
- B = Grooved Pipes and Couplings
- C = Elastomeric Isolators & Grooved Pipes and Couplings
- D = Pipe Stub and Coupling Kit
- E = Elastomeric Isolators & Pipe Stub and Coupling Kit

### Digit 41 – Flow Switch

- 0 = No Flow Switch
- 5 = 10 bar IP-67; Flow Switch x 1
- 6 = 10 bar IP-67; Flow Switch x 2
- 7 = Factory Installed Proof of Water Flow

### Digit 42 – 2-Way Water Regulating Valve

- 0 = No 2-Way Water Regulating Valve

### Digit 43 – Sound Reduction Package

- 0 = No Sound Reduction Package
- A = Sound Reduction – Factory Installed

### Digit 44 – Insulation

- 0 = No Insulation
- 1 = Factory Insulation - All Cold Parts
- 2 = Insulation for High Humidity

### Digit 45 – Factory Charge

- 0 = R134a
- 1 = Nitrogen charge for R134a field charged
- Z = R1234ze
- Y = Nitrogen charge for R1234ze field charged

### Digit 46 – Base Rail Forklifting

- 0 = No Base Rail Forklifting
- B = Base Rail Forklifting

### Digit 47 – Label and Literature Language

- B = Spanish
- C = German
- D = English
- E = French
- H = Dutch
- J = Italian
- K = Finish
- M = Swedish
- P = Polish
- R = Russian
- T = Czech
- U = Greek
- V = Portuguese
- X = Romanian
- Y = Turkish
- 2 = Hungarian

### Digit 48 – Special

- 0 = None
- S = Special

### Digit 49 – 55

- 0 = None

### Digit 56 – Shipping Package

- 2 = Shrink Wrap
- 4 = Container

### Digit 57 – Control Panel IP 20 Protection

- 0 = No IP 20 Protection of Control Panel
- 1 = IP 20 Protection of Control Panel

### Digit 58 – Pressure Gages

- 0 = Without Pressure Gages
- 1 = With Pressure Gages

### Digit 59 – Performance Test Options

- A = Standard Test TRANE Specifications (SES) (RTWD only)
- 0 = No Performance Test
- B = Customer Inspection with Standard Test
- C = 1 Point Test with Report
- D = 2 Point Test with Report
- E = 3 Point Test with Report
- F = 4 Point Test with Report
- G = Witness 1 Point Test with Report
- H = Witness 2 Point Test with Report
- J = Witness 3 Point Test with Report
- K = Witness 4 Point Test with Report



# General data

**Table 1 - RTWD Standard Efficiency - R134a**

		RTWD 160	RTWD 170	RTWD 190	RTWD 200
<b>Indicative performances</b>					
Cooling Capacity (1)	(kW)	582.0	642.0	700.0	769.0
Total Power input in cooling (1)	(kW)	133.0	149.0	161.0	174.0
Heating Capacity (2)	(kW)	568.3	624.2	679.8	746.8
Total Power input in heating (2)	(kW)	138.3	154.1	167.0	181.7
<b>Compressor</b>					
Compressor Number per Circuit	#	1/1	1/1	1/1	1/1
Type		Screw			
Model		M2/N1	N1/N1	N1/N2	N2/N2
<b>Evaporator</b>					
Quantity	#	1			
Type		Flooded shell and tube heat exchanger			
Evaporator model		E3BM2	E3BM1	E3BM1	E3BMJ
Evaporator Water Content volume	(l)	69.4	75.5	84.0	90.1
<b>Two pass evaporator</b>					
Evap. Water Flow rate - Minimum (3)	(l/s)	8.4	9.3	10.6	11.5
Evap. Water Flow rate - Maximum (3)	(l/s)	30.7	34.1	38.9	42.3
Nominal water connection size (Grooved coupling)	(in) - (mm)	5 1" (139.7 mm)	5 1" (139.7 mm)	5 1" (139.7 mm)	5 1" (139.7 mm)
<b>Three pass evaporator</b>					
Evap. Water Flow rate - Minimum (3)	(l/s)	5.6	6.2	7.1	7.7
Evap. Water Flow rate - Maximum (3)	(l/s)	20.4	22.7	25.9	28.2
Nominal water connection size (Grooved coupling)	(in) - (mm)	4" (114.3 mm)	4" (114.3 mm)	4" (114.3 mm)	4" (114.3 mm)
<b>Condenser</b>					
Quantity	#	1			
Type		Shell and Tube Heat Exchanger			
Condenser model		C3BM2	C3BM2	C3BM1	C3BMJ
Condenser Water Content volume	(l)	87.5	93.6	102.9	111.1
<b>Two pass condenser</b>					
Cond. Water Flow rate - Minimum	(l/s)	11.0	12.1	13.6	15.0
Cond. Water Flow rate - Maximum	(l/s)	40.4	44.2	49.9	55.0
Nominal water connection size (Grooved coupling)	(in) - (mm)	6" (168.3 mm)	6" (168.3 mm)	6" (168.3 mm)	6" (168.3 mm)
<b>Dimensions (4)</b>					
Unit Length	(mm)	3490	3490	3490	3490
Unit Width	(mm)	1310	1310	1310	1310
Unit Height	(mm)	1970	1970	1970	1970
<b>Weights (5)</b>					
Shipping Weight	(kg)	3718	3881	3900	3924
Operating Weight	(kg)	3874	4049	4086	4125
<b>System data (6)</b>					
Nb of refrigerant circuit	#	2	2	2	2
Minimum cooling load %	%	30	30	30	30
<b>Standard unit</b>					
R134a refrigerant charge Circuit1 / Circuit 2 (6)	(kg)	65/67	65/65	65/67	65/66
Oil charge Circuit1 / Circuit 2	(l)	9.9/11.7	11.7/11.7	11.7/11.7	11.7/11.7
POE Oil type		OIL048E or OIL023E			

- (1) Indicative performance at Evaporator water temperature: 12°C / 7°C - Condenser water temperature 30°C/35°C - for detailed performances consult order write up.
- (2) Indicative performance at Evaporator water temperature: 10°C / 7°C - Condenser water temperature 40°C/45°C - for detailed performances consult order write up.
- (3) Not applicable for Glycol application - see tables with Minimum Flow with Glycol.
- (4) These dimensions are the maximum for a specific size, they may vary from one configuration to another within a same size. For accurate dimensions of a specific configuration, refer to relevant submittal drawings.
- (5) All weights +/-5% and are the maximum for each size and may vary from one configuration to another for the same size (add 62kg for unit with acoustic package) and refer to relevant drawing for a specific configuration.
- (6) System data are indicative and subject to change without notice. Please refer to unit nameplate data.

## General data

**Table 2 - RTWD High Efficiency - R134a**

		RTWD 60	RTWD 70	RTWD 80	RTWD 90	RTWD 100	RTWD 110	RTWD 120
<b>Indicative performances</b>								
Cooling Capacity (1)	(kW)	235.0	276.0	317.0	365.0	390.0	417.0	452.0
Total Power input in cooling (1)	(kW)	48.0	57.0	65.0	74.0	79.0	84.0	91.0
Heating Capacity (2)	(kW)	250.3	299.2	340.1	386.8	414.1	443.9	477.4
Total Power input in heating (2)	(kW)	57.9	70.1	80.0	90.4	96.1	102.4	109.2
<b>Compressor</b>								
Compressor Number per Circuit	#	1/1	1/1	1/1	1/1	1/1	1/1	1/1
Type		Screw						
Model		K1/K1	K2/K2	K2/L1	L1/L1	L1/L2	L2/L2	L2/M1
<b>Evaporator</b>								
Quantity	#	1	1	1	1	1	1	1
Type		Flooded shell and tube heat exchanger						
Evaporator model		E1AM2	E1AM1	E1AMJ	E2AM2	E2AM2	E2AM1	E2AMJ
Evaporator Water Content volume	(l)	37.0	40.2	45.2	57.9	57.9	62.3	65.4
<b>Two pass evaporator</b>								
Evap. Water Flow rate - Minimum (3)	(l/s)	4.5	5.0	5.7	7.0	7.0	7.7	8.2
Evap. Water Flow rate - Maximum (3)	(l/s)	16.6	18.4	21.1	25.7	25.7	28.2	30.0
Nominal water connection size (Grooved coupling)	(in) - (mm)	411 (114.3 mm)	411 (114.3 mm)	411 (114.3 mm)	5 1" (139.7 mm)	5 1" (139.7 mm)	5 1" (139.7 mm)	5 1" (139.7 mm)
<b>Three pass evaporator</b>								
Evap. Water Flow rate - Minimum (3)	(l/s)	3.0	3.3	3.8	4.7	4.7	5.1	5.4
Evap. Water Flow rate - Maximum (3)	(l/s)	11	12.2	14.1	17.2	17.2	18.8	20
Nominal water connection size (Grooved coupling)	(in) - (mm)	3" (88.9 mm)	3" (88.9 mm)	3" (88.9 mm)	4" (114.3 mm)	4" (114.3 mm)	4" (114.3 mm)	4" (114.3 mm)
<b>Condenser</b>								
Quantity	#	1	1	1	1	1	1	1
Type		Shell and Tube Heat Exchanger						
Condenser model		C1AM2	C1AM2	C1AMJ	C2AM3	C2AM2	C2AM2	C2AMJ
Condenser Water Content volume	(l)	45.1	45.1	52.2	58.1	62.7	62.7	68.3
<b>Two pass condenser</b>								
Cond. Water Flow rate - Minimum	(l/s)	5.4	5.4	6.6	7.3	8.1	8.1	9.1
Cond. Water Flow rate - Maximum	(l/s)	19.9	19.9	24.4	26.9	29.8	29.8	33.2
Nominal water connection size (Grooved coupling)	(in) - (mm)	5 1" (139.7 mm)	5 1" (139.7 mm)	5 1" (139.7 mm)	5 1" (139.7 mm)	5 1" (139.7 mm)	5 1" (139.7 mm)	5 1" (139.7 mm)
<b>Dimensions (4)</b>								
Unit Length	(mm)	3320	3320	3320	3320	3320	3320	3320
Unit Width	(mm)	1070	1070	1070	1060	1060	1060	1060
Unit Height	(mm)	1940	1940	1940	1960	1960	1960	1960
<b>Weights (5)</b>								
Shipping Weight	(kg)	2568	2573	2637	2812	2849	2883	3065
Operating Weight	(kg)	2650	2658	2673	2928	2970	3008	3198
<b>System data (6)</b>								
Nb of refrigerant circuit	#	2	2	2	2	2	2	2
Minimum cooling load %	%	30	30	30	30	30	30	30
<b>Standard unit</b>								
R134a refrigerant charge Circuit1 / Circuit 2 (6)	(kg)	45/45	45/45	44/44	55/55	55/56	55/55	54/54
Oil charge Circuit1 / Circuit 2	(l)	6.8/6.8	6.8/6.8	6.8/6.8	6.8/6.8	6.8/9.9	9.9/9.9	9.9/9.9
POE Oil type		OIL048E or OIL023E						

(1) Indicative performance at Evaporator water temperature: 12°C / 7°C - Condenser water temperature 30°C/35°C - for detailed performances consult order write up.

(2) Indicative performance at Evaporator water temperature: 10°C / 7°C - Condenser water temperature 40°C/45°C - for detailed performances consult order write up.

(3) Not applicable for Glycol application - see tables with Minimum Flow with Glycol.

(4) These dimensions are the maximum for a specific size, they may vary from one configuration to another within a same size. For accurate dimensions of a specific configuration, refer to relevant submittal drawings.

(5) All weights +/-5% and are the maximum for each size and may vary from one configuration to another for the same size (add 62kg for unit with acoustic package) and refer to relevant drawing for a specific configuration.

(6) System data are indicative and subject to change without notice. Please refer to unit nameplate data.

## General data

**Table 2 - RTWD High Efficiency - R134a (Continued)**

		RTWD 130	RTWD 140	RTWD 160	RTWD 180	RTWD 200	RTWD 220	RTWD 250
<b>Indicative performances</b>								
Cooling Capacity (1)	(kW)	488	531	579	638	700.1	765	836
Total Power input in cooling (1)	(kW)	99	107	114	127	138.7	155	168
Heating Capacity (2)	(kW)	512	562	616	677	740.1	812.9	888.4
Total Power input in heating (2)	(kW)	116	128	139	154	167.9	184.6	199.6
<b>Compressor</b>								
Compressor Number per Circuit	#	1/1	1/1	1/1	1/1	1/1	1/1	1/1
Type		Screw						
Model		M1/M1	M1/M2	M2/M2	M2/N1	N1/N1	N1/N2	N2/N2
<b>Evaporator</b>								
Quantity	#	1	1	1	1	1	1	1
Type		Flooded shell and tube heat exchanger						
Evaporator model		E3AM3	E3AM2	E3AM1	E3AMJ	E5AM2	E5AM1	E5AMJ
Evaporator Water Content volume	(l)	72.6	77.0	85.0	91.0	108	113.3	120.3
<b>Two pass evaporator</b>								
Evap. Water Flow rate - Minimum (3)	(l/s)	8.8	9.5	10.7	11.7	13.3	14.1	15.1
Evap. Water Flow rate - Maximum (3)	(l/s)	32.4	34.9	39.1	43.0	48.6	51.5	55.3
Nominal water connection size (Grooved coupling)	(in) - (mm)	DN125-5' (139.7 mm)	DN125-5' (139.7 mm)	DN125-5' (139.7 mm)	DN125-5' (139.7 mm)	DN150-6' (168.3 mm)	DN150-6' (168.3 mm)	DN150-6' (168.3 mm)
<b>Three pass evaporator</b>								
Evap. Water Flow rate - Minimum (3)	(l/s)	5.9	6.4	7.13	7.82	8.83	9.3	10.1
Evap. Water Flow rate - Maximum (3)	(l/s)	21.6	23.3	26.12	28.64	32.43	34.3	36.9
Nominal water connection size (Grooved coupling)	(in) - (mm)	DN150-6" (168.3 mm)	DN150-6" (168.3 mm)	DN150-6" (168.3 mm)	DN150-6" (168.3 mm)	DN150-6" (168.3 mm)	DN150-6" (168.3 mm)	DN150-6" (168.3 mm)
<b>Condenser</b>								
Quantity	#	1	1	1	1	1	1	1
Type		Shell and Tube Heat Exchanger						
Condenser model		C3AM3	C3AM2	C3AM1	C3AMJ	C5AM2	C5AM2	C5AM1
Condenser Water Content volume	(l)	81.7	86.8	93.0	99.0	118	117.8	133.3
<b>Two pass condenser</b>								
Cond. Water Flow rate - Minimum	(l/s)	10	11	12	13	15.4	15.4	18
Cond. Water Flow rate - Maximum	(l/s)	37	40	44	48	56.4	56.4	65.9
Nominal water connection size (Grooved coupling)	(in) - (mm)	DN150-6' (168.3 mm)	DN150-6' (168.3 mm)	DN150-6' (168.3 mm)	DN150-6' (168.3 mm)	DN150-6' (168.3 mm)	DN150-6' (168.3 mm)	DN150-6' (168.3 mm)
<b>Dimensions (4)</b>								
Unit Length	(mm)	3400	3400	3400	3490	3490	3490	3490
Unit Width	(mm)	1280	1280	1280	1310	1310	1310	1310
Unit Height	(mm)	1950	1950	1950	1970	2010	2010	2010
<b>Weights (5)</b>								
Shipping Weight	(kg)	3616	3638	3668	3851	4262	4273	4326
Operating Weight	(kg)	3771	3802	3846	4042	4488	4594	4579
<b>System data (6)</b>								
Nb of refrigerant circuit	#	2	2	2	2	2	2	2
Minimum cooling load %	%	30	30	30	30	30	30	30
<b>Standard unit</b>								
R134a refrigerant charge Circuit1 / Circuit 2 (6)	(kg)	61/61	60/62	61/61	60/62	81/81	80/83	82/82
Oil charge Circuit1 / Circuit 2	(l)	9.9/9.9	9.9/9.9	10/10	10/12	12/12	11.7/11.7	11.7/11.7
POE Oil type		OIL048E or OIL023E						

- (1) Indicative performance at Evaporator water temperature: 12°C / 7°C - Condenser water temperature 30°C/35°C - for detailed performances consult order write up.
- (2) Indicative performance at Evaporator water temperature: 10°C / 7°C - Condenser water temperature 40°C/45°C - for detailed performances consult order write up.
- (3) Not applicable for Glycol application - see tables with Minimum Flow with Glycol.
- (4) These dimensions are the maximum for a specific size, they may vary from one configuration to another within a same size. For accurate dimensions of a specific configuration, refer to relevant submittal drawings.
- (5) All weights +/-5% and are the maximum for each size and may vary from one configuration to another for the same size (add 62kg for unit with acoustic package) and refer to relevant drawing for a specific configuration.
- (6) System data are indicative and subject to change without notice. Please refer to unit nameplate data.

## General data

**Table 3 - RTWD Extra High Efficiency - R134a**

		RTWD 160	RTWD 180	RTWD 200
<b>Indicative performances</b>				
Cooling Capacity (1)	(kW)	598	659	709
Total Power input in cooling (1)	(kW)	114	126	136
Heating Capacity (2)	(kW)	629	691	744
Total Power input in heating (2)	(kW)	138	153	166
<b>Compressor</b>				
Compressor Number per Circuit	#	1/1	1/1	1/1
Type		Screw		
Model		M2/M2	M2/N1	N1/N1
<b>Evaporator</b>				
Quantity	#	1	1	1
Type		Flooded shell and tube heat exchanger		
Evaporator model		E4AM1	E4AMJ	E5AMJ
Evaporator Water Content volume	(l)	72.6	77.0	84.5
<b>Two pass evaporator</b>				
Evap. Water Flow rate - Minimum (3)	(l/s)	11.7	12.7	15.1
Evap. Water Flow rate - Maximum (3)	(l/s)	43.0	46.6	55.3
Nominal water connection size (Grooved coupling)	(in) - (mm)	611 (168.3 mm)	611 (168.3 mm)	611 (168.3 mm)
<b>Three pass evaporator</b>				
Evap. Water Flow rate - Minimum (3)	(l/s)	7.8	8.5	10.1
Evap. Water Flow rate - Maximum (3)	(l/s)	28.6	31	36.9
Nominal water connection size (Grooved coupling)	(in) - (mm)	411 (114.3 mm)	411 (114.3 mm)	411 (114.3 mm)
<b>Condenser</b>				
Quantity	#	1	1	1
Type		Shell and Tube Heat Exchanger		
Condenser model		C4AM2	C4AMJ	C5AMJ
Condenser Water Content volume	(l)			
<b>Two pass condenser</b>				
Cond. Water Flow rate - Minimum	(l/s)	113.4	130.6	148.2
Cond. Water Flow rate - Maximum	(l/s)	12.9	15.4	20.5
Nominal water connection size (Grooved coupling)	(in) - (mm)	47.5 6" (168.3)	56.4 6" (168.3)	75.1 6" (168.3)
<b>Dimensions (4)</b>				
Unit Length	(mm)	3830	3830	3490
Unit Width	(mm)	1280	1310	1310
Unit Height	(mm)	2010	2010	2010
<b>Weights (5)</b>				
Shipping Weight	(kg)	3954	4175	4357
Operating Weight	(kg)	4172	4408	4625
<b>System data (6)</b>				
Nb of refrigerant circuit	#	2	2	2
Minimum cooling load %	%	30	30	30
<b>Standard unit</b>				
R134a refrigerant charge Circuit1 / Circuit 2 (6)	(kg)	80/80	79/81	80/79
Oil charge Circuit1 / Circuit 2	(l)	9.9/9.9	9.9/9.9	9.9/9.9
POE Oil type		OIL048E or OIL023E		

- (1) Indicative performance at Evaporator water temperature: 12°C / 7°C - Condenser water temperature 30°C/35°C - for detailed performances consult order write up.
- (2) Indicative performance at Evaporator water temperature: 10°C / 7°C - Condenser water temperature 40°C/45°C - for detailed performances consult order write up.
- (3) Not applicable for Glycol application - see tables with Minimum Flow with Glycol.
- (4) These dimensions are the maximum for a specific size, they may vary from one configuration to another within a same size. For accurate dimensions of a specific configuration, refer to relevant submittal drawings.
- (5) All weights +/-5% and are the maximum for each size and may vary from one configuration to another for the same size (add 62kg for unit with acoustic package) and refer to relevant drawing for a specific configuration.
- (6) System data are indicative and subject to change without notice. Please refer to unit nameplate data.

## General data

**Table 4 - RTWD High Seasonal Efficiency - R134a**

		RTWD 60	RTWD 70	RTWD 80	RTWD 90	RTWD 100	RTWD 110	RTWD 120	RTWD 130
<b>Indicative performances</b>									
Cooling Capacity (1)	(kW)	234.8	276.3	316.9	364.7	389.7	417.4	452.4	487.7
Total Power input in cooling (1)	(kW)	49.4	58.8	67.7	76.9	81.4	86.6	93.5	100.8
Heating Capacity (2)	(kW)	250.3	299.2	340.1	386.8	414.1	443.9	477.4	512.1
Total Power input in heating (2)	(kW)	62.0	75.0	85.5	96.7	102.2	108.5	115.3	122.2
<b>Compressor</b>									
Compressor Number per Circuit	#	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
Type		Screw							
Model		K1/K1	K2/K2	K2/L1	L1/L1	L1/L2	L2/L2	L2/M1	M1/M1
<b>Evaporator</b>									
Quantity	#	1	1	1	1	1	1	1	1
Type		Flooded shell and tube heat exchanger							
Evaporator model		E1AM2	E1AM1	E1AMJ	E2AM2	E2AM2	E2AM1	E2AMJ	E3AM3
Evaporator Water Content volume	(l)	37.0	40.2	45.2	57.9	57.9	62.3	65.4	72.6
<b>Two pass evaporator</b>									
Evap. Water Flow rate - Minimum (3)	(l/s)	4.5	5.0	5.7	7.0	7.0	7.7	8.2	8.8
Evap. Water Flow rate - Maximum (3)	(l/s)	16.6	18.4	21.1	25.7	25.7	28.2	30.0	
Nominal water connection size (Grooved coupling)	(in) - (mm)	DN100-4' (114.3 mm)	DN100-4' (114.3 mm)	DN100-4' (114.3 mm)	DN125-5' (139.7 mm)	DN125-5' (139.7 mm)	DN125-5' (139.7 mm)	DN125-5' (139.7 mm)	DN125-5' (139.7 mm)
<b>Three pass evaporator</b>									
Evap. Water Flow rate - Minimum (3)	(l/s)	3.0	3.3	3.8	4.7	4.7	5.1	5.4	5.9
Evap. Water Flow rate - Maximum (3)	(l/s)	11.0	12.2	14.1	17.2	17.2	18.8	20.0	21.6
Nominal water connection size (Grooved coupling)	(in) - (mm)	DN80-3' (88.9 mm)	DN80-3' (88.9 mm)	DN80-3' (88.9 mm)	DN100-4' (114.3 mm)	DN100-4' (114.3 mm)	DN100-4' (114.3 mm)	DN100-4' (114.3 mm)	DN100-4' (114.3 mm)
<b>Condenser</b>									
Quantity	#	1	1	1	1	1	1	1	1
Type		Shell and Tube Heat Exchanger							
Condenser model		C1AM2	C1AM2	C1AMJ	C2AM3	C2AM2	C2AM2	C2AMJ	C3AM3
Condenser Water Content volume	(l)	45.1	45.1	52.2	58.1	62.7	62.7	68.3	81.7
<b>Two pass condenser</b>									
Cond. Water Flow rate - Minimum	(l/s)	5.4	5.4	6.6	7.3	8.1	8.1	9.1	10.0
Cond. Water Flow rate - Maximum	(l/s)	19.9	19.9	24.4	26.9	29.8	29.8	33.2	36.7
Nominal water connection size (Grooved coupling)	(in) - (mm)	DN125-5' (139.7 mm)	DN125-5' (139.7 mm)	DN125-5' (139.7 mm)	DN125-5' (139.7 mm)	DN125-5' (139.7 mm)	DN125-5' (139.7 mm)	DN125-5' (139.7 mm)	DN150-6' (168.3 mm)
<b>Dimensions (4)</b>									
Unit Length	(mm)	3320	3320	3320	3320	3320	3320	3320	3400
Unit Width	(mm)	1130	1130	1130	1120	1120	1120	1120	1300
Unit Height	(mm)	1940	1940	1940	1960	1960	1960	1960	1950
<b>Weights (5)</b>									
Shipping Weight	(kg)	2706	2711	2793	2986	3023	3057	3239	3790
Operating Weight	(kg)	2788	2796	2829	3102	3144	3182	3372	3945
<b>System data (6)</b>									
Nb of refrigerant circuit	#	2	2	2	2	2	2	2	2
Minimum cooling load %	%	30	30	30	30	30	30	30	30
<b>Standard unit</b>									
R134a refrigerant charge Circuit1 / Circuit 2 (6)	(kg)	45/45	45/45	45/44	55/55	55/56	55/55	54/54	61/61
Oil charge Circuit1 / Circuit 2	(l)	6.8/6.8	6.8/6.8	6.8/6.8	6.8/6.8	6.8/9.9	9.9/9.9	9.9/9.9	9.9/9.9
POE Oil type		OIL048E or OIL023E							

(1) Indicative performance at Evaporator water temperature: 12°C / 7°C - Condenser water temperature 30°C/35°C - for detailed performances consult order write up.

(2) Indicative performance at Evaporator water temperature: 10°C / 7°C - Condenser water temperature 40°C/45°C - for detailed performances consult order write up.

(3) Not applicable for Glycol application - see tables with Minimum Flow with Glycol.

(4) These dimensions are the maximum for a specific size, they may vary from one configuration to another within a same size. For accurate dimensions of a specific configuration, refer to relevant submittal drawings.

(5) All weights +/-5% and are the maximum for each size and may vary from one configuration to another for the same size (add 62kg for unit with acoustic package) and refer to relevant drawing for a specific configuration.

(6) System data are indicative and subject to change without notice. Please refer to unit nameplate data.

## General data

**Table 4 - RTWD High Seasonal Efficiency - R134a (Continued)**

		RTWD 140	RTWD 160	RTWD 180	RTWD 200	RTWD 220	RTWD 250	RTWD 260	RTWD 270
<b>Indicative performances</b>									
Cooling Capacity (1)	(kW)	531.1	597.7	658.5	708.6	765.4	836.4	900.6	979.5
Total Power input in cooling (1)	(kW)	108.8	115.4	128.9	140.3	159.5	172.5	202.8	218.1
Heating Capacity (2)	(kW)	562.2	629.2	691.1	744.0	812.9	888.4	959.0	1032.9
Total Power input in heating (2)	(kW)	132.1	141.3	155.4	167.5	187.1	202.5	230.0	248.8
<b>Compressor</b>									
Compressor Number per Circuit	#	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
Type		Screw							
Model		M1/M2	M2/M2	M2/N1	N1/N1	N1/N2	N2/N2	N1/N2	N2:N2
<b>Evaporator</b>									
Quantity	#	1	1	1	1	1	1	1	1
Type		Flooded shell and tube heat exchanger							
Evaporator model		E3AM2	E3AM1	E3AMJ	E5AM2	E5AM1	E5AMJ	E5AMJ	E5AMJ
Evaporator Water Content volume	(l)	77.0	72.6	77.0	84.5	113.3	120.3	113.3	120.3
<b>Two pass evaporator</b>									
Evap. Water Flow rate - Minimum (3)	(l/s)	9.5	11.7	12.7	15.1	14.1	15.1	14.1	15.1
Evap. Water Flow rate - Maximum (3)	(l/s)		43.0	46.6	55.3				
Nominal water connection size (Grooved coupling)	(in) - (mm)	DN125-5' (139.7 mm)	DN150-6' (168.3 mm)	DN150-6' (168.3 mm)	DN150-6' (168.3 mm)	DN150-6' (168.3 mm)	DN150-6' (168.3 mm)	DN150-6' (168.3 mm)	DN150-6' (168.3 mm)
<b>Three pass evaporator</b>									
Evap. Water Flow rate - Minimum (3)	(l/s)	6.4	7.8	8.5	10.1	9.3	10.1	9.3	10.1
Evap. Water Flow rate - Maximum (3)	(l/s)	23.3	28.6	31	36.9	34.3	36.9	34.3	36.9
Nominal water connection size (Grooved coupling)	(in) - (mm)	DN100-4' (114.3 mm)	DN100-4' (114.3 mm)	DN100-4' (114.3 mm)	DN100-4' (114.3 mm)	DN100-4' (114.3 mm)	DN100-4' (114.3 mm)	DN100-4' (114.3 mm)	DN100-4' (114.3 mm)
<b>Condenser</b>									
Quantity	#	1	1	1	1	1	1	1	1
Type		Shell and Tube Heat Exchanger							
Condenser model		C3AM2	C3AM1	C3AMJ	C5AM2	C5AM2	C5AM1	C5AM1	C5AM1
Condenser Water Content volume	(l)	86.8	93.0	99.0	118	117.8	133.3	117.8	133.3
<b>Two pass condenser</b>									
Cond. Water Flow rate - Minimum	(l/s)	10.9	5.4	5.4	6.6	15.4	18.0	15.4	18.0
Cond. Water Flow rate - Maximum	(l/s)	39.9	19.9	19.9	24.4	56.4	65.9	56.4	65.9
Nominal water connection size (Grooved coupling)	(in) - (mm)	DN150-6' (168.3 mm)	DN150-6' (168.3 mm)	DN150-6' (168.3 mm)	DN150-6' (168.3 mm)	DN150-6' (168.3 mm)	DN150-6' (168.3 mm)	DN150-6' (168.3 mm)	DN150-6' (168.3 mm)
<b>Dimensions (4)</b>									
Unit Length	(mm)	3400	3830	3830	3490	3490	3490	3490	3490
Unit Width	(mm)	1300	1300	1330	1340	1340	1340	1340	1340
Unit Height	(mm)	1950	2010	2010	2010	2010	2010	2010	2010
<b>Weights (5)</b>									
Shipping Weight	(kg)	3832	4168	4389	4571	4487	4540	4487	4540
Operating Weight	(kg)	3996	4386	4622	4839	4718	4793	4718	4793
<b>System data (6)</b>									
Nb of refrigerant circuit	#	2	2	2	2	2	2	2	2
Minimum cooling load %	%	30	30	30	30	30	30	30	30
<b>Standard unit</b>									
R134a refrigerant charge Circuit1 / Circuit 2 (6)	(kg)	45/45	45/45	45/44	55/55	55/56	55/55	54/54	61/61
Oil charge Circuit1 / Circuit 2	(l)	6.8/6.8	6.8/6.8	6.8/6.8	6.8/6.8	6.8/9.9	9.9/9.9	9.9/9.9	9.9/9.9
POE Oil type		OIL048E or OIL023E							

(1) Indicative performance at Evaporator water temperature: 12°C / 7°C - Condenser water temperature 30°C/35°C - for detailed performances consult order write up.

(2) Indicative performance at Evaporator water temperature: 10°C / 7°C - Condenser water temperature 40°C/45°C - for detailed performances consult order write up.

(3) Not applicable for Glycol application - see tables with Minimum Flow with Glycol.

(4) These dimensions are the maximum for a specific size, they may vary from one configuration to another within a same size. For accurate dimensions of a specific configuration, refer to relevant submittal drawings.

(5) All weights +/-5% and are the maximum for each size and may vary from one configuration to another for the same size (add 62kg for unit with acoustic package) and refer to relevant drawing for a specific configuration.

(6) System data are indicative and subject to change without notice. Please refer to unit nameplate data.

## General data

**Table 5 - RTUD - R134a**

		RTUD 60	RTUD 70	RTUD 80	RTUD 90	RTUD 100	RTUD 110	RTUD 120	RTUD 130
<b>Indicative performances</b>									
Cooling Capacity (1)	(kW)	209	250	284	323	346	372	401	430
Total Power input in cooling (1)	(kW)	55	66	75	85	91	96	103	110
<b>Compressor</b>									
Compressor Number per Circuit	#	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
Type		Screw							
Model		K1/K1	K2/K2	K2/L1	L1/L1	L1/L2	L2/L2	L2/M1	M1/M1
<b>Evaporator</b>									
Quantity	#	1	1	1	1	1	1	1	1
Type		Flooded shell and tube heat exchanger							
Evaporator model		E1AM2	E1AM1	E1AMJ	E2AM2	E2AM2	E2AM1	E2AMJ	E3AM3
Evaporator Water Content volume	(l)	37.0	40.2	45.2	57.9	57.9	62.3	65.4	72.6
<b>Two pass evaporator</b>									
Evap. Water Flow rate - Minimum (2)	(l/s)	4.5	5.0	5.7	7.0	7.0	7.7	8.2	8.8
Evap. Water Flow rate - Maximum (2)	(l/s)	16.6	18.4	21.1	25.7	25.7	28.2	30.0	32.4
Nominal water connection size (Grooved coupling)	(in) - (mm)	411 (114.3 mm)	411 (114.3 mm)	411 (114.3 mm)	51" (139.7 mm)	51" (139.7 mm)	51" (139.7 mm)	51" (139.7 mm)	51" (139.7 mm)
<b>Three pass evaporator</b>									
Evap. Water Flow rate - Minimum (2)	(l/s)	3.0	3.3	3.8	4.7	4.7	5.1	5.4	5.9
Evap. Water Flow rate - Maximum (2)	(l/s)	11	12.2	14.1	17.2	17.2	18.8	20	21.6
Nominal water connection size (Grooved coupling)	(in) - (mm)	311 (88.9 mm)	311 (88.9 mm)	311 (88.9 mm)	411 (114.3 mm)	411 (114.3 mm)	411 (114.3 mm)	411 (114.3 mm)	411 (114.3 mm)
<b>Condenser</b>									
Discharge Connection Diameter	(in)	2"1/8 / 2"1/8	2"1/8 / 2"1/9	2"1/8 / 2"1/10	2"1/8 / 2"1/11	2"1/8 / 2"5/8	2"5/8 / 2"5/8	2"5/8 / 2"5/8	2"5/8 / 2"5/8
Liquid Connection Diameter	(in)	1"1/8 / 1"1/8	1"1/8 / 1"1/8	1"1/8 / 1"1/8	1"1/8 / 1"1/8	1"1/8 / 1"1/8	1"1/8 / 1"1/8	1"1/8 / 1"1/8	1"3/8 / 1"3/8
<b>Dimensions (3)</b>									
Unit Length	(mm)	3320	3320	3320	3320	3320	3320	3320	3400
Unit Width	(mm)	1070	1070	1070	1070	1070	1070	1070	1280
Unit Height	(mm)	1960	1960	1960	1960	1960	1960	1960	1950
<b>Weights (4)</b>									
Shipping Weight	(kg)	2223	2229	2284	2382	2410	2445	2618	3078
Operating Weight	(kg)	2260	2269	2329	2440	2468	2507	2683	3151
<b>System data (5)</b>									
Nb of refrigerant circuit	#	2	2	2	2	2	2	2	2
Minimum cooling load %	%	30	30	30	30	30	30	30	30
<b>Standard unit</b>									
R134a refrigerant content Circuit1 / Circuit 2	(kg)	23/23	22/22	21/21	29/29	29/29	28/28	28/28	30/30
Oil charge Circuit1 / Circuit 2 (6)	(l)	6.8/6.8	6.8/6.8	6.8/6.8	6.8/6.8	6.8/9.9	9.9/9.9	9.9/9.9	
POE Oil type		OIL048E or OIL023E							
Maximum R134a Refrigerant charge in the system		144/144	140/140	140/140	160/160	160/160	157/157	156/156	180/180

- (1) Indicative performance at Evaporator water temperature: 12°C / 7°C - Condenser water temperature 30°C/35°C (RTWD equivalent conditions) - for detailed condenser condition and units performances consult order write up.
- (2) Not applicable for Glycol application - see tables with Minimum Flow with Glycol.
- (3) These dimensions are the maximum for a specific size, they may vary from one configuration to another within a same size. For accurate dimensions of a specific configuration, refer to relevant submittal drawings.
- (4) All weights +/-5% and are the maximum for each size and may vary from one configuration to another for the same size (add 62kg for unit with acoustic package) and refer to relevant drawing for a specific configuration.
- (5) System data are indicative and subject to change without notice. Please refer to unit nameplate data.
- (6) RTUD unit is shipped w/o oil - oil must be ordered separately as it is not coming with unit.

## General data

**Table 5 - RTUD - R134a (Continued)**

		RTUD 140	RTUD 160	RTUD 170	RTUD 180	RTUD 190	RTUD 200	RTUD 220	RTUD 250
<b>Indicative performances</b>									
Cooling Capacity (1)	(kW)	474	519	584	569	637	637	682	748
Total Power input in cooling (1)	(kW)	120	130	157	145	171	171	175	190
<b>Compressor</b>									
Compressor Number per Circuit	#	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
Type		Screw							
Model		M1/M2	M2/M2	N1/N1	M2/N1	N1/N2	N1/N1	N1/N2	N2/N2
<b>Evaporator</b>									
Quantity	#	1	1	1	1	1	1	1	1
Type		Flooded shell and tube heat exchanger							
Evaporator model		E3AM2	E3BM2	E3BM1	E3AMJ	E3BM1	E5AM2	E5AM1	E5AMJ
Evaporator Water Content volume	(l)	77.0	85.0	75.5	91.0	84.0	108.0	113.3	120.3
<b>Two pass evaporator</b>									
Evap. Water Flow rate - Minimum (2)	(l/s)	9.5	10.7	9.3	11.7	10.6	13.3	14.1	15.1
Evap. Water Flow rate - Maximum (2)	(l/s)	34.9	39.1	34.1	43	38.9	48.6	51.5	55.3
Nominal water connection size (Grooved coupling)	(in) - (mm)	5 1" (139.7 mm)	5 1" (139.7 mm)	5 1" (139.7 mm)	5 1" (139.7 mm)	5 1" (139.7 mm)	6" (168.3 mm)	6" (168.3 mm)	6" (168.3 mm)
<b>Three pass evaporator</b>									
Evap. Water Flow rate - Minimum (2)	(l/s)	6.4	7.13	6.2	7.82	7.1	8.83	9.3	10.1
Evap. Water Flow rate - Maximum (2)	(l/s)	23.3	26.12	22.7	28.64	25.9	32.43	24.3	36.9
Nominal water connection size (Grooved coupling)	(in) - (mm)	411 (114.3 mm)	411 (114.3 mm)	411 (114.3 mm)	411 (114.3 mm)	411 (114.3 mm)	411 (114.3 mm)	411 (114.3 mm)	411 (114.3 mm)
<b>Condenser</b>									
Discharge Connection Diameter	(in)	2"5/8 / 2"5/8	2"5/8 / 3"1/8	3"1/8 / 3"1/8	2"5/8 / 2"5/8	3"1/8 / 3"1/8	3"1/8 / 3"1/8	3"1/8 / 3"1/8	3"1/8 / 3"1/8
Liquid Connection Diameter	(in)	1"3/8 / 1"3/8	1"3/8 / 1"3/8	1"3/8 / 1"3/8	1"3/8 / 1"3/8	1"3/8 / 1"5/8	1"3/8 / 1"3/8	1"3/8 / 1"5/8	1"5/8 / 1"5/8
<b>Dimensions (3)</b>									
Unit Length	(mm)	3400	3400	3490	3400	3490	3490	3490	3490
Unit Width	(mm)	1280	1280	1310	1280	1310	1310	1310	1310
Unit Height	(mm)	1950	1950	1970	1950	1970	2010	2010	2010
<b>Weights (4)</b>									
Shipping Weight	(kg)	3087	3225	3346	3393	3345	3476	3510	3525
Operating Weight	(kg)	3164	3310	3421	3485	3429	3584	3623	3645
<b>System data (5)</b>									
Nb of refrigerant circuit	#	2	2	2	2	2	2	2	2
Minimum cooling load %	%	30	30	30	30	30	30	30	30
<b>Standard unit</b>									
R134a refrigerant content Circuit1 / Circuit 2	(kg)	30/30	30/30	30/30	30/30	30/30	30/30	30/30	30/30
Oil charge Circuit1 / Circuit 2 (6)	(l)								
POE Oil type		OIL048E or OIL023E							
Maximum R134a Refrigerant charge in the system		177/177	173/173		170/170		177/177	191/191	189/189

- (1) Indicative performance at Evaporator water temperature: 12°C / 7°C - Condenser water temperature 30°C/35°C (RTWD equivalent conditions) - for detailed condenser condition and units performances consult order write up.
- (2) Not applicable for Glycol application - see tables with Minimum Flow with Glycol.
- (3) These dimensions are the maximum for a specific size, they may vary from one configuration to another within a same size. For accurate dimensions of a specific configuration, refer to relevant submittal drawings.
- (4) All weights +/-5% and are the maximum for each size and may vary from one configuration to another for the same size (add 62kg for unit with acoustic package) and refer to relevant drawing for a specific configuration.
- (5) System data are indicative and subject to change without notice. Please refer to unit nameplate data.
- (6) RTUD unit is shipped w/o oil - oil must be ordered separately as it is not coming with unit.



## General data

**Table 6 - RTWD High Seasonal Efficiency - R1234ze**

		RTWD 100	RTWD 110	RTWF 120	RTWD 130	RTWD 140	RTWD 160
<b>Indicative performances</b>							
Cooling Capacity (1)	(kW)	HSE 368	HSE 402	HSE 438	HSE 482	HSE 534	HSE 587
Total Power input in cooling (1)	(kW)	75	82	90	100	101	111
Heating Capacity (2)	(kW)	397	434	473	520	576	633
Total Power input in heating (2)	(kW)	85	93	101	112	113	126
<b>Compressor</b>							
Compressor Number per Circuit	#	1/1	1/1	1/1	1/1	1/1	1/1
Type		Screw					
Model		M1/M1	M1/M2	M2/M2	M2/N5	N5/N5	N5/N6
<b>Evaporator</b>							
Quantity	#	1	1	1	1	1	1
Type		Flooded shell and tube heat exchanger					
Evaporator model		E3AM	E3AM	E3AM	E3AM	E4AM	E4AM
Evaporator Water Content volume	(l)	91	91	91	91	118	118
<b>Two pass evaporator</b>							
Evap. Water Flow rate - Minimum (3)	(l/s)	11.8	11.8	11.8	11.8	12.7	12.7
Evap. Water Flow rate - Maximum (3)	(l/s)	43.1	43.1	43.1	43.1	46.6	46.6
Nominal water connection size (Grooved coupling)	(in) - (mm)	5" (139.7)	5" (139.7)	5" (139.7)	5" (139.7)	6" (168.3 mm)	6" (168.3 mm)
<b>Three pass evaporator</b>							
Evap. Water Flow rate - Minimum (3)	(l/s)	7.8	7.8	7.8	7.8	8.5	8.5
Evap. Water Flow rate - Maximum (3)	(l/s)	28.7	28.7	28.7	28.7	31.1	31.1
Nominal water connection size (Grooved coupling)	(in) - (mm)	4" (114.3 mm)	4" (114.3 mm)	4" (114.3 mm)	4" (114.3 mm)	4" (114.3 mm)	4" (114.3 mm)
<b>Condenser</b>							
Quantity	#	1	1	1	1	1	1
Type		Shell and tube heat exchanger					
Condenser model		C3AM	C3AM	C3AM	C3AM	C4AM	C4AM
Condenser Water Content volume	(l)	99	99	99	99	131	131
<b>Two pass condenser</b>							
Cond. Water Flow rate - Minimum	(l/s)	13.0	13.0	13.0	13.0	15.4	15.4
Cond. Water Flow rate - Maximum	(l/s)	47.6	47.6	47.6	47.6	56.5	56.5
Nominal water connection size (Grooved coupling)	(in) - (mm)	6" (168.3 mm)	6" (168.3 mm)	6" (168.3 mm)	6" (168.3 mm)	6" (168.3 mm)	6" (168.3 mm)
<b>Dimensions (4)</b>							
Unit Length	(mm)	3395	3395	3395	3395	3811	3811
Unit Width	(mm)	1148	1148	1148	1148	1155	1155
Unit Height	(mm)	1943	1943	1943	1943	1998	1998
<b>Weights (5)</b>							
Shipping Weight	(kg)	3901	3902	3904	4060	4531	4533
Operating Weight	(kg)	4092	4093	4095	4251	4780	4782
<b>System data (6)</b>							
Nb of refrigerant circuit	#	2	2	2	2	2	2
Minimum cooling load %	%	30	30	30	30	30	30
<b>Standard unit</b>							
R1234ze refrigerant charge Circuit1 / Circuit 2 (6)	(kg)	60/60	60/60	60/60	60/60	80/80	80/80
Oil charge Circuit1 / Circuit 2	(l)	9/9	9/9	9/9	11/11	11/11	11/11
POE Oil type		OIL0066E or OIL0067E					

(1) Indicative performance at Evaporator water temperature: 12°C / 7°C - Condenser water temperature 30°C/35°C - for detailed performances consult order write up.

(2) Indicative performance at Evaporator water temperature: 10°C / 7°C - Condenser water temperature 40°C/45°C - for detailed performances consult order write up.

(3) Not applicable for Glycol application - see tables with Minimum Flow with Glycol.

(4) These dimensions are the maximum for a specific size, they may vary from one configuration to another within a same size. For accurate dimensions of a specific configuration, refer to relevant submittal drawings.

(5) All weights +/-5% and are the maximum for each size and may vary from one configuration to another for the same size (add 62kg for unit with acoustic package) and refer to relevant drawing for a specific configuration.

(6) System data are indicative and subject to change without notice. Please refer to unit nameplate data.

## General data

**Table 6 - RTWD High Seasonal Efficiency - R1234ze (Continued)**

		RTWD 170	RTWD 180	RTWD 200	RTWD 220	RTWD 250
<b>Indicative performances</b>						
Cooling Capacity (1)	(kW)	HSE 642	HSE 689	HSE 718	HSE 765	HSE 814
Total Power input in cooling (1)	(kW)	121	135	147	160	174
Heating Capacity (2)	(kW)	691	748	788	845	902
Total Power input in heating (2)	(kW)	138	154	168	183	198
<b>Compressor</b>						
Compressor Number per Circuit	#	1/1	1/1	1/1	1/1	1/1
Type		Screw				
Model		N6/N6	N6/N6-60	N6-60/N6-60	N6-60/N6-70	N6-70/N6-70
<b>Evaporator</b>						
Quantity	#	1	1	1	1	1
Type		Flooded shell and tube heat exchanger				
Evaporator model		E4AM	E4AM	E5AM	E5AM	E5AM
Evaporator Water Content volume	(l)	118	118	120	120	120
<b>Two pass evaporator</b>						
Evap. Water Flow rate - Minimum (3)	(l/s)	12.7	12.7	15.1	15.1	15.1
Evap. Water Flow rate - Maximum (3)	(l/s)	46.6	46.6	55.5	55.5	55.5
Nominal water connection size (Grooved coupling)	(in) - (mm)	6" (168.3 mm)				
<b>Three pass evaporator</b>						
Evap. Water Flow rate - Minimum (3)	(l/s)	8.5	8.5	10.1	10.1	10.1
Evap. Water Flow rate - Maximum (3)	(l/s)	31.1	31.1	37.0	37.0	37.0
Nominal water connection size (Grooved coupling)	(in) - (mm)	4" (114.3 mm)	4" (114.3 mm)	4" (114.3 mm)	4" (114.3 mm)	4" (114.3 mm)
<b>Condenser</b>						
Quantity	#	1	1	1	1	1
Type		Shell and tube heat exchanger				
Condenser model		C4AM	C4AM	C5AM	C5AM	C5AM
Condenser Water Content volume	(l)	131	131	148	148	148
<b>Two pass condenser</b>						
Cond. Water Flow rate - Minimum	(l/s)	15.4	15.4	20.5	20.5	20.5
Cond. Water Flow rate - Maximum	(l/s)	56.5	56.5	75.3	75.3	75.3
Nominal water connection size (Grooved coupling)	(in) - (mm)	6" (168.3 mm)				
<b>Dimensions (4)</b>						
Unit Length	(mm)	3811	3811	3489	3489	3489
Unit Width	(mm)	1155	1155	1159	1159	1159
Unit Height	(mm)	1998	1998	2004	2004	2004
<b>Weights (5)</b>						
Shipping Weight	(kg)	4535	4535	4572	4573	4575
Operating Weight	(kg)	4784	4784	4841	4842	4844
<b>System data (6)</b>						
Nb of refrigerant circuit	#	2	2	2	2	2
Minimum cooling load %	%	30	27	25	23	21
<b>Standard unit</b>						
R1234ze refrigerant charge Circuit1 / Circuit 2 (6)	(kg)	80/80	80/80	80/80	80/80	80/80
Oil charge Circuit1 / Circuit 2	(l)	11/11	11/11	11/11	11/11	11/11
POE Oil type		OIL0066E or OIL0067E				

(1) Indicative performance at Evaporator water temperature: 12°C / 7°C - Condenser water temperature 30°C/35°C - for detailed performances consult order write up.

(2) Indicative performance at Evaporator water temperature: 10°C / 7°C - Condenser water temperature 40°C/45°C - for detailed performances consult order write up.

(3) Not applicable for Glycol application - see tables with Minimum Flow with Glycol.

(4) These dimensions are the maximum for a specific size, they may vary from one configuration to another within a same size. For accurate dimensions of a specific configuration, refer to relevant submittal drawings.

(5) All weights +/-5% and are the maximum for each size and may vary from one configuration to another for the same size (add 62kg for unit with acoustic package) and refer to relevant drawing for a specific configuration.

(6) System data are indicative and subject to change without notice. Please refer to unit nameplate data.

## General data

**Table 7 - RTWD High Efficiency - R1234ze**

		RTWD 100	RTWD 110	RTWD 120	RTWD 130	RTWD 140	RTWD 160	RTWD 170
<b>Indicative performances</b>								
Cooling Capacity (1)	(kW)	HE 359	HE 394	HE 434	HE 476	HE 534	HE 584	HE 636
Total Power input in cooling (1)	(kW)	70	77	84	93	98	107	117
Heating Capacity (2)	(kW)	386	425	467	513	576	630	684
Total Power input in heating (2)	(kW)	80	88	96	106	111	122	133
<b>Compressor</b>								
Compressor Number per Circuit	#	1/1	1/1	1/1	1/1	1/1	1/1	1/1
Type		Screw						
Model		M1/M1	M1/M2	M2/M2	M2/N5	N5/N5	N5/N6	N6/N6
<b>Evaporator</b>								
Quantity	#	1	1	1	1	1	1	1
Type		Flooded shell and tube heat exchanger						
Evaporator model		E3AM	E3AM	E3AM	E3AM	E4AM	E4AM	E4AM
Evaporator Water Content volume	(l)	91	91	91	91	118	118	118
<b>Two pass evaporator</b>								
Evap. Water Flow rate - Minimum (3)	(l/s)	11.8	11.8	11.8	11.8	12.7	12.7	12.7
Evap. Water Flow rate - Maximum (3)	(l/s)	43.1	43.1	43.1	43.1	46.6	46.6	46.6
Nominal water connection size (Grooved coupling)	(in) - (mm)	5" (139.7)	5" (139.7)	5" (139.7)	5" (139.7)	6" (168.3 mm)	6" (168.3 mm)	6" (168.3 mm)
<b>Three pass evaporator</b>								
Evap. Water Flow rate - Minimum (3)	(l/s)	7.8	7.8	7.8	7.8	8.5	8.5	8.5
Evap. Water Flow rate - Maximum (3)	(l/s)	28.7	28.7	28.7	28.7	31.1	31.1	31.1
Nominal water connection size (Grooved coupling)	(in) - (mm)	4" (114.3 mm)	4" (114.3 mm)	4" (114.3 mm)	4" (114.3 mm)	4" (114.3 mm)	4" (114.3 mm)	4" (114.3 mm)
<b>Condenser</b>								
Quantity	#	1	1	1	1	1	1	1
Type		Shell and tube heat exchanger						
Condenser model		C3AM	C3AM	C3AM	C3AM	C4AM	C4AM	C4AM
Condenser Water Content volume	(l)	99	99	99	99	131	131	131
<b>Two pass condenser</b>								
Cond. Water Flow rate - Minimum	(l/s)	13	13	13	13	15	15	15
Cond. Water Flow rate - Maximum	(l/s)	48	48	48	48	57	57	57
Nominal water connection size (Grooved coupling)	(in) - (mm)	6" (168.3 mm)	6" (168.3 mm)	6" (168.3 mm)	6" (168.3 mm)	6" (168.3 mm)	6" (168.3 mm)	6" (168.3 mm)
<b>Dimensions (4)</b>								
Unit Length	(mm)	3395	3395	3395	3395	3811	3811	3811
Unit Width	(mm)	1148	1148	1148	1148	1155	1155	1155
Unit Height	(mm)	1943	1943	1943	1943	1998	1998	1998
<b>Weights (5)</b>								
Shipping Weight	(kg)	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Operating Weight	(kg)	TBD	TBD	TBD	TBD	TBD	TBD	TBD
<b>System data (6)</b>								
Nb of refrigerant circuit	#	2	2	2	2	2	2	2
Minimum cooling load %	%	0.30	0.30	0.30	0.30	0.30	0.30	0.30
<b>Standard unit</b>								
R1234ze refrigerant charge Circuit1 / Circuit 2 (6)	(kg)	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Oil charge Circuit1 / Circuit 2	(l)	TBD	TBD	TBD	TBD	TBD	TBD	TBD
POE Oil type		OIL0066E or OIL0067E						

(1) Indicative performance at Evaporator water temperature: 12°C / 7°C - Condenser water temperature 30°C/35°C - for detailed performances consult order write up.

(2) Indicative performance at Evaporator water temperature: 10°C / 7°C - Condenser water temperature 40°C/45°C - for detailed performances consult order write up.

(3) Not applicable for Glycol application - see tables with Minimum Flow with Glycol.

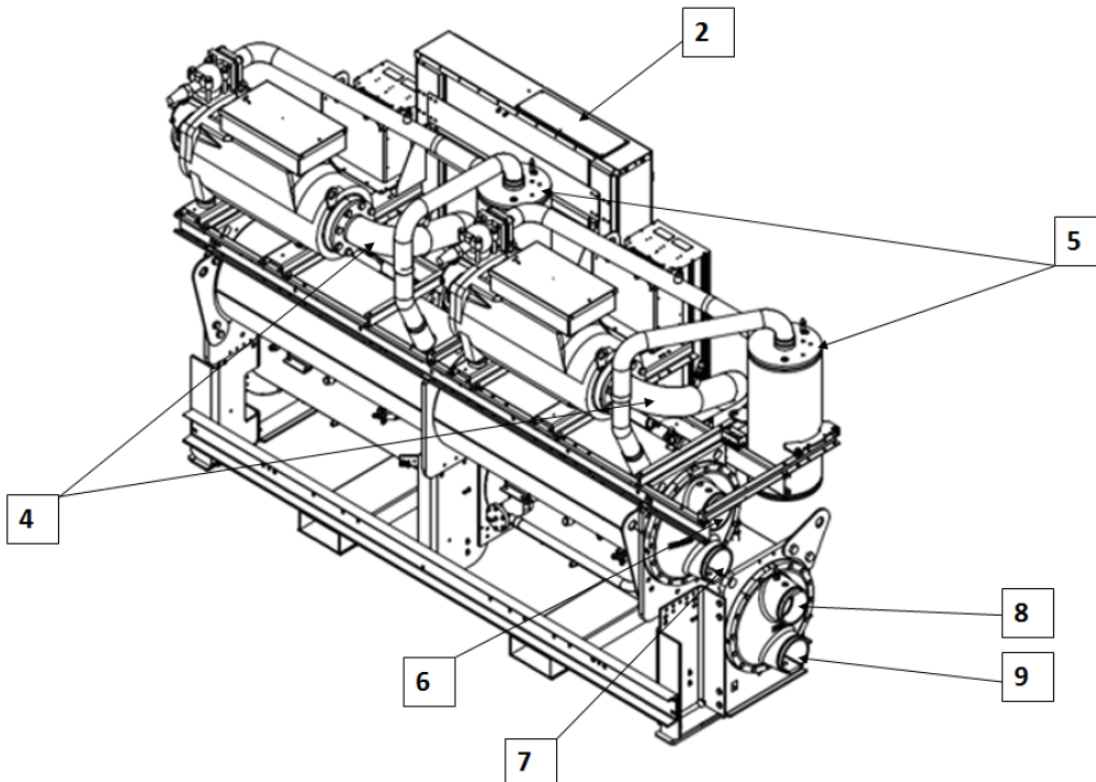
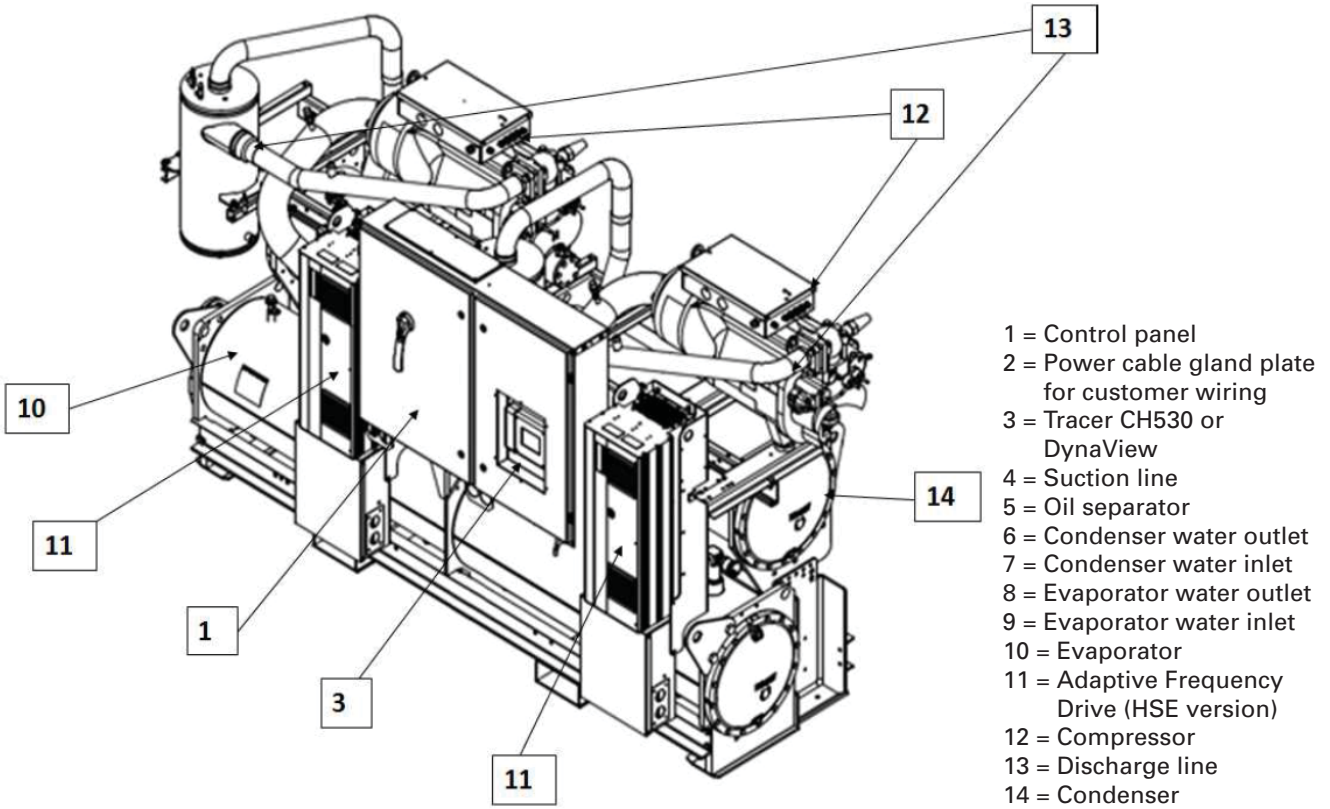
(4) These dimensions are the maximum for a specific size, they may vary from one configuration to another within a same size. For accurate dimensions of a specific configuration, refer to relevant submittal drawings.

(5) All weights +/-5% and are the maximum for each size and may vary from one configuration to another for the same size (add 62kg for unit with acoustic package) and refer to relevant drawing for a specific configuration.

(6) System data are indicative and subject to change without notice. Please refer to unit nameplate data.

# Unit Description

Figure 1 - Component location for Typical RTWD unit



## Unit Description

### Installation overview and requirements.

#### Contractor responsibilities

A list of the contractor responsibilities typically associated with the RTWD installation process is provided in Table 8.

- Locate and maintain the loose parts. Loose parts are located in the control panel.
- Install the unit on a foundation with flat support surfaces, level within 5 mm and of sufficient strength to support concentrated loading. Place the manufacturer-supplied isolation pad assemblies under the unit.
- Install the unit per the instructions outlined in the "Mechanical Installation" section.
- Complete all water piping and electrical connections.

**Note:** Field piping must be arranged and supported to avoid stress on the equipment. It is strongly recommended that the piping contractor provide at least 1m of clearance between the pre-installation piping and the planned location of the unit. This will allow for proper fit-up upon arrival of the unit at the installation site. All necessary piping adjustments can be made at that time.

- Where specified, supply and install valves in the water piping upstream and downstream of the evaporator and condenser water boxes, to isolate the shells for maintenance and to balance/trim the system.
- Install flow switches or equivalent devices in both the chilled water and condenser water piping. Interlock each switch with the proper pump starter and Tracer CH530, to ensure that the unit can only operate when water flow is established.
- Supply and install taps for thermometers and pressure gauges in the water piping, adjacent to the inlet and outlet connections of both the evaporator and the condenser.
- Supply and install drain valves on each water box.
- Supply and install vent cocks on each water box.
- Where specified, supply and install strainers ahead of all pumps and automatic modulating valves.
- Supply and install refrigerant pressure relief piping from the pressure relief to the atmosphere.
- Start the unit under supervision of a qualified service technician.
- Where specified, supply and insulate the evaporator and any other portion of the unit, as required, to prevent sweating under normal operating conditions.
- For unit-mounted starters, cutouts are provided at the top of the panel for line-side wiring.
- Supply and install the wire terminal lugs to the starter.
- Supply and install field wiring to the line-side lugs of the starter

**Table 8**

Type of requirement	Trane-supplied Trane-installed	Trane-supplied Field-installed	Field-supplied Field-installed
Foundation			Meet foundation requirements
Rigging			<ul style="list-style-type: none"> <li>• Safety chains</li> <li>• Clevis connectors</li> <li>• Lifting beams</li> </ul>
Isolation		Neoprene isolators (optional)	Isolation pads or neoprene isoators (optional)
Electrical	<ul style="list-style-type: none"> <li>• Circuit breaker or fusible disconnects (optional)</li> <li>• Unit mounted starter <ul style="list-style-type: none"> <li>– Wye-Delta starter on SE, HE, XE versions</li> <li>– AFD (Adaptive Frequency Drive) on HSE version</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Flow switches (may be field-supplied)</li> <li>• Harmonic filters on HSE version (on request - sizing according to client electrical network)</li> </ul>	<ul style="list-style-type: none"> <li>• Circuit breakers or fusible disconnects (optional)</li> <li>• Electrical connections to unit mounted starter (optional)</li> <li>• Electrical connections to remote mounted starter (optional)</li> <li>• Wiring sizes per submittal and local regulations</li> <li>• Terminal lugs</li> <li>• Ground connection(s)</li> <li>• BAS wiring (optional)</li> <li>• Control voltage wiring</li> <li>• Chilled water pump contactor and wiring including interlock</li> <li>• Option relays and wiring</li> </ul>
Water piping		<ul style="list-style-type: none"> <li>• Flow switches (may be field-supplied)</li> </ul>	<ul style="list-style-type: none"> <li>• Taps for thermometers and gauges</li> <li>• Thermometers</li> <li>• Strainers (as required)</li> <li>• Water flow pressure gauges</li> <li>• Isolation and balancing valves in water piping</li> <li>• Vents and drain on waterbox valves</li> <li>• Pressure relief valves (for waterboxes as required)</li> </ul>
Relief	<ul style="list-style-type: none"> <li>• Single relief valves</li> <li>• Dual relief valves (optional)</li> </ul>		<ul style="list-style-type: none"> <li>• Vent line and flexible connector and vent line from relief valve to atmosphere</li> </ul>
Insulation	<ul style="list-style-type: none"> <li>• Insulation</li> <li>• High humidity insulation (optional)</li> </ul>		<ul style="list-style-type: none"> <li>• Insulation</li> </ul>
Water piping connection components	<ul style="list-style-type: none"> <li>• Grooved pipe</li> <li>• Grooved pipe to flanged connection (optional)</li> </ul>		
Caution on exposure to refrigerant			Respect recommendation of IOM addendum



## Unit Description

### Unit Storage

If the chiller is to be stored for more than one month prior to installation, observe the following precautions:

- Do not remove the protective coverings from the electrical panel.
- Store the chiller in a dry, vibration-free, secure area.
- At least every three months, attach a gauge and manually check the pressure in the refrigerant circuit. If the refrigerant pressure is below the values in table 9 below, call a qualified service organization and the appropriate Trane sales office.

Table 9

Temperature	Pressure mini for R134a bar gage	Pressure mini for R1234ze bar gage
20°C	4.7	3.3
10°C	3.1	2.1

**NOTE:** Pressure will be approximately 1.0 bar if shipped with the optional nitrogen charge.

- This chiller could have been performance tested before shipment. The water boxes drain plugs were withdrawn to avoid the stagnation of the water and possible freeze up under the tubes bundle. Rust colors can be present and are totally normal but they must be wiped off at the time of reception.

### Sound Considerations

Refer to Engineering Bulletin for sound consideration applications.

Locate the unit away from sound-sensitive areas. Install the isolation pads under the unit. Refer to "Unit Isolation."

Install rubber vibration isolators in all water piping. Use flexible electrical conduit for final connection to the Tracer UC800.

Seal all wall penetrations.

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

### Foundation

Provide rigid, non-warping mounting pads or a concrete foundation of sufficient strength and mass to support the chiller operating weight (including completed piping and full operating charges of refrigerant, oil and water). Refer to General information for unit operating weights. Once in place, level the chiller within 6 mm over its length and width.

The manufacturer is not responsible for equipment problems resulting from an improperly designed or constructed foundation.

### Vibration Eliminators

Provide rubber boot type isolators for all water piping at the unit.

Provide flexible conduit for electrical connections to the unit.

Isolate all pipe hangers and be sure they are not supported by main structure beams that could introduce vibration into occupied spaces.

Make sure that the piping does not put additional stress on the unit.

**NOTE:** Do not use metal braided type eliminators on the water piping. Metal braided eliminators are not effective at the frequencies at which the unit will operate.

### Clearances

Provide enough space around the unit to allow the installation and maintenance personnel unrestricted access to all service points. A minimum of 1 m is recommended for compressor service and to provide sufficient clearance for the opening of control panel doors. Refer to submittals (documents supplied in document package coming with unit) for minimum clearances required for condenser or evaporator tube service. In all cases, local codes will take precedence over these recommendations. If the room configuration requires a variance to the clearance dimensions, contact your sales representative.

**NOTE:** Required vertical clearance above the unit is at least 1 m. There should be no piping or conduit located over the compressor motor.

**NOTE:** Maximum clearances are given. Depending on the unit configuration, some units may require less clearance than others in the same category. Heat exchanger tube removal clearance is necessary for detubing and retubing.

### Ventilation

The unit produces heat even though the compressor is cooled by the refrigerant. Make provisions to remove heat generated by unit operation from the equipment room. Ventilation must be adequate to maintain an ambient temperature lower than 40°C. Vent the pressure relief valves in accordance with all local and national codes. Refer to "Pressure Relief Valves". Make provisions in the equipment room to keep the chiller from being exposed to ambient temperatures below 10°C.

### Water Drainage

Locate the unit near a large capacity drain for water vessel drain-down during shutdown or repair. Condensers and evaporators are provided with drain connections. Refer to "Water Piping." All local and national codes apply.

### Unit dimensions and weights

Refer to the unit submittals for specific dimensional information (documents supplied in document package coming with unit).

# Installation – Mechanical

## Rigging

The chiller should be moved by lifting or by the base rail designed for forklifting. Refer to the unit model number for more details. Refer to submittal and lifting drawings provided with order/unit to get unit lifting weights and center of gravity dimensions. Refer to the rigging label attached to the unit for further details.

### **WARNING Lifting and Moving Instructions!**

Do not use cables (chains or slings) except as shown. Lifting beam crossbars must be positioned so the lifting cables do not contact the sides of the unit. Each of the cables (chains or slings) used to lift the unit must be capable of supporting the entire weight of the unit. Test lift unit at minimal height to verify even level lift. Lifting cables (chains or slings) may not be of the same length. Adjust as necessary for even level lift. The high center of gravity on this unit requires the use of an anti-rolling cable (chain or sling). To prevent unit from rolling, attach cable (chain or sling) with no tension and minimal slack around compressor suction pipe as shown. Other lifting arrangements could result in death, serious injury, or equipment damage.

## Lifting Procedure

Attach chains or cables to lifting beam, as shown in lifting drawing provided with unit. Lifting beam crossbars **MUST** be positioned so lifting cables do not contact the sides of the unit. Attach the anti-rolling cable to the circuit 2 compressor suction pipe. Adjust as necessary for even level lift.

## Unit Isolation and Leveling

### Mounting

Construct an isolated concrete pad for the unit or provide concrete footings at each of the four unit mounting points. Mount the unit directly to the concrete pads or footings. Level the unit using the base rail as a reference. The unit must be level within 5 mm over the entire length and width. Use shims as necessary to level the unit.

### Neoprene Isolator Installation (optional)

Install the optional neoprene isolators at each mounting location. Isolators are identified by part number and color.

1. Secure the isolators to the mounting surface, using the mounting slots in the isolator base plate. Do not fully tighten the isolator mounting bolts at this time.
2. Align the mounting holes in the base of the unit, with the threaded positioning pins on the top of the isolators.
3. Lower the unit on to the isolators and secure the isolator to the unit with a nut. Maximum isolator deflection should be approximately 6.4mm.

Level the unit carefully. Refer to "Leveling".

Fully tighten the isolators mounting bolts.

## NOTICE

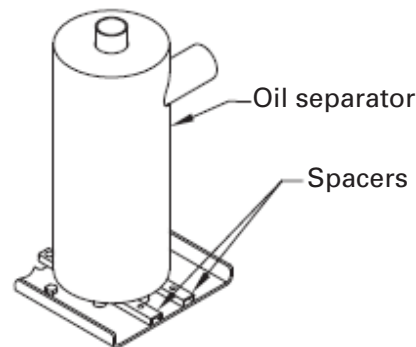
### Remove Shipping Spacers

For all RTWD 060-120 and all RTUD 060-120, remove and discard the two shipping spacers with four bolts, located underneath the oil separator, as shown in Figure 2 before starting unit. Failure to remove the spacers could result in excessive noise and vibration transmission into the building.

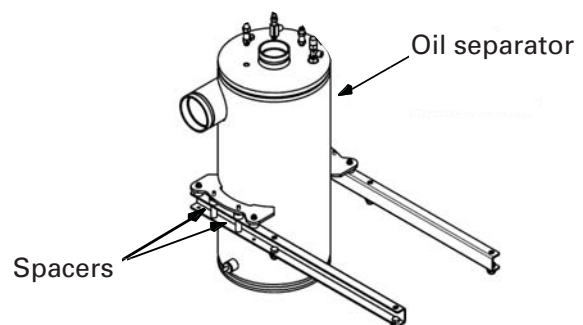
For RTUD 130-270 ton units, remove and discard the four sets of shipping spacers (each including two spacers and one bolt), located within the oil separator mounting brackets, as shown in Figure 3 before starting unit.

Failure to remove the spacers could result in excessive noise and vibration transmission into the building.

**Figure 2 - Oil Separator Spacer Removal - RTWD and RTUD 060-120**



**Figure 3 - Oil Separator Spacer Removal - RTWD and RTUD 130-270**





# Evaporator Piping

Thoroughly flush all water piping to the RTWD/RTUD unit before making the final piping connections to the unit. Components and layout will vary slightly, depending on the location of connections and the water source.

## **CAUTION Evaporator Damage!**

The chilled water connections to the evaporator are to be grooved-pipe type connections. Do not attempt to weld these connections, as 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. To prevent damage to chilled water components, do not allow evaporator pressure (maximum working pressure) to exceed 10 bar.

## **CAUTION Equipment Damage!**

If using an acidic commercial flushing solution, construct a temporary bypass around the unit to prevent damage to internal components of the evaporator.

## **CAUTION Proper Water Treatment!**

The use of untreated or improperly treated water in a Chiller 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 which result from untreated or improperly treated water, or saline or brackish water.

## **CAUTION Use Piping Strainers!**

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

## **Drainage**

Locate the unit near a large capacity drain for water vessel drain-down during shutdown or repair. Condensers and evaporators are provided with drain connections. Refer to "Water Piping." All local and national codes apply. A vent is provided on the top of the evaporator at the return end. Be sure to provide additional vents at high points in the piping to bleed air from the chilled water system. Install necessary pressure gauges to monitor the entering and leaving chilled water pressures. Provide shutoff valves in lines to the gauges to isolate them from the system when they are not in use. Use rubber vibration eliminators to prevent vibration transmission through the water lines. If desired, install thermometers in the lines to monitor entering and leaving water temperatures. Install a balancing valve in the leaving water line to control water flow balance. Install shutoff valves on both the entering and leaving water lines so that the evaporator can be isolated for service. A pipe strainer must be installed in the entering water line to prevent water-borne debris from entering the evaporator.

## **Reversing Water Boxes**

Water boxes on the evaporator and condenser can NOT be rotated or swapped end for end. Altering the water boxes will lead to poor efficiency, poor oil management and possible freeze-up of the evaporator.

## **Evaporator Piping Components**

"Piping components" include all devices and controls used to provide proper water system operation and unit operating safety. These components and their general locations are given below.

Entering Chilled Water Piping - field installed

- Air vents (to bleed air from system)
- Water pressure gauges with shutoff valves
- Vibration eliminators
- Shutoff (isolation) valves
- Thermometers (if desired)
- Cleanout tees
- Relief valve
- Pipe strainer

## **CAUTION Use Piping Strainers!**

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

Leaving Chilled Water Piping - field installed

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



## Evaporator Piping

### Evaporator Drain Flow Proving Devices

The installer must provide flow switches or differential pressure switches with pump inter-locks to prove system water flow. To provide chiller protection, install and wire flow switches in series with the water pump interlocks, for both chilled water and condenser water circuits (refer to the Installation - Electrical section). Specific connections and schematic wiring diagrams are shipped with the unit.

Flow switches must prevent or stop compressor operation if either system water flow drops off below the required minimum shown on the pressure drop curves. Follow the manufacturer's recommendations for selection and installation procedures. General guidelines for flow switch installation are outlined below.

#### **CAUTION!**

##### **Evaporator Damage!**

**For all RTWD-RTUD units, chilled water pumps MUST be controlled by the Trane CH530 to avoid catastrophic damage to the evaporator due to freezing.**

- Mount the switch upright on a horizontal portion of water outlet pipe, with a minimum of 5 pipe diameters run on each side of the switch.
- Do not install close to elbows, orifices or valves.

NOTE: The arrow on the switch must point in the direction of the water flow.

- To prevent switch fluttering, remove all air from the water system

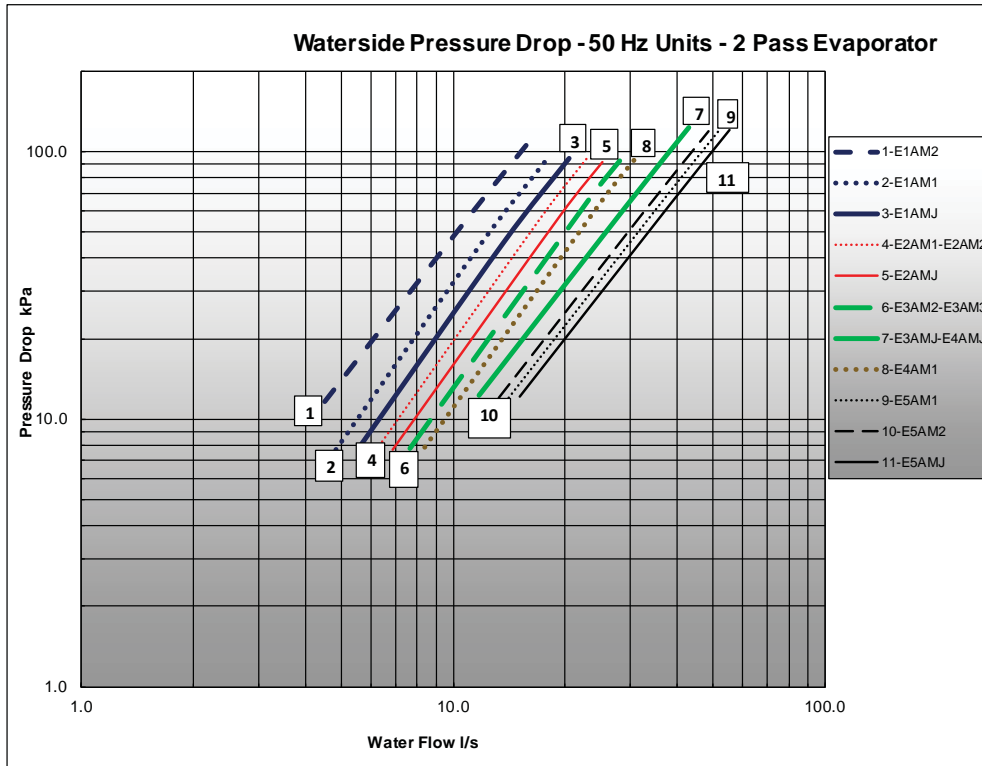
NOTE: The CH530 provides a 6-second time delay on the flow switch input before shutting down the unit on a loss-of-flow diagnostic. Contact a qualified service organization if nuisance machine shutdowns persist.

- Adjust the switch to open when water flow falls below minimum. Refer to the General Data table for minimum flow recommendations for specific water pass arrangements. Flow switch contacts are closed on proof of water flow.

Note: To prevent evaporator damage, do not use water flow switch to cycle the system.

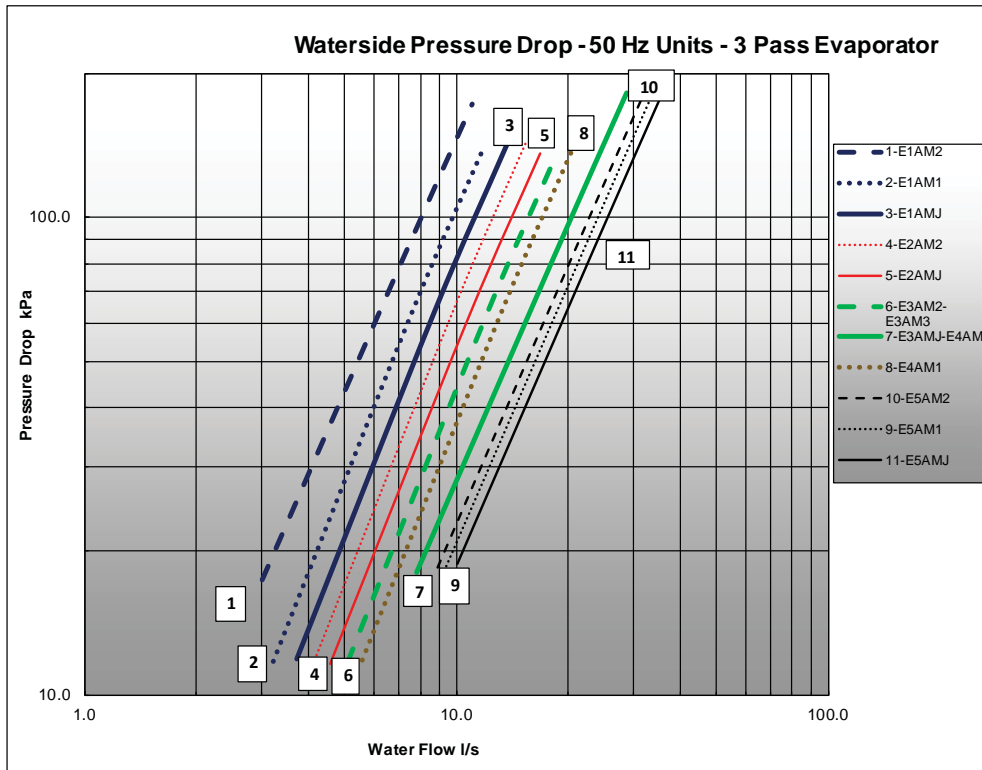
## Evaporator Piping

Figure 4 - 2 pass Evaporator Pressure Drop curves



Select unit evaporator and limits according to General data table.

Figure 5 - 3 pass Evaporator Pressure Drop curves



Select unit evaporator and limits according to General data table.

# Condenser Piping

Condenser water inlet and outlet types, sizes and locations are given in the Unit Dimensions and Weights. Condenser pressure drops are shown in Figure 6.

## Condenser Piping Components

Condenser piping components and layout vary, depending on the location of connections and the water source. Condenser piping components generally function identically to those in the evaporator piping system, as described in "Evaporator Piping". In addition, cooling tower systems should include a manual or automatic bypass valve that can alter the water flow rate, to maintain condensing pressure. Well water (or city water) condensing systems should include a pressure reducing valve and a water regulating valve. Pressure reducing valve should be installed to reduce water pressure entering the condenser. This is required only if the water pressure exceeds 10 bar. This is necessary to prevent damage to the disc and seat of the water regulating valve that can be caused by excessive pressure drop through the valve and also due to the design of the condenser. The condenser waterside is rated at 10 bar.

### CAUTION Equipment Damage!

To prevent damage to the condenser or regulating valve, the condenser water pressure should not exceed 10 bar. The optional water regulating valve maintains condensing pressure and temperature by throttling water flow leaving the condenser in response to compressor discharge pressure. Adjust the regulating valve for proper operation during unit start-up. Refer to RLC-PRB021-EN for further details regarding condenser water temperature control.

Note: Plugged tees are installed to provide access for chemical cleaning of the condenser tubes. Condenser piping must be in accordance with all applicable local and national codes.

## Condenser Drains

The condenser shells can be drained by removing the drain plugs from the bottom of the condenser heads. Also, remove the vent plugs at the top of the condenser heads to facilitate complete drainage. When the unit is shipped, the drain plugs are removed from the condenser and placed in a plastic bag in the control panel, along with the evaporator drain plug. The condenser drains may be connected to suitable drains to permit drainage during unit servicing. If they are not, the drain plugs must be installed.

CAUTION! In case of low evaporator leaving water temperature applications, the non use of glycol on the condenser side may result in condenser tube freeze-up.

## Water Regulating Valve

### Water Treatment

Using untreated or improperly treated water in these units may result in inefficient operation and possible tube damage. Consult a qualified water treatment specialist to determine whether treatment is needed. The following disclamatory label is provided on each RTWD unit:

CAUTION Proper Water Treatment! The use of untreated or improperly treated water in a Chiller 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 which result from untreated or improperly treated water, or saline or brackish water.

For leaving chilled water temperatures below 3.3°C, it is mandatory to operate the unit with the appropriate freeze inhibitor (glycol type and percentage) in both evaporator and condenser water loops.

### Water Pressure Gauges

Install field-supplied pressure gauges (with manifolds, whenever practical) on the RTWD units. 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. To read manifolded 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.

### Water Pressure Relief Valves

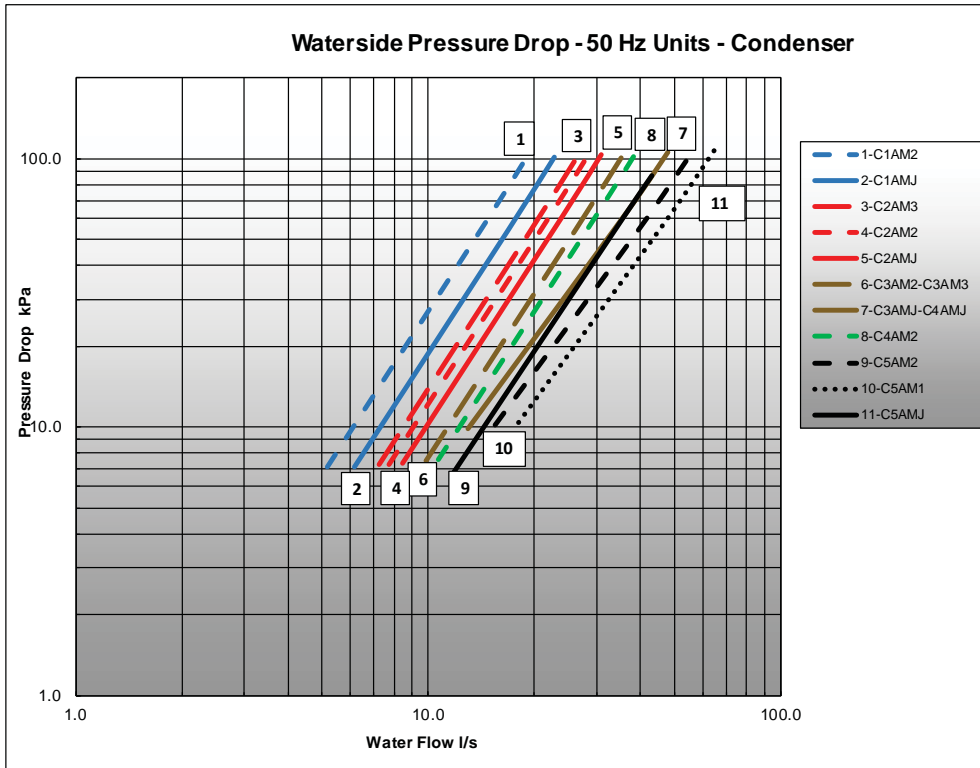
Install a water pressure relief valve in the condenser and evaporator leaving chilled water piping. Water vessels with close coupled shutoff valves have a high potential for hydrostatic pressure buildup on a water temperature increase. Refer to applicable codes for relief valve installation guidelines.

### CAUTION Prevent Shell Damage!

To prevent shell damage, install pressure relief valves in both the evaporator and condenser water systems.

## Condenser Piping

Figure 6 - Condenser Pressure drop curves



Select unit Condenser and limits according to General data table.

# Relief Valves

## Refrigerant Relief Valve Venting

To prevent injury due to inhalation of R134a or R1234ze gases, do not discharge refrigerant anywhere. If multiple chillers are installed, each unit must have separate venting for its relief valves. Consult local regulations for any special relief-line requirements.

All relief-valve venting is the responsibility of the installing contractor.

Note: After being opened once, relief valves tend to leak.

### Condenser Pressure Relief Valve Venting

All RTWD units utilize a refrigerant-pressure relief valve for each circuit which must be vented to the outdoor atmosphere. The valves are located at the top of the condenser. Refer to local codes for relief valve vent line sizing requirements.

Note: Vent line length must not exceed code recommendations. If the line length will exceed code recommendations for the outlet size of the valve, install a vent line of the next larger pipe size.

RTUD units are not equipped with refrigerant pressure relief valve on the high pressure side. The safety valve calibration installed on refrigerant piping or on the condenser must not exceed 25 bar.

### CAUTION Equipment Damage!

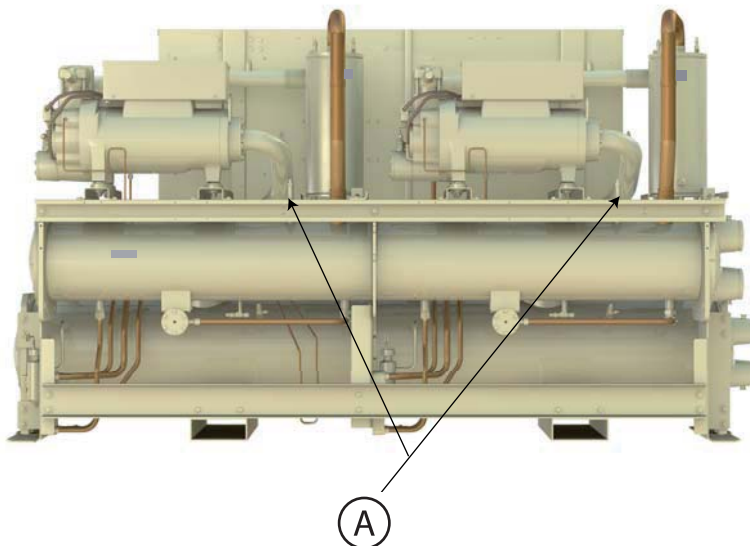
To prevent capacity reduction and relief valve damage, do not exceed vent piping code specifications. RTWD relief valve discharge setpoints are 21 bar rel. Once the relief valve has opened, it will reclose when pressure is reduced to a safe level. Pipe each relief valve on the unit into a common vent line. Provide access valve located at the low point of the vent piping, to enable draining of any condensate that may accumulate in the piping.

### WARNING Contains Refrigerant!

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 or serious injury or equipment damage. If multiple chillers are installed, each unit must have a separate venting for its relief valves. Consult local regulations for any special relief line requirements.

Note: Units can be ordered with "Dual Relief Valve" options. Model number digit 16 is a "2". RTWD units this option will have 4 total relief valves.

**Figure 7 - Condenser Relief Valves**



A = Condenser relief valves

# Split system installation

## RTUD Installation

The installation of a split system offers a good economic alternative to satisfy the chilled water demand for cooling a building, particularly in the case of new construction.

### Releasing the Nitrogen Holding Charge

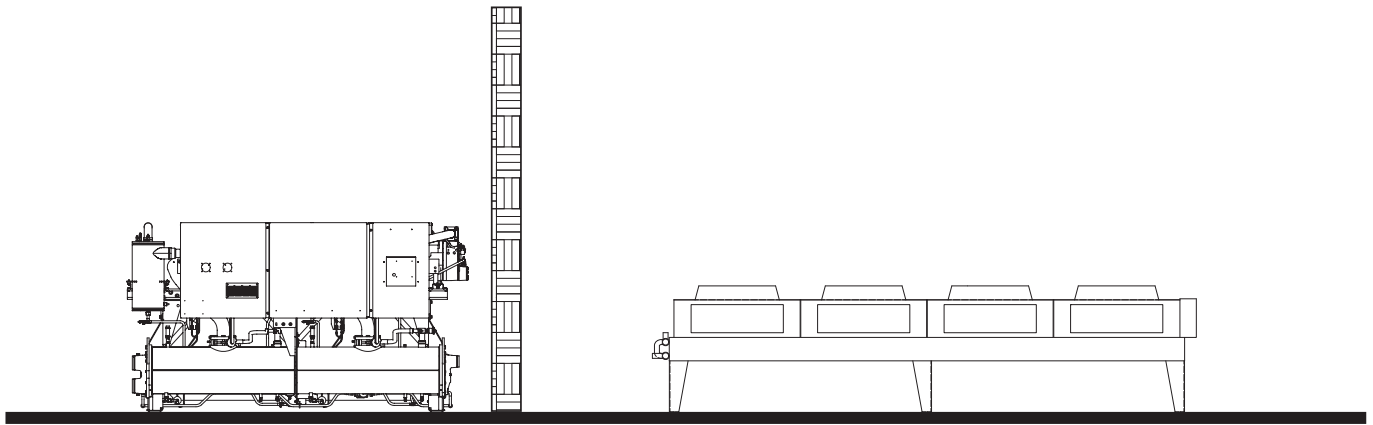
The nitrogen holding charge can be released into the atmosphere.

**CAUTION!** When releasing nitrogen holding charge, ventilate the room. Avoid breathing in the nitrogen.

### Application examples

#### No Elevation Difference

*Figure 8 - No Elevation Difference*



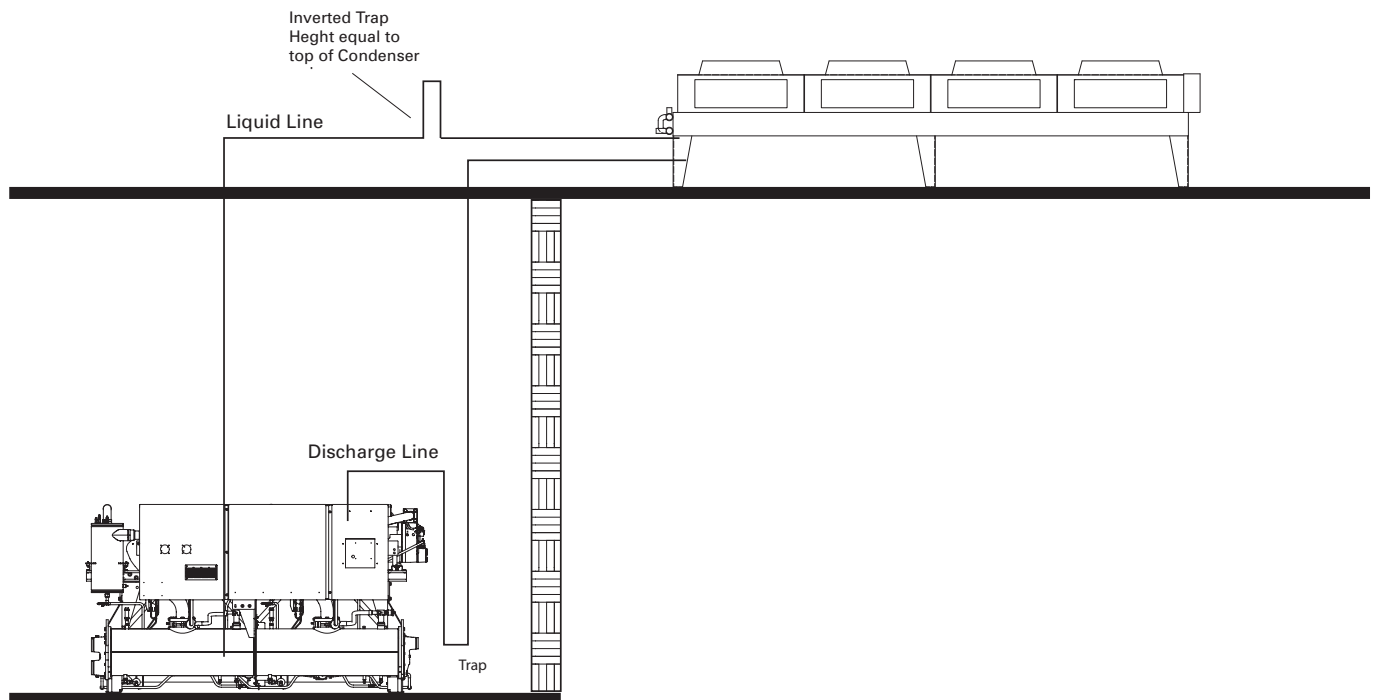
## RESTRICTIONS

- Total distance between components should not exceed 61 m (actual) or 91 m (equivalent).
- Liquid line height must not exceed 4.5 m from the base of the air-cooled condenser unit.
- Discharge line trap is recommended leaving the oil separator if the discharge piping runs for more than 3 m (actual) horizontally above the RTUD unit.

## Split system installation

### Condenser Above the Compressor Chiller

*Figure 9 - Condenser above the compressor chiller*



#### RESTRICTIONS

- Total distance between components should not exceed 61 m (actual) or 91 m (equivalent).
- Elevation difference greater than 30 m (actual) will result in at least a 2% efficiency decrease.



## Split system installation

### System Configuration

The system can be configured in any of the primary arrangements as shown in Figure 8 and 9. The configuration and its associated elevation, along with the total distance between the RTUD and the air-cooled condenser, plays a critical role in determining the liquid line and discharge line sizes. This will also affect the field refrigerant and oil charges. Consequently, there are physical limits which must not be violated if the system is to operate as designed. Please note the following restrictions:

1. The discharge line sizing is different for different leaving evaporator water temperatures.
2. The total distance between the RTUD and the air-cooled condenser must not exceed 61 m actual or 91 m equivalent.
3. Liquid line risers must not exceed 4.5 m from the base of the air-cooled condenser.
4. Discharge line risers cannot exceed an elevation difference greater than 30 m (actual) without a minimum of 2% efficiency decrease.
5. Refer to Figure 9 for location of recommended traps.
6. Circuit #1 on the condenser must be connected to Circuit # 1 on the RTUD unit.

### CAUTION

#### Equipment Damage!

If circuits are crossed, serious equipment damage may occur.

### Equivalent Line Length

To determine the appropriate size for field installed liquid and discharge lines, it is first necessary to establish the equivalent length of pipe for each line, including the added flow resistance of elbows, valves, etc. An initial approximation can be made by assuming that the equivalent length of pipe is 1.5 times the actual pipe length.

*NOTE: Table 10 states the equivalent length, for various non-ferrous valves and fittings. When calculating the equivalent length, do not include piping of the unit. Only field piping must be considered.*

**CAUTION! RTUD is only a component of a complete installation. It includes its own high pressure protection set at 23 bar. The party in charge of the supply of the condenser and of its refrigerant piping is responsible for implementing all required protections to comply with PED requirements for the design pressure of the condenser installed. Refer to the document PROD-SVX01 \_XX delivered with this chiller to check all the mandatory conformity requirements of the Pressure Equipment and Machinery directives for this installation.**

**Table 10 - Equivalent Lengths of Non-Ferrous Valves and Fittings**

Line Size Inches OD	Globe Valve (m)	Angle Valve (m)	Short Radius Elbow (m)	Long Radius Elbow (m)
1 1/8	27	8.8	0.8	0.6
1 3/8	31	10.1	1.0	0.7
1 5/8	35	10.4	1.2	0.8
2 1/8	43	11.9	1.6	1.0
2 5/8	48	13.4	2.0	1.3
3 1/8	56	16.2	2.4	1.6
3 5/8	66	20.1	3.1	1.9
4 1/8	76	23.2	3.7	2.2



## Split system installation

### Liquid Line Sizing

Trane recommends that the liquid line diameter be as small as possible, while maintaining acceptable pressure drop. This is necessary to minimize refrigerant charge. The total length between the components must not exceed 61 m (actual) or 91 m equivalent.

The liquid line risers must not exceed 4.5 m from the base of the air-cooled condenser. The liquid line does not have to be pitched. Line sizing must be done manually not to violate the 2.8°C subcooling requirement at the EXV.

Liquid lines are not typically insulated. However, if the lines run through an area of high ambient temperature (eg. boiler room), subcooling may drop below required levels. In these situations, insulate the liquid lines.

Use of a liquid line receiver is not recommended because it adds to the overall refrigerant volume of the circuit.

*Note: In case of power failure to the expansion valve, the amount of liquid refrigerant contained in the refrigerant system must not exceed the holding capacity of the evaporator. See Table 11 for the maximum allowable charge in each circuit.*

### Discharge (Hot Gas) Line Sizing

The discharge lines should pitch downward, in the direction of the hot gas flow, at the rate of 12.5 mm per each 3 meters of horizontal run.

Discharge line size is based on the velocity needed to obtain sufficient oil return.

Discharge lines are not typically insulated. If insulation is required, it should be approved for use at temperatures up to 110°C (max discharge temp).

**Note:** The discharge line should drop well below the compressor discharge outlet before beginning its vertical rise. This prevents possible refrigerant drainage back to the compressor and oil separator during the unit STOP cycle. Refer to Figure 8 and 9 for details.



## Split system installation

### Refrigerant Charge Determination

The approximate amount of the refrigerant charge required by the system must be determined by referring to Table 11 and must be verified by running the system and checking the liquid line sightglasses.

*Note: The maximum charge can reduce the maximum length of the piping. Due to maximum allowable refrigerant charge not all units can have 61 m of piping.*

To determine the approximate charge, first refer to Table 11 and establish the required charge without the field-installed piping. Then refer to Table 12, to determine the charge required for the field-installed piping. The approximate charge is therefore the sum of the values from Table 11 and Table 12.

**Table 11 - System Refrigerant Charge**

Ton	Max Unit Charge Circuit 1 (Kg)	Max Unit Charge Circuit 2 (Kg)
60	144	144
70	140	140
80	140	140
90	160	160
100	160	160
110	157	157
120	156	156
130	180	180
140	177	177
160	173	173
170	177	177
180	170	170
190	177	177
200	191	191
220	189	189
250	185	185

**Table 12 - Field-Installed Piping Charge**

Pipe O.D.	Discharge Line (kg)	Liquid Line (kg)
1 1/8	-	18.6
1 3/8	-	28.1
1 5/8	-	40.0
2 1/8	3.6	69.9
2 5/8	5.9	-
3 1/8	8.2	-
4 1/8	14.5	-

*Note: The amounts of refrigerant listed in Table 12 are based on 30 m of pipe. Actual requirements will be in direct proportion to the actual length of the piping.*

*Note: Table 12 assumes: Liquid Temperature = 41°C; Saturated Discharge Temperature = 52°C; Discharge Superheat = 16.7°C.*

### NOTICE

#### REFRIGERANT CHARGING!

##### Equipment Damage

Add initial field refrigerant charge only through the service valve on the liquid line, not the service valves on the evaporator, and insure that water is flowing through the evaporator during the charging process. Failure to do the above could result in equipment damage.

### RTUD Chilled Water Flow Control

#### CAUTION

##### Equipment Damage

ALL RTUD unit chilled water pumps **MUST** be controlled by the Trane CH530 to avoid catastrophic damage to the evaporator due to freezing.

### Oil Charge Determination

The RTUD unit is factory charged with the amount of oil required by the system. No additional oil is required for field installed piping.

### Outdoor Air Temperature Sensor Installation Requirements

The outdoor air temperature sensor is optional for the RTUD water cooled units, but is a required sensor for the RTUD compressor chiller units. The sensor is required as an important input to the condenser fan control algorithm as well as for the low outdoor air ambient lockout feature. The temperature sensor probe is shipped separately inside the control panel.

It is necessary for the chiller installer to locate and install the separate outdoor air sensor probe at the remote air cooled condenser at a location to sense the coil's entering air temperature, while avoiding direct sunlight. It should be located at least 5.1 cm from the coil face and somewhere "in-between" the two refrigerant circuits. Where the condenser installation is such that the two refrigerant circuit's condensers are physically separate from each other, or one circuit is more likely to see re-circulated warmer air, an attempt should be made to locate the probe to see an average temperature of the two separate condensers. Note: it is important that the probe provided not be substituted with another probe, as the probe and the electronics are "matched / calibrated" at the factory for accuracy.

A twisted pair sheathed cable shall be run and connected between the probe at the remote condenser and its LLID module in the chiller control panel. The sensor's circuit is a class II power limited analog circuit and therefore the wire should not be run in close proximity to any power or line voltage wiring. The splices at the condenser end, should be made to be water tight. The wire run should be physically supported at equal intervals with consideration for safety and reliability/durability with wire ties or similar to meet local codes.

## Split system installation

### Fan Control for the Remote Air Cooled Condenser

The CH530 Controls for the RTUD compressor chiller provide as an option, the flexible and full control of 2-circuit remote air cooled condenser fans. In addition to the option for controlling between 2 to 8 fixed speed fans per circuit (or multiples thereof), a separate additional option includes the ability to control either two speed fans or variable speed fan/drive combinations in conjunction with other fixed speed fans, to provide low ambient outdoor air temperature capability. The controls will also provide an option for a simple per circuit interlock output (in lieu of actual fan control) to use in the scenario in which independent fan head pressure or differential pressure controls (by others) is applied. It is recommended however, that for the best overall unit performance, the integral fan control option is selected.

The controls support control of a remote, air cooled condenser fan deck, from 2 to 8 fans per circuit (1-8 fans for variable speed). It supports options to control the following types of standard ambient outdoor air temperature fan decks: 1) all fans fixed speed, and 2) all fans two speed. It will also support the following low ambient outdoor air temperature fan decks 1) one fan per circuit is Two-Speed, (remaining fans fixed speed), and 2) One fan per circuit is variable speed i.e. variable frequency drive (VFD), (remaining fans fixed speed). In the variable fan low ambient outdoor air option the VFD fan and fixed speed fans are sequenced accordingly to provide continuous control from 0-100% air flow per circuit. Fan staging provides the correct combination of fixed speed fan relay, VFD relay (to enable operation of the VFD), and speed outputs to provide air flow control commanded by the fan algorithm running inside the CH530 Main Processor. The fan deck arrangement is independently configurable per circuit.

Since the condenser is provided separately from the RTUD compressor chiller, the RTUD electrical panel design does not provide for condensing unit's control power requirements. The chiller's control power transformer is not sized to provide the control power for the additional fan contactor loads. The CH530 controls, when properly optioned, will provide for pilot duty rated relays, low voltage binary inputs, and low voltage analog outputs to control the remote contactors and inverters provided by others. The CH530 fan control relays located in the chiller control panel, are intended to control the fan contactors that are located in the remote air cooled condenser panel. The Fan Control Relays are rated for up to 7.2 Amps resistive, 2.88 Amps pilot duty 1/3 HP, 7.2 FLA at 120 VAC, and up to 5 Amps general purpose at 240 VAC. All wiring for the field connections to the condenser, will have screw terminals for termination in the RTUD control panel with the exception of the outdoor air temperature sensor (addressed above). Refer to the wiring diagrams.

Separate fan control algorithms are used for fixed speed and variable speed systems. For the variable speed fan deck option, the fan control reverts to fixed speed control if an inverter drive fault is detected through a binary input interface with the drive. An informational diagnostic is also provided to indicate the issue.

For more fan control information, reference "Controls Interface" chapter sections.

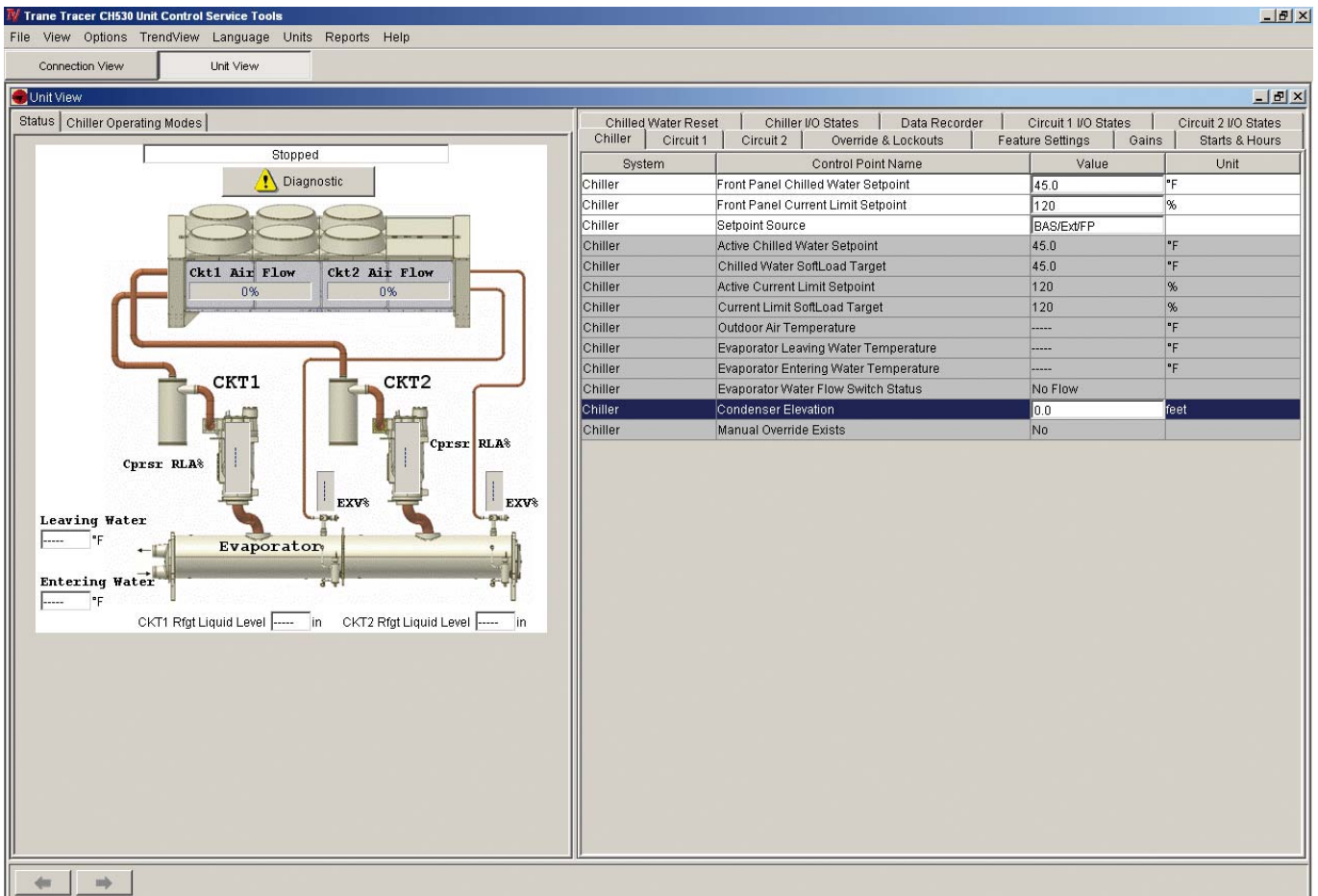
## Split system installation

### RTUD Condenser Elevation Setting

Condenser elevation setting is a require input during startup of an RTUD chiller, and is accessible in TechView, on the Unit View Screen. Go to the Unit View/Chiller Tab, select Condenser Elevation setting and enter condenser elevation in appropriate units. Reference Figure 10. The shipped default of this setting is 0 and it represents the distance of the bottom of the condenser, relative to the top of the evaporator. Use a positive value for the condenser above the evaporator and a negative value for the condenser below the evaporator. An estimate to within +/- 91 cm is required.

Condenser elevation setting allows proper EXV operation. Failure to properly set the elevation can result in low pressure cutout trips, or low differential pressure trips during startup or large load transients, as well as poor EXV liquid level control during operation.

Figure 10 - RTUD Condenser Elevation Setting - TechView



The screenshot shows the 'Unit View' screen for a Trane Tracer CH530 unit. The left pane displays a schematic of the RTUD system, including two air handlers (Ckt1 and Ckt2), compressors (Cprsr), refrigerant liquid accumulators (RLA), and expansion valves (EXV) connected to an evaporator. The right pane shows a table of control point settings.

System	Control Point Name	Value	Unit
Chiller	Front Panel Chilled Water Setpoint	45.0	*F
Chiller	Front Panel Current Limit Setpoint	120	%
Chiller	Setpoint Source	BAS/Ext/FP	
Chiller	Active Chilled Water Setpoint	45.0	*F
Chiller	Chilled Water SoftLoad Target	45.0	*F
Chiller	Active Current Limit Setpoint	120	%
Chiller	Current Limit SoftLoad Target	120	%
Chiller	Outdoor Air Temperature	-----	*F
Chiller	Evaporator Leaving Water Temperature	-----	*F
Chiller	Evaporator Entering Water Temperature	-----	*F
Chiller	Evaporator Water Flow Switch Status	No Flow	
Chiller	Condenser Elevation	0.0	feet
Chiller	Manual Override Exists	No	

# General Electrical Recommendations

## Electrical Parts

When reviewing this manual keep in mind.

- All field-installed wiring must be in accordance with local regulations, CE directives and guidelines. Be sure to satisfy proper equipment grounding requirements according CE
- The following standardized values - Maximum Amps - Short Circuit Amps - Starting Amps are displayed on unit nameplate.
- All field-installed wiring must be checked for proper terminations, and for possible shorts or grounds.

**Note:** always refer to wiring diagrams shipped with chiller or unit submittal for specific electrical schematic and connection information.

### **WARNING! Hazardous Voltage with Capacitor!**

Disconnect all electric power, including remote disconnects and discharge all motor start/run and AFD (Adaptive Frequency TM Drive) capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized.

## RTWD HSE version

- Time before to work on the electrical panel of the unit: once the AFD is off (confirmed by the extinction of the display), it is mandatory to wait one minute before working on the electrical panel.
- However, for any intervention in the AFD, the indicated time on the label of the AFD must be respected. Before installing the chiller with HSE version, the user must evaluate the potential electromagnetic problems in the surrounding area. The following should be considered:
  - a) the presence above, below and adjacent to the unit of for example: welding equipment or other power cables, control cables or signaling and telephone cables;
  - b) receivers and transmitters, radio and television;
  - c) computer and other control equipment;
  - d) the critical safety equipment, eg protection of industrial equipment;
  - e) the health of neighboring persons, for example, use of pacemakers or appliances against deafness;
  - f) the immunity of other equipment in the environment. The user must ensure that the other materials used in the environment are compatible. This may require additional protection measures;

If electromagnetic disturbances are detected, it shall be the responsibility of the user to resolve the situation. In any case, the electromagnetic interferences have to be reduced until they are no longer troublesome.

- 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 discharges capacitors. Verify with an appropriate voltmeter that all capacitors have discharged

- DC bus capacitors retain hazardous voltages after input power has been disconnected. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized.

After disconnecting input power, wait twenty (20) minutes for units which are equipped with variable frequency drive (0V DC) before touching any internal components.

Failure to follow these instructions could result death or serious injury.

*For additional information regarding the safe discharge of capacitors, see "Adaptive Frequency™ Drive (AFD3) Capacitor Discharge" and BAS-SVX19B-E4.*

### **Hazardous Voltage – Pressurized Burning Fluid!**

Before removing compressor terminal box cover for servicing, or servicing power side of control panel, CLOSE COMPRESSOR DISCHARGE SERVICE VALVE and disconnect all electric power including remote disconnects. Discharge all motor start/run capacitors. Follow lockout/tagout procedures to ensure the power cannot be inadvertently energized. Verify with an appropriate voltmeter that all capacitors have discharged.

The compressor contains hot, pressurized refrigerant. Motor terminals act as a seal against this refrigerant. Care should be taken when servicing NOT to damage or loosen motor terminals.

Do not operate compressor without terminal box cover in place.

Failure to follow all electrical safety precautions could result in death or seriously injure.

## General Electrical Recommendations

**CAUTION!** To avoid corrosion, overheating or general damage, at terminal connections, unit is designed for copper mono-conductors only. In case of multiconductor cable, an intermediate connection box must be added. For cable with alternative material, bi-material connecting devices are mandatory. Cable routing inside control panel should be made case by case by installer.

Do not allow conduit to interfere with other components, structural members or equipment. Control voltage (115V) wiring in conduit must be separate from conduit carrying low voltage (<30V) wiring. To prevent control malfunctions, do not run low voltage wiring (<30V) in conduit with conductors carrying more than 30V.

### WARNING!

The Warning Label is displayed on the equipment and shown on wiring diagrams and schematics. Strict adherence to these warnings must be observed. Failure to do so may result in personal injury or death.

**CAUTION!** Units including RTWD HSE units must not be linked to the neutral wiring of the installation. Units are compatible with the following neutral operating conditions:

TNS	IT	TNC	TT
Standard	Special	Special	Standard*

\* Differential protection should be suited for industrial machinery with current leak which can be higher than 500 mA (several motors and frequency drives).

## Electrical data tables

The electrical data details is given in the tables contained in this chapter. the data are function of the configuration of the unit and the following digit of the model number

- Unit efficiency (Digit 12)
- Unit application (Digit 15)
- Evaporator application (Digit 21)
- Compressor starter type (Digit 24)

The following data are defined

- Unit Maximum Power input (kW)
- Unit rated amps (Max compr + Control)
- Unit start up amps (Starting Amps of the largest compr+RLA of 2nd compr+ control)
- Unit Displacement Power factor
- Disconnect switch size (A)
- Oil Separator Crankcase Heater:  
2 x 125 W whatever the size RTWD/RTUD
- Compressor Crankcase Heater:  
2 x 150 W whatever the size RTWD/RTUD
- Control Circuit: Factory installed transformer whatever the size RTWD/RTUD
- Short Circuit Intensity: 35 KA max whatever the size RTWD/RTUD

For each circuit

- Compressor motor RLA
- Compressor motor LRA
- Compressor motor max Amps
- Compressor motor max Power Input

**Note:** Rating is made for 400 V, 3 phases, 50 Hz power supply.

**Table 13 - RTWD Standard Efficiency R134a**

Unit size		160	160	160	160	160	160	170	170	170	170	170	170	
Unit Type	Digit 12	1	1	1	1	1	1	1	1	1	1	1	1	
Unit Application	Digit 15	A	A	A	B;C	A	B;C	A	A	A	B;C	A	B;C	
Evap Application	Digit 21	1	1	2;3	*	2;3	*	1	1	2;3	*	2;3	*	
Comp Starter	digit 24	Y	B	Y	Y	B	B	Y	B	Y	Y	B	B	
Compressor	C1	M2 LoVi	M2 LoVi	M2 HiVi	M2 HiVi	M2 HiVi	M2 HiVi	N1 LoVi	N1 LoVi	N1 HiVi	N1 HiVi	N1 HiVi	N1 HiVi	
	C2	N1 LoVi	N1 LoVi	N1 HiVi	N1 HiVi	N1 HiVi	N1 HiVi	N1 LoVi	N1 LoVi	N1 HiVi	N1 HiVi	N1 HiVi	N1 HiVi	
Circuit 1	Motor RLA (A)	98.0	98.0	98.0	132.8	98.0	132.8	116.8	116.8	116.8	160.8	116.8	160.8	
	Motor LRA (A)	259.0	0.0	259.0	259.0	0.0	0.0	291.0	0.0	291.0	291.0	0.0	0.0	
	Max Amps (A)	114.0	102.9	114.0	166.0	102.9	153.3	141.0	128.8	141.0	201.0	128.8	188.1	
Circuit 2	Max Power input (kW)	66.3	67.7	66.3	98.9	67.7	100.9	83.1	84.8	83.1	121.3	84.8	123.8	
	Motor RLA (A)	116.8	116.8	116.8	160.8	116.8	160.8	116.8	116.8	116.8	160.8	116.8	160.8	
	Motor LRA (A)	291.0	0.0	291.0	291.0	0.0	0.0	291.0	0.0	291.0	291.0	0.0	0.0	
Unit @ Max	Max Amps (A)	141.0	128.8	141.0	201.0	128.8	188.1	141.0	128.8	141.0	201.0	128.8	188.1	
	Max Power input (kW)	83.1	84.8	83.1	121.3	84.8	123.8	83.1	84.8	83.1	121.3	84.8	123.8	
	Starting Amps (A)	407.0	233.7	407.0	462.0	233.7	343.4	434.0	259.6	434.0	494.0	259.6	378.1	
Disconnect Switch Digit 26=C	Amps ctl + auxiliaires	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
	Max. Amps (A)	257.0	233.7	257.0	369.0	233.7	343.4	284.0	259.6	284.0	404.0	259.6	378.1	
	displacement power factor (DPF)	0.85	0.95	0.85	0.87	0.95	0.95	0.85	0.95	0.85	0.87	0.95	0.95	
Circuit Breaker + Bus bar Digit 26=D	short circuit withstand rating (kA)	35	35	35	35	35	35	35	35	35	35	35	35	
	Fuse size (A) C1	160 aM-T1 200 gG-T1 160 aM-T1 200 aM-T2 200 gG-T1 200 gG-T2 200 aM-T1 200 gG-T1 200 aM-T1 250 aM-T2 200 gG-T1 250 aM-T2												
	Fuse size (A) C2	200 aM-T1 200 gG-T1 200 aM-T1 250 aM-T2 200 gG-T1 250 aM-T2 200 aM-T1 200 gG-T1 200 aM-T1 250 aM-T2 200 gG-T1 250 aM-T2												
Circuit Breaker + Bus bar Digit 26=D	Disconnect Switch Size	6X250A - T1	6X250A - T1	6X250A - T1	6X400A - T2	6X250A - T1	6X400A - T2	6X250A - T1	6X400A - T1	6X250A - T1	6X400A - T2	6X250A - T1	6X400A - T2	
	Max connecting Wire (mm <sup>2</sup> )	2 x 185	2 x 185	2 x 185	2 x 240	2 x 185	2 x 240	2 x 185	2 x 185	2 x 185	2 x 240	2 x 185	2 x 240	
	Bus bar width (mm)	32	32	32	45	32	45	32	32	32	45	32	45	
Circuit Breaker + Bus bar Digit 26=D	circuit breaker size (A) C1	NSX 160A	NSX 160A	NSX 160A	NSX 250A	NSX 160A	NSX 250A	NSX 160A	NSX 160A	NSX 160A	NSX 250A	NSX 160A	NSX 250A	
	circuit breaker size (A) C2	NSX 160A	NSX 160A	NSX 160A	NSX 250A	NSX 160A	NSX 250A	NSX 160A	NSX 160A	NSX 160A	NSX 250A	NSX 160A	NSX 250A	
	Bus bar connection	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	
Circuit Breaker + Bus bar Digit 26=D	Max connecting Wire (mm <sup>2</sup> )	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	



**Table 13 - RTWD Standard Efficiency R134a (Continued)**

Unit size		190	190	190	190	190	190	200	200	200	200	200	200
Unit Type	Digit 12	1	1	1	1	1	1	1	1	1	1	1	1
Unit Application	Digit 15	A	A	A	B;C	A	B;C	A	A	A	B;C	A	B;C
Evap Application	Digit 21	1	1	2;3	*	2;3	*	1	1	2;3	*	2;3	*
Comp Starter	digit 24	Y	B	Y	Y	B	B	Y	B	Y	Y	B	B
Compressor	C1	N1 LoVi	N1 LoVi	N1 HiVi	N1 HiVi	N1 HiVi	N1 HiVi	N2 LoVi	N2 LoVi	N2 HiVi	N2 HiVi	N2 HiVi	N2 HiVi
	C2	N2 LoVi	N2 LoVi	N2 HiVi	N2 HiVi	N2 HiVi	N2 HiVi	N2 LoVi	N2 LoVi	N2 HiVi	N2 HiVi	N2 HiVi	N2 HiVi
Circuit 1	Motor RLA (A)	116.8	116.8	116.8	160.8	116.8	160.8	140.8	140.8	132.8	192.0	132.8	192.0
	Motor LRA (A)	291.0	0.0	291.0	291.0	0.0	0.0	354.0	0.0	354.0	354.0	0.0	0.0
	Max Amps (A)	141.0	128.8	141.0	201.0	128.8	188.1	168.0	153.6	168.0	240.0	153.6	223.6
	Max Power input (kW)	83.1	84.8	83.1	121.3	84.8	123.8	99.1	101.1	98.9	144.2	101.1	147.1
Circuit 2	Motor RLA (A)	140.8	140.8	132.8	192.0	132.8	192.0	140.8	140.8	132.8	192.0	132.8	192.0
	Motor LRA (A)	354.0	0.0	354.0	354.0	0.0	0.0	354.0	0.0	354.0	354.0	0.0	0.0
	Max Amps (A)	168.0	153.6	168.0	240.0	153.6	223.6	168.0	153.6	168.0	240.0	153.6	223.6
	Max Power input (kW)	99.1	101.1	98.9	144.2	101.1	147.1	99.1	101.1	98.9	144.2	101.1	147.1
Unit @ Max	Starting Amps (A)	497.0	284.4	497.0	557.0	284.4	413.6	524.0	309.2	524.0	597.0	309.2	449.1
	Amps ctl + auxiliaires	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	3.0	2.0	2.0
	Max. Amps (A)	311.0	284.4	311.0	443.0	284.4	413.6	338.0	309.2	338.0	482.0	309.2	449.1
	displacement power factor (DPF)	0.85	0.95	0.85	0.87	0.95	0.95	0.85	0.95	0.85	0.87	0.95	0.95
	short circuit withstand rating (kA)	35	35	35	35	35	35	35	35	35	36	35	35
Disconnect Switch Digit 26=C	Fuse size (A) C1	200 aM-T1200	gG-T2200	aM-T1250	aM-T2200	gG-T2250	aM-T2250	aM-T1250	aM-T2250	aM-T1315	aM-T2250	aM-T2315	aM-T2
	Fuse size (A) C2	250 aM-T1250	aM-T2250	aM-T1315	aM-T2250	aM-T2315	aM-T2250	aM-T1250	aM-T2250	aM-T1315	aM-T2250	aM-T2315	aM-T2
	Disconnect Switch Size	6X250A - T1	6X400A - T2	6X250A - T1	6X400A - T2	6X400A - T2	6X400A - T2	6X250A - T1	6X400A - T2	6X250A - T1	6X400A - T2	6X400A - T2	6X400A - T2
	Max connecting Wire (mm <sup>2</sup> )	2 x 185	2 x 240	2 x 185	2 x 240	2 x 240	2 x 240	2 x 185	2 x 240	2 x 185	2 x 240	2 x 240	2 x 240
	Bus bar width (mm)	32	45	32	45	45	45	32	45	32	45	45	45
Circuit Breaker + circuit breaker size Bus bar Digit 26=D	Bus bar (A) C1	NSX 160A	NSX 160A	NSX 160A	NSX 400A	NSX 160A	NSX 400A	NSX 250A	NSX 250A	NSX 250A	NSX 400A	NSX 250A	NSX 400A
	circuit breaker size (A) C2	NSX 250A	NSX 250A	NSX 250A	NSX 400A	NSX 250A	NSX 400A	NSX 250A	NSX 250A	NSX 250A	NSX 400A	NSX 250A	NSX 400A
	Bus bar connection	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x10	Copper bar 50x8	Copper bar 50x10	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x10	Copper bar 50x8	Copper bar 50x10
	Max connecting Wire (mm <sup>2</sup> )	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240



**Table 14 - RTWD High Efficiency R134a**

Unit size		060	060	060	070	070	070	080	080	080	090	090
Unit Type	Digit 12	2	2	2	2	2	2	2	2	2	2	2
Unit Application	Digit 15	A	A	B;C	A	A	B;C	A	A	B;C	A	A
Evap Application	Digit 21	1	2;3	*	1	2;3	*	1	2;3	*	1	2;3
Comp Starter	digit 24	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Compressor	C1	K1 LoVi	K1 HiVi	K1 HiVi	K2 LoVi	K2 HiVi	K2 HiVi	K2 LoVi	K2 HiVi	K2 HiVi	L1 LoVi	L1 HiVi
	C2	K1 LoVi	K1 HiVi	K1 HiVi	K2 LoVi	K2 HiVi	K2 HiVi	L1 LoVi	L1 HiVi	L1 HiVi	L1 LoVi	L1 HiVi
Circuit 1	Motor RLA (A)	38.0	38.0	52.8	46.0	46.0	61.6	46.0	46.0	61.6	60.0	60.0
	Motor LRA (A)	112.0	112.0	112.0	129.0	129.0	129.0	129.0	129.0	129.0	144.0	144.0
	Max Amps (A)	43.0	43.0	66.0	53.0	53.0	77.0	53.0	53.0	77.0	68.0	68.0
	Max Power input (kW)	26.5	26.5	41.7	31.4	31.4	49.3	31.4	31.4	49.3	41.5	41.5
Circuit 2	Motor RLA (A)	38.0	38.0	52.8	46.0	46.0	61.6	60.0	60.0	77.6	60.0	60.0
	Motor LRA (A)	112.0	112.0	112.0	129.0	129.0	129.0	144.0	144.0	144.0	144.0	144.0
	Max Amps (A)	43.0	43.0	66.0	53.0	53.0	77.0	68.0	68.0	97.0	68.0	68.0
	Max Power input (kW)	26.5	26.5	41.7	31.4	31.4	49.3	41.5	41.5	60.1	41.5	41.5
Unit @ Max	Starting Amps (A)	157.0	157.0	180.0	184.0	184.0	208.0	199.0	199.0	228.0	214.0	214.0
	Amps ctl + auxiliaires	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
	Max. Amps (A)	88.0	88.0	134.0	108.0	108.0	156.0	123.0	123.0	176.0	138.0	138.0
	displacement power factor (DPF)	0.89	0.89	0.91	0.85	0.85	0.92	0.87	0.87	0.91	0.88	0.88
Disconnect Switch Digit 26=C	short circuit withstand rating (kA)	35	35	35	35	35	35	35	35	35	35	35
	Fuse size (A) C1	63 aM-T0063	aM-T0080	aM-T0080	aM-T0080	aM-T00	100 aM-T00	80 aM-T0080	aM-T00	100 aM-T00	100 aM-T00	100 aM-T00
Circuit Breaker + Bus bar Digit 26=D	Fuse size (A) C2	63 aM-T0063	aM-T0080	aM-T0080	aM-T0080	aM-T00	100 aM-T00	125 aM-T00	125 aM-T00	125 aM-T00	100 aM-T00	100 aM-T00
	Disconect Switch Size	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00
	Max connecting Wire (mm <sup>2</sup> )	2 x 95	2 x 95	2 x 95	2 x 95	2 x 95	2 x 95	2 x 95	2 x 95	2 x 95	2 x 95	2 x 95
	Bus bar width (mm)	20	20	20	20	20	20	20	20	20	20	20
Circuit Breaker + Bus bar Digit 26=D	circuit breaker size (A) C1	NSX 100A	NSX 100A	NSX 100A	NSX 100A	NSX 100A	NSX 100A	NSX 100A	NSX 100A	NSX 100A	NSX 100A	NSX 100A
	circuit breaker size (A) C2	NSX 100A	NSX 100A	NSX 100A	NSX 100A	NSX 100A	NSX 100A	NSX 100A	NSX 100A	NSX 100A	NSX 160A	NSX 100A
	Bus bar connection	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8
	Max connecting Wire (mm <sup>2</sup> )	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240



**Table 14 - RTWD High Efficiency R134a (Continued)**

Unit size		090	100	100	100	110	110	110	120	120	120	130
Unit Type	Digit 12	2	2	2	2	2	2	2	2	2	2	2
Unit Application	Digit 15	B;C	A	A	B;C	A	A	B;C	A	A	B;C	A
Evap Application	Digit 21	*	1	2;3	*	1	2;3	*	1	2;3	*	1
Comp Starter	digit 24	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Compressor	C1	L1 HiVi	L1 LoVi	L1 HiVi	L1 HiVi	L2 LoVi	L2 HiVi	L2 HiVi	L2 LoVi	L2 HiVi	L2 HiVi	M1 LoVi
	C2	L1 HiVi	L2 LoVi	L2 HiVi	L2 HiVi	L2 LoVi	L2 HiVi	L2 HiVi	M1 LoVi	M1 HiVi	M1 HiVi	M1 LoVi
Circuit 1	Motor RLA (A)	77.6	60.0	60.0	77.6	72.0	72.0	92.8	72.0	72.0	92.8	84.8
	Motor LRA (A)	144.0	144.0	144.0	144.0	180.0	180.0	180.0	180.0	180.0	180.0	217.0
	Max Amps (A)	97.0	68.0	68.0	97.0	80.0	80.0	116.0	80.0	80.0	116.0	94.0
	Max Power input (kW)	60.1	41.5	41.5	60.1	46.0	46.0	70.7	46.0	46.0	70.7	54.8
Circuit 2	Motor RLA (A)	77.6	72.0	72.0	92.8	72.0	72.0	92.8	84.8	84.8	112.8	84.8
	Motor LRA (A)	144.0	180.0	180.0	180.0	180.0	180.0	180.0	217.0	217.0	217.0	217.0
	Max Amps (A)	97.0	80.0	80.0	116.0	80.0	80.0	116.0	94.0	94.0	141.0	94.0
	Max Power input (kW)	60.1	46.0	46.0	70.7	46.0	46.0	70.7	54.8	54.8	83.3	54.8
Unit @ Max	Starting Amps (A)	243.0	250.0	250.0	279.0	262.0	262.0	298.0	299.0	299.0	335.0	313.0
	Amps ctl + auxiliares	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
	Max. Amps (A)	196.0	150.0	150.0	215.0	162.0	162.0	234.0	176.0	176.0	259.0	190.0
	displacement power factor (DPF)	0.89	0.85	0.85	0.89	0.83	0.83	0.88	0.84	0.84	0.86	0.84
	short circuit withstand rating (kA)	35	35	35	35	35	35	35	35	35	35	35
Disconnect Switch Digit 26=C	Fuse size (A) C1	125 aM-T00	100 aM-T00	100 aM-T00	125 aM-T00	125 aM-T00	125 aM-T00	160 aM-T00	125 aM-T00	125 aM-T00	160 aM-T1	125 aM-T1
	Fuse size (A) C2	125 aM-T00	125 aM-T00	125 aM-T00	160 aM-T00	125 aM-T00	125 aM-T00	160 aM-T00	125 aM-T00	125 aM-T00	160 aM-T1	125 aM-T1
	Disconnect Switch Size	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00	6X250A - T1	6X250A - T1
	Max connecting Wire (mm <sup>2</sup> )	2 x 95	2 x 95	2 x 95	2 x 95	2 x 95	2 x 95	2 x 95	2 x 95	2 x 95	2 x 185	2 x 185
	Bus bar width (mm)	20	20	20	20	20	20	20	20	20	32	32
Circuit Breaker + Bus bar Digit 26=D	circuit breaker size (A) C1	NSX 160A	NSX 100A	NSX 100A	NSX 160A	NSX 100A	NSX 100A	NSX 160A	NSX 100A	NSX 100A	NSX 160A	NSX 160A
	circuit breaker size (A) C2	NSX 160A	NSX 100A	NSX 100A	NSX 160A	NSX 100A	NSX 100A	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 160A
	Bus bar connection	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8
	Max connecting Wire (mm <sup>2</sup> )	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240

**Table 14 - RTWD High Efficiency R134a (Continued)**

Unit size		130	130	140	140	140	160	160	160	180	180
Unit Type	Digit 12	2	2	2	2	2	2	2	2	2	2
Unit Application	Digit 15	A	B;C	A	A	B;C	A	A	B;C	A	A
Evap Application	Digit 21	2;3	*	1	2;3	*	1	2;3	*	1	2;3
Comp Starter	digit 24	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Compressor	C1	M1 HiVi	M1 HiVi	M1 LoVi	M1 HiVi	M1 HiVi	M2 LoVi	M2 HiVi	M2 HiVi	M2 LoVi	M2 HiVi
	C2	M1 HiVi	M1 HiVi	M2 LoVi	M2 HiVi	M2 HiVi	M2 LoVi	M2 HiVi	M2 HiVi	N1 LoVi	N1 HiVi
Circuit 1	Motor RLA (A)	84.8	112.8	84.8	84.8	112.8	98.0	98.0	132.8	98.0	98.0
	Motor LRA (A)	217.0	217.0	217.0	217.0	217.0	259.0	259.0	259.0	259.0	259.0
	Max Amps (A)	94.0	141.0	94.0	94.0	141.0	114.0	114.0	166.0	114.0	114.0
	Max Power input (kW)	54.8	83.3	54.8	54.8	83.3	66.3	66.3	98.9	66.3	66.3
Circuit 2	Motor RLA (A)	84.8	112.8	98.0	98.0	132.8	98.0	98.0	132.8	116.8	116.8
	Motor LRA (A)	217.0	217.0	259.0	259.0	259.0	259.0	259.0	259.0	291.0	291.0
	Max Amps (A)	94.0	141.0	114.0	114.0	166.0	114.0	114.0	166.0	141.0	141.0
	Max Power input (kW)	54.8	83.3	66.3	66.3	98.9	66.3	66.3	98.9	83.1	83.1
Unit @ Max	Starting Amps (A)	313.0	360.0	355.0	355.0	402.0	375.0	375.0	427.0	407.0	407.0
	Amps ctl + auxiliaires	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
	Max. Amps (A)	190.0	284.0	210.0	210.0	309.0	230.0	230.0	334.0	257.0	257.0
	displacement power factor (DPF)	0.84	0.85	0.84	0.84	0.86	0.84	0.84	0.86	0.85	0.85
	short circuit withstand rating (kA)	35	35	35	35	35	35	35	35	35	35
Disconnect Switch Digit 26=C	Fuse size (A) C1	125 aM-T1	160 aM-T1	125 aM-T1	125 aM-T1	160 aM-T1	160 aM-T1	160 aM-T1	200 aM-T1	160 aM-T1	160 aM-T1
	Fuse size (A) C2	125 aM-T1	160 aM-T1	160 aM-T1	160 aM-T1	200 aM-T1	160 aM-T1	160 aM-T1	200 aM-T1	200 aM-T1	200 aM-T1
	Disconnect Switch Size	6X250A - T1	6X250A - T1	6X250A - T1	6X250A - T1	6X250A - T1	6X250A - T1	6X250A - T1	6X250A - T1	6X250A - T1	6X250A - T1
	Max connecting Wire (mm <sup>2</sup> )	2 x 185	2 x 185	2 x 185	2 x 185	2 x 185	2 x 185	2 x 185	2 x 185	2 x 185	2 x 185
	Bus bar width (mm)	32	32	32	32	32	32	32	32	32	32
Circuit Breaker + Bus bar Digit 26=D	circuit breaker size (A) C1	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 250A	NSX 160A	NSX 160A
	circuit breaker size (A) C2	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 250A	NSX 160A	NSX 160A	NSX 250A	NSX 160A	NSX 160A
	Bus bar connection	Copper bar	Copper bar	Copper bar	Copper bar	Copper bar	Copper bar	Copper bar	Copper bar	Copper bar	Copper bar
	Max connecting Wire (mm <sup>2</sup> )	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240



**Table 14 - RTWD High Efficiency R134a (Continued)**

Unit size		180	200	200	200	220	220	220	250	250	250
Unit Type	Digit 12	2	2	2	2	2	2	2	2	2	2
Unit Application	Digit 15	B;C	A	A	B;C	A	A	B;C	A	A	B;C
Evap Application	Digit 21	*	1	2;3	*	1	2;3	*	1	2;3	*
Comp Starter	digit 24	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Compressor	C1	M2 HiVi	N1 LoVi	N1 HiVi	N1 HiVi	N1 LoVi	N1 HiVi	N1 HiVi	N2 LoVi	N2 HiVi	N2 HiVi
	C2	N1 HiVi	N1 LoVi	N1 HiVi	N1 HiVi	N2 LoVi	N2 HiVi	N2 HiVi	N2 LoVi	N2 HiVi	N2 HiVi
Circuit 1	Motor RLA (A)	132.8	116.8	116.8	160.8	116.8	116.8	160.8	140.8	132.8	192.0
	Motor LRA (A)	259.0	291.0	291.0	291.0	291.0	291.0	291.0	354.0	354.0	354.0
	Max Amps (A)	166.0	141.0	141.0	201.0	141.0	141.0	201.0	168.0	168.0	240.0
	Max Power input (kW)	98.9	83.1	83.1	121.3	83.1	83.1	121.3	99.1	98.9	144.2
Circuit 2	Motor RLA (A)	160.8	116.8	116.8	160.8	140.8	132.8	192.0	140.8	132.8	192.0
	Motor LRA (A)	291.0	291.0	291.0	291.0	354.0	354.0	354.0	354.0	354.0	354.0
	Max Amps (A)	201.0	141.0	141.0	201.0	168.0	168.0	240.0	168.0	168.0	240.0
	Max Power input (kW)	121.3	83.1	83.1	121.3	99.1	98.9	144.2	99.1	98.9	144.2
Unit @ Max	Starting Amps (A)	462.0	434.0	434.0	494.0	497.0	497.0	557.0	524.0	524.0	596.0
	Amps ctl + auxiliaires	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
	Max. Amps (A)	369.0	284.0	284.0	404.0	311.0	311.0	443.0	338.0	338.0	482.0
	displacement power factor (DPF)	0.87	0.85	0.85	0.87	0.85	0.85	0.87	0.85	0.85	0.87
	short circuit withstand rating (kA)	35	35	35	35	35	35	35	35	35	35
Disconnect Switch Digit 26=C	Fuse size (A) C1	200 aM-T2	200 aM-T1	200 aM-T1	250 aM-T2	200 aM-T1	200 aM-T1	250 aM-T2	250 aM-T1	250 aM-T1	315 aM-T2
	Fuse size (A) C2	250 aM-T2	200 aM-T1	200 aM-T1	250 aM-T2	250 aM-T1	250 aM-T1	315 aM-T2	250 aM-T1	250 aM-T1	315 aM-T2
	Disconect Switch Size	6X400A - T2	6X250A - T1	6X250A - T1	6X400A - T2	6X250A - T1	6X250A - T1	6X400A - T2	6X250A - T1	6X250A - T1	6X400A - T2
	Max connecting Wire (mm <sup>2</sup> )	2 x 240	2 x 185	2 x 185	2 x 240	2 x 185	2 x 185	2 x 240	2 x 185	2 x 185	2 x 240
	Bus bar width (mm)	45	32	32	45	32	32	45	32	32	45
Circuit Breaker + Bus bar Digit 26=D	circuit breaker size (A) C1	NSX 250A	NSX 160A	NSX 160A	NSX 250A	NSX 160A	NSX 160A	NSX 400A	NSX 250A	NSX 250A	NSX 400A
	circuit breaker size (A) C2	NSX 250A	NSX 160A	NSX 160A	NSX 250A	NSX 250A	NSX 250A	NSX 400A	NSX 250A	NSX 250A	NSX 400A
	Bus bar connection	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x10	Copper bar 50x8	Copper bar 50x8	Copper bar 50x10
	Max connecting Wire (mm <sup>2</sup> )	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240

**Table 15 - RTWD Extra High Efficiency R134a**

Unit size		160	160	160	160	160	160	180	180
Unit Type	Digit 12	3	3	3	3	3	3	3	3
Unit Application	Digit 15	A	A	A	A	B;C	B;C	A	A
Evap Application	Digit 21	1	1	2;3	2;3	*	*	1	1
Comp Starter	digit 24	Y	B	Y	B	B	Y	Y	B
Compressor	C1	M2 LoVi	M2 LoVi	M2 HiVi	M2 HiVi	M2 HiVi	M2 HiVi	M2 LoVi	M2 LoVi
	C2	M2 LoVi	M2 LoVi	M2 HiVi	M2 HiVi	M2 HiVi	M2 HiVi	N1 LoVi	N1 LoVi
Circuit 1	Motor RLA (A)	98.0	98.0	98.0	98.0	132.8	132.8	98.0	98.0
	Motor LRA (A)	259.0	0.0	259.0	0.0	0.0	259.0	259.0	0.0
	Max Amps (A)	114.0	102.9	114.0	102.9	153.3	166.0	114.0	102.9
	Max Power input (kW)	66.3	67.7	66.3	67.7	100.9	98.9	66.3	67.7
Circuit 2	Motor RLA (A)	98.0	98.0	98.0	98.0	132.8	132.8	116.8	116.8
	Motor LRA (A)	259.0	0.0	259.0	0.0	0.0	259.0	291.0	0.0
	Max Amps (A)	114.0	102.9	114.0	102.9	153.3	166.0	141.0	128.8
	Max Power input (kW)	66.3	67.7	66.3	67.7	100.9	98.9	83.1	84.8
Unit @ Max	Starting Amps (A)	375.0	207.7	375.0	207.7	308.7	427.0	407.0	233.7
	Amps ctl + auxiliaires	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
	Max. Amps (A)	230.0	207.7	230.0	207.7	308.7	334.0	257.0	233.7
	displacement power factor (DPF)	0.84	0.95	0.84	0.95	0.95	0.86	0.85	0.95
	short circuit withstand rating (kA)	35	35	35	35	35	35	35	35
Disconnect Switch Digit 26=C	Fuse size (A) C1	160 aM-T1	200 gG-T1	200 aM-T1	200 gG-T1	200 gG-T1	200 aM-T1	160 aM-T1	200 gG-T1
	Fuse size (A) C2	160 aM-T1	200 gG-T1	200 aM-T1	200 gG-T1	200 gG-T1	200 aM-T1	200 aM-T1	200 gG-T1
	Disconect Switch Size	6X250A - T1	6X250A - T1	6X250A - T1	6X250A - T1	6X250A - T1	6X250A - T1	6X250A - T1	6X250A - T1
	Max connecting Wire (mm <sup>2</sup> )	2 x 185	2 x 185	2 x 185	2 x 185	2 x 185	2 x 185	2 x 185	2 x 185
	Bus bar width (mm)	32	32	32	32	32	32	32	32
Circuit Breaker + Bus bar Digit 26=D	circuit breaker size (A) C1	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 250A	NSX 250A	NSX 160A	NSX 160A
	circuit breaker size (A) C2	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 250A	NSX 250A	NSX 160A	NSX 160A
	Bus bar connection	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8
	Max connecting Wire (mm <sup>2</sup> )	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240



**Table 15 - RTWD Extra High Efficiency R134a (Continued)**

Unit size		180	180	180	200	200	200	200	200
Unit Type	Digit 12	3	3	3	3	3	3	3	3
Unit Application	Digit 15	A	A	B;C	A	A	A	A	B;C
Evap Application	Digit 21	2;3	2;3	*	1	1	2;3	2;3	*
Comp Starter	digit 24	Y	B	B	Y	B	Y	B	B
Compressor	C1	M2 HiVi	M2 HiVi	M2 HiVi	N1 LoVi	N1 LoVi	N1 HiVi	N1 HiVi	N1 HiVi
	C2	N1 HiVi	N1 HiVi	N1 HiVi	N1 LoVi	N1 LoVi	N1 HiVi	N1 HiVi	N1 HiVi
Circuit 1	Motor RLA (A)	98.0	98.0	132.8	116.8	116.8	116.8	116.8	160.8
	Motor LRA (A)	259.0	0.0	0.0	291.0	0.0	291.0	0.0	0.0
	Max Amps (A)	114.0	102.9	153.3	141.0	128.8	141.0	128.8	188.1
	Max Power input (kW)	66.3	67.7	100.9	83.1	84.8	83.1	84.8	123.8
Circuit 2	Motor RLA (A)	116.8	116.8	160.8	116.8	116.8	116.8	116.8	160.8
	Motor LRA (A)	291.0	0.0	0.0	291.0	0.0	291.0	0.0	0.0
	Max Amps (A)	141.0	128.8	188.1	141.0	128.8	141.0	128.8	188.1
	Max Power input (kW)	83.1	84.8	123.8	83.1	84.8	83.1	84.8	123.8
Unit @ Max	Starting Amps (A)	407.0	233.7	343.4	434.0	259.6	434.0	259.6	378.1
	Amps ctl + auxiliaires	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
	Max. Amps (A)	257.0	233.7	343.4	284.0	259.6	284.0	259.6	378.1
	displacement power factor (DPF)	0.85	0.95	0.95	0.85	0.95	0.85	0.95	0.95
	short circuit withstand rating (kA)	35	35	35	35	35	35	35	35
Disconnect Switch Digit 26=C	Fuse size (A) C1	160 aM-T1	200 gG-T1	200 gG-T2	200 aM-T1	200 gG-T1	200 aM-T1	200 gG-T1	250 aM-T2
	Fuse size (A) C2	200 aM-T1	200 gG-T1	250 aM-T2	200 aM-T1	200 gG-T1	200 aM-T1	200 gG-T1	250 aM-T2
	Disconect Switch Size	6X250A - T1	6X250A - T1	6X400A - T2	6X250A - T1	6X250A - T1	6X250A - T1	6X250A - T1	6X400A - T2
	Max connecting Wire (mm <sup>2</sup> )	2 x 185	2 x 185	2 x 240	2 x 185	2 x 185	2 x 185	2 x 185	2 x 240
	Bus bar width (mm)	32	32	45	32	32	32	32	45
	Circuit Breaker + Bus bar Digit 26=D	circuit breaker size (A) C1	NSX 160A	NSX 160A	NSX 250A	NSX 160A	NSX 160A	NSX 160A	NSX 160A
circuit breaker size (A) C2		NSX 160A	NSX 160A	NSX 250A	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 250A
Bus bar connection		Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8
Max connecting Wire (mm <sup>2</sup> )		2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240



**Table 16 - RTWD High Seasonal Efficiency R134a**

Unit size		060	060	060	070	070	070	080	080	080	090	090	090
Unit Type	Digit 12	2	2	2	2	2	2	2	2	2	2	2	2
Unit Application	Digit 15	A	A	B;C	A	A	B;C	A	A	B;C	A	A	B;C
Evap Application	Digit 21	1	2;3	*	1	2;3	*	1	2;3	*	1	2;3	*
Comp Starter	digit 24	B	B	B	B	B	B	B	B	B	B	B	B
Compressor	C1	K1 LoVi	K1 HiVi	K1 HiVi	K2 LoVi	K2 HiVi	K2 HiVi	K2 LoVi	K2 HiVi	K2 HiVi	L1 LoVi	L1 HiVi	L1 HiVi
	C2	K1 LoVi	K1 HiVi	K1 HiVi	K2 LoVi	K2 HiVi	K2 HiVi	L1 LoVi	L1 HiVi	L1 HiVi	L1 LoVi	L1 HiVi	L1 HiVi
Circuit 1	Motor RLA (A)	38.0	38.0	52.8	46.0	46.0	61.6	46.0	46.0	61.6	60.0	60.0	77.6
	Motor LRA (A)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Max Amps (A)	41.1	41.1	64.6	48.7	48.7	76.4	48.7	48.7	76.4	64.3	64.3	93.2
	Max Power input (kW)	27.1	27.1	42.6	32.0	32.0	50.3	32.0	32.0	50.3	42.3	42.3	61.3
Circuit 2	Motor RLA (A)	38.0	38.0	52.8	46.0	46.0	61.6	60.0	60.0	77.6	60.0	60.0	77.6
	Motor LRA (A)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Max Amps (A)	41.1	41.1	64.6	48.7	48.7	76.4	64.3	64.3	93.2	64.3	64.3	93.2
	Max Power input (kW)	27.1	27.1	42.6	32.0	32.0	50.3	42.3	42.3	61.3	42.3	42.3	61.3
Unit @ Max	Starting Amps (A)	84.2	84.2	131.3	99.3	99.3	154.9	114.9	114.9	171.6	130.5	130.5	188.4
	Amps ctl + auxiliares	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
	Max. Amps (A)	84.2	84.2	131.3	99.3	99.3	154.9	114.9	114.9	171.6	130.5	130.5	188.4
	displacement power factor (DPF)	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950
	short circuit withstand rating (kA)	35	35	35	35	35	35	35	35	35	35	35	35
Disconnect Switch Digit 26=C	Fuse size (A) C1	63 gG-T00	63 gG-T00	63 gG-T00	63 gG-T00	63 gG-T00	125 gG-T00	63 gG-T00	63 gG-T00	125 gG-T00	80 gG-T00	80 gG-T00	160 gG-T00
	Fuse size (A) C2	63 gG-T00	63 gG-T00	63 gG-T00	63 gG-T00	63 gG-T00	125 gG-T00	80 gG-T00	80 gG-T00	160 gG-T00	80 gG-T00	80 gG-T00	160 gG-T00
	Disconnect Switch Size	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00
	Max connecting Wire (mm <sup>2</sup> )	2 x 95	2 x 95	2 x 95	2 x 95	2 x 95	2 x 95	2 x 95	2 x 95	2 x 95	2 x 95	2 x 95	2 x 95
	Bus bar width (mm)	20	20	20	20	20	20	20	20	20	20	20	20
Circuit Breaker + Bus bar Digit 26=D	circuit breaker size (A) C1	NSX 100A	NSX 100A	NSX 100A	NSX 100A	NSX 100A	NSX 100A	NSX 100A	NSX 100A	NSX 100A	NSX 100A	NSX 100A	NSX 160A
	circuit breaker size (A) C2	NSX 100A	NSX 100A	NSX 100A	NSX 100A	NSX 100A	NSX 100A	NSX 100A	NSX 100A	NSX 160A	NSX 100A	NSX 100A	NSX 160A
	Bus bar connection	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8
	Max connecting Wire (mm <sup>2</sup> )	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240



**Table 16 - RTWD High Seasonal Efficiency R134a (Continued)**

Unit size		100	100	100	110	110	110	120	120	120	130	130	130
Unit Type	Digit 12	2	2	2	2	2	2	2	2	2	2	2	2
Unit Application	Digit 15	A	A	B;C	A	A	B;C	A	A	B;C	A	A	B;C
Evap Application	Digit 21	1	2;3	*	1	2;3	*	1	2;3	*	1	2;3	*
Comp Starter	digit 24	B	B	B	B	B	B	B	B	B	B	B	B
Compressor	C1	L1 LoVi	L1 HiVi	L1 HiVi	L2 LoVi	L2 HiVi	L2 HiVi	L2 LoVi	L2 HiVi	L2 HiVi	M1 LoVi	M1 HiVi	M1 HiVi
	C2	L2 LoVi	L2 HiVi	L2 HiVi	L2 LoVi	L2 HiVi	L2 HiVi	M1 LoVi	M1 HiVi	M1 HiVi	M1 LoVi	M1 HiVi	M1 HiVi
Circuit 1	Motor RLA (A)	60.0	60.0	77.6	72.0	72.0	92.8	72.0	72.0	92.8	84.8	84.8	112.8
	Motor LRA (A)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Max Amps (A)	64.3	64.3	93.2	71.3	71.3	109.6	71.3	71.3	109.6	85.0	85.0	129.1
	Max Power input (kW)	42.3	42.3	61.3	46.9	46.9	72.1	46.9	46.9	72.1	56.0	56.0	85.0
Circuit 2	Motor RLA (A)	72.0	72.0	92.8	72.0	72.0	92.8	84.8	84.8	112.8	84.8	84.8	112.8
	Motor LRA (A)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Max Amps (A)	71.3	71.3	109.6	71.3	71.3	109.6	85.0	85.0	129.1	85.0	85.0	129.1
	Max Power input (kW)	46.9	46.9	72.1	46.9	46.9	72.1	56.0	56.0	85.0	56.0	56.0	85.0
Unit @ Max	Starting Amps (A)	137.6	137.6	204.8	144.6	144.6	221.2	158.3	158.3	240.8	172.0	172.0	260.3
	Amps ctl + auxiliaires	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
	Max. Amps (A)	137.6	137.6	204.8	144.6	144.6	221.2	158.3	158.3	240.8	172.0	172.0	260.3
	displacement power factor (DPF)	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950
	short circuit withstand rating (kA)	35	35	35	35	35	35	35	35	35	35	35	35
Disconnect Switch Digit 26=C	Fuse size (A) C1	80 gG-T0080	gG-T00	125 gG-T00	125 gG-T00	125 gG-T00	160 gG-T00	125 gG-T00	125 gG-T00	200 gG-T1	160 gG-T1	160 gG-T1	200 gG-T1
	Fuse size (A) C2	100 gG-T00	100 gG-T00	160 gG-T00	125 gG-T00	125 gG-T00	160 gG-T00	160 gG-T00	160 gG-T00	200 gG-T1	160 gG-T1	160 gG-T1	200 gG-T1
	Disconnect Switch Size	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00	6X250A - T1	6X250A - T1	6X250A - T1	6X250A - T1
	Max connecting Wire (mm <sup>2</sup> )	2 x 95	2 x 95	2 x 95	2 x 95	2 x 95	2 x 95	2 x 95	2 x 95	2 x 185	2 x 185	2 x 185	2 x 185
	Bus bar width (mm)	20	20	20	20	20	20	20	20	32	32	32	32
Circuit Breaker + Bus bar Digit 26=D	circuit breaker size (A) C1	NSX 100A	NSX 100A	NSX 160A	NSX 100A	NSX 100A	NSX 160A	NSX 100A	NSX 100A	NSX 160A	NSX 160A	NSX 160A	NSX 160A
	circuit breaker size (A) C2	NSX 100A	NSX 100A	NSX 160A	NSX 100A	NSX 100A	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 160A
	Bus bar connection	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8
	Max connecting Wire (mm <sup>2</sup> )	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240



**Table 16 - RTWD High Seasonal Efficiency R134a (Continued)**

Unit size		140	140	140	160	160	160	180	180	180	200	200	200
Unit Type	Digit 12	2	2	2	2	2	2	2	2	2	2	2	2
Unit Application	Digit 15	A	A	B;C	A	A	B;C	A	A	B;C	A	A	B;C
Evap Application	Digit 21	1	2;3	*	1	2;3	*	1	2;3	*	1	2;3	*
Comp Starter	digit 24	B	B	B	B	B	B	B	B	B	B	B	B
Compressor	C1	M1 LoVi	M1 HiVi	M1 HiVi	M2 LoVi	M2 HiVi	M2 HiVi	M2 LoVi	M2 HiVi	M2 HiVi	N1 LoVi	N1 HiVi	N1 HiVi
	C2	M2 LoVi	M2 HiVi	M2 HiVi	M2 LoVi	M2 HiVi	M2 HiVi	N1 LoVi	N1 HiVi	N1 HiVi	N1 LoVi	N1 HiVi	N1 HiVi
Circuit 1	Motor RLA (A)	84.8	84.8	112.8	98.0	98.0	132.8	98.0	98.0	132.8	116.8	116.8	160.8
	Motor LRA (A)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Max Amps (A)	85.0	85.0	129.1	102.9	102.9	153.3	102.9	102.9	153.3	128.8	128.8	188.1
Circuit 2	Max Power input (kW)	56.0	56.0	85.0	67.7	67.7	100.9	67.7	67.7	100.9	84.8	84.8	123.8
	Motor RLA (A)	98.0	98.0	132.8	98.0	98.0	132.8	116.8	116.8	160.8	116.8	116.8	160.8
	Motor LRA (A)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unit @ Max	Max Amps (A)	102.9	102.9	153.3	102.9	102.9	153.3	128.8	128.8	188.1	128.8	128.8	188.1
	Max Power input (kW)	67.7	67.7	100.9	67.7	67.7	100.9	84.8	84.8	123.8	84.8	84.8	123.8
	Starting Amps (A)	189.9	189.9	284.5	207.7	207.7	308.7	233.7	233.7	343.4	259.6	259.6	378.1
Disconnect Switch Digit 26=C	Amps ctl + auxiliaires	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
	Max. Amps (A)	189.9	189.9	284.5	207.7	207.7	308.7	233.7	233.7	343.4	259.6	259.6	378.1
	displacement power factor (DPF)	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950
Circuit Breaker + Bus bar Digit 26=D	short circuit withstand rating (kA)	35	35	35	35	35	35	35	35	35	35	35	35
	Fuse size (A) C1	160 gG-T1	160 gG-T1	200 gG-T1	200 gG-T1	200 gG-T1	200 gG-T1	200 gG-T1	200 gG-T1	200 gG-T1	200 gG-T1	200 gG-T1	250 aM-T2
	Fuse size (A) C2	200 gG-T1	200 gG-T1	200 gG-T1	200 gG-T1	200 gG-T1	200 gG-T1	200 gG-T1	200 gG-T1	250 aM-T2	200 gG-T1	200 gG-T1	250 aM-T2
Circuit Breaker + Bus bar Digit 26=D	Disconnect Switch Size	6X250A - T1	6X250A - T1	6X250A - T1	6X250A - T1	6X250A - T1	6X250A - T1	6X250A - T1	6X250A - T1	6X400A - T2	6X250A - T1	6X250A - T1	6X400A - T2
	Max connecting Wire (mm <sup>2</sup> )	2 x 185	2 x 185	2 x 185	2 x 185	2 x 185	2 x 185	2 x 185	2 x 185	2 x 240	2 x 185	2 x 185	2 x 240
	Bus bar width (mm)	32	32	32	32	32	32	32	32	45	32	32	45
Circuit Breaker + Bus bar Digit 26=D	circuit breaker size (A) C1	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 250A	NSX 160A	NSX 160A	NSX 250A	NSX 160A	NSX 160A	NSX 250A
	circuit breaker size (A) C2	NSX 160A	NSX 160A	NSX 250A	NSX 160A	NSX 160A	NSX 250A	NSX 160A	NSX 160A	NSX 250A	NSX 160A	NSX 160A	NSX 250A
	Bus bar connection	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8
Circuit Breaker + Bus bar Digit 26=D	Max connecting Wire (mm <sup>2</sup> )	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240



**Table 16 - RTWD High Seasonal Efficiency R134a (Continued)**

Unit size		220	220	220	250	250	250	260	260	260	270	270	270
Unit Type	Digit 12	2	2	2	2	2	2	2	2	2	2	2	2
Unit Application	Digit 15	A	A	B;C	A	A	B;C	A	A	B;C	A	A	B;C
Evap Application	Digit 21	1	2;3	*	1	2;3	*	1	2;3	*	1	2;3	*
Comp Starter	digit 24	B	B	B	B	B	B	B	B	B	B	B	B
Compressor	C1	N1 LoVi	N1 HiVi	N1 HiVi	N2 LoVi	N2 HiVi	N2 HiVi	N1 60 LoVi	N1 60 HiVi	N1 60 HiVi	N2 60 LoVi	N2 60 HiVi	N2 60 HiVi
	C2	N2 LoVi	N2 HiVi	N2 HiVi	N2 LoVi	N2 HiVi	N2 HiVi	N2 60 LoVi	N2 60 HiVi	N2 60 HiVi	N2 60 LoVi	N2 60 HiVi	N2 60 HiVi
Circuit 1	Motor RLA (A)	116.8	116.8	160.8	140.8	132.8	192.0	147.4	147.4	194.4	177.8	177.8	234.4
	Motor LRA (A)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Max Amps (A)	128.8	128.8	188.1	153.6	153.6	223.6	164.4	164.4	225.3	195.6	195.6	267.9
	Max Power input (kW)	84.8	84.8	123.8	101.1	101.1	147.1	108.2	108.2	148.3	128.7	128.7	176.3
Circuit 2	Motor RLA (A)	140.8	132.8	192.0	140.8	132.8	192.0	177.8	177.8	234.4	177.8	177.8	234.4
	Motor LRA (A)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Max Amps (A)	153.6	153.6	223.6	153.6	153.6	223.6	195.6	195.6	267.9	195.6	195.6	267.9
	Max Power input (kW)	101.1	101.1	147.1	101.1	101.1	147.1	128.7	128.7	176.3	128.7	128.7	176.3
Unit @ Max	Starting Amps (A)	284.4	284.4	413.6	309.2	309.2	449.1	362.0	362.0	495.2	393.1	393.1	537.8
	Amps ctl + auxiliaires	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
	Max. Amps (A)	284.4	284.4	413.6	309.2	309.2	449.1	362.0	362.0	495.2	393.1	393.1	537.8
	displacement power factor (DPF)	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950
	short circuit withstand rating (kA)	35	35	35	35	35	35	35	35	35	35	35	35
Disconnect Switch Digit 26=C	Fuse size (A) C1	200 gG-T2200	200 gG-T2250	250 aM-T2250	250 aM-T2250	250 aM-T2315	200 aM-T2200	200 gG-T2200	200 gG-T2315	250 aM-T2250	250 aM-T2250	250 aM-T2315	250 aM-T2
	Fuse size (A) C2	250 aM-T2250	250 aM-T2315	250 aM-T2250	250 aM-T2250	250 aM-T2315	250 aM-T2250	250 aM-T2250	250 aM-T2315	250 aM-T2250	250 aM-T2250	250 aM-T2315	250 aM-T2
	Disconect Switch Size	6X400A - T2	6X400A - T2	6X400A - T2	6X400A - T2	6X400A - T2	6X400A - T2	6X400A - T2	6X400A - T2	6X400A - T2	6X400A - T2	6X400A - T2	6X400A - T2
	Max connecting Wire (mm <sup>2</sup> )	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240
	Bus bar width (mm)	45	45	45	45	45	45	45	45	45	45	45	45
Circuit Breaker + Bus bar Digit 26=D	circuit breaker size (A) C1	NSX 160A	NSX 160A	NSX 250A	NSX 250A	NSX 250A	NSX 400A	NSX 250A	NSX 250A	NSX 400A	NSX 250A	NSX 250A	NSX 400A
	circuit breaker size (A) C2	NSX 250A	NSX 250A	NSX 250A	NSX 250A	NSX 250A	NSX 400A	NSX 250A	NSX 250A	NSX 400A	NSX 250A	NSX 250A	NSX 400A
	Bus bar connection	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x10	Copper bar 50x8	Copper bar 50x8	Copper bar 50x10	Copper bar 50x8	Copper bar 50x8	Copper bar 50x10
	Max connecting Wire (mm <sup>2</sup> )	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240

**Table 17 - RTUD R134a**

Unit size		060	060	070	070	080	080	090	090	100	100	110	110
Unit Type	Digit 12	2	2	2	2	2	2	2	2	2	2	2	2
Unit Application	Digit 15	D;E	D;E	D;E	D;E	D;E	D;E	D;E	D;E	D;E	D;E	D;E	D;E
Evap Application	Digit 21	*	*	*	*	*	*	*	*	*	*	*	*
Comp Starter	digit 24	Y	B	Y	B	Y	B	Y	B	Y	B	Y	B
Compressor	C1	K1 HiVi	K1 HiVi	K2 HiVi	K2 HiVi	K2 HiVi	K2 HiVi	L1 HiVi	L1 HiVi	L1 HiVi	L1 HiVi	L2 HiVi	L2 HiVi
	C2	K1 HiVi	K1 HiVi	K2 HiVi	K2 HiVi	L1 HiVi	L1 HiVi	L1 HiVi	L1 HiVi	L2 HiVi	L2 HiVi	L2 HiVi	L2 HiVi
Circuit 1	Motor RLA (A)	52.8	52.8	61.6	61.6	61.6	61.6	77.6	77.6	77.6	77.6	92.8	92.8
	Motor LRA (A)	112.0	0.0	129.0	0.0	129.0	0.0	144.0	0.0	144.0	0.0	180.0	0.0
	Max Amps (A)	66.0	64.6	77.0	76.4	77.0	76.4	97.0	93.2	97.0	93.2	116.0	109.6
Circuit 2	Motor RLA (A)	52.8	52.8	61.6	61.6	77.6	77.6	77.6	77.6	92.8	92.8	92.8	92.8
	Motor LRA (A)	112.0	0.0	129.0	0.0	144.0	0.0	144.0	0.0	180.0	0.0	180.0	0.0
	Max Amps (A)	66.0	64.6	77.0	76.4	97.0	93.2	97.0	93.2	116.0	109.6	116.0	109.6
Unit @ Max	Max Power input (kW)	41.7	42.6	49.3	50.3	49.3	50.3	60.1	61.3	60.1	61.3	70.7	72.1
	Starting Amps (A)	180.0	131.3	208.0	154.9	228.0	171.6	243.0	188.4	279.0	204.8	298.0	221.2
	Ampsctl + auxiliaires	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Disconnect Switch Digit 26=C	Max. Amps (A)	134.0	131.3	156.0	154.9	176.0	171.6	196.0	188.4	215.0	204.8	234.0	221.2
	displacement power factor (DPF)	0.91	0.95	0.92	0.95	0.91	0.95	0.89	0.95	0.89	0.95	0.88	0.95
	short circuit withstand rating (kA)	35	35	35	35	35	35	35	35	35	35	35	35
Circuit Breaker + Bus bar Digit 26=D	Fuse size (A) C1	80 aM-T00	80 gG-T00	100 aM-T00	125 gG-T00	100 aM-T00	125 gG-T00	125 aM-T00	160 gG-T00	125 aM-T00	160 gG-T00	160 aM-T00	160 gG-T00
	Fuse size (A) C2	80 aM-T00	80 gG-T00	100 aM-T00	125 gG-T00	125 aM-T00	160 gG-T00	125 aM-T00	160 gG-T00	160 aM-T00	160 gG-T00	160 aM-T00	160 gG-T00
	Disconnect Switch Size	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00	6X160A - T00
	Max connecting Wire (mm <sup>2</sup> )	2 x 95	2 x 95	2 x 95	2 x 95	2 x 95	2 x 95	2 x 95	2 x 95	2 x 95	2 x 95	2 x 95	2 x 95
	Bus bar width (mm)	20	20	20	20	20	20	20	20	20	20	20	20
Circuit Breaker + Bus bar Digit 26=D	circuit breaker size (A) C1	NSX 100A	NSX 100A	NSX 100A	NSX 100A	NSX 100A	NSX 100A	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 160A
	circuit breaker size (A) C2	NSX 100A	NSX 100A	NSX 100A	NSX 100A	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 160A
	Bus bar connection	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8
Circuit Breaker + Bus bar Digit 26=D	Max connecting Wire (mm <sup>2</sup> )	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240



**Table 17 - RTUD R134a (Continued)**

Unit size		120	120	130	130	140	140	160	160	160	160	170	170
Unit Type	Digit 12	2	2	2	2	2	2	1	1	2	2	1	1
Unit Application	Digit 15	D;E	D;E	D;E	D;E	D;E	D;E	D;E	D;E	D;E	D;E	D;E	D;E
Evap Application	Digit 21	*	*	*	*	*	*	*	*	*	*	*	*
Comp Starter	digit 24	Y	B	Y	B	Y	B	Y	B	Y	B	Y	B
Compressor	C1	L2 HiVi	L2 HiVi	M1 HiVi	M1 HiVi	M1 HiVi	M1 HiVi	M2 HiVi	M2 HiVi	M2 HiVi	M2 HiVi	N1 HiVi	N1 HiVi
	C2	M1 HiVi	M1 HiVi	M1 HiVi	M1 HiVi	M2 HiVi	M2 HiVi	N1 HiVi	N1 HiVi	M2 HiVi	M2 HiVi	N1 HiVi	N1 HiVi
Circuit 1	Motor RLA (A)	92.8	92.8	112.8	112.8	112.8	112.8	132.8	132.8	132.8	132.8	160.8	160.8
	Motor LRA (A)	180.0	0.0	217.0	0.0	217.0	0.0	259.0	0.0	259.0	0.0	291.0	0.0
	Max Amps (A)	116.0	109.6	141.0	129.1	141.0	129.1	166.0	153.3	166.0	153.3	201.0	188.1
	Max Power input (kW)	70.7	72.1	83.3	85.0	83.3	85.0	98.9	100.9	98.9	100.9	121.3	123.8
Circuit 2	Motor RLA (A)	112.8	112.8	112.8	112.8	132.8	132.8	160.8	160.8	132.8	132.8	160.8	160.8
	Motor LRA (A)	217.0	0.0	217.0	0.0	259.0	0.0	291.0	0.0	259.0	0.0	291.0	0.0
	Max Amps (A)	141.0	129.1	141.0	129.1	166.0	153.3	201.0	188.1	166.0	153.3	201.0	188.1
	Max Power input (kW)	83.3	85.0	83.3	85.0	98.9	100.9	121.3	123.8	98.9	100.9	121.3	123.8
Unit @ Max	Starting Amps (A)	335.0	240.8	360.0	260.3	402.0	284.5	462.0	343.4	427.0	308.7	494.0	378.1
	Amps ctl + auxiliaires	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
	Max. Amps (A)	259.0	240.8	284.0	260.3	309.0	284.5	369.0	343.4	334.0	308.7	404.0	378.1
	displacement power factor (DPF)	0.86	0.95	0.85	0.95	0.86	0.95	0.87	0.95	0.86	0.95	0.87	0.95
	short circuit withstand rating (kA)	35	35	35	35	35	35	35	35	35	35	35	35
Disconnect Switch Digit 26=C	Fuse size (A) C1	160 aM-T1200 gG-T1	160 aM-T1200 gG-T1	160 aM-T1200 gG-T1	160 aM-T1200 gG-T1	200 aM-T1200 gG-T1	200 aM-T1200 gG-T1	250 aM-T2200 gG-T2	250 aM-T2200 gG-T2	250 aM-T1200 gG-T1	250 aM-T1200 gG-T1	250 aM-T2250 aM-T2	250 aM-T2
	Fuse size (A) C2	160 aM-T1200 gG-T1	160 aM-T1200 gG-T1	160 aM-T1200 gG-T1	200 aM-T1200 gG-T1	250 aM-T2250 aM-T2200	250 aM-T1200 gG-T1	250 aM-T2250 aM-T2200	250 aM-T1200 gG-T1	250 aM-T1200 gG-T1	250 aM-T2250 aM-T2	250 aM-T2250 aM-T2	250 aM-T2
	Disconnect Switch Size	6X250A - T1	6X250A - T1	6X250A - T1	6X250A - T1	6X250A - T1	6X250A - T1	6X400A - T2	6X400A - T2	6X250A - T1	6X250A - T1	6X400A - T2	6X400A - T2
	Max connecting Wire (mm <sup>2</sup> )	2 x 185	2 x 185	2 x 185	2 x 185	2 x 185	2 x 185	2 x 240	2 x 240	2 x 185	2 x 185	2 x 240	2 x 240
	Bus bar width (mm)	32	32	32	32	32	32	45	45	32	32	45	45
Circuit Breaker + circuit breaker size Bus bar Digit 26=D	Bus bar (A) C1	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 250A	NSX 250A	NSX 250A	NSX 250A	NSX 250A	NSX 250A
	circuit breaker size (A) C2	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 250A	NSX 160A	NSX 250A	NSX 250A	NSX 250A	NSX 250A	NSX 250A	NSX 250A
	Bus bar connection	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8
	Max connecting Wire (mm <sup>2</sup> )	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240

**Table 17 - RTUD R134a (Continued)**

Unit size		180	180	190	190	200	200	220	220	250	250	260	270
Unit Type	Digit 12	2	2	1	1	2	2	2	2	2	2	2	2
Unit Application	Digit 15	D;E	D;E	D;E	D;E	D;E	D;E	D;E	D;E	D;E	D;E	D;E	D;E
Evap Application	Digit 21	*	*	*	*	*	*	*	*	*	*	*	*
Comp Starter	digit 24	Y	B	Y	B	Y	B	Y	B	Y	B	B	B
Compressor	C1	M2 HiVi	M2 HiVi	N1 HiVi	N1 HiVi	N1 HiVi	N1 HiVi	N1 HiVi	N1 HiVi	N2 HiVi	N2 HiVi	N1 60 HiVi	N2 60 HiVi
	C2	N1 HiVi	N1 HiVi	N2 HiVi	N2 HiVi	N1 HiVi	N1 HiVi	N2 HiVi	N2 HiVi	N2 HiVi	N2 HiVi	N2 60 HiVi	N2 60 HiVi
Circuit 1	Motor RLA (A)	132.8	132.8	160.8	160.8	160.8	160.8	160.8	160.8	192.0	192.0	194.4	234.4
	Motor LRA (A)	259.0	0.0	291.0	0.0	291.0	0.0	291.0	0.0	354.0	0.0	0.0	0.0
	Max Amps (A)	166.0	153.3	201.0	188.1	201.0	188.1	201.0	188.1	240.0	223.6	225.3	267.9
Circuit 2	Motor RLA (A)	160.8	160.8	192.0	192.0	160.8	160.8	192.0	192.0	192.0	192.0	234.4	234.4
	Motor LRA (A)	291.0	0.0	354.0	0.0	291.0	0.0	354.0	0.0	354.0	0.0	0.0	0.0
	Max Amps (A)	201.0	188.1	240.0	223.6	201.0	188.1	240.0	223.6	240.0	223.6	267.9	267.9
Unit @ Max	Max Power input (kW)	98.9	100.9	121.3	123.8	121.3	123.8	121.3	123.8	144.2	147.1	148.3	176.3
	Starting Amps (A)	462.0	343.4	557.0	413.6	494.0	378.1	557.0	413.6	596.0	449.1	495.2	537.8
	Amps ctl + auxiliaires	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Disconnect Switch Digit 26=C	Max. Amps (A)	369.0	343.4	443.0	413.6	404.0	378.1	443.0	413.6	482.0	449.1	495.2	537.8
	displacement power factor (DPF)	0.87	0.95	0.87	0.95	0.87	0.95	0.87	0.95	0.87	0.95	0.95	0.95
	short circuit withstand rating (kA)	35	35	35	35	35	35	35	35	35	35	35	35
Circuit Breaker + Bus bar Digit 26=D	Fuse size (A) C1	200 aM-T2200 gG-T2250 aM-T2250 aM-T2250 aM-T2250 aM-T2250 aM-T2250 aM-T2250 aM-T2250 aM-T2315 aM-T2315 aM-T2315 aM-T2315 aM-T2											
	Fuse size (A) C2	250 aM-T2250 aM-T2315 aM-T2315 aM-T2250 aM-T2250 aM-T2315 aM-T2315 aM-T2315 aM-T2315 aM-T2315 aM-T2315 aM-T2315 aM-T2											
	Disconnect Switch Size	6X400A - T2	6X400A - T2	6X400A - T2	6X400A - T2	6X400A - T2	6X400A - T2	6X400A - T2	6X400A - T2	6X400A - T2	6X400A - T2	6X400A - T2	6X400A - T2
	Max connecting Wire (mm <sup>2</sup> )	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240
	Bus bar width (mm)	45	45	45	45	45	45	45	45	45	45	45	45
Circuit Breaker + Bus bar Digit 26=D	circuit breaker size (A) C1	NSX 250A NSX 250A NSX 400A NSX 400A NSX 250A NSX 250A NSX 400A NSX 400A NSX 400A NSX 400A NSX 400A NSX 400A NSX 400A											
	circuit breaker size (A) C2	NSX 250A NSX 250A NSX 400A NSX 400A NSX 250A NSX 250A NSX 400A NSX 400A NSX 400A NSX 400A NSX 400A NSX 400A NSX 400A											
	Bus bar connection	Copper bar 50x8	Copper bar 50x8	Copper bar 50x10	Copper bar 50x10	Copper bar 50x8	Copper bar 50x8	Copper bar 50x10	Copper bar 50x10	Copper bar 50x10	Copper bar 50x10	Copper bar 50x10	Copper bar 50x10
Circuit Breaker + Bus bar Digit 26=D	Max connecting Wire (mm <sup>2</sup> )	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240



**Table 18 - RTWD High Efficiency R1234ze**

Unit size		100	100	100	110	110	110	120	120	120	130	130
Unit Type	Digit 12	2	2	2	2	2	2	2	2	2	2	2
Unit Application	Digit 15	A	A	B;C	A	A	B;C	A	A	B;C	A	A
Evap Application	Digit 21	1	2;3	*	1	2;3	*	1	2;3	*	1	2;3
Comp Starter	digit 24	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Compressor	C1	M1 HiVi	M1 HiVi	M1 HiVi	M1 HiVi	M1 HiVi	M1 HiVi	M2 HiVi	M2 HiVi	M2 HiVi	M2 HiVi	M2 HiVi
	C2	M1 HiVi	M1 HiVi	M1 HiVi	M2 HiVi	M2 HiVi	M2 HiVi	M2 HiVi	M2 HiVi	M2 HiVi	N5 HiVi	N5 HiVi
Circuit 1	Motor RLA (A)	63.2	63.2	95.2	63.2	63.2	95.2	76.8	76.8	113.6	76.8	76.8
	Motor LRA (A)	217.0	217.0	217.0	217.0	217.0	217.0	259.0	259.0	259.0	259.0	259.0
	Max Amps (A)	79.0	79.0	119.0	79.0	79.0	119.0	96.0	96.0	142.0	96.0	96.0
	Max Power input (kW)	46.0	46.0	73.0	46.0	46.0	73.0	56.0	56.0	87.0	56.0	56.0
Circuit 2	Motor RLA (A)	63.2	63.2	95.2	76.8	76.8	113.6	76.8	76.8	113.6	87.2	87.2
	Motor LRA (A)	217.0	217.0	217.0	259.0	259.0	259.0	259.0	259.0	259.0	291.0	291.0
	Max Amps (A)	79.0	79.0	119.0	96.0	96.0	142.0	96.0	96.0	142.0	109.0	109.0
	Max Power input (kW)	46.0	46.0	73.0	56.0	56.0	87.0	56.0	56.0	87.0	63.0	63.0
Unit @ Max	Starting Amps (A)	258.0	258.0	338.0	294.0	294.0	380.0	311.0	311.0	403.0	335.0	335.0
	Amps ctl + auxiliaires	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
	Max. Amps (A)	160.0	160.0	240.0	177.0	177.0	263.0	194.0	194.0	286.0	207.0	207.0
	displacement power factor (DPF)	0.84	0.84	0.89	0.84	0.84	0.88	0.84	0.84	0.88	0.84	0.84
	short circuit withstand rating (kA)	35	35	35	35	35	35	35	35	35	35	35
Disconnect Switch Digit 26=C	Fuse size (A) C1	125 aM-T1	125 aM-T1	160 aM-T1	125 aM-T1	125 aM-T1	160 aM-T1	160 aM-T1	160 aM-T1	200 aM-T1	160 aM-T1	160 aM-T1
	Fuse size (A) C2	125 aM-T1	125 aM-T1	160 aM-T1	160 aM-T1	160 aM-T1	200 aM-T1	160 aM-T1	160 aM-T1	200 aM-T1	200 aM-T1	200 aM-T1
	Disconnect Switch Size	6X250A - T1	6X250A - T1	6X250A - T1	6X250A - T1	6X250A - T1	6X250A - T1	6X250A - T1	6X250A - T1	6X250A - T1	6X250A - T1	6X250A - T1
	Max connecting Wire (mm <sup>2</sup> )	2 x 185	2 x 185	2 x 185	2 x 185	2 x 185	2 x 185	2 x 185	2 x 185	2 x 185	2 x 185	2 x 185
	Bus bar width (mm)	32	32	32	32	32	32	32	32	32	32	32
Circuit Breaker + Bus bar Digit 26=D	circuit breaker size (A) C1	NSX 100A	NSX 100A	NSX 160A	NSX 100A	NSX 100A	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 160A
	circuit breaker size (A) C2	NSX 100A	NSX 100A	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 160A
	Bus bar connection	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8
	Max connecting Wire (mm <sup>2</sup> )	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240

**Table 18 - RTWD High Efficiency R1234ze (Continued)**

Unit size		130	140	140	140	160	160	160	170	170	170
Unit Type	Digit 12	2	2	2	2	2	2	2	2	2	2
Unit Application	Digit 15	B;C	A	A	B;C	A	A	B;C	A	A	B;C
Evap Application	Digit 21	*	1	2;3	*	1	2;3	*	1	2;3	*
Comp Starter	digit 24	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Compressor	C1	M2 HiVi	N5 HiVi	N5 HiVi	N5 HiVi	N5 HiVi	N5 HiVi	N5 HiVi	N6 HiVi	N6 HiVi	N6 HiVi
	C2	N5 HiVi	N5 HiVi	N5 HiVi	N5 HiVi	N6 HiVi	N6 HiVi	N6 HiVi	N6 HiVi	N6 HiVi	N6 HiVi
Circuit 1	Motor RLA (A)	113.6	87.2	87.2	130.4	87.2	87.2	130.4	107.2	107.2	163.2
	Motor LRA (A)	259.0	291.0	291.0	291.0	291.0	291.0	291.0	354.0	354.0	354.0
	Max Amps (A)	142.0	109.0	109.0	163.0	109.0	109.0	163.0	134.0	134.0	204.0
	Max Power input (kW)	87.0	63.0	63.0	98.0	63.0	63.0	98.0	79.0	79.0	125.0
Circuit 2	Motor RLA (A)	130.4	87.2	87.2	130.4	107.2	107.2	163.2	107.2	107.2	163.2
	Motor LRA (A)	291.0	291.0	291.0	291.0	354.0	354.0	354.0	354.0	354.0	354.0
	Max Amps (A)	163.0	109.0	109.0	163.0	134.0	134.0	204.0	134.0	134.0	204.0
	Max Power input (kW)	98.0	63.0	63.0	98.0	79.0	79.0	125.0	79.0	79.0	125.0
Unit @ Max	Starting Amps (A)	435.0	348.0	348.0	456.0	395.0	395.0	519.0	420.0	420.0	560.0
	Amps ctl + auxiliaires	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
	Max. Amps (A)	307.0	220.0	220.0	328.0	245.0	245.0	369.0	270.0	270.0	410.0
	displacement power factor (DPF)	0.88	0.83	0.83	0.87	0.84	0.84	0.88	0.85	0.85	0.88
	short circuit withstand rating (kA)	35	35	35	35	35	35	35	35	35	35
Disconnect Switch Digit 26=C	Fuse size (A) C1	200 aM-T2	200 aM-T1	200 aM-T1	250 aM-T2	200 aM-T1	200 aM-T1	250 aM-T2	250 aM-T1	250 aM-T1	315 aM-T2
	Fuse size (A) C2	250 aM-T2	200 aM-T1	200 aM-T1	250 aM-T2	250 aM-T1	250 aM-T1	315 aM-T2	250 aM-T1	250 aM-T1	315 aM-T2
	Disconnect Switch Size	6X400A - T2	6X250A - T1	6X250A - T1	6X400A - T2	6X250A - T1	6X250A - T1	6X400A - T2	6X250A - T1	6X250A - T1	6X400A - T2
	Max connecting Wire (mm <sup>2</sup> )	2 x 240	2 x 185	2 x 185	2 x 240	2 x 185	2 x 185	2 x 240	2 x 185	2 x 185	2 x 240
	Bus bar width (mm)	45	32	32	45	32	32	45	32	32	45
Circuit Breaker + Bus bar Digit 26=D	circuit breaker size (A) C1	NSX 160A	NSX 160A	NSX 160A	NSX 250A	NSX 160A	NSX 160A	NSX 250A	NSX 160A	NSX 160A	NSX 250A
	circuit breaker size (A) C2	NSX 250A	NSX 160A	NSX 160A	NSX 250A	NSX 160A	NSX 160A	NSX 250A	NSX 160A	NSX 160A	NSX 250A
	Bus bar connection	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8
	Max connecting Wire (mm <sup>2</sup> )	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240



**Table 19 - RTWD High Seasonal Efficiency R1234ze**

Unit size		100	100	100	110	110	110	120	120	120	130	130
Unit Type	Digit 12	2	2	2	2	2	2	2	2	2	2	2
Unit Application	Digit 15	A	A	B;C	A	A	B;C	A	A	B;C	A	A
Evap Application	Digit 21	1	2;3	*	1	2;3	*	1	2;3	*	1	2;3
Comp Starter	digit 24	B	B	B	B	B	B	B	B	B	B	B
Compressor	C1	M1 HiVi	M1 HiVi	M1 HiVi	M1 HiVi	M1 HiVi	M1 HiVi	M2 HiVi	M2 HiVi	M2 HiVi	M2 HiVi	M2 HiVi
	C2	M1 HiVi	M1 HiVi	M1 HiVi	M2 HiVi	M2 HiVi	M2 HiVi	M2 HiVi	M2 HiVi	M2 HiVi	N5 HiVi	N5 HiVi
Circuit 1	Motor RLA (A)	65.6	65.6	95.2	65.6	65.6	95.2	78.4	78.4	113.6	78.4	78.4
	Motor LRA (A)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Max Amps (A)	72.9	72.9	113.2	72.9	72.9	113.2	89.9	89.9	134.9	89.9	89.9
	Max Power input (kW)	48.0	48.0	74.5	48.0	48.0	74.5	59.2	59.2	88.8	59.2	59.2
Circuit 2	Motor RLA (A)	65.6	65.6	95.2	78.4	78.4	113.6	78.4	78.4	113.6	91.2	91.2
	Motor LRA (A)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Max Amps (A)	72.9	72.9	113.2	89.9	89.9	134.9	89.9	89.9	134.9	103.9	103.9
	Max Power input (kW)	48.0	48.0	74.5	59.2	59.2	88.8	59.2	59.2	88.8	68.4	68.4
Unit @ Max	Starting Amps (A)	147.7	147.7	228.4	164.8	164.8	250.1	181.8	181.8	271.8	195.8	195.8
	Amps ctl + auxiliaires	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
	Max. Amps (A)	147.7	147.7	228.4	164.8	164.8	250.1	181.8	181.8	271.8	195.8	195.8
	displacement power factor (DPF)	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
	short circuit withstand rating (kA)	35	35	35	35	35	35	35	35	35	35	35
Disconnect Switch Digit 26=C	Fuse size (A) C1	125 gG-T00	125 gG-T00	200 gG-T1	125 gG-T00	125 gG-T00	200 gG-T1	160 gG-T1	160 gG-T1	200 gG-T1	160 gG-T1	160 gG-T1
	Fuse size (A) C2	125 gG-T00	125 gG-T00	200 gG-T1	160 gG-T00	160 gG-T00	200 gG-T1	160 gG-T1	160 gG-T1	200 gG-T1	200 gG-T1	200 gG-T1
	Disconnect Switch Size	6X160A - T00	6X160A - T00	6X250A - T1	6X160A - T00	6X160A - T00	6X250A - T1	6X250A - T1	6X250A - T1	6X250A - T1	6X250A - T1	6X250A - T1
	Max connecting Wire (mm <sup>2</sup> )	2 x 95	2 x 95	2 x 185	2 x 95	2 x 95	2 x 185	2 x 185	2 x 185	2 x 185	2 x 185	2 x 185
	Bus bar width (mm)	20	20	32	20	20	32	32	32	32	32	32
Circuit Breaker + Bus bar Digit 26=D	circuit breaker size (A) C1	NSX 100A	NSX 100A	NSX 160A	NSX 100A	NSX 100A	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 160A
	circuit breaker size (A) C2	NSX 100A	NSX 100A	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 160A	NSX 160A
	Bus bar connection	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8
	Max connecting Wire (mm <sup>2</sup> )	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240



**Table 19 - RTWD High Seasonal Efficiency R1234ze (Continued)**

Unit size		130	140	140	140	160	160	160	170	170	170	180
Unit Type	Digit 12	2	2	2	2	2	2	2	2	2	2	2
Unit Application	Digit 15	B;C	A	A	B;C	A	A	B;C	A	A	B;C	A
Evap Application	Digit 21	*	1	2;3	*	1	2;3	*	1	2;3	*	1
Comp Starter	digit 24	B	B	B	B	B	B	B	B	B	B	B
Compressor	C1	M2 HiVi	N5 HiVi	N5 HiVi	N5 HiVi	N5 HiVi	N5 HiVi	N5 HiVi	N6 HiVi	N6 HiVi	N6 HiVi	N6 HiVi
	C2	N5 HiVi	N5 HiVi	N5 HiVi	N5 HiVi	N6 HiVi	N6 HiVi	N6 HiVi	N6 HiVi	N6 HiVi	N6 HiVi	N6E2 60 HiVi
Circuit 1	Motor RLA (A)	113.6	91.2	91.2	148.8	91.2	91.2	148.8	108.8	108.8	170.4	108.8
	Motor LRA (A)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Max Amps (A)	134.9	103.9	103.9	170.5	103.9	103.9	170.5	124.0	124.0	203.1	124.0
	Max Power input (kW)	88.8	68.4	68.4	112.2	68.4	68.4	112.2	81.6	81.6	133.7	81.6
Circuit 2	Motor RLA (A)	148.8	91.2	91.2	148.8	108.8	108.8	170.4	108.8	108.8	170.4	128.0
	Motor LRA (A)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Max Amps (A)	170.5	103.9	103.9	170.5	124.0	124.0	203.1	124.0	124.0	203.1	150.4
	Max Power input (kW)	112.2	68.4	68.4	112.2	81.6	81.6	133.7	81.6	81.6	133.7	99.0
Unit @ Max	Starting Amps (A)	307.4	209.7	209.7	343.1	229.9	229.9	375.6	250.1	250.1	408.2	276.4
	Amps cti + auxiliaires	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
	Max. Amps (A)	307.4	209.7	209.7	343.1	229.9	229.9	375.6	250.1	250.1	408.2	276.4
	displacement power factor (DPF)	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
	short circuit withstand rating (kA)	35	35	35	35	35	35	35	35	35	35	35
Disconnect Switch Digit 26=C	Fuse size (A) C1	200 gG-T2200 gG-T1 200 gG-T1 250 aM-T2200 gG-T1 200 gG-T1 250 aM-T2200 gG-T1 200 gG-T1 250 aM-T2200 gG-T2										
	Fuse size (A) C2	250 aM-T2200 gG-T1 200 gG-T1 250 aM-T2200 gG-T1 200 gG-T1 250 aM-T2200 gG-T1 200 gG-T1 250 aM-T2200 gG-T2										
	Disconnect Switch Size	6X400A - T2	6X250A - T1	6X250A - T1	6X400A - T2	6X250A - T1	6X250A - T1	6X400A - T2	6X250A - T1	6X250A - T1	6X400A - T2	6X400A - T2
	Max connecting Wire (mm <sup>2</sup> )	2 x 240	2 x 185	2 x 185	2 x 240	2 x 185	2 x 185	2 x 240	2 x 185	2 x 185	2 x 240	2 x 240
	Bus bar width (mm)	45	32	32	45	32	32	45	32	32	45	45
Circuit Breaker + Bus bar Digit 26=D	circuit breaker size (A) C1	NSX 160A NSX 160A NSX 160A NSX 250A NSX 160A NSX 160A NSX 250A NSX 160A NSX 160A NSX 250A NSX 160A NSX 250A NSX 160A										
	circuit breaker size (A) C2	NSX 250A NSX 160A NSX 160A NSX 250A NSX 160A NSX 160A NSX 250A NSX 160A NSX 160A NSX 250A NSX 160A NSX 250A NSX 250A										
	Bus bar connection	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8	Copper bar 50x8
	Max connecting Wire (mm <sup>2</sup> )	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240	2 x 240



**Table 19 - RTWD High Seasonal Efficiency R1234ze (Continued)**

Unit size		180	180	200	200	200	220	220	220	250	250	250
Unit Type	Digit 12	2	2	2	2	2	2	2	2	2	2	2
Unit Application	Digit 15	A	B;C	A	A	B;C	A	A	B;C	A	A	B;C
Evap Application	Digit 21	2;3	*	1	2;3	*	1	2;3	*	1	2;3	*
Comp Starter	digit 24	B	B	B	B	B	B	B	B	B	B	B
Compressor	C1	N6 HiVi	N6 HiVi	N6E2 60 HiVi	N6E2 60 HiVi	N6E2 60 HiVi	N6E2 60 HiVi	N6E2 60 HiVi	N6E2 60 HiVi	N6E2 70 HiVi	N6E2 70 HiVi	N6E2 70 HiVi
	C2	N6E2 60 HiVi	N6E2 60 HiVi	N6E2 60 HiVi	N6E2 60 HiVi	N6E2 60 HiVi	N6E2 70 HiVi	N6E2 70 HiVi	N6E2 70 HiVi	N6E2 70 HiVi	N6E2 70 HiVi	N6E2 70 HiVi
Circuit 1	Motor RLA (A)	108.8	170.4	128.0	128.0	204.8	128.0	128.0	204.8	146.4	146.4	236.8
	Motor LRA (A)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Max Amps (A)	124.0	203.1	150.4	150.4	235.7	150.4	150.4	235.7	172.1	172.1	271.3
	Max Power input (kW)	81.6	133.7	99.0	99.0	155.1	99.0	99.0	155.1	113.3	113.3	178.6
Circuit 2	Motor RLA (A)	128.0	204.8	128.0	128.0	204.8	146.4	146.4	236.8	146.4	146.4	236.8
	Motor LRA (A)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Max Amps (A)	150.4	235.7	150.4	150.4	235.7	172.1	172.1	271.3	172.1	172.1	271.3
	Max Power input (kW)	99.0	155.1	99.0	99.0	155.1	113.3	113.3	178.6	113.3	113.3	178.6
Unit @ Max	Starting Amps (A)	276.4	440.7	302.8	302.8	473.3	324.5	324.5	509.0	346.2	346.2	544.6
	Amps ctl + auxiliaires	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
	Max. Amps (A)	276.4	440.7	302.8	302.8	473.3	324.5	324.5	509.0	346.2	346.2	544.6
	displacement power factor (DPF)	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
	short circuit withstand rating (kA)	35	35	35	35	35	35	35	35	35	35	35
Disconnect Switch Digit 26=C	Fuse size (A) C1	200 gG-T2250 aM-T2250 aM-T2250 aM-T2315 aM-T2250 aM-T2250 aM-T2315 aM-T2250 aM-T2250 aM-T2315 aM-T2250 aM-T2315 aM-T2										
	Fuse size (A) C2	250 aM-T2315 aM-T2250 aM-T2250 aM-T2315 aM-T2250 aM-T2250 aM-T2315 aM-T2250 aM-T2250 aM-T2315 aM-T2250 aM-T2315 aM-T2										
	Disconnect Switch Size	6X400A - T2 6X400A - T2 6X400A - T2 6X400A - T2 6X400A - T2 6X400A - T2 6X400A - T2 6X400A - T2 6X400A - T2 6X400A - T2 6X400A - T2										
	Max connecting Wire (mm <sup>2</sup> )	2 x 240 2 x 240 2 x 240 2 x 240 2 x 240 2 x 240 2 x 240 2 x 240 2 x 240 2 x 240 2 x 240 2 x 240 2 x 240										
	Bus bar width (mm)	45 45 45 45 45 45 45 45 45 45 45 45 45										
Circuit Breaker + Bus bar Digit 26=D	circuit breaker size (A) C1	NSX 160A NSX 400A NSX 250A NSX 250A NSX 400A NSX 250A NSX 250A NSX 400A NSX 250A NSX 400A NSX 250A NSX 250A NSX 400A										
	circuit breaker size (A) C2	NSX 250A NSX 400A NSX 250A NSX 250A NSX 400A NSX 250A NSX 250A NSX 400A NSX 250A NSX 400A NSX 250A NSX 250A NSX 400A										
	Bus bar connection	Copper bar 50x8 Copper bar 50x10 Copper bar 50x8 Copper bar 50x8 Copper bar 50x10 Copper bar 50x8 Copper bar 50x8 Copper bar 50x10 Copper bar 50x8 Copper bar 50x10 Copper bar 50x8 Copper bar 50x10 Copper bar 50x10										
	Max connecting Wire (mm <sup>2</sup> )	2 x 240 2 x 240 2 x 240 2 x 240 2 x 240 2 x 240 2 x 240 2 x 240 2 x 240 2 x 240 2 x 240 2 x 240 2 x 240										

# Installer-Supplied Components

Customer wiring interface connections are shown in the electrical schematics and connection diagrams that are shipped with the unit. The installer must provide the following components if not ordered with the unit:

- Power supply wiring (in conduit) for all field-wired connections
- All control (interconnecting) wiring (in conduit) for field supplied devices
- Fused-disconnect switches

## Power Supply Wiring

All power supply wiring must be sized and selected accordingly by the project engineer in accordance with standard IEC 60364. All wiring must comply with local codes. The installing (or electrical) contractor must provide and install the system interconnecting wiring, as well as the power supply wiring. It must be properly sized and equipped with the appropriate fused disconnect switches. The type and installation location(s) of the fused-disconnect switches must comply with all applicable codes.

Cut holes into the sides of the control panel for the appropriately-sized power wiring conduits. The wiring is passed through these conduits and connected to the terminal blocks.

To provide proper phasing of 3 phase input, make connections as shown in field wiring diagrams and as stated on the yellow WARNING label in the starter panel. Proper equipment grounds must be provided to each ground connection in the panel.

**CAUTION!** Customer wiring interface connections are shown in the electrical schematics and connection diagrams that are shipped with the unit. The installer must provide the following components if not ordered with the unit.

## Control Power Supply

Chiller is provided with control power transformer, it is not necessary to provide additional control power voltage to the unit.

## Installer-Supplied Components

Customer wiring interface connections are shown in the electrical schematics and connection diagrams that are shipped with the unit. The installer must provide the following components if not ordered with the unit:

- Power supply wiring (in conduit) for all field-wired connections.
- All control (interconnecting) wiring (in conduit) for field supplied devices.
- Fused-disconnect switches or circuit breakers.
- Power factor correction capacitors.

## Power Supply Wiring

**WARNING Ground Wire!** All field-installed wiring must be completed by qualified personnel. All field-installed wiring must comply with local codes and regulations. Failure to follow this instruction could result in death or serious injuries. All power supply wiring must be sized and selected accordingly in accordance with local codes and regulations.

## CAUTION!

RTWD HSE versions must not be linked to the neutral wiring of the installation.

**WARNING Hazardous Voltage!** Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury. All wiring must comply with local codes and regulations. The installing (or electrical) contractor must provide and install the system interconnecting wiring, as well as the power supply wiring. It must be properly sized and equipped with the appropriate fused disconnect switches. The type and installation location(s) of the fused disconnects must comply with all local codes and regulations.

To provide proper phasing of 3-phase input, make connections as shown in field wiring diagrams and as stated on the WARNING label in the starter panel. For additional information on proper phasing, refer to "Unit Voltage Phasing." Proper equipment ground must be provided to each ground connection in the panel (one for each customer-supplied conductor per phase). 110 volt field-provided connections (either control or power) are made through knockouts on the right side of the panel for RTWD SE, HE, XE and RTUD or bottom side for RTWD HSE. Additional grounds may be required for each 110 volt power supply to the unit.

## Installation – Electrical

### Control Power Supply

The unit is equipped with a control power transformer; it is not necessary to provide additional control power voltage to the unit. All units are factory-connected for appropriate labeled voltages.

### Interconnecting Wiring

#### Chilled Water Flow (Pump) Interlock

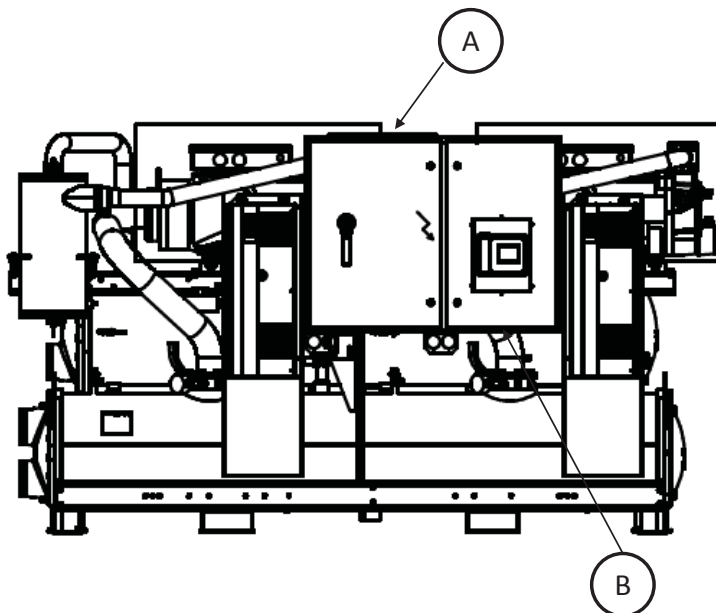
The Model RTWD Series R® chiller requires a field-supplied control voltage contact input through a flow proving switch 5S5 and an auxiliary contact 5K9 AUX. Connect the proving switch and auxiliary contact to 1A15 J3-1 and 1X4-1. Refer to the field wiring for details.

The auxiliary contact can be starter contactor auxiliary, or any signal which indicates the pump is running. A flow switch is still required and cannot be omitted.

#### Chilled Water Pump Control

An evaporator water pump output relay closes when the chiller is given a signal to go into the Auto mode of operation from any source. The contact is opened to turn off the pump in the event of most machine level diagnostics to prevent the build up of pump heat.

*Figure 11 - Power Entrance*



A = Incoming power entrance  
B = Low voltage entrance

## Installation – Electrical

### CAUTION Evaporator Damage!

The RTWD units do NOT require evaporator pump control. All systems with a remote condenser REQUIRE chilled water pumps must be controlled by the Trane CH530 to avoid catastrophic damage to the evaporator due to freezing. The relay output from 1A14 is required to operate the Evaporator Water Pump (EWP) contactor. Contacts should be compatible with 115/240 VAC control circuit. The EWP relay operates in different modes depending on CH530 or Tracer commands, if available, or service pumpdown (See maintenance section). Normally, the EWP relay follows the AUTO mode of the chiller. Whenever the chiller has no diagnostics and is in the AUTO mode, regardless of where the auto command is coming from, the normally open relay is energized. When the chiller exits the AUTO mode, the relay is timed open for an adjustable (using TechView) 0 to 30 minutes. The non-AUTO modes in which the pump is stopped, include Reset (88), Stop (00), External Stop (100), Remote Display Stop (600), Stopped by Tracer (300), Low Ambient Run Inhibit (200), and Ice Building complete (101). Regardless of whether the chiller is allowed to control the pump on a full-time basis, if the MP calls for a pump to start and water does not flow, the evaporator may be damaged catastrophically. It is the responsibility of the installing contractor and/or the customer to ensure that a pump will start when called upon by the chiller controls.

**Table 20 - Pump Relay Operation**

Chiller mode	Relay operation
Auto	Instant close
Ice building	Instant close
Tracer override	Close
Stop	Timed open
Ice complete	Instant open
Diagnostics	Instant open

Note: Exceptions are listed below.

When going from Stop to Auto, the EWP relay is energized immediately. If evaporator water flow is not established in 4 minutes and 15 sec., the CH530 de-energizes the EWP relay and generates a non-latching diagnostic. If flow returns (e.g. someone else is controlling the pump), the diagnostic is cleared, the EWP is re-energized, and normal control resumed.

If evaporator water flow is lost once it had been established, the EWP relay remains energized and a non-latching diagnostic is generated. If flow returns, the diagnostic is cleared and the chiller returns to normal operation.

In general, when there is either a non-latching or latching diagnostic, the EWP relay is turned off as though there was a zero time delay. Exceptions (see above table) whereby the relay continues to be energized occur with:

A Low Chilled Water Temp. diagnostic (non-latching) (unless also accompanied by an Evap Leaving Water Temperature Sensor Diagnostic)

or

A starter contactor interrupt failure diagnostic, in which a compressor continues to draw current even after commanded to have shutdown

or

A Loss of Evaporator Water Flow diagnostic (non-latching) and the unit is in the AUTO mode, after initially having proven evaporator water flow.

### Alarm and Status Relay Outputs (Programmable Relays)

A programmable relay concept provides for enunciation of certain events or states of the chiller, selected from a list of likely needs, while only using four physical output relays, as shown in the field wiring diagram. The four relays are provided (generally with a Quad Relay Output LLID) as part of the Alarm Relay Output Option. The relay's contacts are isolated Form C (SPDT), suitable for use with 120 VAC circuits drawing up to 2.8 amps inductive, 7.2 amps resistive, or 1/3 HP and for 240 VAC circuits drawing up to 0.5 amp resistive.

The list of events/states that can be assigned to the programmable relays can be found in Table 20. The relay will be energized when the event/state occurs.

## Installation – Electrical

**Table 21 - Alarm and Status Relay Output Configuration Table**

	<b>Diagnostics</b>
Alarm - Latching	This output is true whenever there is any active diagnostic that requires a manual reset to clear, that affects either the Chiller, the Circuit, or any of the Compressors on a 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 either the Chiller, the Circuit, or any of the Compressors on a 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
Alarm Ckt 1	This output is true whenever there is any diagnostic effecting Refrigerant Circuit 1, whether latching or automatically clearing, including diagnostics affecting the entire chiller. This classification does not include informational diagnostics.
Alarm Ckt 2	This output is true whenever there is any diagnostic affecting Refrigerant Circuit 2 whether latching or automatically clearing, including diagnostics effecting the entire chiller. This classification does not include informational diagnostics.
Chiller Limit Mode (with a 20 minute filter)	This output is true whenever the chiller has been running in one of the Unloading types of limit modes (Condenser, Evaporator, Current Limit or Phase Imbalance Limit) continuously for the last 20 minutes.
Circuit 1 Running	This output is true whenever any compressors are running (or commanded to be running) on Refrigerant Circuit 1, and false when no compressors are commanded to be running on that circuit.
Circuit 2 Running	This output is true whenever any compressors are running (or commanded to be running) on Refrigerant Circuit 2, and false when no compressors are commanded to be running on that circuit.
Chiller Running	This output is true whenever any compressors are running (or commanded to be running) on the chiller and false when no compressors are commanded to be running on the chiller.
Maximum Capacity (software 18.0 or later)	This output is true whenever the chiller has reached maximum capacity or had reached its maximum capacity and since that time has not fallen below 70% average current relative to the rated ARI current for the chiller. The output is false when the chiller falls below 70% average current and, since that time, had not reestablished maximum capacity.

## Installation – Electrical

### Relay Assignments Using TechView

CH530 Service Tool (TechView) is used to install the Alarm and Status Relay Option package and assign any of the above list of events or status to each of the four relays provided with the option. The relays to be programmed are referred to by the relay's terminal numbers on the LLID board 1A13.

The default assignments for the four available relays of the RTWD Alarm and Status Package Option are:

**Table 22 - Default assignments**

Relay	
Relay 1 Terminals J2 -12,11,10:	Alarm
Relay 2 Terminals J2 - 9,8,7:	Chiller Running
Relay 3 Terminals J2-6,5,4:	Maximum Capacity (software 18.0 or later)
Relay 4 Terminals J2-3,2,1:	Chiller Limit

If any of the Alarm/Status relays are used, provide electrical power, 110 VAC with fused disconnect to the panel and wire through the appropriate relays (terminals on 1A13. Provide wiring (switched hot, neutral, and ground connections) to the remote annunciation devices. Do not use power from the chiller's control panel transformer to power these remote devices. Refer to the field diagrams which are shipped with the unit.

#### Low Voltage Wiring

#### **WARNING Ground Wire!**

**All field-installed wiring must be completed by qualified personnel. All field-installed wiring must comply with local codes and regulations. Failure to follow this instruction could result in death or serious injuries.**

The remote devices described below require low voltage wiring. All wiring to and from these remote input devices to the control panel must be made with shielded, twisted pair conductors. Be sure to ground the shielding only at the panel.

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

#### Emergency Stop

CH530 provides auxiliary control for a customer specified/installed latching trip out.

When this customer-furnished remote contact 5K24 is provided, the chiller will run normally when the contact is closed. When the contact opens, the unit will trip on a manually resettable diagnostic. This condition requires manual reset at the chiller switch on the front of the control panel.

Connect low voltage leads to terminal strip locations on 1A5, J2-3 and 4. Refer to the field diagrams that are shipped with the unit. Silver or gold-plated contacts are recommended. These customer-furnished contacts must be compatible with 24 VDC, 12 mA resistive load.

#### External Auto/Stop

If the unit requires the external Auto/Stop function, the installer must provide leads from the remote contacts 5K23 to the proper terminals on 1A5 J2-1 and 2. The chiller 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. Unit operation will be inhibited. Closure of the contacts will permit the unit to return to normal operation. Field-supplied contacts for all low voltage connections must be compatible with dry circuit 24 VDC for a 12 mA resistive load. Refer to the field diagrams that are shipped with the unit.

#### External Circuit Lockout – Circuit #1 and Circuit #2

CH530 provides auxiliary control of a customer specified or installed contact closure, for individual operation of either Circuit #1 or #2. If the contact is closed, the refrigerant circuit will not operate 5K21 and 5K22. Upon contact opening, the refrigerant circuit will run normally. This feature is used to restrict total chiller operation, e.g. during emergency generator operations. Connections to 1A10 are shown in the field diagrams that are shipped with the unit. These customer-supplied contact closures must be compatible with 24 VDC, 12 mA resistive load. Silver or gold plated contacts are recommended.



## Installation – Electrical

### Ice Building Option

CH530 provides auxiliary control for a customer specified/installed contact closure for ice building if so configured and enabled. This output is known as the Ice Building Status Relay. The normally open contact will be closed when ice building is in progress and open when ice building has been normally terminated either through Ice Termination setpoint being reached or removal of the Ice Building command. This output is for use with the ice storage system equipment or controls (provided by others) to signal the system changes required as the chiller mode changes from “ice building” to “ice complete”. When contact 5K20 is provided, the chiller will run normally when the contact is open. CH530 will accept either an isolated contact closure (External Ice Building command) or a Remote Communicated input (Tracer) to initiate and command the Ice Building mode. CH530 also provides a “Front Panel Ice Termination Setpoint”, settable through TechView, and adjustable from -6.7 to -0.5°C in at least 1°C increments. When in the Ice Building mode, and the evaporator entering water temperature drops below the ice termination setpoint, the chiller terminates the Ice Building mode and changes to the Ice Building Complete Mode.

### CAUTION

#### Evaporator Damage!

**Freeze inhibitor must be adequate for the leaving water temperature. Failure to do so may result in damage to system components.**

Techview must also be used to enable or disable Ice Machine Control. This setting does not prevent the Tracer from commanding Ice Building mode.

Upon contact closure, the CH530 will initiate an ice building mode, in which the unit runs fully loaded at all times. Ice building shall be terminated either by opening the contact or based on the entering evaporator water temperature. CH530 will not permit the ice building mode to be reentered until the unit has been switched out of ice building mode (open 5K20 contacts) and then switched back into ice building mode (close 5K20 contacts.)

In ice building, all limits (freeze avoidance, evaporator, condenser, current) will be ignored. All safeties will be enforced. If, while in ice building mode, the unit gets down to the freeze stat setting (water or refrigerant), the unit will shut down on a manually resettable diagnostic, just as in normal operation. Connect leads from 5K20 to the proper terminals of 1A10. Refer to the field diagrams which are shipped with the unit. Silver or gold-plated contacts are recommended. These customer furnished contacts must be compatible with 24 VDC, 12 mA resistive load.

### External Chilled Water Setpoint (ECWS) Option

The CH530 provides inputs that accept either 4-20 mA or 2-10 VDC signals to set the external chilled water setpoint (ECWS). This is not a reset function. The input defines the setpoint. This input is primarily used with generic BAS (building automation systems). The chilled water setpoint set via the DynaView or through digital communication with Tracer (Comm3). The arbitration of the various chilled water setpoint sources is described in the flow charts at the end of the section.

The chilled water setpoint may be changed from a remote location by sending either a 2-10 VDC or 4-20 mA signal to the 1A7, J2-1 and 2. The 2-10 VDC and 4-20 mA each correspond to a -12 to 18°C external chilled water setpoint.

The following equations apply:

	Voltage signal	Current signal
As generated from external source	$VDC = 0.1455 * (ECWS) + 0.5454$	$mA = 0.2909 (ECWS) + 1.0909$
As processed by CH530	$ECWS = 6.875 * (VDC) - 3.75$	$ECWS = 3.4375 (mA) - 3.75$



## Installation – Electrical

If the ECWS input develops an open or short, the LLID will report either a very high or very low value back to the main processor. This will generate an informational diagnostic and the unit will default to using the Front Panel (DynaView) Chilled Water Setpoint. TechView Service Tool is used to set the input signal type from the factory default of 2-10 VDC to that of 4-20 mA. TechView is also used to install or remove the External Chilled Water Setpoint option as well as a means to enable and disable ECWS.

### External Current Limit Setpoint (ECLS) Option

Similar to the above, the CH530 also provides for an optional External Current Limit Setpoint that will accept either a 2-10 VDC (default) or a 4-20 mA signal. The Current Limit Setting can also be set via the DynaView or through digital communication with Tracer (Comm 3). The arbitration of the various sources of current limit is described in the flow charts at the end of this section. The External Current Limit Setpoint may be changed from a remote location by hooking up the analog input signal to the 1A7, J2-4 and 5. Refer to the following paragraph on Analog Input Signal Wiring Details. The following equations apply for ECLS:

	Voltage signal	Current signal
As generated from external source	$VDC + 0.133 * (\%) - 6.0$	$mA = 0.266 * (\%) - 12.0$
As processed by CH530	$\% = 7.5 * (VDC) + 45.0$	$\% = 3.75 * (mA) + 45.0$

If the ECLS input develops an open or short, the LLID will report either a very high or very low value back to the man processor. This will generate an informational diagnostic and the unit will default to using the Front Panel (DynaView) Current Limit Setpoint. The TechView Service Tool must be used to set the input signal type from the factory default of 2-10 VDC to that of 4-20 mA current. TechView must be also be used to install or remove the External Current Limit Setpoint Option for field installation, or can be used to enable or disable the feature (if installed).

### ECLS and ECWS Analog Input Signal Wiring Details:

Both the ECWS and ECLS can be connected and setup as either a 2-10 VDC (factory default), 4-20 mA, or resistance input (also a form of 4-20mA) as indicated below. Depending on the type to be used, the TechView Service Tool must be used to configure the LLID and the MP for the proper input type that is being used. This is accomplished by a setting change on the Custom Tab of the Configuration View within TechView.

The J2-3 and J2-6 terminal is chassis grounded and terminal J2-1 and J2-4 can be used to source 12 VDC. The ECLS uses terminals J2-2 and J2-3. ECWS uses terminals J2-5 and J2-6. Both inputs are only compatible with high-side current sources.

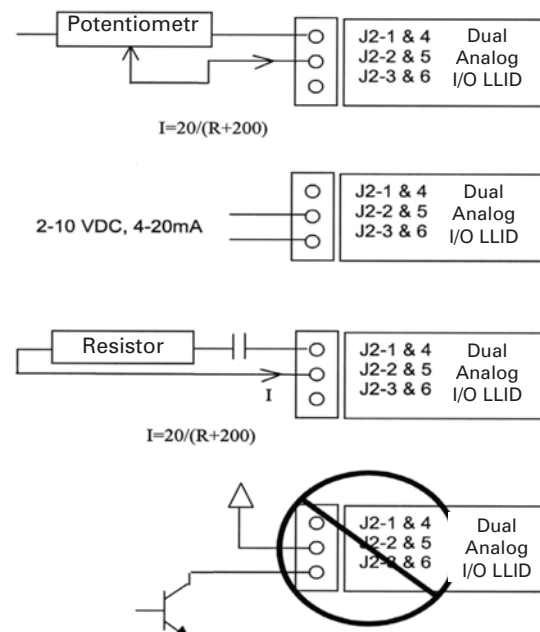
### Chilled Water Reset (CWR)

CH530 resets the chilled water temperature set point based on either return water temperature, or outdoor air temperature. Return Reset is standard, Outdoor Reset is optional.

The following shall be selectable:

- One of three Reset Types: None, Return Water Temperature Reset, Outdoor Air Temperature Reset, or Constant Return Water Temperature Reset.
- Reset Ratio Set Points.
- For outdoor air temperature reset there shall be both positive and negative reset ratio's.
- Start Reset Set Points.
- Maximum Reset Set Points.

**Figure 12 - Wiring Examples for ECLS and ECWS**



## Installation – Electrical

Reset type	Reset ratio range	Start reset range	Maximum reset range	Increment SI units	Factory default value
Return	10 to 120%	2.2 to 16.7°C	0.0 to 11.1°C	1%	50%
Outdoor	80 to -80%	10 to 54.4°C	0.0 to 11.1°C	1%	10%

The equations for each type of reset are as follows:

### Return

$$CWS' = CWS + \text{RATIO} (\text{START RESET} - (\text{TWE} - \text{TWL}))$$

and  $CWS' > \text{or} = CWS$

and  $CWS' - CWS < \text{or} = \text{Maximum Reset}$

### Outdoor

$$CWS' = CWS + \text{RATIO} * (\text{START RESET} - \text{TOD})$$

and  $CWS' > \text{or} = CWS$

and  $CWS' - CWS < \text{or} = \text{Maximum Reset}$

### where

CWS' is the new chilled water set point or the "reset CWS"

CWS is the active chilled water set point before any reset has occurred, e.g. normally Front

Panel, Tracer, or ECWS

RESET RATIO is a user adjustable gain

START RESET is a user adjustable reference

TOD is the outdoor temperature

TWE is entering evap. water temperature

TWL is leaving evap. water temperature

MAXIMUM RESET is a user adjustable limit providing the maximum amount of reset. For all types of reset,  $CWS' - CWS < \text{or} = \text{Maximum Reset}$ .

In addition to Return and Outdoor Reset, the MP provides a menu item for the operator to select a Constant Return Reset. Constant Return Reset will reset the leaving water temperature set point so as to provide a constant entering water temperature. The Constant Return Reset equation is the same as the Return Reset equation except on selection of Constant Return Reset, the MP will automatically set Ratio, Start Reset, and Maximum

Reset to the following:

RATIO = 100%

START RESET = Design Delta Temp.

MAXIMUM RESET = Design Delta Temp.

The equation for Constant Return is then as follows:

$$CWS' = CWS + 100\% (\text{Design Delta Temp.} - (\text{TWE} - \text{TWL}))$$

and  $CWS' > \text{or} = CWS$

and  $CWS' - CWS < \text{or} = \text{Maximum Reset}$

When any type of CWR is enabled, the MP will step the Active CWS toward the desired CWS (based on the above equations and setup parameters) at a rate of 1 degree C every 5 minutes until the Active CWS equals the desired CWS'. This applies when the chiller is running.

When the chiller is not running the CWS is reset immediately (within one minute) for Return Reset and at a rate of 1 degree C every 5 minutes for Outdoor Reset. The chiller will start at the Differential to Start value above a fully reset CWS or CWS' for both Return and Outdoor Reset.

# Communications Interface options

## External Analog Output

As an option, CH530 provides a 2-10 VDC analog output to indicate condenser pressure. The configuration item provides for the installation of the necessary hardware and software as well as defines which of two possible ways the output is configured. The selections for the configuration item are as follows:

1) Analog voltage output is a function of percent HPC condenser pressure - Percent HPC Condenser Pressure Indication

The transfer function is 2 to 10 Vdc corresponding to 0 Psia (or kPa abs) and the Software High Pressure Cutout (HPC) setting in Psia (or kPa abs). The Percent HPC Condenser Pressure indication output is based on the Condenser Refrigerant Pressure transducers.

Note: For the RTWD and RTUD chillers, the High Pressure Cutout Setting is replaced by the Software High Pressure Cutout setting, (The Software HPC is a configuration setting and is defined as an absolute pressure (its inherent units is Kpa (abs)). For multiple circuit chillers, such as RTWD, the condenser pressure used in the calculation will be the lowest condenser pressure of all of the running circuits. Condenser pressure transducers that are invalid (i.e. non-communicative or out of range) will be excluded. Note: If both transducers are invalid, then output shall 1.0 VDC (per the table below), but if only one is invalid, the opposite transducers value shall be used for the analog output.

For this feature:

Percent HPC = ((Lowest Condenser Pressure of all running circuits (abs) / Software HPC configuration setting in absolute units)\*100.

The following equations are applied:

Percent HPC	Percent HPC Condenser Pressure Indication Output(Vdc)
Sensor (or all sensors) out of range	Vdc = 1.0
0-100	Vdc = .08(Percent HPC) + 2
>100	Vdc=10.0



## Communications Interface options

2) Analog voltage output is a function of refrigerant differential pressure with the endpoints customer defined in the Refrigerant Pressure Analog Output settings - Refrigerant Differential Pressure Indication

The transfer function is 2 to 10 Vdc corresponding from the "Differential Pressure Output Minimum Pressure" setting to the "Differential Pressure Output Maximum Pressure" setting. Both settings are configuration settings in the service tool. Since the calculations relate to pressure differences, they can be made in either gauge or absolute as long as they are consistent. For multiple circuit chillers, such as RTWD, the refrigerant differential pressure used in the calculation will be the lowest differential pressure of all of the running circuits. If a given circuit's Condenser or Evaporator pressure transducers that are invalid (i.e. non-communicative or out of range) that circuit's DP will be excluded. Note: If both circuits have at least one pressure transducer invalid, then output shall 1.0 VDC (per the table below), but if only one circuit has an invalid pressure transducer, the opposite circuit's DP value shall be used for the analog output.

For this feature:

Refrigerant Differential Pressure = Lowest of (condenser refrigerant pressure ckt x - evaporator refrigerant pressure ckt x)

The "Differential Pressure Output Minimum and Maximum Pressure" configuration settings are not a negative number and the Refrigerant Differential Pressure used in the calc shall be clamped to be never less than zero.

The following equations are applied:

Refrigerant Differential Pressure	Refrigerant Differential Pressure Indication Output (Vdc)
Sensor(s) out of range	Vdc = 1.0
< Differential Pressure Output Minimum Pressure	Vdc = 2.0
Differential Pressure Output Minimum Pressure <= Refrigerant Differential Pressure <= Differential Pressure Output Maximum Pressure	$Vdc = 2 + \frac{8 * (\text{Refrigerant Differential Pressure} - \text{Min Delta Pressure Calibration})}{(\text{Max Delta Pressure Calibration} - \text{Min Delta Pressure Calibration})}$
> Differential Pressure Output Maximum Pressure	Vdc=10.0

## Communications Interface options

### Optional Tracer Communications Interface

This option allows the Tracer CH530 controller to exchange information (e.g. operating setpoints and Auto/Standby commands) with a higher-level control device, such as a Tracer Summit or a multiple-machine controller. A shielded, twisted pair connection establishes the bi-directional communications link between the Tracer CH530 and the building automation system.

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

#### **WARNING Ground Wire!**

**All field-installed wiring must be completed by qualified personnel. All field-installed wiring must comply with local codes and regulations. Failure to follow this instruction could result in death or serious injuries.**

Field wiring for the communication link must meet the following requirements:

- All wiring must be in accordance with local codes and regulations.
- Communication link wiring must be shielded, twisted pair wiring (Belden 8760 or equivalent). See the table below for wire size selection:

*Table 23 - Wire size*

	Maximum Length of Communication Wire
2.5 mm <sup>2</sup>	1525 m
1.5 mm <sup>2</sup>	610 m
1.0 mm <sup>2</sup>	305 m

- The communication link cannot pass between buildings.
- All units on the communication link can be connected in a "daisy chain" configuration.

#### **LonTalk Communications Interface for Chillers (LCI-C)**

CH530 provides an optional LonTalk Communication Interface (LCI-C) between the chiller and a Building Automation System (BAS). An LCI-C LLID shall be used to provide "gateway" functionality between a LonTalk compatible device and the Chiller. The inputs/outputs include both mandatory and optional network variables as established by the LonMark Functional Chiller Profile 8040.

#### **Installation Recommendations**

- 0.34 mm<sup>2</sup> Level 4 unshielded communication wire recommended for most LCI-C installations
- LCI-C link limits: 1300m, 60 devices
- Termination resistors are required
- 105 ohms at each end for Level 4 wire
- 82 ohms at each end for Trane "purple" wire
- LCI-C topology should be daisy chain
- Zone sensor communication stubs limited to 8 per link, 15 m each (maximum)
- One repeater can be used for an additional 1300 m, 60 devices, 8 communication Stubs



## Communications Interface options

**Table 24 - LonTalk Points List**

Inputs/Outputs	Variable type		SNVT / UNVT
<b>Input</b>			
Chiller Enable/Disable	binary	Start (1)/stop (0)	SNVT_switch
Chilled Water Setpoint	analog	temperature	SNVT_temp_p
Capacity Limit Setpoint	analog	% current	SNVT_lev_percent
Chiller Mode	Note 1		SNVT_hvac_mode
<b>Outputs</b>			
Chiller On/Off	binary	On(1)/off(0)	SNVT_switch
Active Chilled Water Setpoint	analog	temperature	SNVT_temp_p
Percent RLA	analog	% current	SNVT_lev_percent
Active Current Limit Setpoint	analog	temperature	SNVT_temp_p
Percent RLA	analog	temperature	SNVT_temp_p
Leaving Chilled Water Temperature	analog	temperature	SNVT_temp_p
Entering Chilled Water Temperature	analog	temperature	SNVT_temp_p
Leaving Condenser Water Temperature	analog	temperature	SNVT_temp_p
Entering Condenser Water Temperature	analog	temperature	SNVT_temp_p
Alarm Description	Note 2		
Chiller status	Note 3		

**Note 1.** Chiller Mode is used to place the chiller into an alternate mode; Cool or Ice Build

**Note 2.** Alarm Description denotes alarm severity and target.

Severity: no alarm, warning, normal shutdown, immediate shutdown

Target: Chiller, Platform, Ice Building (Chiller is refrigerant circuit and Platform is control circuit)

**Note 3.** Chiller Status describes Chiller Run Mode and Chiller Operating Mode.

Run Modes: Off, Starting, Running, Shutting Down

Operating Modes: Cool, Ice Build

States: Alarm, Run Enabled, Local Control, Limited, CHW Flow, Cond Flow

# Operating Principles

This section contains an overview of the operation of RTWD/RTUD chillers equipped with microcomputer-based control systems. It describes the overall operating principles of the RTWD/RTUD water chiller.

*Note: To ensure proper diagnosis and repair, contact a qualified service organization if a problem should occur.*

## General - RTWD

The Model RTWD units are dual-compressor, dual circuit, water-cooled liquid chillers.

These units are equipped with unit-mounted starter/control panels.

The basic components of an RTWD unit are:

- Unit-mounted panel containing starter and Tracer CH530 controller and Input/Output LLIDS
- Helical-rotary compressor
- Evaporator
- Electronic expansion valve
- Water-cooled condenser with integral subcooler
- Oil supply system
- Oil cooler (application dependent)
- Related interconnecting piping
- AFD (Adaptive Frequency Drive) on HSE versions

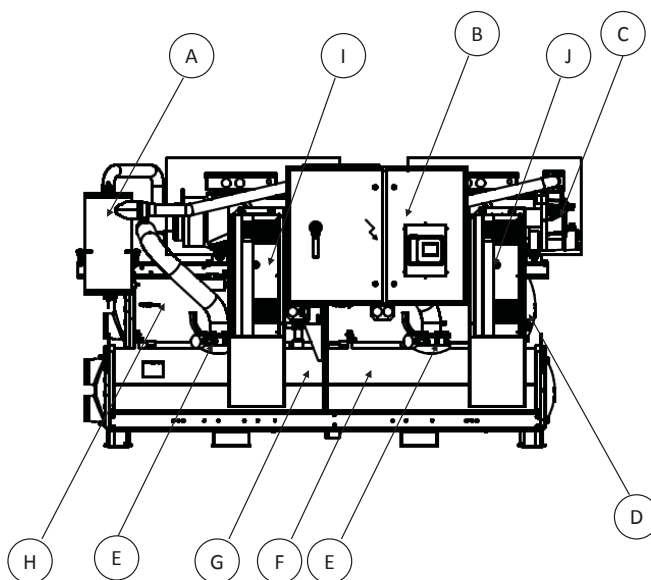
Components of a typical RTWD/RTUD unit are identified in the following diagram.

## General - RTUD

The Model RTUD units are dual compressor, dual circuit compressor chillers.

These units are equipped with unit mounted starter/control panel.

**Figure 13 - Components (front view)**



The basic components of an RTUD unit are:

- Unit-mounted panel containing starter and tracer CH530 controller and Input/Output LLIDS
- Helical-rotary compressor
- Evaporator
- Electronic expansion valve
- Oil supply system
- Oil cooler
- Related interconnecting piping

Components of a typical RTUD unit are identified in the following diagram.

### WARNING Contains Refrigerant!

**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 or serious injury or equipment damage.**

### WARNING Hazardous Voltage!

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

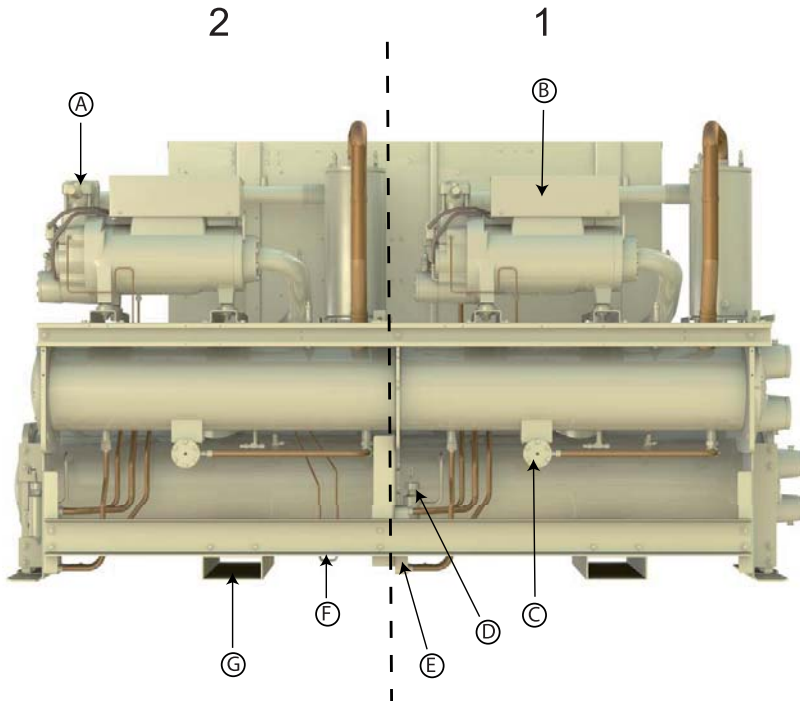
### RTWD HSE version

- Time before to work on the electrical panel of the unit: once the AFD is off (confirmed by the extinction of the display), it is mandatory to wait one minute before working on the electrical panel.
- However, for any intervention in the AFD, the indicated time on the label of the AFD must be respected.

- A = Oil separator circuit 1
- B = Control panel
- C = Compressor circuit 2
- D = Condenser circuit 2 (RTWD only)
- E = Suction service valve
- F = Evaporator circuit 2
- G = Evaporator circuit 1
- H = Condenser circuit 1 (RTWD only)
- I = Adaptive Frequency Drive circuit 1
- J = Adaptive Frequency Drive circuit 2

## Operating Principles

Figure 14 - Components (back view)



- 1 = Circuit 1
- 2 = Circuit 2
- A = Discharge service valve
- B = Compressor junction box
- C = Filter
- D = Liquid level sensor
- E = Oil cooler (application dependant)
- F = Gas pump (behind frame)
- G = Baserail for forklifting (option)



## Operating Principles

### Refrigeration (Cooling) Cycle

#### Overview

The refrigeration cycle of the Series R chiller is conceptually similar to that of other Trane chiller products. It makes use of a shell-and-tube evaporator design with refrigerant evaporating on the shell side and water flowing inside tubes having enhanced surfaces.

The compressor is a twin-rotor helical rotary type. It uses a suction gas-cooled motor that operates at lower motor temperatures under continuous full and part load operating conditions. An oil management system provides an almost oil-free refrigerant to the shells to maximize heat transfer performance, while providing lubrication and rotor sealing to the compressor. The lubrication system ensures long compressor life and contributes to quiet operation.

For RTWD units, condensing is accomplished in a shell-and-tube heat exchanger where refrigerant is condensed on the shell side and water flows internally in the tubes.

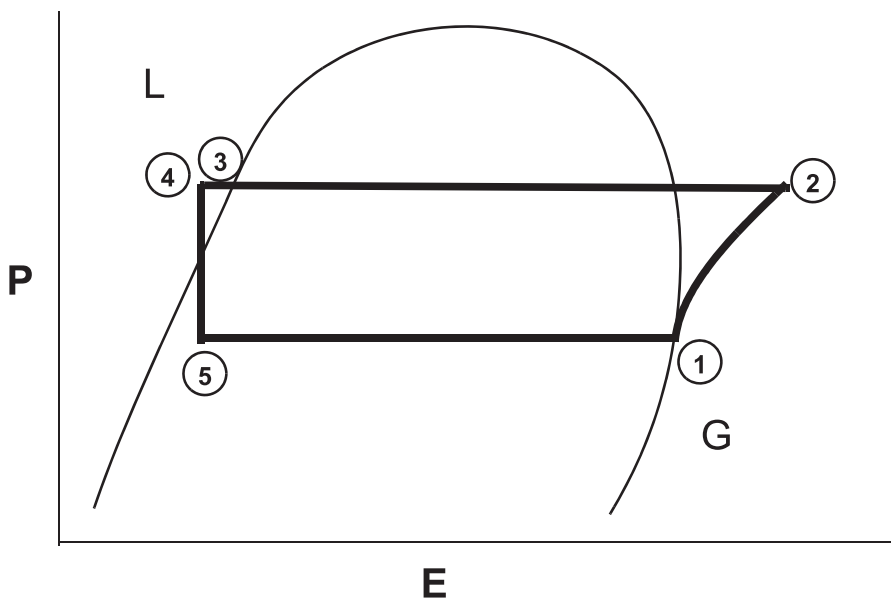
For RTUD units, condensing is accomplished in a remote air-cooled condenser unit. The refrigerant flows through the tubes in the condenser. Air flows over the coils in the condenser, removing the heat and condensing the refrigerant.

A unit-mounted starter (Wye delta on SE, HE, PE Versions or AFD on HSE versions) and control panel is provided on every chiller. Microprocessor-based unit control modules (Tracer CH530) provide for accurate chilled water control as well as monitoring, protection and adaptive limit functions. The "adaptive" nature of the controls intelligently prevents the chiller from operating outside of its limits, or compensates for unusual operating conditions, while keeping the chiller running rather than simply tripping due to a safety concern. When problems do occur, diagnostic messages assist the operator in troubleshooting.

#### Cycle Description

The refrigeration cycle for the RTWD/RTUD chiller can be described using the pressure-enthalpy diagram shown in Figure 15. Key State Points are indicated on the figure and are referenced in the discussion following.

Figure 15 - Pressure/Enthalpy Curve



L = Liquid  
G = Gas  
P = Pressure  
E = Enthalpy



## Operating Principles

Evaporation of refrigerant occurs in the evaporator. A metered amount of refrigerant liquid enters a distribution system in the evaporator shell and is then distributed to the tubes in the evaporator tube bundle. The refrigerant vaporizes as it cools the water flowing through the evaporator tubes. Refrigerant vapor leaves the evaporator as saturated vapor (State Pt. 1).

The refrigerant vapor generated in the evaporator flows to the suction end of the compressor where it enters the motor compartment of the suction-gas-cooled motor.

The refrigerant flows across the motor, providing the necessary cooling, then enters the compression chamber. Refrigerant is compressed in the compressor to discharge pressure conditions. Simultaneously, lubricant is injected into the compressor for two purposes: (1) to lubricate the rolling element bearings, and (2) to seal the very small clearances between the compressor's twin rotors. Immediately following the compression process the lubricant and refrigerant are effectively divided using an oil separator. The oil-free refrigerant vapor enters the condenser at State Pt. 2. The lubrication and oil management issues are discussed in more detail in the compressor description and oil management sections that follow.

For RTWD units, a discharge baffle within the condenser shell distributes the compressed refrigerant vapor evenly across the condenser tube bundle. Cooling tower water, circulating through the condenser tubes, absorbs heat from this refrigerant and condenses it.

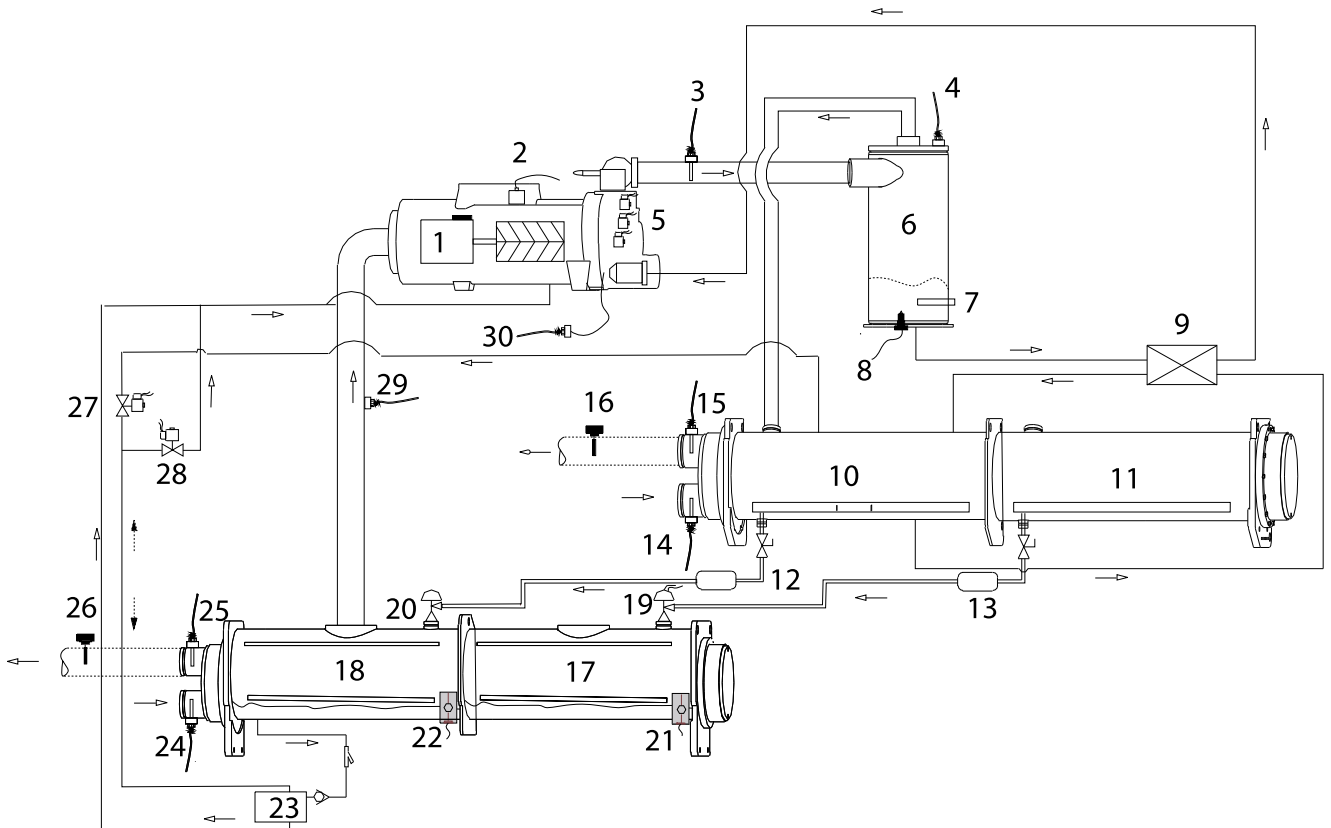
For RTUD units, airflows across the condenser coils, absorbing heat from the refrigerant and condensing it.

As the refrigerant leaves the bottom of the condenser (State Pt. 3), it enters an integral subcooler where it is subcooled before traveling to the electronic expansion valve (State Pt. 4). The pressure drop created by the expansion process vaporizes a portion of the liquid refrigerant. The resulting mixture of liquid and gaseous refrigerant then enters the Evaporator Distribution system (State Pt. 5). The flash gas from the expansion process is internally routed to compressor suction, and while the liquid refrigerant is distributed over the tube bundle in the evaporator.

The RTWD/RTUD chiller maximizes the evaporator heat transfer performance while minimizing refrigerant charge requirements. This is accomplished by metering the liquid refrigerant flow to the evaporator's distribution system using the electronic expansion valve. A relatively low liquid level is maintained in the evaporator shell, which contains a bit of surplus refrigerant liquid and accumulated lubricant. A liquid level measurement device monitors this level and provides feedback information to the CH530 unit controller, which commands the electronic expansion valve to reposition when necessary. If the level rises, the expansion valve is closed slightly, and if the level is dropping, the valve is opened slightly such that a steady level is maintained.

## Operating Principles

**Figure 16 - RTWD/RTUD Typical Refrigerant Circuit**



- 1 Compressor A - circuit 1
- 2 High Pressure Cutout Switch
- 3 Comp. Discharge Temp Sensor
- 4 Cond. Rfght. Pressure Trans.
- 5 Load/Unload and Step Solenoids
- 6 Oil Separator Circuit 1
- 7 Oil Heater
- 8 Optical Oil Loss Level Sensor
- 9 Oil Cooler (optional for RTWD)
- 10 Condenser - circuit 1 (RTWD only)
- 11 Condenser - circuit 2 (RTWD only)
- 12 Refrigerant Filter - circuit 1
- 13 Refrigerant Filter - circuit 2
- 14 Condenser Enter Water Temp. Sensor (RTWD only)
- 15 Condenser Leaving Water Temp. Sensor (RTWD only)
- 16 Condenser Water Flow Switch (RTWD only)
- 17 Evaporator - circuit 2
- 18 Evaporator - circuit 1
- 19 EXV - circuit 2
- 20 EXV - circuit 1
- 21 Liquid Level Sensor -circuit 2
- 22 Liquid Level Sensor -circuit 1
- 23 Gas Pump - circuit 1
- 24 Evaporator Entering Water Temperature Sensor
- 25 Evaporator Leaving Water Temperature Sensor
- 26 Evaporator Water Flow Switch
- 27 Gas Pump Drain Solenoid Valve
- 28 Gas Pump Fill Solenoid Valves
- 29 Suction Pressure Transducer
- 30 Oil Pressure Transducer

Note : The schematic above is typical refrigerant flow diagram. For accurate flow chart refer to relevant flow diagram shipped with the unit

## Operating Principles

### Oil System Operation (RTWD/RTUD)

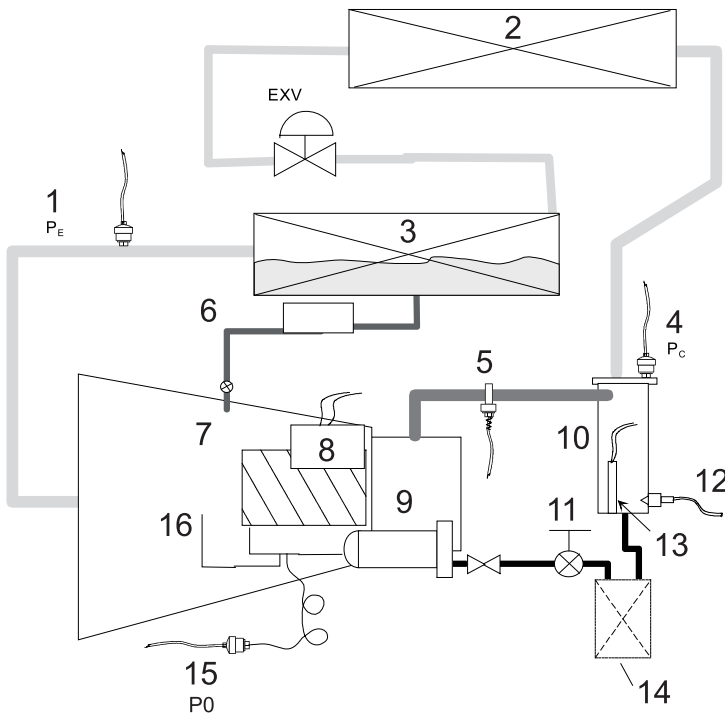
#### Overview

Oil that collects in the bottom of the oil separator is at condensing pressure during compressor operation; therefore, oil is constantly moving to lower pressure areas.

As the oil leaves the separator, it passes through the oil cooler. It then goes through the service valve and filter. At this point it travels through the master oil valve. Then it provides oil injection and bearing lubrication.

If the compressor stops for any reason, the master oil valve closes, isolating the oil charge in the separator and oil cooler during off periods. The master oil valve is a pressure activated valve. Discharge pressure off the rotors, that is developed when the compressor is on, causes the valve to open.

**Figure 17 - RTWD/RTUD Oil Circuit**



- 1 = Evaporator refrigerant pressure transducer
- 2 = Condenser (RTWD only)
- 3 = Evaporator
- 4 = Condenser refrigerant pressure transducer
- 5 = Compressor discharge temperature sensor
- 6 = Gas pump oil return system
- 7 = Compressor
- 8 = Compressor heater
- 9 = Internal compressor oil filter
- 10 = Oil separator
- 11 = Manual service valve
- 12 = Optical oil eye
- 13 = Oil separator sump heater
- 14 = Optional oil cooler
- 15 = Oil pressure transducer
- 16 = Bearing and rotor restrictors and oil injection

## Operating Principles

### Compressor Motor

A two-pole, hermetic, induction motor (3600 rpm at 60 hz, 3000 rpm at 50hz) directly drives the compressor rotors. The motor is cooled by suction refrigerant gas from the evaporator, entering the end of the motor housing through the suction line.

### Compressor Rotors

Each compressor has two rotors - "male" and "female" - which provide compression.

See Figure 18. 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.

The helical rotary compressor is a positive displacement device. The refrigerant from the evaporator is drawn into the suction opening at the end of the motor barrel, through a suction strainer screen, across the motor, and into the intake of the compressor rotor section. The gas is then compressed and discharged directly into the discharge line.

There is no physical contact between the rotors and compressor housing. The rotors contact each other at the point where the driving action between the male and female rotors occurs. Oil is injected along the top of the compressor rotor section, coating both rotors and the compressor housing interior. Although this oil does provide rotor lubrication, its primary purpose is to seal the clearance spaces between the rotors and compressor housing.

A positive seal between these internal parts enhances compressor efficiency by limiting leakage between the high pressure and low pressure cavities.

### Oil Filter

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. This also prevents excessive wear of compressor rotor and bearing surfaces.

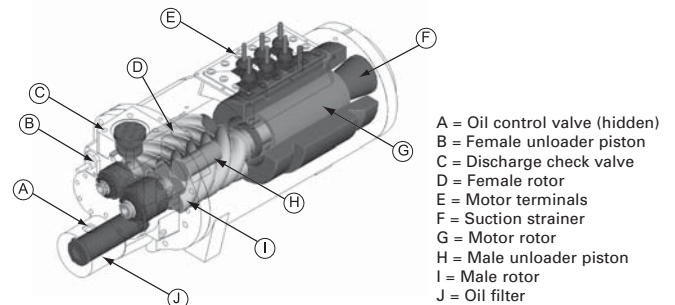
### Compressor Rotor Oil Supply

Oil flows through this circuit directly from the master oil filter, through the master oil valve to the top of the compressor rotor housing. There it is injected along the top of the rotors to seal clearance spaces between the rotors and the compressor housing and to lubricate the rotors.

### Compressor Bearing Oil Supply

Oil is injected into the bearing housings located at each end of both the male and female rotors. Each bearing housing is vented to compressor suction, so that oil leaving the bearings returns through the compressor rotors to the oil separator.

Figure 18 - RTWD Compressor



### Oil Separator

The oil separator consists of a vertical tube, joined at the top by the refrigerant discharge line from the compressor. This causes the refrigerant to swirl in the tube and throws the oil to the outside, where it collects on the walls and flows to the bottom. The compressed refrigerant vapor, stripped of oil droplets, exits out the top of the oil separator and is discharged into the condenser.

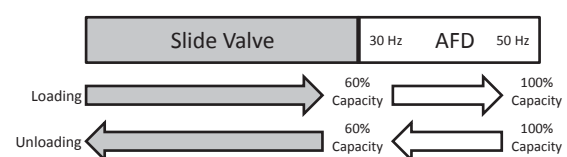
### Compressor Loading Sequence

The customer has the option to choose either fixed staging order or balanced start stop. If the CH530 is set with fixed staging order, compressor A on circuit 1 will start first on a command for cooling, unless a diagnostic has the first compressor locked out. If the first compressor cannot satisfy the demand, the CH530 will start the other compressor and then balance the load on both compressors by pulsing the load/unload solenoids or adjust motor frequency through AFD (Case of HSE version). If the CH530 is set with balanced start stop, the compressor starts vary depending on the compressor wear. The amount of wear on a compressor is calculated by: number of operating hours + starts multiplied by 10. The compressor with the least wear is cycled on first. Once the cooling load is met, the compressor with the most wear is cycled off first.

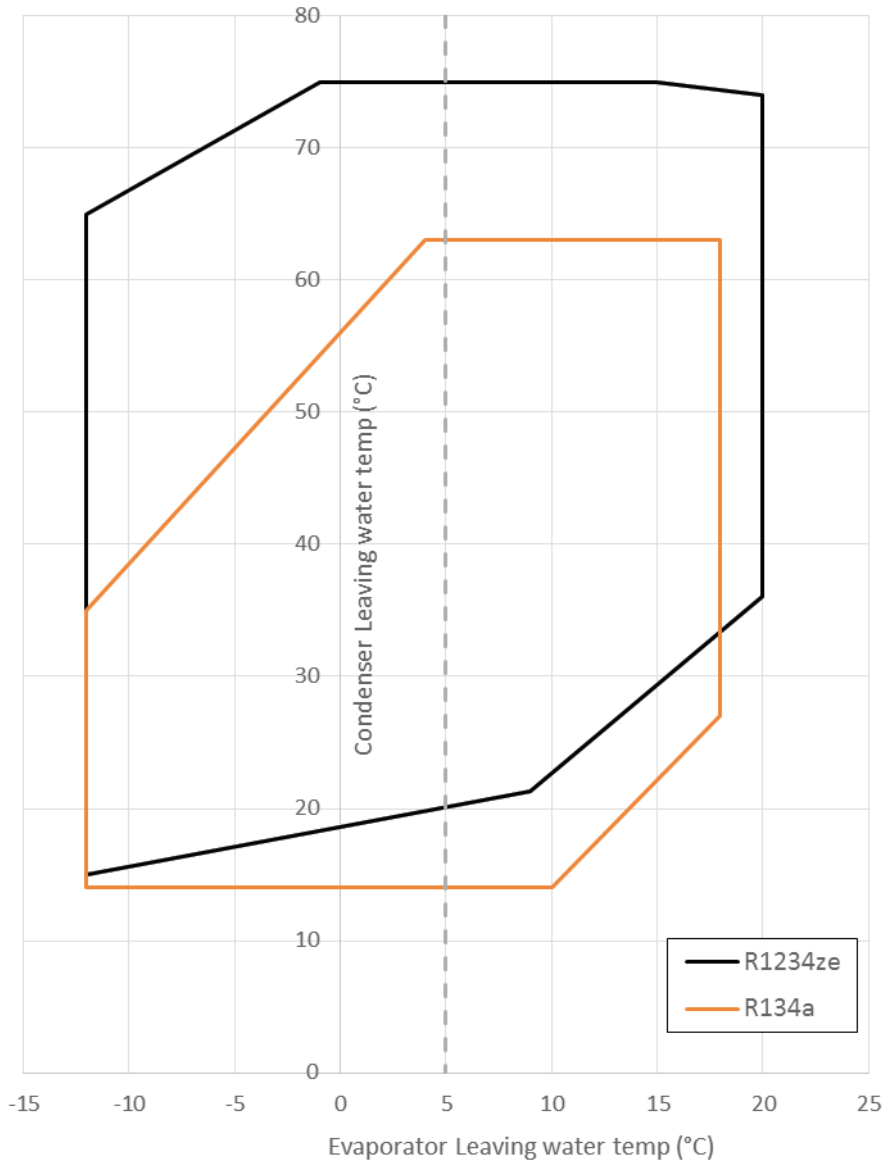
### Slide Valve movement for HSE version

Slide valve operates in HSE versions coordinated with AFD. Tracer UC800 algorithm controls the compressor capacity with higher slide valve capacity and lower AFD frequency to get higher efficiency.

The loading/unloading schema below is a general figure, it could be different in case of sudden modifications of the operating data. Also it has not to be considered as a starting/stopping mode.



# RTWD Operating map



# Pre-Start Checkout

When installation is complete, but prior to putting the unit into service, the following pre-start procedures must be reviewed and verified correct:

## **⚠ WARNING** **Hazardous Voltage!**

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

**NOTE:** Verify removal of oil separator shipping spaces as required in Installation-Mechanical chapter. Failure to remove the spacers could result in excessive noise and vibration transmission into the building.

- Inspect all wiring connections to be sure they are clean and tight.
- For RTUD units, verify that unit piping between RTUD and condenser is as described in "Installation-Mechanical" section.
- For RTUD units : oil is not supplied with unit and must be ordered separately to be charged in the unit when pipe work is done to avoid moisture pollution.
- Verify that all refrigerant valves are "OPEN".

## **RTWD HSE version**

- Time before to work on the electrical panel of the unit: once the AFD is off (confirmed by the extinction of the display), it is mandatory to wait one minute before working on the electrical panel.
- However, for any intervention in the AFD, the indicated time on the label of the AFD must be respected.

## **CAUTION** **Compressor Damage!**

Do not operate the unit with the compressor, oil discharge, liquid line service valves and the manual shutoff on the refrigerant supply to the auxiliary coolers "CLOSED". Failure to "OPEN" all valves may cause serious compressor damage.

- 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 percent. Refer to Paragraph "Unit Voltage Imbalance".
- Check the unit power phasing to be sure that it has been installed in an "ABC" sequence. Refer to Paragraph "Unit Voltage Phasing".

## **⚠ 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.**

- Fill the evaporator and condenser chilled water circuits. Vent the system while it is being filled. Open the vents on the top of the evaporator and condenser during filling and close when filling is completed.



## Pre-Start Checkout

### 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 which result from untreated or improperly treated water, or saline or brackish water.

- Close the fused-disconnect switch(es) that supplies power to the chilled water pump starter and the condenser water pump starter.

### WARNING

#### Hazardous Voltage!

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

#### RTWD HSE version

- Time before to work on the electrical panel of the unit: once the AFD is off (confirmed by the extinction of the display), it is mandatory to wait one minute before working on the electrical panel.
- However, for any intervention in the AFD, the indicated time on the label of the AFD must be respected.
- Start the chilled water pump and condenser water pump (RTWD only).
- to begin circulation of the water. Inspect all piping for leakage and make any necessary repairs.
- With water circulating through the system, adjust water flow and check water pressure drop through the evaporator and condenser.
- Adjust the chilled water flow switch and condenser water flow switch (if installed) for proper operation.
- Prove all Interlock and Interconnecting Wiring Interlock and External as described in Section "Installation-Electrical".
- Check and set, as required, all CH530 Menu Items.
- Stop the chilled water pump and condenser water pump.

#### 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.

Voltage to the unit must meet the criteria given in. Measure each leg of the supply voltage at the unit's main power fused-disconnect. If the measured voltage on any leg is not within specified range, notify the supplier of the power and correct the situation before operating the unit.

### 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.



## Pre-Start Checkout

### 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:

% Imbalance =

$$[(V_x - V_{ave}) \times 100 / V_{ave}]$$

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

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

For example, if the three measured voltages are 401, 410, and 417 volts, the average would be:

$$(401 + 410 + 417) / 3 = 410$$

The percentage of the imbalance is then:

$$[100(410 - 401) / 410] = 2.2\%$$

This exceeds the maximum allowable (2%) by 0.2%.

### Unit Voltage Phasing

It is important that proper rotation of the compressors 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 with the incoming power supply phased A, B, C.

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, 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. Press the Stop key on the Clear Language 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 block, as follows:

Phase	Sea. Lead	Terminal
Phase A		L1
Phase B		L2
Phase C		L3

4. Turn 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 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 disconnect 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.



## Pre-Start Checkout

### **⚠ WARNING** **Hazardous Voltage!**

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

#### **RTWD HSE version**

- Time before to work on the electrical panel of the unit: once the AFD is off (confirmed by the extinction of the display), it is mandatory to wait one minute before working on the electrical panel.
- However, for any intervention in the AFD, the indicated time on the label of the AFD must be respected.

#### **Water System Flow Rates**

Establish a balanced chilled water flow through the evaporator. The flow rates should fall between the minimum and maximum values. Chilled 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.

The flow rates through the condenser must also be balanced. The flow rates should fall between the minimum and maximum values.

#### **Water System Pressure Drop**

Measure water pressure drop through the evaporator and condenser at the field-installed pressure taps on the system water piping. Use the same gauge for each measurement. Do not include valves, strainers fittings in the pressure drop readings.

Pressure drop readings should be approximately those shown in the Pressure Drop Charts starting with Figure 4.

### **CAUTION** **Equipment Damage!**

Ensure that the oil separator and compressor heaters have been operating for a minimum of 24 hours before starting. Failure to do so may result in equipment damage.

## Pre-Start Checkout

### Start-up

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

1. Press the STOP key on the CH530.
2. As necessary, adjust the setpoint values in the CH530 menus using TechView.
3. Close the fused-disconnect switch for the chilled water pump. Energize the pump(s) to start water circulation.
4. Check the service valves on the discharge line, suction line, oil line and liquid line for each circuit. These valves must be open (backseated) before starting the compressors.

### 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.**

5. Press the AUTO key. If the chiller control calls for cooling 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.
6. Verify that the chilled water pump runs for at least one minute after the chiller is commanded to stop (for normal chilled water systems).

Note: Once the system has been operating for approximately 30 minutes and has become stabilized, complete the remaining start-up procedures, as follows:

7. Check the evaporator refrigerant pressure and the condenser refrigerant pressure under Refrigerant Report on the CH530 TechView. The pressures are referenced to sea level (1.0135 bar abs).
8. Check the EXV sight glasses after sufficient time has elapsed to stabilize the chiller. The refrigerant flow past the sight glasses should be clear. Bubbles in the refrigerant indicate either low refrigerant charge or excessive pressure drop in the liquid line or a stuck open expansion valve. A restriction in the line can sometimes be identified by a noticeable temperature differential between the two sides of the restriction. Frost will often form on the line at this point. Proper refrigerant charges are shown in the General Data tables.

Note: Important! A clear sight glass alone does not mean that the system is properly charged. Also check system subcooling, liquid level control and unit operating pressures.

9. Measure the system subcooling.
10. A shortage of refrigerant is indicated if operating pressures are low and subcooling is also low. If the operating pressures, sight glass, superheat and subcooling readings indicate a refrigerant shortage, gas-charge refrigerant into each circuit, as required. With the unit running, add refrigerant vapor by connecting the charging line to the suction service valve and charging through the backseat port until operating conditions become normal.

### Seasonal Unit Start-Up Procedure

1. Close all valves and re-install the drain plugs in the evaporator and condenser heads.
2. Service the auxiliary equipment according to the start-up/maintenance instructions provided by the respective equipment manufacturers.
3. Vent and fill the cooling tower, if used, as well as the condenser and piping. At this point, all air must be removed from the system (including each pass). Close the vents in the evaporator chilled water circuits.
4. Open all the valves in the evaporator chilled water circuits.
5. If the evaporator was previously drained, vent and fill the evaporator and chilled water circuit. When all air is removed from the system (including each pass), install the vent plugs in the evaporator water boxes.
6. Verify condenser coils are clean.

### CAUTION

#### Equipment Damage!

**Ensure that the oil separator and compressor heaters have been operating for a minimum of 24 hours before starting. Failure to do so may result in equipment damage.**

### 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.**

# Service and Maintenance

## Overview

This section describes preventative maintenance procedures and intervals for the RTWD unit. Use a periodic maintenance program to ensure optimal performance and efficiency of the Series R units.

An important aspect of the chiller maintenance program is the regular completion of the "Series R Operating Log"; an example of this log is provided in this manual. When filled out properly the completed logs can be reviewed to identify any developing trends in the chiller's operating conditions.

For example, if the machine operator notices a gradual increase in condensing pressure during a month's time, he can systematically check for and then correct, the possible cause(s) of this condition (e.g., fouled condenser tubes, non-condensables in the system).

### CAUTION

#### Refrigerant!

If both suction and discharge pressures are low but sub-cooling is normal, a problem other than refrigerant shortage exists. Do not add refrigerant, as this may result in overcharging the circuit.

Use only refrigerants specified on the unit nameplate (R134a or R1234ze) and Trane OIL 048E on SE, HE, PE versions with R134a, OIL00317 on HSE version with 134a and OIL066E or OIL067E for R1234ze. Failure to do so may cause compressor damage and improper unit operation.

### CAUTION

#### Equipment Damage!

Ensure that the oil separator and compressor heaters have been operating for a minimum of 24 hours before starting. Failure to do so may result in equipment damage.

## Maintenance

### WARNING Hazardous Voltage!

Disconnect all electric power, including remote disconnects and discharge all motor start/run capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. Verify with an appropriate voltmeter that all capacitors have discharged. Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury.

#### RTWD HSE version

- Time before to work on the electrical panel of the unit: once the AFD is off (confirmed by the extinction of the display), it is mandatory to wait one minute before working on the electrical panel.
- However, for any intervention in the AFD, the indicated time on the label of the AFD must be respected.

### 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.

## 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:

- Log the chiller.
- Check evaporator and condenser pressures with gauges and compare to the reading on the CH530. Pressure readings should fall within the specified ranges listed under Operating Conditions.

*Note: Optimum condenser pressure is dependent on condenser water temperature, and should equal the saturation pressure of the refrigerant at a temperature 1 to 3°C above that of leaving condenser water at full load.*

## Monthly Maintenance and Checks

- Review operating log.
- Clean all water strainers in both the chilled and condensing water piping systems.
- Measure the oil filter pressure drop. Replace oil filter if required. Refer to "Service Procedures".
- Measure and log the subcooling and superheat.
- If operating conditions indicate a refrigerant shortage, leak check the unit and confirm using soap bubbles.
- Repair all leaks.
- Trim refrigerant charge until the unit operates in the conditions listed in the note below.

*Note: Eurovent conditions are condenser water: 30/35°C and evaporator water: 12/7°C.*

**Table 25 - Operating Conditions at Full Load for R134A**

Description	Condition
Evaporator pressure	2.1 - 3.1 bar
Condensing pressure	5.2 - 8.6 bar
Discharge superheat	5.6 - 8.3 K
Subcooling	2.8 - 5.6 K

## Service and Maintenance

All conditions stated above are based on the unit running fully loaded, running at Eurovent.

- If full load conditions can not be met. Refer to note below to trim the refrigerant charge

*Note: Conditions at minimum must be: entering condenser water: 29°C and entering evaporator water: 13°C*

**Table 26 - Operating Conditions at Minimum Load for R134a**

Description	Condition
Evaporator approach	Less than 4°C (non glycol applications)*
Condensing approach	Less than 4°C*
Subcooling	1-16°C
EXV percent open	10-20% open

\* approximately 0.5°C for new unit.

### Annual Maintenance

Shut down the chiller once each year to check the following:

#### WARNING

##### Hazardous Voltage!

Disconnect all electric power, including remote disconnects and discharge all motor start/run capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. Verify with an appropriate voltmeter that all capacitors have discharged. Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury.

##### RTWD HSE version

- Time before to work on the electrical panel of the unit: once the AFD is off (confirmed by the extinction of the display), it is mandatory to wait one minute before working on the electrical panel.
- However, for any intervention in the AFD, the indicated time on the label of the AFD must be respected.
- Perform all weekly and monthly maintenance procedures.
- Check the refrigerant charge and oil level. Refer to "Maintenance Procedures". Routine oil changing is not necessary on a hermetic system.
- Have a qualified laboratory perform an oil analysis to determine system moisture content and acid level.

*Note: Due to the hygroscopic properties of the POE oil, all oil must be stored in metal containers. The oil will absorb water if stored in a plastic container.*

- Check the pressure drop across the oil filter. Refer to "Maintenance Procedures".
- Contact a qualified service organization to leak check the chiller, to inspect safety controls, and inspect electrical components for deficiencies.
- Inspect all piping components for leakage and/or damage. Clean out any inline strainers.
- Clean and repaint any areas that show signs of corrosion.
- Test vent piping of all relief valves for presence of refrigerant to detect improperly sealed relief valves. Replace any leaking relief valve.
- Inspect the condenser tubes for fouling; clean if necessary. Refer to "Maintenance Procedures".
- Check to make sure that the crank case heater is working.

### Scheduling Other Maintenance

- Use a nondestructive tube test to inspect the condenser and evaporator tubes at 3- year intervals. *Note: It may be desirable to perform tube tests on these components at more frequent intervals, depending upon chiller application. This is especially true of critical process equipment.*
- Depending on chiller duty, contact a qualified service organization to determine when to conduct a complete examination of the unit to determine the condition of the compressor and internal components.

**Note: Do not swap R134a by R1234ze without intervention of Trane Service organization for advice on technical changes.**

## Service and Maintenance

### Service Procedures

Cleaning the Condenser  
(RTWD Only)

#### CAUTION Proper Water Treatment!

The use of untreated or improperly treated water in a RTWD 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 which result from untreated or improperly treated water, saline or brackish water.

At 65°C condensing leaving water temperature and above, it is mandatory to have condenser equipped with CuNi tubes.

Condenser tube fouling is suspect when the “approach” temperature (i.e., the difference between the refrigerant condensing temperature and the leaving condenser water temperature) is higher than predicted.

Standard water applications will operate with less than a 5.5°C approach. If the approach exceeds 5.5°C cleaning the condenser tubes is recommended.

Note: Glycol in the water system may as much as double the standard approach.

If the annual condenser tube inspection indicates that the tubes are fouled, 2 cleaning methods can be used to rid the tubes of contaminants. The methods are:

#### Mechanical Cleaning Procedure

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

#### **WARNING** **Heavy Objects!**

Each of the individual cables (chains or slings) used to lift the waterbox must be capable of supporting the entire weight of the waterbox. The cables (chains or slings) must be rated for overhead lifting applications with an acceptable working load limit. Failure to properly lift waterbox could result in death or serious injury.

#### **WARNING** **Eyebolts!**

The proper use and ratings for eyebolts can be found in ANSI/ASME standard B18.15. Maximum load rating for eyebolts are based on a straight vertical lift in a gradually increasing manner. Angular lifts will significantly lower maximum loads and should be avoided whenever possible. Loads should always be applied to eyebolts in the plane of the eye, not at some angle to this plane. Failure to properly lift waterbox could result in death or serious injury.

Review mechanical room limitations and determine the safest method or methods of rigging and lifting the waterboxes.

#### Waterbox Removal Procedure - Method 1

This selection applies to the units and condenser side waterboxes shown in Table 27.

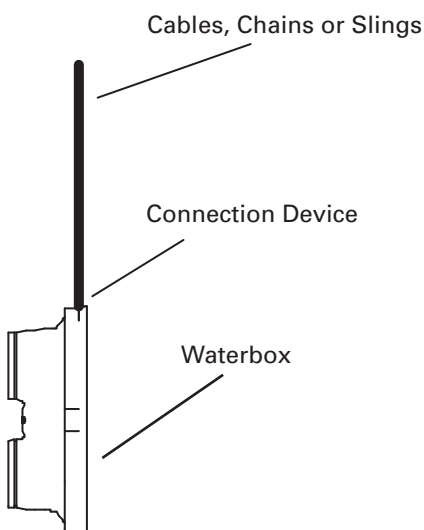
**Table 27 - Waterbox Removal Procedure - Method 1**

Size	Efficiency	Condenser Waterbox
060, 070, 080, 090 100, 110, 120	HE / HSE	Supply, Return
130, 140	HE / HSE	Supply
160, 180, 200	HE	Supply
220, 250	HE / HSE	Supply
260, 270	HSE	Supply
160, 180, 200	PE / HSE	Supply
160, 170, 190, 200	SE	Supply

## Service and Maintenance

1. Select the proper lift connection device from Table 24. The rated lifting capacity of the selected lift connection device must meet or exceed the published weight of the waterbox. Reference Tables 22 and 23 for waterbox weights.
2. Ensure the lift connection device has the correct connection for the waterbox. Example: thread type (course/fine, English/metric). Bolt diameter (English/metric).
3. Properly connect the lift connection device to the waterbox. Refer to Figure 19. Ensure lift connection device is securely fastened.

**Figure 19 - Water box lifting**



4. Install hoist ring on to the lifting connection on the waterbox. Torque to 37 Nm.
5. Disconnect water pipes, if connected.
6. Remove waterbox bolts
7. Lift the waterbox away from the shell.

### Waterbox Removal Procedure – Method 2

This selection applies to the units and condenser side waterboxes shown in Table 28.

**Table 28 - Waterbox Removal Procedure - Method 2**

Size	Efficiency	Condenser Waterbox
130, 140	HE / HSE	Return
160, 180, 200	HE	Return
220, 250	HE / HSE	Return
260, 270	HSE	Return
160, 180, 200	PE / HSE	Return
160, 170, 190, 200	SE	Return

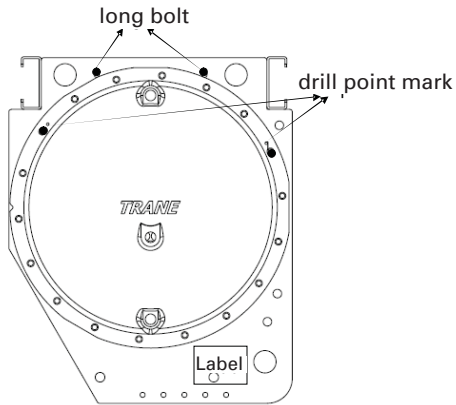
## CAUTION

**To prevent injury, do not place hands or fingers between waterbox and condenser tubesheet.**

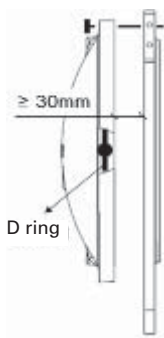
1. Select the proper lift connection device from Table 24. The rated lifting capacity of the selected lift connection device must meet or exceed the published weight of the waterbox. Reference Tables 30 and 31 for waterbox weights.
2. Ensure the lift connection device has the correct connection for the waterbox.  
Example: thread type (course/fine, English/metric). Bolt diameter (English/metric).
3. Disconnect water pipes, if connected.
4. Remove the two bolts with drill point mark. Install the long bolts into these two holes. The long bolts are located on the two thread holes just above the waterbox, as shown in Figure 21.
5. Remove the remaining bolts. Slide the waterbox out about 30 mm through two long bolts. Install the Safety Hoist ring (D ring) connection device into the tap drill hole located on waterbox right side (face to waterbox convex). Refer to Figure 22.
6. Remove the left long bolt while supporting waterbox from outside of waterbox. Swing the waterbox outboard. Put lifting chain on Safety Hoist ring and remove the remaining long bolt. Refer to Figure 22.
7. Lift the waterbox away from the shell.

## Service and Maintenance

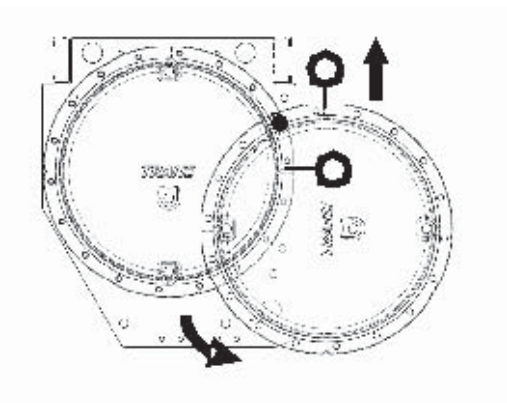
**Figure 20 - Waterbox Removal - Remove Bolts**



**Figure 21 - Waterbox Removal - Slide Out, Install Safety Hoist Ring**



**Figure 22 - Waterbox Removal - Swing Out, Install Lifting Chain**



### **⚠ WARNING** **OVERHEAD HAZARD!**

Never stand below or in close proximity 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.

#### All RTWD Units

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

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

2. Work a round nylon or brass bristled brush (attached to a rod) in and out of each of the condenser water tubes to loosen the sludge.
3. 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.)

#### 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 waterbox bolts.
- Torque bolts in a star pattern. Refer to table below for torque values.

*Note: Torque bolts in a star pattern.*

#### Torque Values

Evaporator	Condenser (RTWD only)
88 Nm	88 Nm



## Service and Maintenance

### Waterbox Weights

**Table 29 - RTWD/RTUD Evaporator Waterbox Weights**

Model	Size	Efficiency	Waterbox	Evap Pass	Standard Grooved Pipe Waterbox	
					Weight (kg)	Lifting connection
RTWD / RTUD	060, 070, 080	HE / HSE	Supply	2 or 3	21.5	M12 x 1.75
RTWD / RTUD	060, 070, 081	HE / HSE	Return	2 or 3	21.5	M12 x 1.75
RTWD / RTUD	090, 100, 110, 120	HE / HSE	Return	2	21.5	M12 x 1.75
RTWD / RTUD	130, 140	HE / HSE	Return	2	21.5	M12 x 1.75
RTWD / RTUD	160, 180	HE	Return	2	21.5	M12 x 1.75
RTWD	160, 170, 190, 200	SE	Return	2	21.5	M12 x 1.75
RTUD	160, 170, 190	SE	Return	2	21.5	M12 x 1.75
RTWD / RTUD	090, 100, 110, 120	HE / HSE	Supply	2 or 3	29	M12 x 1.75
RTWD / RTUD	090, 100, 110, 120	HE / HSE	Return	3	29	M12 x 1.75
RTWD / RTUD	130, 140	HE / HSE	Supply	2 or 3	29	M12 x 1.75
RTWD / RTUD	160, 180	HE	Supply	2 or 3	29	M12 x 1.75
RTWD	160, 170, 190, 200	SE	Supply	2 or 3	29	M12 x 1.75
RTWD	160, 180, 200	PE / HSE	Return	2	29	M12 x 1.75
RTWD / RTUD	200	HE	Return	2	29	M12 x 1.75
RTWD	220, 250, 260, 270	HE / HSE	Return	2	29	M12 x 1.75
RTWD / RTUD	130, 140	HE	Return	3	29	M12 x 1.75
RTWD	160, 170, 190, 200	SE	Return	3	29	M12 x 1.75
RTUD	160, 170, 190	SE	Supply	2 or 3	29	M12 x 1.75
RTUD	160, 170, 190	SE	Return	3	29	M12 x 1.75
RTWD	160, 180, 200	PE / HSE	Supply	2 or 3	37	M12 x 1.75
RTWD / RTUD	200	HE	Supply	2 or 3	37	M12 x 1.75
RTWD / RTUD	220, 250	HE / HSE	Supply	2 or 3	37	M12 x 1.75
RTWD	260, 270	HSE	Supply	2 or 3	37	M12 x 1.75
RTWD	160, 180, 200	PE / HSE	Return	3	37	M12 x 1.75
RTWD / RTUD	220, 250	HE / HSE	Return	3	37	M12 x 1.75
RTWD	260, 270	HSE	Return	3	37	M12 x 1.75

**Table 30 - RTWD Condenser Waterbox Weights**

Model	Size	Efficiency	Waterbox	Standard Grooved Pipe Waterbox	
				Weight (kg)	Lifting connection
RTWD	060, 070, 080	HE / HSE	Return	23.5	M12 x 1.75
RTWD	090, 100, 110, 120	HE / HSE	Return	23.5	M12 x 1.75
RTWD	060, 070, 080, 090, 100, 110, 120	HE / HSE	Supply	32.5	M12 x 1.75
RTWD	130, 140	HE / HSE	Return	32.5	M12 x 1.75
RTWD	160, 180, 200	HE	Return	32.5	M12 x 1.75
RTWD	220, 250, 260, 270	HE / HSE	Return	32.5	M12 x 1.75
RTWD	160, 170, 190, 200	SE	Return	32.5	M12 x 1.75
RTWD	160, 180, 200	PE / HSE	Return	32.5	M12 x 1.75
RTWD	130, 140	HE / HSE	Supply	42	M12 x 1.75
RTWD	160, 180, 200	HE	Supply	42	M12 x 1.75
RTWD	220, 250	HE / HSE	Supply	42	M12 x 1.75
RTWD	260, 270	HSE	Supply	42	M12 x 1.75
RTWD	160, 170, 190, 200	SE	Supply	42	M12 x 1.75
RTWD	160, 180, 200	PE / HSE	Supply	42	M12 x 1.75

## Service and Maintenance

### Parts Ordering Information

Obtain the required parts from your local Trane Parts Center.

### Chemical Cleaning Procedure

- Scale deposits are best removed by chemical means. Consult a qualified water treatment specialist (i.e., one that knows the local water supply chemical/mineral content) for a recommended cleaning solution suitable for the job. (A standard condenser water circuit is composed solely of copper, cast iron and steel.) Improper chemical cleaning can damage tube walls.

**Table 31 - Connection devices**

Unit	Product
RTWD/RTUD - All units	Safety Hoist Ring M12x1.75

- All of 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.

*Note: Chemical tube cleaning should always be followed by mechanical tube cleaning with R134a, OIL00317 on HSE version with 134a and OIL066E or OIL067E for R1234ze.*

### Compressor Oil

#### CAUTION Equipment Damage!

To prevent oil sump heater burnout, open the unit main power disconnect switch before removing oil from the compressor.

Trane Polyolester Oil is the approved oil for the RTWD/RTUD units. Polyolester oil is extremely hygroscopic meaning it readily attracts moisture. The oil can not be stored in plastic containers due to the hygroscopic properties. As with mineral oil, if water is in the system it will react with the oil to form acids. Use Table 32 to determine the acceptability of the oil.

Trane approved oil :

R134a : OIL048E and OIL023E on SE, HE, XE version - OIL 00317 for HSE version with AFD.

R1234ze: OIL066E and OIL067E.

The proper charge amounts are given in general data tables.

Note: Use an oil transfer pump to change the oil regardless of chiller pressure.

**Table 32 - POE Oil Properties**

Description	Acceptable levels
Moisture content	Less than 300 ppm
Acid level	Less than 0.5 TAN (mg KOH/g)

### Oil Sump Level Check

Running the chiller at minimum load is the best for the quickest return of oil to the separator and sump. The machine still needs to sit for approximately 30 minutes before the level is taken. At minimum load, the discharge superheat should be highest. The more heat in the oil as it lays in the sump, the more refrigerant will boil off in the sump and leave more concentrated oil.

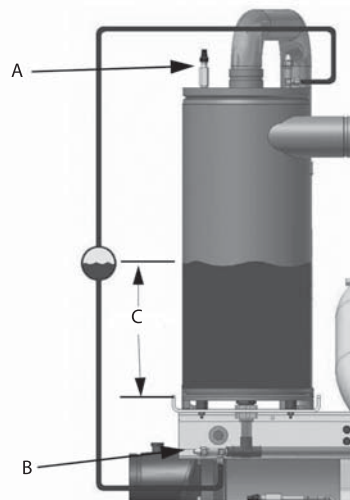
The oil level in the oil sump can be measured to give an indication of the system oil charge. Follow the procedures below to measure the level.

- Run the unit fully unloaded for approximately 20 minutes.
- Cycle the compressor off line.

#### CAUTION Oil Loss!

**Never operate the compressor with the sightglass service valves opened. Severe oil loss will occur. Close the valves after checking the oil level. The sump is above the condenser and it is possible to drain the oil.**

**Figure 23 - Determining Oil Level in Sump**



A = Oil separator service valve  
B = Oil sump service valve  
C = 10-24cm

- Attach a 3/8" or 1/2" hose with a sightglass in the middle to the oil sump service valve (1/4" flare) and the oil separator service valve (1/4" flare).

*Note: Using high pressure rated clear hose with appropriate fittings can help speed up the process.*

- After the unit is off line for 30 minutes, move the sightglass along the side of the oil sump.
- The level should be between 10-24 cm from the bottom of the oil sump. If the level appears to be above 24 cm, the oil sump is completely full. Most likely more oil resides in the rest of the system and some oil needs to be removed until the level falls between 10-24 cm in the oil sump.

*Note: Nominal height of oil is 20 cm.*

## Service and Maintenance

6. If the level is below 10cm, there is not enough oil in the sump. This can occur from not enough oil in the system or more likely, oil migration to the evaporator. Oil migration can occur from a low refrigerant charge, gas pump malfunction, etc.

*Note: If the oil is logged in the evaporator confirm the operation of the gas pump. If the gas pump is not functioning properly all oil will be logged in the evaporator.*

7. After the level is determined, close the service valves and remove the hose/sightglass assembly.

### Removing Compressor Oil

The oil in the compressor oil sump is under a constant positive pressure at ambient temperature. To remove oil, open the service valve located on the bottom of the oil sump and drain the oil into a suitable container using the procedure outlined below:

#### CAUTION POE Oil!

**Due to the hygroscopic properties of the POE oil, all oil must be stored in metal containers. The oil will absorb water if stored in a plastic container.**

Oil should not be removed until the refrigerant is isolated or removed.

1. Connect a line to the oil sump drain valve.
2. Open the valve and allow the desired amount of oil to flow into the container and close the charging valve.
3. Measure the exact amount of oil removed from the unit.

### Oil Charging Procedure

It is critical to fill the oil lines feeding the compressor when charging a system with oil. The diagnostic "Loss of oil at the compressor stopped" will be generated if the oil lines are not full on start-up.

To properly charge the system with oil, follow the steps below:

1. Locate the 1/4" schrader valve on the end of the compressor.
2. Loosely connect oil pump to schrader valve called out in step 1.
3. Operate oil charging pump until oil appears at the charging valve connection; then tighten the connection.

*Note: To keep air from entering the oil, the charging valve connection must be air-tight.*

4. Open the service valve and pump in the required amount of oil.

*Note: Adding oil at the oil charging port ensures that the oil filter cavity and the oil lines back to the oil separator are filled with oil. An internal oil valve prevents oil from entering the compressor rotors.*

### Replacing the Oil Filter

The filter element should be changed if the oil flow is sufficiently obstructed. Two things can happen: first, the chiller may shut down on a "Low Oil Flow" diagnostic, or secondly, the compressor may shut down on a "Loss of Oil at Compressor (Running) diagnostic.

If either of these diagnostics occurs, it is possible the oil filter needs replacement. The oil filter is not usually the cause of a Loss of oil at Compressor diagnostic.

Specifically, the filter must be changed if the pressure drop between the two service valves in the lubrication circuit exceeds the maximum level as given in Figure 24. This chart shows the relationship between the pressure drop measured in the lubrication circuit as compared with operating pressure differential of the chiller (as measured by pressures in the condenser and evaporator).

Normal pressure drops between the service valves of the lubrication circuit are shown by the lower curve. The upper curve represents the maximum allowable pressure drop and indicates when the oil filter must be changed. Pressure drops that lie between the lower and upper curves are considered acceptable.

For a chiller equipped with an oil cooler, add 0.3 bar to the values shown in Figure 24. For example, if the system pressure differential was 5.5 bar, then the clean filter pressure drop would be approximately 1 bar (up from 0.7 bar). For a chiller with an oil cooler and operating with a dirty oil filter, the maximum allowable pressure drop would be 1.9 bar (up from 1.6 bar).

Under normal operating conditions the element should be replaced after the first year of operation and then as needed thereafter.

## Service and Maintenance

### Refrigerant Charge

If a low refrigerant charge is suspected, first determine the cause of lost refrigerant. Once the problem is repaired follow the procedures below for evacuating and charging the unit.

### Evacuation and Dehydration

1. Disconnect ALL power before/during evacuation.
2. Connect the vacuum pump to the 5/8" flare connection on the bottom of the evaporator and/or condenser.
3. To remove all of the moisture from the system and to insure a leak free unit, pull the system down below 500 microns.
4. After the unit is evacuated, perform a standing rise test for at least an hour. The pressure should not rise more than 150 microns. If the pressures rises more than 150 microns, either a leak is present or moisture is still in the system.

*Note: If oil is in the system, this test is more difficult. The oil is aromatic and will give off vapors that will raise the pressure of the system.*

### Refrigerant Charging

Once the system is deemed leak and moisture free, use the 5/8" flare connections at the bottom of the evaporator and condenser to add refrigerant charge. Refer to General Data Tables and Unit nameplate for refrigerant charge information.

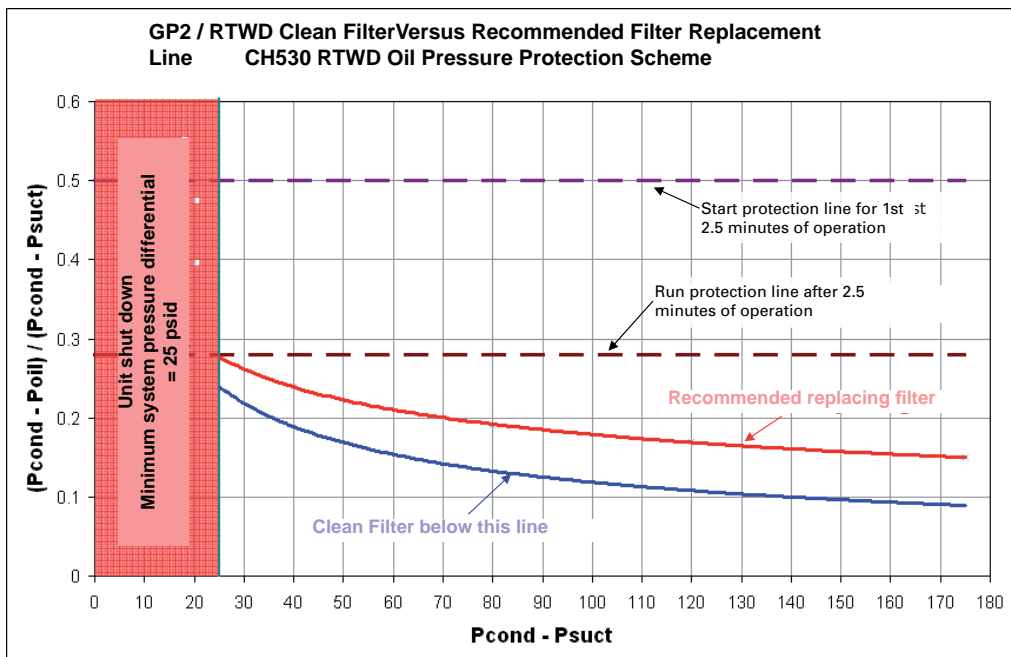
### Refrigerant and Oil Charge Management

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.

#### Some symptoms of a refrigerant under-charged unit:

- Low subcooling
- Higher than normal discharge superheat
- Bubbles in EXV sight glass
- Low liquid level diagnostic
- Larger than normal evaporator approach temperatures (leaving water temperature - saturated evaporator temperature)
- Low evaporator refrigerant temperature limit
- Low refrigerant temperature cutout diagnostic
- Fully open expansion valve
- Possible whistling sound coming from liquid line (due to high vapor velocity)
- High condenser + subcooler pressure drop

**Figure 24 - Recommended Oil Filter Replacement**



## Service and Maintenance

### Some symptoms of a refrigerant over-charged unit:

- High subcooling
- Evaporator liquid level higher than centerline after shut down
- Larger than normal condenser approach temperatures (entering condenser saturated temperature – leaving condenser water temperature)
- Condenser pressure limit
- High pressure cutout diagnostic
- Higher than normal compressor power
- Very low discharge superheat at startup
- Compressor rattle or grinding sound at startup

### Some symptoms of an oil over-charged unit:

- Larger than normal evaporator approach temperatures (leaving water temperature - saturated evaporator temperature)
- Low evaporator refrigerant temperature limit
- Erratic liquid level control
- Low unit capacity
- Low discharge superheat (especially at high loads)
- Low liquid level diagnostics
- High oil sump level after normal shut down

### Some symptoms of an oil under-charged unit:

- Compressor rattle or grinding sound
- Lower than normal pressure drop through oil system
- Seized or welded compressors
- Low oil sump level after normal shut down
- Lower than normal oil concentrations in evaporator

### 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 2.2°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. With the unit off, verify that the EXV is closed. Close liquid line isolation valve.
2. Attach hose to service port on liquid line filter flange.
3. Evacuate refrigerant from liquid line and store.
4. Remove hose.
5. Depress schrader valve to equalize pressure in liquid line with atmospheric pressure.
6. Remove bolts that retain filter flange.
7. Remove old filter element.
8. Inspect replacement filter element and lubricate o-ring with Trane OIL00048.

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

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

### Freeze Protection

For unit operation in a low temperature environment, adequate protection measures must be taken against freezing.

## Recommended service routine frequencies

As a commitment to our customers, we have created a wide service network staffed with experienced factory-authorized technicians. At Trane we offer all the benefits of after sales service direct from the manufacturer and we are committed to our mission statement to provide efficient customer care.

We would be delighted to discuss your individual requirement with you. For further information regarding Trane maintenance agreements please contact your local TRANE sales office.

Year	Commis- sioning	Inspec- tion visit	Seasonal shut down	Seasonal start up	Oil analysis (2)	Vibration analysis (3)	Annual mainte- nance	Preven- tive mainte- nance	Tube analysis (1)	Com- pressor R'newal (4)
1	x	x	x	x		x		xx		
2			x	x	x		x	xxx		
3			x	x	x		x	xxx		
4			x	x	x		x	xxx		
5			x	x	x	x	x	xxx	x	
6			x	x	x	x	x	xxx		
7			x	x	x	x	x	xxx		
8			x	x	x	x	x	xxx		
9			x	x	x	x	x	xxx		
10			x	x	x	x	x	xxx	x	
over 10			every year	every year	every year (2)	x	every year	3 every year	every 3 years	40000 h

This timetable is applicable to units operating in normal conditions with an average of 4000 hours per year. If operating conditions are abnormally severe, an individual timetable must be made for that unit.

- (1) Tube testing required if aggressive water conditions exist. Applies to condensers only on water cooled units.
- (2) Schedule as per previous analysis result or at least once a year.
- (3) Year 1 to define equipment baseline. Subsequent year based on oil analysis results or schedule as per vibration analysis.
- (4) Recommended at 40 000 run hours or 100 000 equivalent operating hours whichever comes first. Schedule also depends on results from oil analysis / vibration analysis.

Seasonal start up and shutdown are mainly recommended for Comfort Air Conditioning and annual and preventive maintenance are mainly recommended for Process application.

## Additional services

### **Oil analysis**

Trane Oil Analysis is a predictive tool used to detect minor issues before they become major problems. It also reduces failure detection time and allows planning for appropriate maintenance. Oil changes can be reduced by half resulting in lower operating costs and a lower impact on the environment.

### **Vibration analysis**

Vibration analysis is required when oil analysis reveals the presence of wear indicating the start of possible bearing or motor failure. Trane oil analysis has the ability to identify the type of metallic particles in the oil which, when combined with the vibration analysis, will clearly point out the failing components.

Vibration analysis should be performed on a regular basis to build a vibration trend of the equipment and avoid unplanned downtime and costs.

### **Compressor R'newal**

To ensure a long lifetime for Trane compressors, system oil and vibration are regularly analyzed. These tests build a detailed picture of the condition of internal system components. Over time, they also help build a 'wear trend' of the equipment. This informs our service experts whether your compressor is due for minor maintenance or a complete overhaul.

### **System upgrade**

This Service provides a consulting service.

Upgrading your equipment will increase the unit reliability and can reduce the operating costs by optimizing the controls. A list of solutions / recommendations to the system will be explained to the customer. Actual upgrade for the system will be costed separately.

### **Water treatment**

This Service provides all of the necessary chemicals to properly treat each water system for the period designated.

The inspections will be conducted at agreed upon intervals and Trane Service First will submit a written report to the customer after each inspection.

These reports will indicate any corrosion, scaling, and alga growth in the system.

### **Refrigerant analysis**

This Service includes a thorough analysis for contamination and solution upgrade.

It is recommended that this analysis be performed every six months.

### **Annual cooling tower maintenance**

This Service includes the inspection and maintenance of the cooling tower at least once a year.

This involves checking the motor.

### **24 hours duty**

This service includes emergency calls outside of the office normal working hours.

This Service is only available with a Maintenance Contract, where available.

### **Trane Select Agreements**

Trane Select Agreements are programs tailored to your needs, your business and your application. They offer four different levels of coverage. From preventive maintenance plans to fully comprehensive solutions, you have the option of selecting the coverage that best suits your requirements.

### **5 years motor-compressor warranty**

This Service will provide a 5 years part and labor warranty for the motor compressor only.

This Service is only available for units covered by a 5 years Maintenance Contract.

### **Tube analysis**

- Eddy Current Tube Testing for prediction of tube failure/wear

- Frequency - every 5 years for first 10 years (depending on the water quality), then every 3 years thereafter.

### **Energy enhancement**

With Trane Building Advantage you can now explore cost effective ways to optimize the energy efficiency of your existing system and generate immediate savings. Energy management solutions are not only for new systems or buildings. Trane Building Advantage offers solutions designed to unlock energy savings in your existing system.



Trane optimizes the performance of homes and buildings around the world. A business of Ingersoll Rand, the leader in creating and sustaining safe, comfortable and energy efficient environments, Trane offers a broad portfolio of advanced controls and HVAC systems, comprehensive building services, and parts.

For more information, visit [www.Trane.com](http://www.Trane.com).

Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice.

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conscious print practices that reduce waste.

