



TRANE®

RTWA

Water-cooled liquid chillers with screw compressor

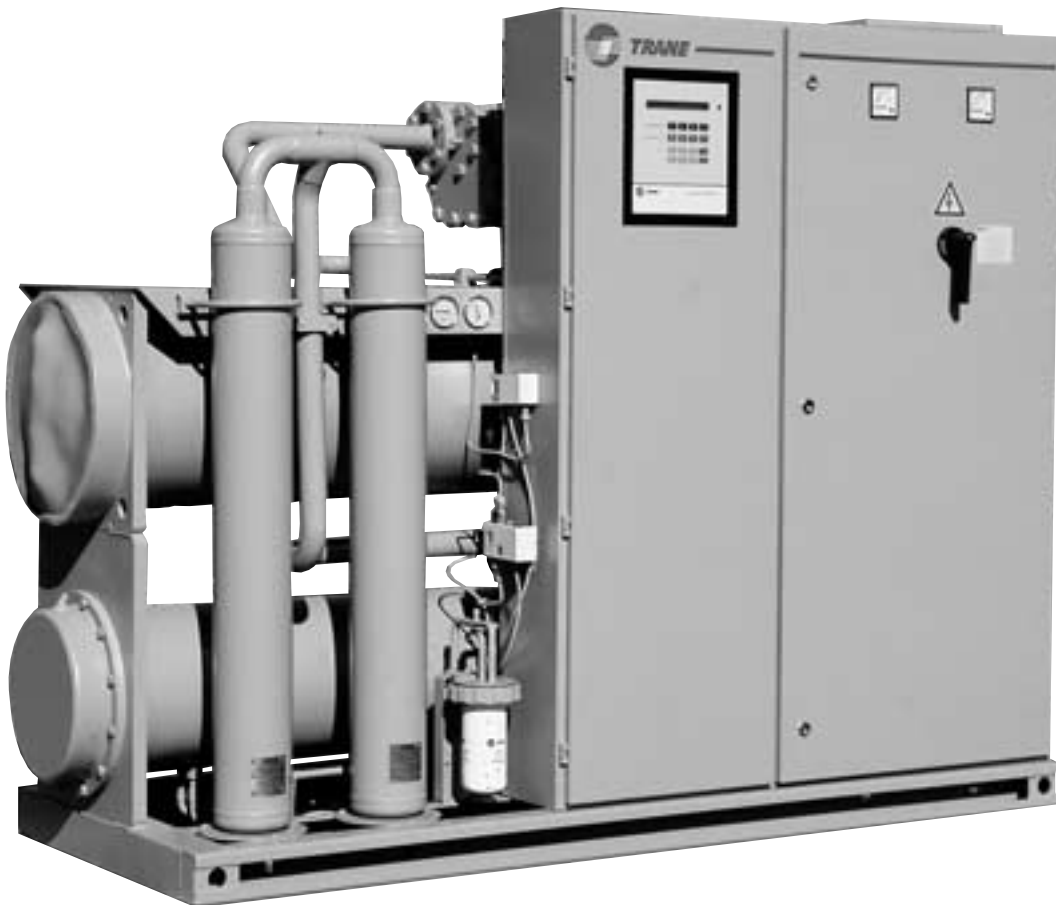
RTUA

Remote condenser liquid chillers with screw compressor

RTCA

Air-cooled condenser

Installation Operation Maintenance



RTWA/RTUA : 108 - 109 - 110 - 207 - 209 - 211 - 212 - 213 - 215 - 216 - 217

RTCA : 108 - 109 - 111 - 113 - 115 - 116 - 208 - 209 - 211 - 213 - 215 - 216 - 217



B20 IM 004 E

**This manual must be used in
conjunction with the
UCM-CLD manual, reference
L80 IM 025 E.**

Foreword

These installation, operation and maintenance instructions are given as a guide to good practice in the installation, putting into service, operation, and maintenance by the user, of Trane RTWA - RTUA - RTCA 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.

Warranty

Warranty is based on the general terms and conditions of Société Trane or Trane UK Ltd. The warranty is void if the equipment is repaired or modified without the written approval of Trane, 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 chapter "Maintenance", it may entail cancellation of warranty and liabilities by Trane.

Reception

On arrival, inspect the unit before signing the delivery note. Specify any damage on the delivery note, and send a registered letter of protest to the last carrier of the goods within 72 hours of delivery. Notify the local Trane Sales Office at the same time. The unit should be totally inspected within 7 days of delivery. If any concealed damage is discovered, send a

registered letter of protest to the carrier within 7 days of delivery and notify the local Trane Office. Units are shipped with the refrigerant operating or holding charge and should be examined with an electronic leak detector to determine the hermetic integrity of the unit. The refrigerant charge is not included in the standard Trane Warranty Cover.

General information

About this manual

Cautions appear at appropriate places in this instruction 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.

About the unit

These RTWA - RTUA - RTCA units are assembled, pressure tested, dehydrated, charged and run tested before shipment. The information contained in this manual applies to units designated RTWA - RTUA - RTCA.

Refrigerant

The refrigerant provided by Société Trane or Trane UK Ltd 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 refrige-

rant. For this, it is necessary to have a precise analysis made by a specialized laboratory. If this condition is not respected, the Société Trane or Trane UK Ltd warranty could be cancelled.

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General information

Inspecting the unit

When the unit is delivered carry out formal identification and check there are no missing parts. Compare the nameplate data with the data on the purchase order and the submittal. Refer to the "Nameplates" section. Check the unit's external components have not been damaged. The carrier must be informed of any damage observed or parts missing, and a written report must be attached to the carrier's delivery document. Specify and communicate to the Trane sales office the extent and nature of the damage observed. Do not undertake installation of a unit that has been damaged without the approval of the sales office.

Check and inspection list

To obtain compensation for any damage which has taken place during transportation, fill out the following check list on the unit's receipt.

- Inspect the individual parts of the shipment before accepting the unit. Make a note of any obvious damage to the unit or packing materials.
- Inspect the unit as soon as possible and before storage, to detect any hidden damage. This type of damage must be reported within 15 days.
- If any hidden damage is detected, you must interrupt unpacking of the unit. Do not remove the damaged unit from the place of reception. If possible take photos of the damaged component. The owner must provide sufficient proof that the damage did not take place after delivery.

- Immediately notify the carrier concerning the damage observed, by telephone and mail. Demand an immediate second inspection of the damage.
- Contact a Trane representative to carry out the repairs. Do not perform repairs before the damage has been confirmed by a representative of the carrier.

List of spare parts

Inspect all the accessories and spare parts supplied with the unit, and compare with the delivery shipping list. This list includes the evaporator and condenser water box drainage plugs, the lifting drawings and the electrical diagrams, as well as the user's documentation, which are placed for shipment inside the control panel and/or the starter panel.

Description of the unit

The RTWA units are water-cooled liquid chillers equipped with one or more screw compressors, an evaporator and a condenser. They are designed for indoor installation.

Sizes 108 to 110 have a single cooling circuit and a CHHB compressor.

Sizes 207 to 212 have 2 independent cooling circuits and one CHHN compressor for each circuit.

Sizes 213 to 217 also have 2 cooling circuits, but equipped with CHHB compressors.

Before the RTWA is shipped it is completely assembled and wired in factory, and undergoes tests for water-tightness, drying, oil and refrigerant loading and satisfactory operation.

The water supply connections - chilled water and condenser water inlets and outlets - are blocked for transportation.

Figure 1: Typical RTWA unit

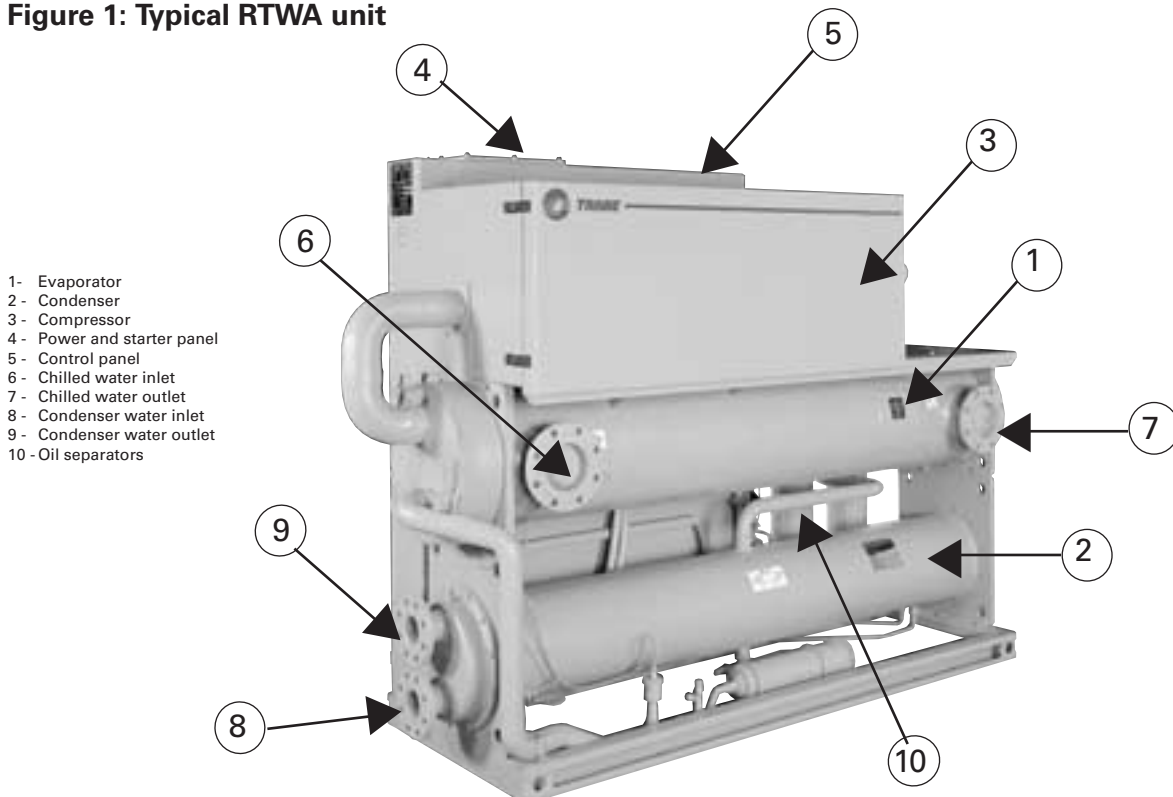


Figure 2: Typical RTUA unit

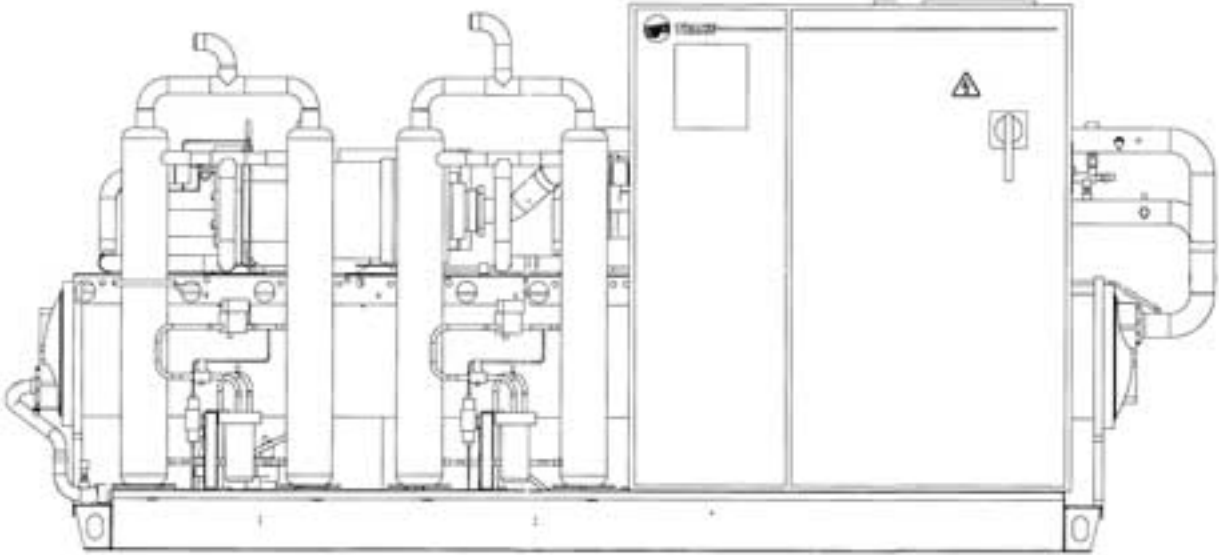
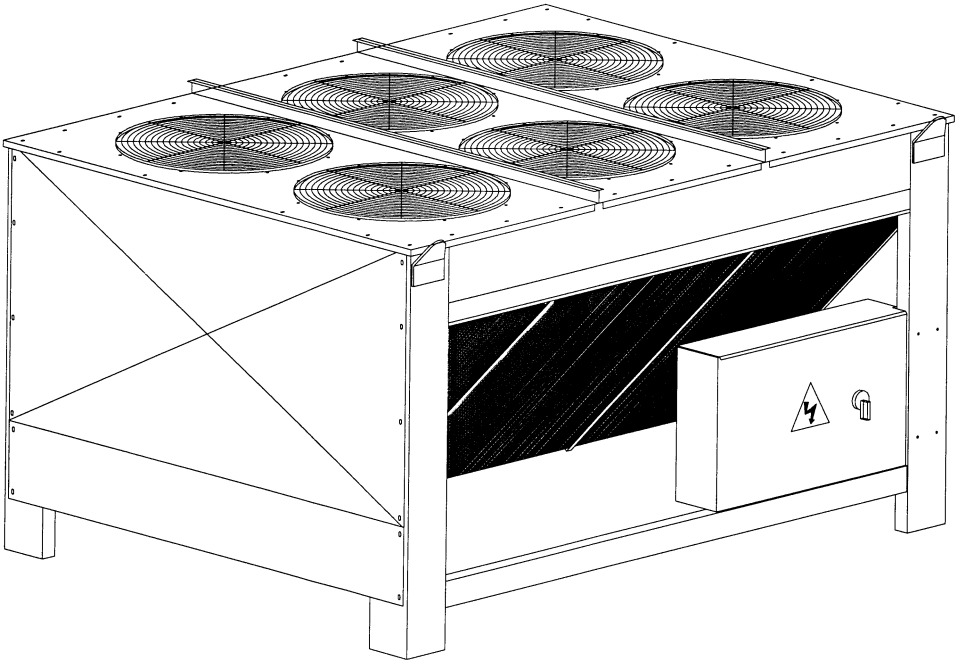


Figure 3: Typical RTCA unit



The RTUA units are liquid chillers equipped with one or more screw compressors and an evaporator designed to operate with RTCA air-cooled condensers. They are intended to operate indoors. The configuration of the number of circuits and types of compressor is identical to the RTWA described above.

The RTUA is shipped once it has been assembled and wired in factory. The discharge piping is blocked at the oil separator outlet level. The tests for water-tightness and drying are performed before the nitrogen holding charge is introduced into the unit. The quantity of oil is attached for filling on site (without the additional quantity of oil required for the piping installed on site). The

drier filters are also attached for assembly after brazing of the refrigerant connections.

The water connections - chilled water inlet and outlet - are blocked for transportation.

The RTCA air-cooled condensers sizes 108 to 216 are dried, vacuum pumped, undergoes a sequence test and a nitrogen holding charge before shipment.

Figures 1 to 3 show the typical RTWA, RTUA and RTCA units and their components. Tables 1 to 3 specify the general characteristics of these units.

Table 1: General mechanical and electrical specifications of the RTWA

Unit type	RTWA	R 22					
		108		109		110	
		STD	HE	STD	HE	STD	HE
Compressor type	CHHB	70	70	85	85	100	100
Operating charge							
Refrigerant	(kg)	45	45	50	50	55	55
Oil	(litres)	14	14	14	14	14	14
Maximum operating amps (1)(3)	(A)	154	154	177	177	207	207
Start-up amps (1)(2)	(A)	433	433	539	539	600	600
Evaporator Water capacity	(litres)	145	134	134	118	118	106
EVP inlet diameter		DIA 5" DN 125/PN 16					
EVP outlet diameter		DIA 5" DN 125/PN 16					
Evaporator Type		ES71	ES81	ES81	ES101	ES101	ES121
Condenser Water capacity	(litres)	32	40	40	47	47	55
CDS inlet diameter		DIA 3" DN 80/PN 16					
CDS outlet diameter		DIA 3" DN 80/PN 16					
Condenser Type		CS61	CS81	CS81	CS101	CS101	CS121
Operating weight (4)	(kg)	1945	1980	2050	2080	2080	2115

Unit type	RTWA	R 134a				
		108	109		110	
		STD	SD	STD	SD	STD
Compressor type	CHHB	70	85	85	100	100
Operating charge						
Refrigerant	(kg)	45	50	50	55	55
Huile	(litres)	14	14	14	14	14
Maximum operating amps (1)(3)	(A)	129	141	141	154	154
Start-up amps (1)(2)	(A)	293	367	367	433	433
Evaporator Water capacity	(litres)	145	145	134	134	118
EVP inlet diameter		DIA 5" DN 125/PN 16				
EVP outlet diameter		DIA 5" DN 125/PN 16				
Evaporator Type		ES71	ES71	ES81	ES81	ES101
Condenser Water capacity	(litres)	32	32	40	40	47
CDS inlet diameter		DIA 3" DN 80/PN 16				
CDS outlet diameter		DIA 3" DN 80/PN 16				
Condenser Type		CS61	CS61	CS81	CS81	CS101
Operating weight (4)	(kg)	1945	2015	2050	2050	2080

(1) With 400V/50Hz/3Ph.

(2) With part-winding start. One compressor at full load, the other starting.

(3) To be taken into account when dimensioning power cables.

(4) With sound-proof hood option, refrigerant and oil operating charges, exchanger water capacity.

General characteristics

Unit type	RTWA	R22						
		207		209		211		212
		STD	HE	STD	HE	STD	HE	STD
Compressor type	CHHN	35	35	40	40	50	50	60
Operating charge								
Refrigerant	(kg)	2x30	2X30	2x32	2X32	2x34	2X34	2x36
Oil	(litres)	2x8	2X8	2x8	2X8	2x8	2X8	2x8
Maximum operating amps (1)(3)	(A)	158	158	180	180	212	212	256
Start-up amps (1)(2)	(A)	288	288	348	348	419	419	507
Evaporator Water capacity	(litres)	145	134	134	118	118	106	106
EVP inlet diameter		DIA 5" DN 125/PN 16						
EVP outlet diameter		DIA 5" DN 125/PN 16						
Evaporator Type		ES70	ES80	ES80	ES100	ES100	ES120	ES120
Condenser Water capacity	(litres)	22	27	27	32	32	38	38
CDS inlet diameter		DIA 3" DN 80/PN 16						
CDS outlet diameter		DIA 3" DN 80/PN 16						
Condenser Type		CS60	CS80	CS80	CS100	CS100	CS120	CS120
Operating weight (4)	(kg)	2270	2315	2295	2320	2325	2400	2395

Unit type	RTWA	R 134a						
		207	209		211		212	
		STD	SD	STD	SD	STD	SD	STD
Compressor type	CHHN	35	40	40	50	50	60	60
Operating charge								
Refrigerant	(kg)	2x30	2X32	2x32	2X34	2x34	2X36	2x36
Oil	(litres)	2x8	2X8	2x8	2X8	2x8	2X8	2x8
Maximum operating amps (1)(3)	(A)	140	158	158	180	180	212	212
Start-up amps (1)(2)	(A)	256	288	288	348	348	419	419
Evaporator Water capacity	(litres)	145	145	134	134	118	118	106
EVP inlet diameter		DIA 5" DN 125/PN 16						
EVP outlet diameter		DIA 5" DN 125/PN 16						
Evaporator Type		ES70	ES70	ES80	ES80	ES100	ES100	ES120
Condenser Water capacity	(litres)	22	22	27	27	32	32	38
CDS inlet diameter		DIA 3" DN 80/PN 16						
CDS outlet diameter		DIA 3" DN 80/PN 16						
Condenser Type		CS60	CS60	CS80	CS80	CS100	CS100	CS120
Operating weight (4)	(kg)	2270	2250	2295	2340	2325	2360	2395

(1) With 400V/50Hz/3Ph.

(2) With part-winding start. One compressor at full load, the other starting.

(3) To be taken into account when dimensioning power cables.

(4) With sound-proof hood option, refrigerant and oil operating charges, exchanger water capacity.

General characteristics

Unit type	RTWA	R 22					
		213		215		216	217
		STD	HE	STD	HE	STD	STD
Compressor type	CHHB	70	70	85	85	85/100	100
Operating operating charge							
Refrigerant	(kg)	2x55	2X55	2x60	2X60	2x60	2x65
Oil	(litres)	2x14	2X14	2x14	2X14	2x14	2x14
Maximum amps (1)(3)	(A)	308	308	354	354	384	414
Start-up amps (1)(2)	(A)	587	587	716	716	777	807
Evaporator Water capacity	(litres)	145	134	134	118	118	106
EVP inlet diameter				DIA 6" DN 150/PN 16			
EVP outlet diameter				DIA 6" DN 150/PN 16			
Evaporator Type		ES140	ES170	ES170	ES200	ES170	ES200
Condenser Water capacity	(litres)	22	27	27	32	27	38
CDS inlet diameter				DIA 5" DN 125/PN 16			
CDS outlet diameter				DIA 5" DN 125/PN 16			
Condenser Type		CS140	CS170	CS170	CS200	CS170	CS200
Operating weight (4)	(kg)	3010	3075	3215	3275	3350	3415

Unit type	RTWA	R 134a					
		213	215		216	217	
		STD	SD	STD	SD	STD	SD
Compressor type	CHHB	70	85	85	85/100	100	100
Operating operating charge							
Refrigerant	(kg)	2x55	2X60	2x60	2X60	2x65	2x65
Oil	(litres)	2x14	2X14	2x14	2X14	2x14	2x14
Maximum amps (1)(3)	(A)	258	282	282	295	306	308
Start-up amps (1)(2)	(A)	422	508	508	574	587	587
Evaporator Water capacity	(litres)	269	269	223	223	223	204
EVP inlet diameter				DIA 5" DN 125/PN 16			
EVP outlet diameter				DIA 5" DN 125/PN 16			
Evaporator Type		ES140	ES140	ES170	ES170	ES170	ES200
Condenser Water capacity	(litres)	34	34	42	42	42	49
CDS inlet diameter				DIA 5" DN 125/PN 16			
CDS outlet diameter				DIA 5" DN 125/PN 16			
Condenser Type		CS140	CS140	CS170	CS170	CS170	CS200
Operating weight (4)	(kg)	3010	3150	3215	3350	3360	3415

(1) With 400V/50Hz/3Ph.

(2) With part-winding start. One compressor at full load, the other starting.

(3) To be taken into account when dimensioning power cables.

(4) With sound-proof hood option, refrigerant and oil operating charges, exchanger water capacity.

Table 2: General mechanical and electrical specifications of the RTUA

Unit type	RTUA	R 22					
		108		109		110	
		STD	HE	STD	HE	STD	HE
Compressor type	CHHB	70	70	85	85	100	100
Operating charge							
Refrigerant	(kg)	15	15	16	16	17	17
Oil	(litres)	14	14	14	14	14	14
Maximum operating amps (1)(3)	(A)	154	154	177	177	207	207
Start-up amps (1)(2)	(A)	433	433	539	539	600	600
Evaporator Water capacity	(litres)	145	134	134	118	118	106
EVP inlet diameter		DIA 5" DN 125/PN 16					
EVP outlet diameter		DIA 5" DN 125/PN 16					
Evaporator Type		ES71	ES81	ES81	ES101	ES101	ES121
Operating weight (4)	(kg)	1630	1640	1710	1710	1710	1720

Unit type	RTUA	R 134a				
		108	109		110	
		STD	SD	STD	SD	STD
Compressor type	CHHB	70	85	85	100	100
Operating charge						
Refrigerant	(kg)	15	16	16	17	17
Oil	(litres)	14	14	14	14	14
Maximum operating amps (1)(3)	(A)	129	141	141	154	154
Start-up amps (1)(2)	(A)	293	367	367	433	433
Evaporator Water capacity	(litres)	145	145	134	134	118
EVP inlet diameter		DIA 5" DN 125/PN 16				
EVP outlet diameter		DIA 5" DN 125/PN 16				
Evaporator Type		ES71	ES71	ES81	ES81	ES101
Operating weight (4)	(kg)	1630	1640	1710	1710	1720

(1) With 400V/50Hz/3Ph.

(2) With part-winding start. One compressor at full load, the other starting.

(3) To be taken into account when dimensioning power cables.

(4) With sound-proof hood option, refrigerant and oil operating charges, exchanger water capacity.

Unit type	RTUA	R 22						
		207		209		211		212
		STD	HE	STD	HE	STD	HE	STD
Compressor type	CHHN	35	35	40	40	50	50	60
Operating charge								
Refrigerant	(kg)	2x10	2x10	2x11	2x11	2x12	2x12	2x13
Oil	(litres)	2x8	2x8	2x8	2x8	2x8	2x8	2x8
Maximum operating amps (1)(3)	(A)	158	158	180	180	212	212	256
Start-up amps (1)(2)	(A)	288	288	348	348	419	419	507
Evaporator Water capacity	(litres)	145	134	134	118	118	106	106
EVP inlet diameter		DIA 5" DN 125/PN 16						
EVP outlet diameter		DIA 5" DN 125/PN 16						
Evaporator Type		ES70	ES80	ES80	ES100	ES100	ES120	ES120
Operating weight (4)	(kg)	1660	1670	1670	1685	1690	1705	1705

General characteristics

Unit type	RTUA	R 134a							
		207		209		211		212	
		STD	SD	STD	SD	STD	SD	STD	
Compressor type	CHHN	35	40	40	50	50	60	60	
Operating charge									
Refrigerant	(kg)	2x10	2x10	2x11	2x11	2x12	2x12	2x13	
Oil	(litres)	2x8	2X8	2x8	2X8	2x8	2X8	2x8	
Maximum operating amps (1)(3)	(A)	140	158	158	180	180	212	212	
Start-up amps (1)(2)	(A)	256	288	288	348	348	419	419	
Evaporator Water capacity	(litres)	145	145	134	134	118	118	106	
EVP inlet diameter		DIA 5" DN 125/PN 16							
EVP outlet diameter		DIA 5" DN 125/PN 16							
Evaporator Type		ES70	ES70	ES80	ES80	ES100	ES100	ES120	
Operating weight (4)	(kg)	1660	1670	1670	1685	1690	1705	1705	

(1) With 400V/50Hz/3Ph.

(2) With part-winding start. One compressor at full load, the other starting.

(3) To be taken into account when dimensioning power cables.

(4) With sound-proof hood option, refrigerant and oil operating charges, exchanger water capacity.

Unit type	RTUA	R 22					
		213		215		216	217
		STD	HE	STD	HE	STD	STD
Compressor type	CHHB	70	70	85	85	85/100	100
Operating charge							
Refrigerant	(kg)	2x18	2x18	2x20	2x20	2x20	2x22
Oil	(litres)	2x14	2X14	2x14	2X14	2x14	2x14
Maximum operating amps (1)(3)	(A)	308	308	354	354	384	414
Start-up amps (1)(2)	(A)	587	587	716	716	777	807
Evaporator Water capacity	(litres)	145	134	134	118	118	106
EVP inlet diameter		DIA 6" DN 150/PN 16					
EVP outlet diameter		DIA 6" DN 150/PN 16					
Evaporator Type		ES140	ES170	ES170	ES200	ES170	ES200
Operating weight (4)	(kg)	2580	2605	2785	2795	2785	2815

Unit type	RTUA	R 134a					
		213	215		216	217	
		STD	SD	STD	SD	SD	STD
Compressor type	CHHB	70	85	85	85/100	100	100
Operating charge							
Refrigerant	(kg)	2x18	2x18	2x20	2x20	2x20	2x22
Oil	(litres)	2x14	2X14	2x14	2X14	2x14	2x14
Maximum operating amps (1)(3)	(A)	258	282	282	295	306	308
Start-up amps (1)(2)	(A)	422	508	508	574	587	587
Evaporator Water capacity	(litres)	269	269	223	223	223	204
EVP inlet diameter		DIA 5" DN 125/PN 16					
EVP outlet diameter		DIA 5" DN 125/PN 16					
Evaporator Type		ES140	ES140	ES170	ES170	ES170	ES200
Operating weight (4)	(kg)	2580	2605	2785	2795	2785	2815

Table 3: Mechanical and technical specifications of the RTCA

Unit type	RTCA	108	109	111	113	115	116
Number of circuits		1	1	1	1	1	1
Operating charge							
Refrigerant	(kg)	22	26	36	44	52	72
Number of fans		4	4	6	8	8	12

Unit type	RTCA	208	209	211	213	215	216
Number of circuits		2	2	2	2	2	2 or 4
Operating charge							
Refrigerant	(kg)	2x11	2x13	2x18	4x11	4x13	4x18
Number of fans		2x2	2x2	2x3	2x4	2x4	2x6
Nominal fan power	(kW)						
R22 standard		1.6	1.6	1.6	1.6	1.6	1.6
R22 LN		0.9	0.9	0.9	0.9	0.9	0.9
R134a Standard		0.9	0.9	0.9	0.9	0.9	0.9
Current fan amps	(A)						
R22 standard		3.7	3.7	3.7	3.7	3.7	3.7
R22 LN		2.8	2.8	2.8	2.8	2.8	2.8
R134a Standard		2.8	2.8	2.8	2.8	2.8	2.8
Discharge connection		1 5/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8
Liquid connection		1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8
Operating weight	(kg)	810	890	1090	1535	1770	2050
Fan rotation speed							
Standard unit	R22			915 rpm			
LN unit	R22			690 rpm			
Standard unit	R134a			690 rpm			

Figure 4: Control panel



All RTWA and RTUA units are equipped with the "Adaptive control" logic system exclusive to Trane which controls the chiller's operating variables. The "Adaptive control" system can correct these variables if necessary, prevent the chiller from stopping and manage the production of chilled water. An optional external communication module is available which enables remote control of the unit.

The compressor power setting is controlled by solenoid valves and oil pressure. The refrigeration circuit comprises an operating charge of refrigerant fluid and refrigeration oil, a drier filter, an electric expansion valve and charge valves (refrigerant and oil).

The evaporator is completely separate and equipped with drain and vent connections (valves to be supplied by the customer). The condenser is equipped with vent and drain devices on the water box.

Cautions and warnings

The warnings are printed in bold characters at appropriate points in this manual.

They warn personnel about risks of physical damage. To guarantee your personal safety and ensure this machine functions correctly it is vital you comply with them.

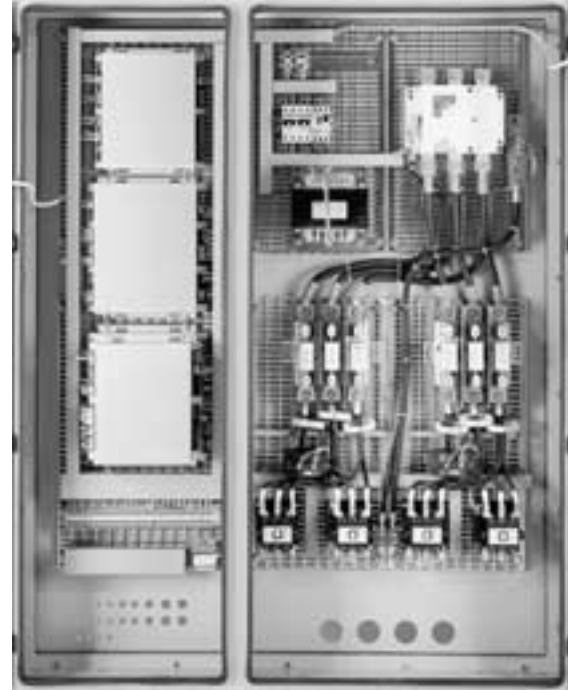
Société Trane shall not be held responsible in the event that the machine is put into operation or serviced by non-qualified personnel.

Installation

The RTWA or RTUA unit must be installed as follows:

- Install the unit on a flat base, with a maximum deviation from horizontal of 6 mm, sufficiently strong to support the unit's weight.
- Install the unit according to the instructions given in the sections entitled "Mechanical and electrical installations" in this manual.

Figure 5: Starter panel



- Install the optional sensors and carry out the electrical connections at the UCM-CLD.



Note: The standard sensor for the chilled water outlet is mounted in factory on the evaporator water outlet.

- At the place indicated, install the valves on the water piping upstream and downstream of the water connections for the evaporator and condenser (RTWA only) in order to isolate the evaporator and condenser for maintenance procedures and balance the system.
- If necessary, install a flow switch on the chilled water piping. Wire the flow switch to the evaporator's water pump relay so that the unit can only operate when the water flow has been established. The mechanism for controlling the chilled water flow is provided by the UCM-CLD without the assistance of a chilled water flow switch. The chilled water flow switch is optional but recommended.
- Install the manometers on the inlet and outlet piping systems of the evaporator and condenser (RTWA).
- Place a drainage valve at the bottom of the evaporator and condenser (RTWA).
- Install a vent valve on the top part of the evaporator and condenser (RTWA).
- Place a filter on the water inlet line to prevent debris entering the system (evaporator and condenser).
- Install filters upstream of all the pumps and the automatic modulating valves.
- Install the cables needed to connect up the unit on the work site.
- Start the unit under the supervision of a qualified service technician.
- Insulate the chilled water lines and the other components of the system to prevent any condensation.

Nameplates

The nameplates for the RTWA and RTUA units are located on the control panel door. (figure 4). A nameplate for the compressor is mounted on the compressor.

Figure 6: Nameplate

N° DE MODELE - MODEL NUMBER			
[]			
[]			
N° SERIE - SERIAL NUMBER		ANNEE - YEAR	
[]		[]	
COMPRESSEUR C1 - C3	QTE - QTY	V / Hz / Ph	A _{max} / FLA kW max
COMPRESSOR C2 - C4	[]	[]	[]
VENTILATEUR - FANS	[]	[]	[]
POMPE A HUILE - OIL PUMP	[]	[]	[]
AUXILIAIRES - AUXILIARY	[]	[]	[]
CONTROLE - CONTROL	[]	[]	VA
INTENSITE DEMARRAGE - STARTING AMPS			
INTENSITE NOMINALE	C1 - C3 /	A	a for BP / HP
RATED LOAD AMP	C2 - C4	[]	LP / HP
REFRIGERANT	QTE - QTY	C1-C3 / C2-C4	kg
HUILE - OIL	QTE - QTY	C1-C3 / C2-C4	[]
PRESSION MAXI D'UTILISATION	(bar)	BP	HP
MAX WORKING PRESSURE	[]	LP	[]
		88190 GOLBEY-FRANCE	
		AN AMERICAN STANDARD COMPANY	
			

Unit nameplate

The unit's nameplate provides the following information:

- unit's model and size,
- unit's serial number,
- unit's electrical characteristics,
- correct operating charges of R22 or R134a and oil,
- list of unit test pressures.

Compressor nameplate

The compressor nameplate provides the following information:

- compressor model number,
- compressor serial number,
- compressor's electrical characteristics,
- operating range,
- refrigerant fluid used.

Storage

If the chiller is stored for a long period prior to installation, the following precautionary measures must be taken:

- 1 Store the chiller in a safe place sheltered from bad weather.
2. Every three months at least, check the pressure in the circuits and conduct a leak test using an electronic refrigerant detector to check the charge is intact. Otherwise, contact a qualified servicing company and a Trane sales office.

Mechanical installation

Before installation

If the unit is damaged during handling or installation, inform the Trane sales office as quickly as possible. An installation check sheet is provided at the end of this manual.

Anti-vibration measures

If necessary position anti-vibration rubber isolators on all the water piping and flexible electrical ducts. Refer to the section entitled "Isolating the unit".

Installation

Install the chiller on rigid, stable supports or a concrete foundation of sufficient weight and strength to support the weight of the chiller in readiness for operation (i.e. with the piping installed and the unit charged with water). Refer to tables 1, 2 and 3 for the unit's operating values. Once the unit is in place, the difference in level widthwise and lengthwise must not exceed 6mm. The Trane company shall not be liable in the event of physical damage caused by installation on a non-conforming foundation.

Clearance space

Allow for the clearance space required for maintenance operations. Refer to the submittals to obtain the unit's dimensions. A minimum clearance of 800 mm is needed to be able to access the compressor and to open the control panel's doors. Refer to the minimum recommended clearance values on the submittals supplied with the unit. In all cases, local legislation imposing additional clearance spaces overrides these recommendations.

Note: If these clearance values have to be modified because of the positioning of the chiller, contact your nearest Trane sales office.

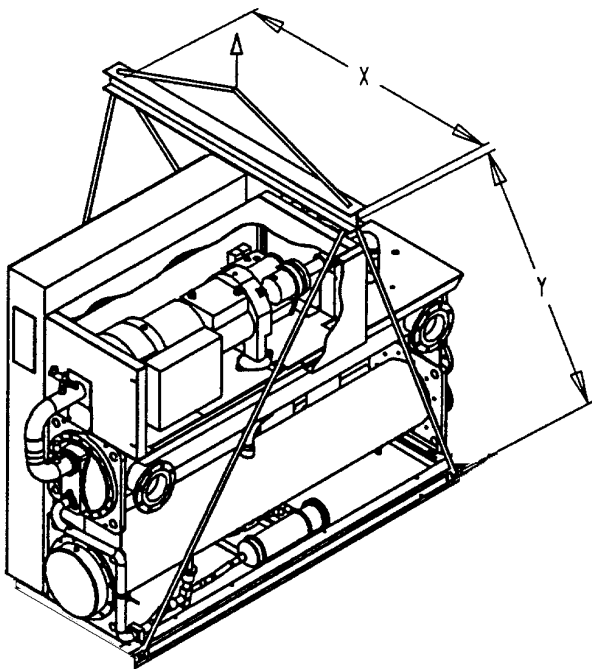
Drainage

Install the unit near to a water drainage point with sufficient capacity to allow drainage when maintenance or repair operations are performed. The evaporator and condenser are equipped with a drainage connection. Refer to the section entitled "Drainage of the evaporator and condenser". Refer to local and national legislation. A vent line on the top part of the evaporator and condenser facilitates evacuation of water for drainage.

Lifting

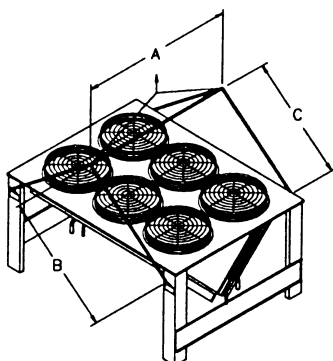
The RTWA, RTUA and RTCA chillers must be lifted into their installation site. See figures 7 and 8. Refer to the lifting diagram supplied with each unit for specific information concerning each unit's weight.

Figure 7: Lifting the RTWA or RTUA



RTWA - RTUA	108 to 212	213 to 217
X	1500	1000
Y	2300	2550

Figure 8: Lifting the RTCA



RTCA	108 to 211	113 to 116
	208 to 211	231 to 216
A	2240	2240
B-C	1700	2800

Caution: To prevent any personal injury or damage to the unit, the capacity of the lifting system must be greater than the unit's weight.

Lifting procedure

- Install the eye bolts in the 4 jack rings provided on the unit (figures 7-8).

Caution: To prevent injury, accidents or damage to the unit, use the lifting method shown in figure 7 for RTWA - RTUA and figure 8 for RTCA.

Warning: this unit must be lifted and handled with care. Avoid sudden movements during lifting and handling.

- Attach the slings or lifting cables to the eye bolts. Each sling used to lift the unit must be capable of supporting the total weight of the chiller.
- Attach the slings to the lifting bar. The total lifting weight, the distribution of weight and the dimensions of the lifting bar are indicated on the handling plan supplied with the unit.

Warning: To prevent any damage, position the lifting bar so that the slings do not touch the unit.

Isolation and levelling of the unit

To reduce the transmission of noise and vibrations as much as possible, use the two assembly methods described below.

1. Place isolating skids under each of the unit's 4 assembly points. Assemble the unit directly on these skids or concrete feet. Carry out levelling using the support part. The difference in level must be no more than 6 mm lengthwise on the unit. Use shims if necessary.

Water connections (RTWA - RTUA)

Rinse all the water piping systems with water before making the final connections to the unit.

Warning: To prevent any damage to the unit, bypass the exchangers if an acid-based rinsing product is used.

Warning: To prevent any damage, do not use untreated water or inadequately treated water.

When making the water connections use flange connectors. Insulate all the piping to reduce temperature increases and prevent condensation.

Evaporator connections (RTWA-RTUA)

Figure 9 shows all the piping systems for the evaporator and its components. The arrangement of the pipes and the other components varies slightly according to the positioning of the connections and the water source.

Warning: The chilled water connections to the evaporator are flange connections.

A vent line is located on the top part of the evaporator at the water return piping end. Install additional vent lines at the highest points in the piping to vent the air present in the chilled water circuit. Install manometers to monitor the pressure of chilled water entering and leaving the evaporator.

Warning: To prevent damage to components in the chilled water circuit, the evaporator pressure must not exceed 10 bars.

Install stop valves connected to the manometers, to isolate them from the system when they are not in operation. Use rubber anti-vibration isolators to prevent vibrations being transmitted into the water lines.

If necessary, install thermometers on the piping systems to monitor the temperature of water entering and leaving the evaporator. Place a balance valve on the chilled water line to control the regularity of the water flow.

Place stop valves on the entering and leaving water lines to isolate the evaporator during maintenance procedures.

A filter must be installed on the entering water line to prevent debris entering the system.

Evaporator piping components

These components include all the control devices and mechanisms making it possible to ensure the water circuit operates correctly and safely. Information concerning these items and their positions is given below.

Chilled water inlet piping

- Air venting (to evacuate the air present in the system).
- Water pressure manometers with stop valves.
- Vibration absorbers.
- Stop valves.
- Thermometers if necessary
- Service T-connectors (customer).
- Filter.

Chilled water outlet piping

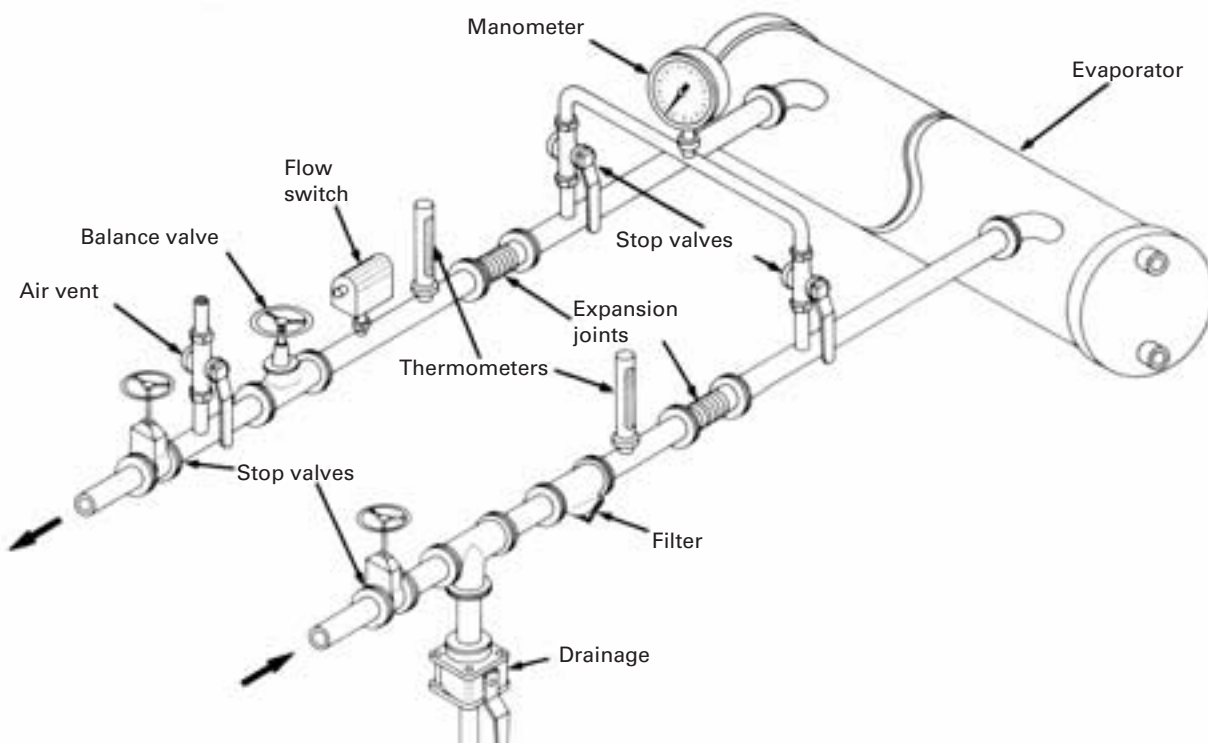
- Air venting (to evacuate air from the system).
- Water pressure manometers with stop valves.
- Vibration absorbers.
- Isolation stop valves.
- Thermometers.
- Service T-connectors (customer).
- Balance valve.
- Flow switch (if necessary).

Evaporator drainage

A 3/4" drainage connector is located underneath the evaporator. It must be connected to a drainage line to enable drainage of the evaporator during unit maintenance procedures. A stop valve must be installed on the drainage line.

If the unit does not have a drain line install the drain plug supplied with the unit.

Figure 9: Typical connection of the evaporator (RTWA-RTUA)



Unit flow switch (option)

The chilled water flow is protected by the UCM-CLD without the assistance of a chilled water flow switch. The flow switch is purely optional but if it is not installed, a signal must be sent to the chiller to indicate the water flow is established, for example the auxiliary contacts of the chilled water pump starter.

If additional protection of the chilled water flow proves necessary, connect a flow switch installed on site, or a differential pressure switch to control the system's water flow. Connect the flow switch in series with the auxiliary contacts of the chilled water pump motor starter.

A special connector is supplied with the unit, together with the wiring diagrams. The piping and control systems must be analysed to determine whether the flow switch is operating correctly, especially systems using a single pump for hot water and chilled water.

Follow the manufacturer's recommendations for the installation procedures. The general rules for installation of flow switches are given below.

1. Mount the flow switch vertically, leaving a length 5 times the piping diameter on each side. Do not install the flow switch near to bends, orifices or valves.

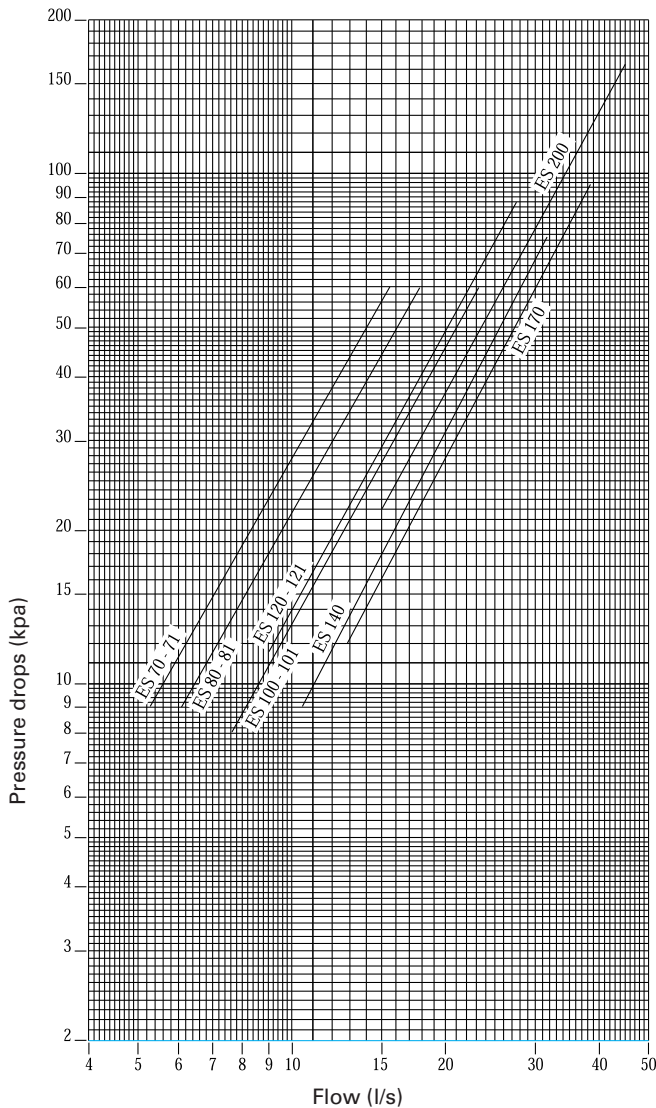
Note: The flow switch arrow must point in the same direction as the water flow.

2. To stop the flow switch vibrating, vent the air from the whole of the water circuit.

Note: The UCM-CLD waits for six seconds after a "flow loss" diagnosis before stopping the unit. Contact a qualified service technician if the machine stops repeatedly.

3. Adjust the flow switch so that it opens when the water flow drops below the nominal value. Refer to figure 10 for minimum flow recommendations. The flow switch contacts are closed when the water flow is established.

Figure 10: Evaporator pressure drops (RTWA-RTUA)



Sizes 108 - 110

ES 71 - 81 - 101 - 121

Sizes 207 - 212

ES 70 - 80 - 100 - 120

Sizes 213 - 216

ES 140 - 170 - 200

Condenser connections (RTWA)

The connections for water entering and leaving the condenser are at the same end. 3/4" drain and vent plugs are supplied.

Figure 11 shows how to connect to a cooling tower for connection to the same end of the condenser.

Make sure the condenser water circuit is equipped with a system providing a constant water temperature.

For example, a three-way valve can be used to bypass the cooling tower in the event of low ambient temperatures, in order to keep the temperature of water entering the condenser at a minimum acceptable level.

Refer to figure 12 for the recommended minimum flow values.

Warning: Inadequate control of the condenser water temperature will cause serious damage to the compressor, as a result of operation at low discharge pressures.

Figure 11: Typical condenser connections (RTWA).

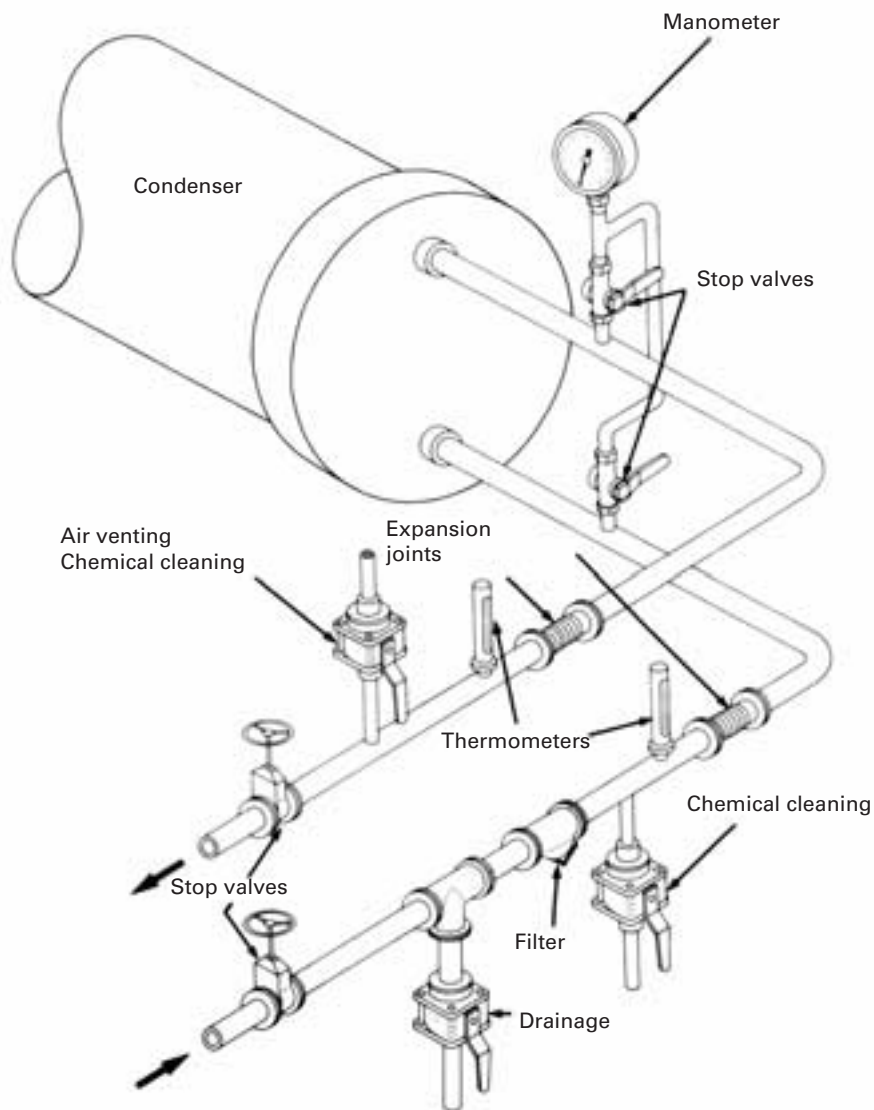
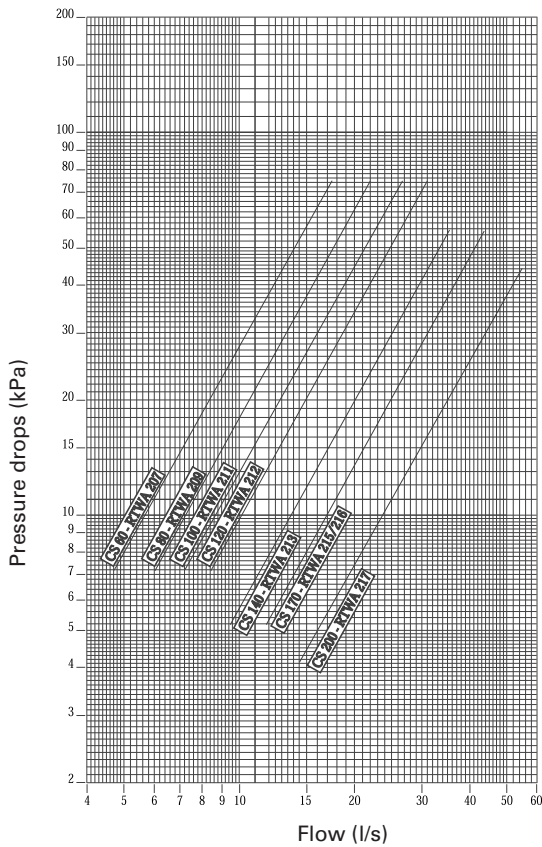


Figure 12: RTWA condenser pressure drops



Sizes 108-110: CS 61-81-101-121
Sizes 207-212: CS 60-80-100-120
Sizes 213-217: CS 140-170-200

Water treatment

If untreated or inadequately treated water is used in these units it may cause incorrect operation and damage tubes. Consult a water treatment specialist to determine whether it is necessary to treat the water.

Customer note
 If untreated or inadequately treated water is used it may lead to accumulation of scale, silt, algae, erosion or corrosion. You must consult a water treatment specialist to decide upon the most suitable treatment, if necessary. The Société Trane warranty does not cover damage caused by corrosion, erosion or deterioration of the unit. Trane shall not be liable for damage caused by use of untreated or inadequately treated water, salt water or brackish water.

Manometers

Install the manometers on site as shown in figures 9 and 11. Place the manometers or valves on a straight section of the piping. Do not install them near bends, etc. Make sure the manometers are always installed at the same level.
 To read the values given by the manometer, open one valve and close the other (depending on the value you want to read). This method makes it possible to avoid the errors caused when manometers have been calibrated in different ways and installed at different levels.

Safety valves

Install a safety valve on the entering water piping of the evaporator and condenser between the evaporator or condenser and its inlet stop valve, as shown in figures 9 and 11. Refer to the local legislation for installation of the safety valves.

Warning: To prevent damage to the evaporator or condenser, install the safety valves in the water circuit of the evaporator and condenser.

Installing and connecting temperature sensors

Regardless of the type of monitoring sensor required by a particular application, the sensor must always be positioned far enough from the evaporator or condenser to enable the sensor to read a correct temperature for the mixed water.

Install the sensor at 4 o'clock on the water piping to prevent any condensation.

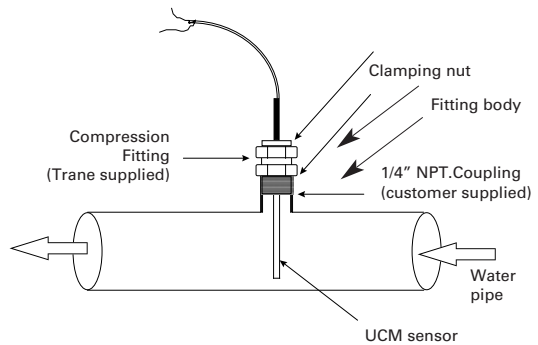
When installing standard or optional temperature sensors described below, comply with the following instructions Figure 13

1. Put thermocontact paste in each sensor bulbwell before inserting the sensor.

Warning: To prevent degraded operation due to electrical interference, run the sensor cables in a duct. However, do not lay sensor cables with other cables whose voltage is greater than 30 VAC.

All the temperature sensors installed on the site have an identification number and a serial number marked on the part body. Also note that both sensors in each pair have the same serial number.
 For all additional information, refer to the UCM-CLD manual.

Figure 13 - UCM water temperature sensor installation



Extension of sensor power cable

A temperature sensor's power cable may not be long enough to reach the UCM-CLD. If this is the case for your installation, connect the cable to a junction box installed in a more convenient position. Plug the sensor cable into the junction box as well as the cable connected to the control panel. (The shielded cable can be cut to the required length).

Note: To lengthen the sensor's power cable, use 0.75 to 1.25 mm² conductors, 600 V. The cable used between the junction box and the control panel must either be in a duct or shielded. If a shielded cable is used, make sure it is not used with other cables carrying 30 V or more.

Evaporator leaving water temperature sensor 5R51 (RTWA and RTUA standard supply).

Install this temperature sensor in the evaporator's leaving water piping system. To install it correctly refer to the general recommendations in the section entitled "Installing and connecting temperature sensors". Connect this sensor to terminals X9 and X10.

Condenser leaving and entering water temperature sensors 5R53, 5R54 (RTWA option).

Install these sensor pairs in the condenser water piping. To install them correctly refer to the general recommendations at the beginning of this chapter. Connect the water temperature sensor located at the condenser outlet (5R53) to terminals X5 and X6, and water temperature sensor located at the condenser inlet (5R54) to terminals X3 and X4.

Evaporator entering water temperature sensor 5R52 (RTWA-RTUA)

When this option is chosen, 2 sensor pairs (i.e. sensors 5R51 and 5R52), are supplied to monitor the evaporator water temperature. In the event of a separate order, eliminate the evaporator leaving water standard sensor (5R51) and replace it with one of the new sensors. Install the last sensor (5R52) in the evaporator entering water piping, taking account of the general recommendations at the beginning of this chapter. Connect the chilled water outlet sensor (5R51) across the X9 and X10 terminals, and the chilled water inlet sensor (5R52) across the terminals X7 and X8.

Condenser sensors 5R3- 5R56 (RTUA - RTCA)

- If an RTCA condenser is used with the RTUA, the sensors required are installed on the RTCA. Connect the outside air sensor 5R3 to terminals 6X24 and 6X25 and the condensation temperature sensors:
 - 5R56(-1) to terminals 6X30 and 6X31 for circuit 1 or for a single circuit unit (the sensor must be installed on the coil that is least exposed to the sun).
 - 5R56-2 to terminals 6X32 and 6X33 for circuit 2.

For connection, refer to the general recommendations in the section "Extension of sensor power cable".

- If the condenser is not an RTCA, ambient temperature and condensation temperature sensors must be connected to the RTUA to monitor it.

The ambient temperature sensor must be installed in a position which represents most accurately the condenser's surrounding environment. It must not be exposed to sunlight or precipitation, which would artificially modify the real outdoor temperature. Care must also be taken to ensure this sensor is not located in the flow of recycled air from the condenser discharge.

The condensation temperature sensor must be installed on the refrigerant piping at the place where it leaves the condenser to enter the sub-cooler. It is necessary to install a condensation temperature sensor on each refrigerant circuit. For a single circuit condenser, place the sensor on the side least exposed to sunlight. This sensor must be fixed in compliance with the method used to attach the bulb for a thermostat expansion valve. This sensor can be fixed outside the piping if it is sufficiently insulated. This insulation must be capable of withstanding high temperatures without degradation.

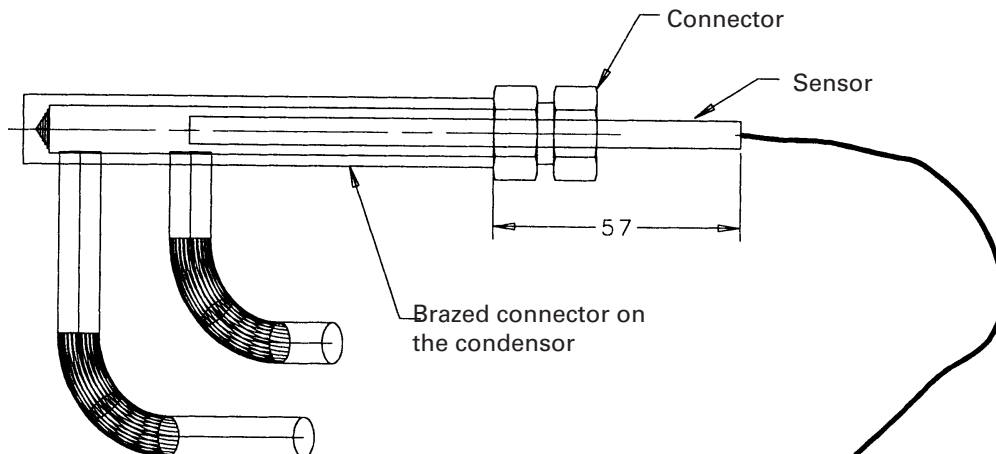
Warning: A defect in fixing or insulating the condensation sensors may cause incorrect adjustment and/or damage the compressor.

If the sensor cannot be mounted in the place where the saturated gas enters the subcooler, it must then be positioned on the subcooler side and not on the condenser side. If the condensation temperature cannot be measured, it is preferable to measure the liquid temperature instead of the discharge temperature.

Note: If the condenser is not an RTCA, the RTUA is shipped with the outdoor air and condensation sensors in the control panel.

Warning: To prevent interference, separate the sensor cables from the power cables.

Detail of positions of refrigerant sensors 5R56-1 and 2



Electrical connections performed by the installer:

Refer to the certified electric diagrams attached with the unit.

For information see table 1.

1. Three-phase power supply of the starter panel 380/415V.
2. Single-phase power supply of the control panel 230V.
3. Connection of the water flow switches to the control panel, locking of the condenser and evaporator pumps.
4. Connection of the water temperature sensors.

Warning: To prevent accidents, open the main power supply disconnect switch before performing any work on the unit. Failure to comply with safety standards may cause serious accidents for maintenance personnel and may also lead to destruction of the equipment.

Electrical connection of the unit must comply with standards in force in the particular country. The electric diagram is attached with the unit when it is shipped. Copies are also available from your nearest Trane sales office.

Warning: Only use copper conductors to make the connections, so as to prevent corrosion or overheating.

The control circuit connections must be separated from the low voltage connections (<30V).

Installation check list

When the unit is installed, complete the check list provided at the end of this manual to verify all the procedures have been performed before the unit starts. This check list does not replace the detailed instructions given in the section of this manual entitled "Mechanical installation". Before doing anything else, read this section carefully to become familiar with the installation procedures.

Unit piping

Rinse all the unit's piping systems with water before making the final connections to the unit.

Warning: If a commercial acid rinsing solution is used, set up a temporary bypass around the unit to prevent damage to internal components of the evaporator and condenser.

Warning: To prevent damage to the equipment, do not use untreated or inadequately treated water.

Operation

RTWA mechanical operation principles

General information

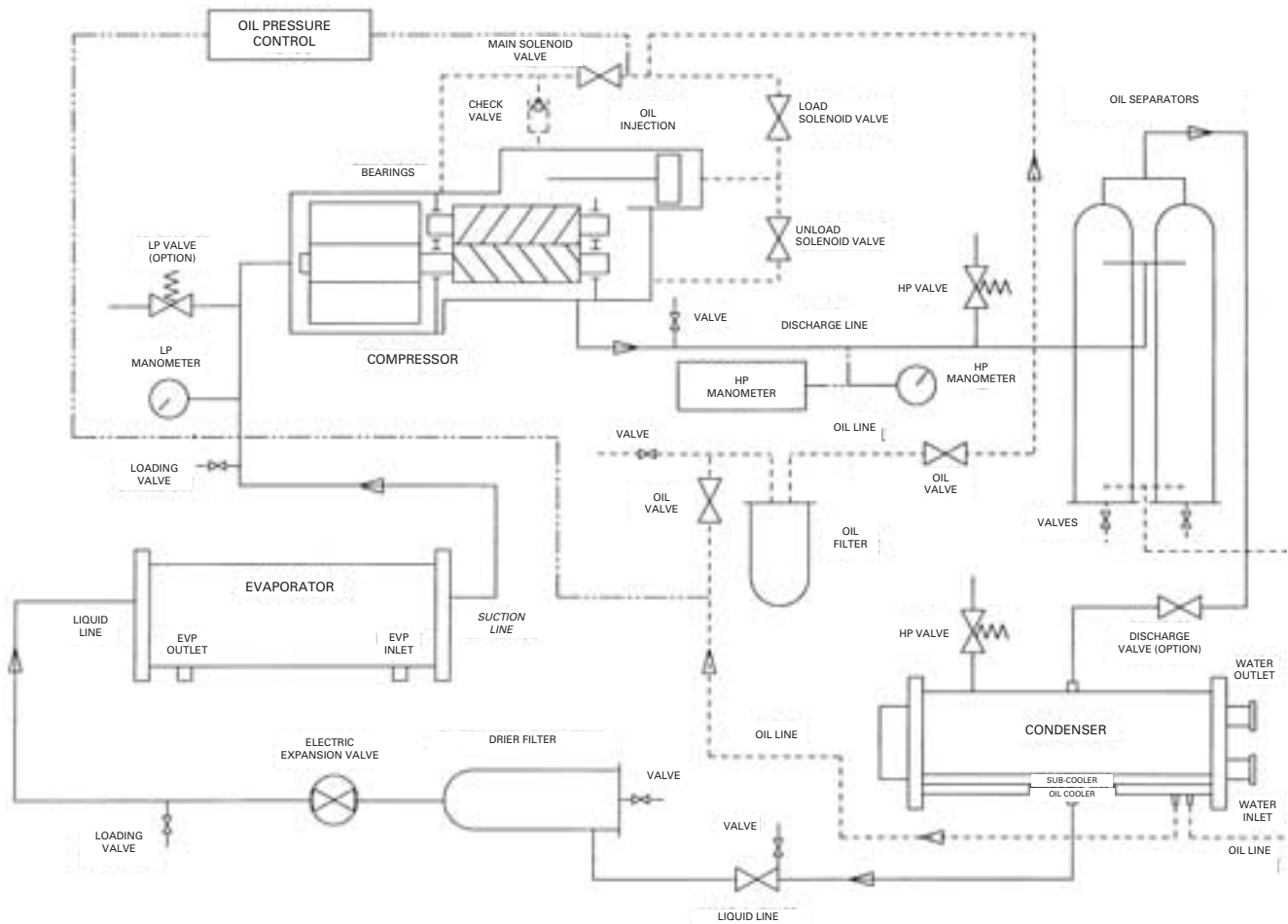
This section of the manual describes the mechanical operation principles of screw compressor water-cooled chillers equipped with microprocessor management systems. The main components of the RTWA units are as follows:

- Unit control module (UCM-CLD)
- Panel mounted on the unit

- Screw compressor
- Direct expansion evaporator
- Water-cooled condenser
- Oil supply (hydraulics and lubrication)
- Interconnecting piping

The main components of a standard RTWA unit are shown in figures 1 to 3.

Figure 14: Refrigeration circuit (e.g. RTWA single circuit)



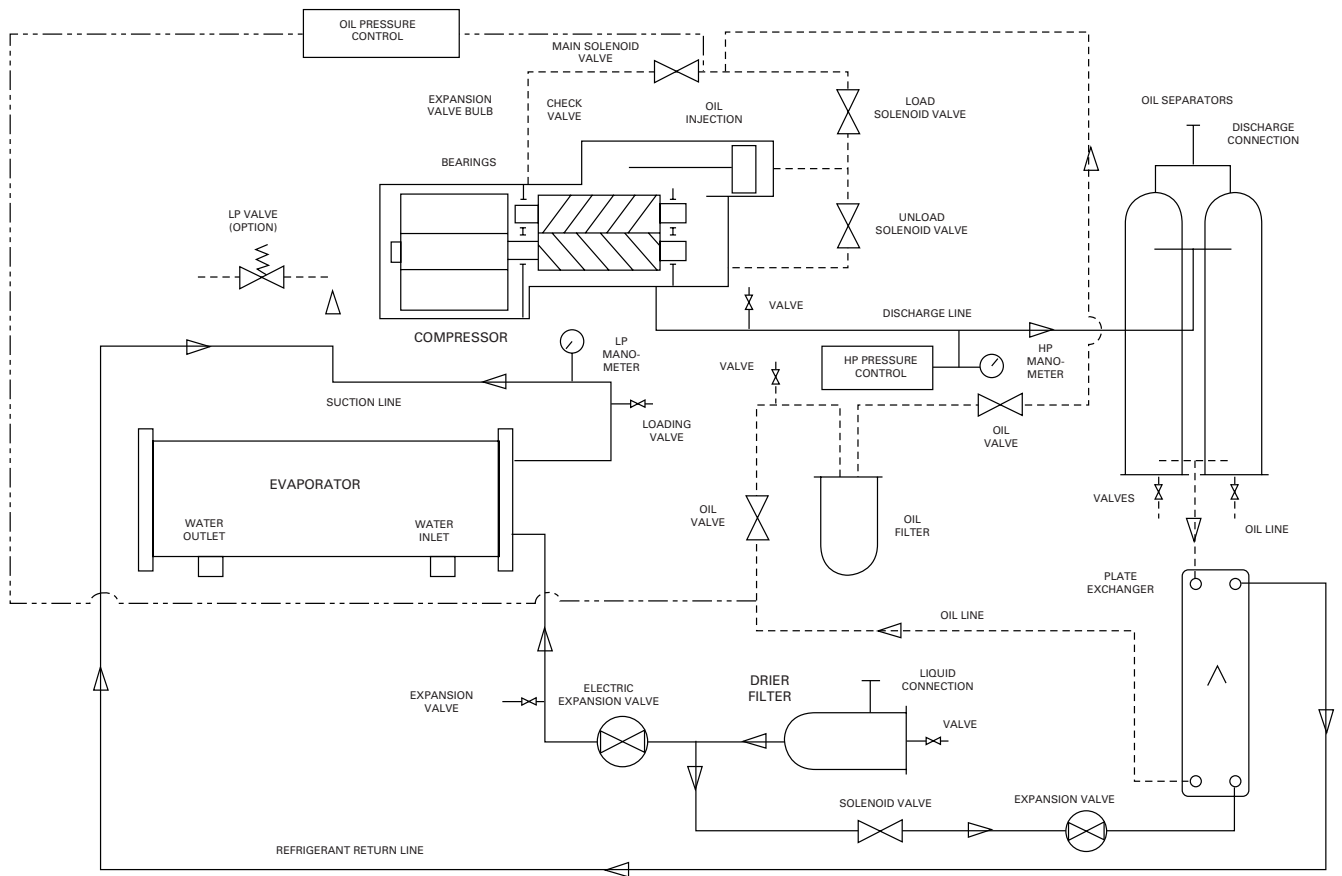
RTUA mechanical operation principles

The main components of a standard RTWA unit are shown on figures 1 to 3.

The main components of the RTWA are as follows:

- Unit control module (UCM-CLD)
- Panel mounted on the unit
- Screw compressor
- Direct expansion evaporator
- Oil supply (hydraulics and lubrication)
- Interconnecting piping.

Figure 15: Refrigeration circuit (e.g. RTUA single circuit)



Description of the refrigeration cycle

The refrigerant fluid vapour exits the evaporator and is sucked into the compressor where it is compressed and then exits in the form of hot gas and oil (injected during the compression cycle). The mixture penetrates into the oil separator at the level of the two inlet/outlet connectors. The oil flows to the bottom of the separator whereas the refrigerant vapour is evacuated upwards and passes through the condenser. Water circulating in the condenser absorbs the heat from the refrigerant fluid which condenses.

The condensed refrigerant fluid passes through the electric expansion valve and arrives in the evaporator tubes. As it vapourises, the refrigerant fluid cools the water in the system that surrounds the evaporator tubes.

Description of the compressor

The compressors in the RTWA screw compressor water-cooled chillers are made up of two separate components: the motor and rotors. See figure 16.

Compressor motor

The compressor's rotors are driven by a two-pole hermetic squirrel cage motor. The motor is cooled by suction of the evaporator's refrigerant vapour. This gas penetrates into the top of the motor housing via the suction line.

Compressor rotors

The compressor is a semi-hermetic, direct drive screw compressor. Each compressor has 3 moving parts: 2 rotors ("male" and "female") provide the compression and a control slide controls the capacity. See figure 16. The male rotor is driven directly by the motor, and the

female rotor is driven in turn by the male rotor. A set of bearings is housed separately at the ends of the two rotors. The slide valve is located above and moves on the rotors. The screw compressor is a positive displacement compressor. Refrigerant fluid originating from the evaporator is sucked into the suction orifice at the end of the motor casing, passes through the suction filter and the motor and arrives at the compressor rotor inlet. The gas is then compressed and evacuated directly into the discharge line. There is no physical contact between the rotors and the compressor housing. The two rotors come into contact at the drive transmission point between the male rotor and the female rotor. The oil is injected onto the top of the compressor's rotor part, and covers both rotors and the inner part of the compressor housing. Although the oil provides lubrication of the rotor, its primary role is to ensure a water-tight seal between the rotors and the compressor housing.

A water-tight seal between these internal components increases the efficiency of the compressor by reducing leaks between the high pressure and low pressure chambers.

The volume is controlled by a control slide located in the compressor rotor. The control slide is located on top of the rotors and is actuated by a piston/cylinder along a line parallel to the rotor axes.

The compressor loading conditions vary depending on the position of the slide valve on the rotors. When the slide covers the rotors completely and is therefore located at the opposite end of discharge, the compressor is fully loaded. The compressor unloads when the slide valve moves towards the discharge point. The slide valve reduces the cooling capacity by reducing the compression surface of the rotors.

Figure 16 A: CHHB compressor

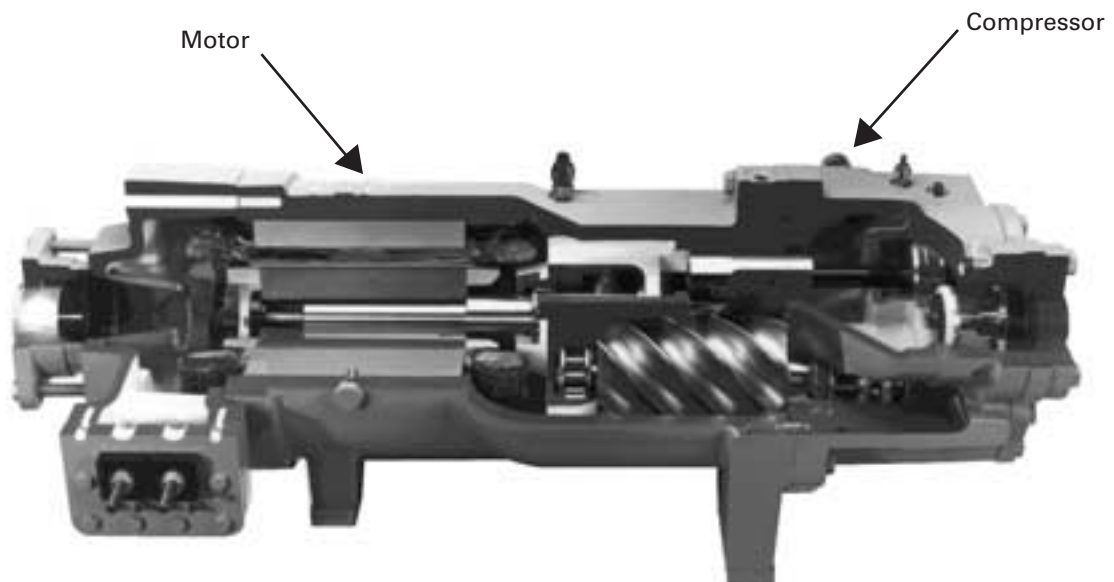
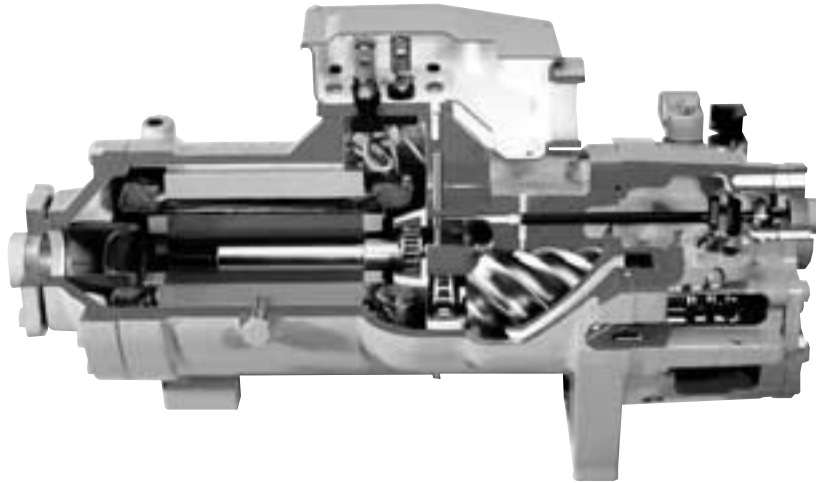


Figure 16 B: CHHN compressor



Compressor loading sequence

When there is a need for cooling, the UCM-CLD will start the compressor that has the lowest number of start-ups. If the first compressor (dual-circuit unit) is insufficient to satisfy the need for cooling, the UCM-CLD will start the second compressor and the load will balance out between the two compressors by pulses on the loading and unloading solenoid valves.

The load will balance out between the compressors according to the load fluctuation until the need for cooling reaches a level where one compressor is sufficient. At this point, the UCM-CLD will stop the compressor that has the highest number of operating hours, and will adjust the load of the other compressor to satisfy the need for cooling.

Connecting the RTUA with a remote air-cooled condenser

The RTUA unit is shipped with a holding nitrogen charge and a separate oil charge. The RTCA condenser is designed to operate with the RTUA unit. To ensure optimum operation and performance, the RTUA must be installed with the RTCA condenser.

If another type of condenser is used, operation and performance may be degraded. Depending on the fan settings, malfunctioning may damage the RTUA due to instability of the H.P.

Warning: If the condenser connected to a dual-circuit RTUA is not an RTCA it must comprise 2 refrigerant circuits, each with its own ventilation. The ventilation cannot be common to the 2 circuits.

For this type of installation (non-RTCA condenser), an ON/OFF signal is available on the UCM-RTUA for each refrigerant circuit, indicating whether the fans on each condenser circuit are ON or OFF. The now autonomous control of the fan on each condenser circuit must comprise the following staging:

For an ambient temperature between 0 and 40°C, there must be 4 air flow control stages for each circuit; i.e. 25 % of the nominal air flow in each stage.

If the ambient temperature is between -18°C and 40°C 8 stages of 12.5% of the nominal flow are required for each circuit where it is possible to combine the staging with a variable speed drive to maintain a condensation temperature of 15 bars.

Using the above components, it is possible to control the staging using the UCM-RTUA. If this is the case, first contact your local TRANE office, who will verify compatibility and determine the appropriate configuration of the UCM-RTUA for this purpose, when the TRANE technician performs the initial start-up. The electrical links between the UCM-RTUA and the condenser must be installed beforehand.

Warning: if the connected condenser is not an RTCA, it must be capable of providing 4 fan control stages per circuit if the ambient temperature is between 0°C and 40°C, or 8 stages if the ambient temperature is between -18°C and 40°C.

The RTUA needs sub-cooled liquid refrigerant to ensure correct operation of the expansion valve. If there is not a minimum of 3°C of sub-cooling, the RTUA will not be operating in good conditions.

Warning: If the connected condenser is not an RTCA, it must be capable of providing a minimum of 3°C of sub-cooling.

The RTUA comprises an evaporator, one or more screw compressors, oil coolers, electronic expansion valves and drier filters. The discharge line is connected at the outlet of the oil separators.

The RTUA and the RTCA are supplied without a safety valve on the high pressure part of the refrigeration circuit. Installation of the safety valves is entirely the responsibility of the installer. Refer to local legislation concerning installation of safety valves (the maximum value must not exceed 32 bars).

The RTUA is supplied with a discharge valve. If installation requires this valve to be mounted, it is mandatory on the RTUA 108 to 110 and 213 to 217 to install two safety valves: one between the compressor and the service valve; and another after the service valve to protect the condenser.

Warning: The safety valve calibration must not exceed 32 bars

The liquid line must be connected at the inlet to the drier filter which is supplied with a bend blocked by a brazed plug.

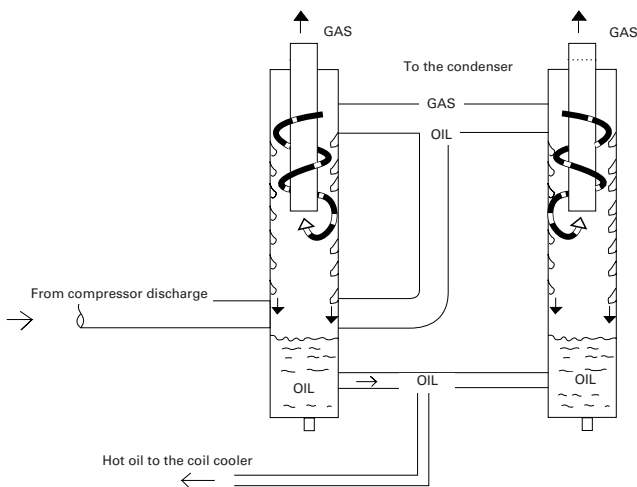
The connection piping must be correctly dimensioned and installed, because these factors have a substantial impact on the system's performance and reliability.

System configuration

The dimensioning of the liquid and discharge lines is determined according to the configuration of the installation and its associated parameters: differences in level and distance between the RTUA and its condenser. These items also determine the oil and refrigerant charges. Therefore, the system can only operate within the limits defined below:

- 1) The diameter of the discharge line is determined by the EVP leaving water temperature.
- 2) The maximum distance between the RTUA and its condenser must not exceed 60 m in reality, or the equivalent of 90 m taking into account load losses.
- 3) The difference in level of the liquid line must not exceed 5 m from the base of the air-cooled condenser, when this condenser is situated below the RTUA.
- 4) A 30 m difference in level on the discharge line results in a 2% loss of efficiency.
- 5) To position the traps refer to the various figures (only one circuit is shown, but the other circuit must be configured using the same method).
- 6) The stipulated order of the circuits must be strictly followed.

Figure 17: Oil separator (single circuit)



Description of the oil circuit

General information

The oil that accumulates at the bottom of the oil separator is at the condensation pressure when the compressor operates. However the oil still moves to the low pressure parts.

Once the oil has left the separator, it enters the cooler located at the bottom of the condenser in the RTWA and in an auxiliary oil cooler in the RTUA. It then enters the service valve and the filter. Some of the oil is then used to actuate the compressor control slide using the load/unload solenoid valves. The rest of the oil passes through the main valve and serves to lubricate the bearings and is injected into the compressor. If the compressor has to be stopped for any reason, the main valve closes and isolates the oil charge in the separator during shutdown periods.

To make sure lubrication is satisfactory and to minimise condensation of refrigerant in the compressor, a heater is installed in the bottom of the compressor housing. A signal from the UCM powers the heater during the shutdown period to prevent the refrigerant condensing in the oil. The heater is powered continuously.

Oil separator

The refrigerant/oil mixture enters the oil separator tangentially and adopts a helicoidal movement. This means the oil (more dense) is centrifuged against the walls and descends into the bottom part of the separator, where it is directed into the cooling circuit. The gas is taken out in the median part of the separator and is directed into the condenser (figure 17).

Oil supply to compressor bearings

The oil is injected into the bearing casings at each end of the male and female rotors. Each set of bearings is drained at the compressor suction so that oil coming out of the bearings returns into the oil separator via the compressor rotors.

Oil supply to the compressor rotor

The oil flows through this circuit from the main solenoid valve to the compressor rotor via the oil filter. Here the oil is injected onto the top of the rotors to fill the spaces between the rotors and compressor housing and lubricate the rotors.

Slide valve

The movement of the slide valve piston determines the position of the slide valve, which in turn regulates the capacity of the compressor. The oil flow inside the cylinder governs the piston movement and is under the control of the load and unload solenoid valves which are normally closed.

The solenoid valves receive "load" and "unload" voltage signals sent by the UCM and which depend on the system's need for cooling. To load the compressor, UCM opens the load solenoid valve while it keeps the unload valve closed. The flow of pressurised oil then penetrates into the cylinder and moves the control slide on the rotors.

To unload the compressor, the load solenoid valve is closed while the unload solenoid valve is open. The oil trapped in the cylinder is taken by suction into a low pressure part of the compressor. As the pressurised oil comes out of the cylinder, the slide valve gradually withdraws from the rotors. When both solenoid valves are closed, the compressor load level is maintained.

Just before normal shutdown of the compressor, the unload solenoid valve is powered up and the slide valve places itself in the total unload position, so that the unit always starts unloaded.

Oil filter

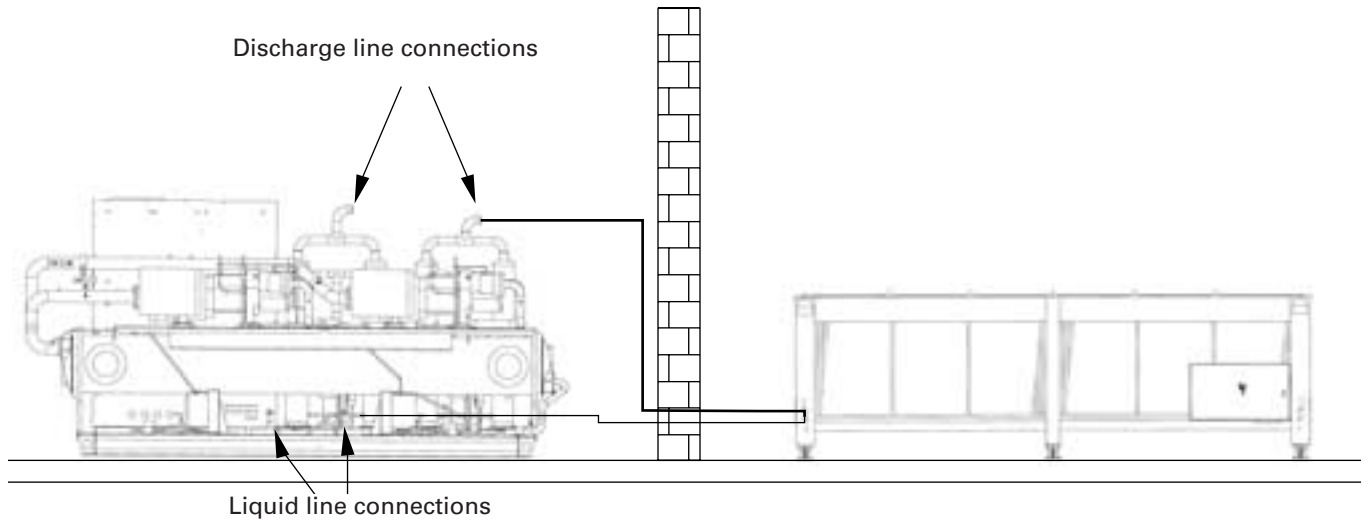
All the RTWA and RTUA units are equipped with a replaceable oil filter. The filter retains all the impurities which might obstruct the solenoid valve orifices and the compressor's internal oil supply piping. This also makes it possible to prevent excessive wear of the compressor rotor and the bearing surfaces. Refer to the chapter entitled "Maintenance" in this manual concerning replacement of the filter. For CHHN compressors (sizes 207 to 212) the oil filter is built into the compressor.

Oil recommended by Trane: OIL 025E (R22), OIL 020E or OIL 021E (R134a)

The oil references are indicated by a self-adhesive sticker. These references are given for standard utilisation (water temperatures). They may change, depending on the operating conditions. For more information, contact your nearest Trane office.

Warning: The oils recommended by Société Trane are subjected to comprehensive testing at the Trane laboratories to ensure they satisfy the specific requirements of Trane compressors, and hence of the user. If an oil is used whose characteristics do not comply with oils recommended by Trane, this is the sole responsibility of the user, whose warranty may be invalidated.

Figure 18 - Units on the same level



Limitations

The distance between the 2 units must not exceed 60 m in reality or the equivalent of 90 m taking into account pressure drops.
 The height of the liquid line in relation to the unit base must be less than 5 m.

It is recommended to place a trap on the discharge line at the oil separator outlet, if this discharge line is horizontal for a distance greater than 5 m, at a height greater than the connection to the oil separators.

Figure 19 - Condenser above the RTUA

Limitations

The distance between the 2 units must not exceed 60 m in reality or the equivalent of 90 m taking into account pressure drops.
 Each 30 m level difference causes a 2% efficiency loss .

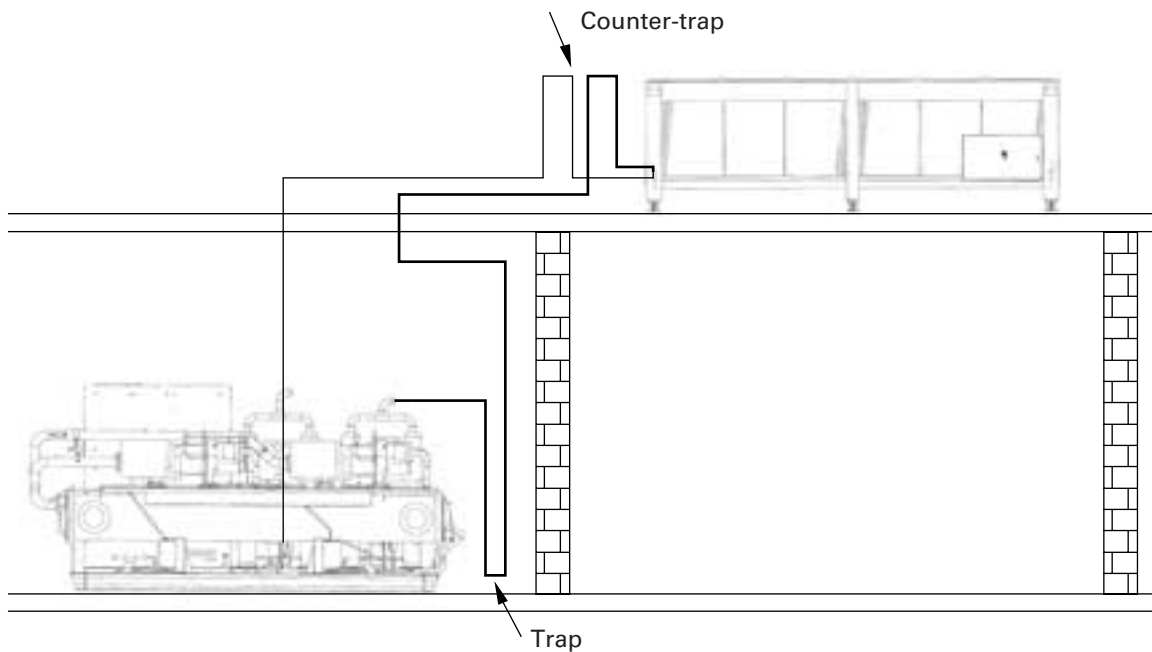
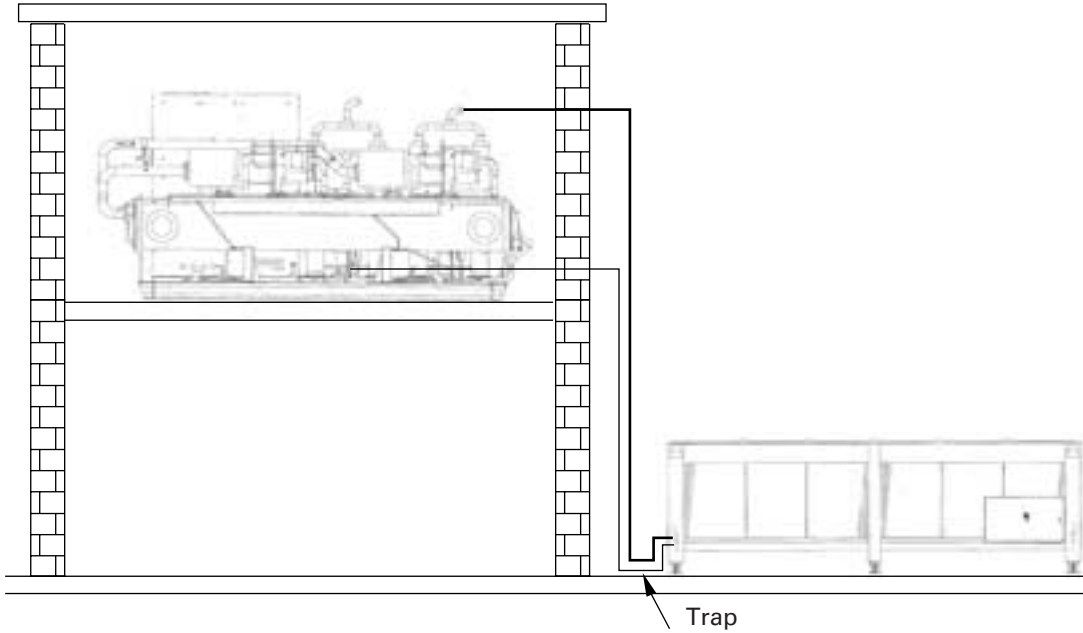


Figure 20 - Condenser below the RTUA

Limitations

The distance between the 2 units must not exceed 60 m in reality or the equivalent of 90 m taking into account pressure drops.

The height of the liquid line in relation to the condenser base must less than 5 m.



Equivalent pressure drops

To correctly determine the size of the liquid and discharge lines for connection on site, it is first necessary to establish the equivalent pressure drops for each line, comprising the additional flow resistances, from bends, valves, etc. As a first approximation, we can estimate the equivalent pressure drops at 1.5 times the piping length.

Size of the liquid line

The standpipe must not be more than 5 m above the air-cooled condenser base. It is not necessary to slope the liquid line.

It is recommended to have a line diameter as small as possible, while maintaining an acceptable pressure drops and so as to minimise the refrigerant charge (length and maximum pressure drops defined above).

Determine the size using the following criteria:

1. Operating conditions with full load.
2. Maximum pressure drops of 100 kPa.
3. Liquid speed not exceeding 3 m/s (to prevent liquid shocks).

In normal operating conditions (suction temperature 4.5°C, condenser air inlet temperature 35°C or condensation temperature of 52°C), the liquid leaving the condenser is sub-cooled by approximately 11°C. Take this value as a basis to determine the maximum permitted pressure drops, and use it to calculate the liquid line pressure drops.

Discharge line

Install them so as to obtain a gas speed in the horizontal and vertical lines making it possible to carry along the compressor oil. Determine the dimensions of the suction line using the following criteria:

1. 2.5 m/s (mini) in the horizontal parts.
2. 5.0 m/s (mini) in the vertical parts.
3. Maximum speed 20 m/s.

The minimum slope of the suction line to the condenser must be 5%.

Isolate refrigerant fluid lines from the building to prevent the vibrations normally generated by the ducts from being transmitted to the building's structure.

Also avoid bypassing the unit's isolation system by fixing the refrigerant fluid lines or the electrical ducts very rigidly.

Any vibrations may be propagated into the building via rigid piping or lines.

Pressure tests

Leak detection

During these operations, take the following precautions:

1. Do not use oxygen or acetylene instead of the refrigerant fluid and nitrogen to detect leaks. This may cause a violent explosion.
2. Always use the expansion valve, safety valves and manometers to control the test pressure in the system. Excessive pressure may cause piping to rupture, damage the unit or cause an explosion resulting in personal injury.

Carry out the liquid line and hot gas line pressure tests using the standards in force. The test pressures applied to the liquid line and the discharge line must comply with the standards applicable in the country concerned.

Insert enough refrigerant fluid into the circuit to obtain a pressure of 1 bar. By injecting dry nitrogen using a pump, increase this pressure to 7 bars. Look for leaks using a detector. Perform this operation with great care on the entire system.

If leaks are detected, evacuate the fluid from the system and repair the defective component. Repeat the test process to check the repair is water-tight.

Vacuum pumping

For this operation, use a vane pump making it possible to obtain a partial vacuum of 100 microns or less.

When pumping out to create a vacuum, it is important to connect the pump to the high and low pressure sides of the system.

Comply with the manufacturer's recommendations when using the pump.

The pipes used to connect the pump to the systems must be made of copper and have as big a diameter as possible. A large pipe sectional area reduces flow resistance and shortens the duration of vacuum pumping.

Do not use rubber or synthetic pipes which retain humidity, increase the vacuum pumping time and cause pressure rises during the vacuum tests, making it impossible to determine whether there is a leak if there is too much humidity in the system, or to search for the cause of excess pressures due to the type of pipes.

An electronic vacuum measurement manometer must be installed upstream of the vacuum pump stop valve, as shown in figure 20. Close valve B and open valve A. After a few minutes, the manometer reading indicates the lowest vacuum level that can be obtained by the pump.

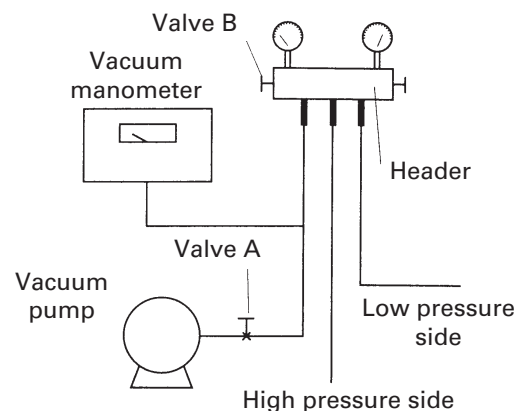
Vane pumps should make it possible to obtain a vacuum of less than 100 microns.

Open valve B and operate the vacuum pump until 500 Hg microns (0.67 mbar) or less is obtained. Close valve A when you read the manometer. Once the value of 500 microns or less has been reached and valve A has been closed, after a certain period a pressure rise will be observed.

The maximum permissible increase is 200 microns after 15 minutes. If this limit is exceeded and the value remains constant, there is too much humidity in the system.

A continuous increase in pressure indicates there is a leak in the system.

Figure 21: Vacuum pump connection



RTCA operation

Choice of unit position

1. The floor surface must be horizontal and sufficiently strong to support the unit (refer to: Weights of units in operation, tables 1, 2 and 3).
2. Install anti-vibration studs when it is necessary to prevent transmission of vibrations.
3. The unit must be positioned so that the air flow through the condensation coils is not hindered by any obstacle.
The condensation coils must be protected from side winds when their speed exceeds 16 km/h. Position the unit above the average height of snow observed in the region where it is installed.
You must never install a canopy above the unit, because the recycling of hot air this generates would reduce the capacity of the condensation coils. A minimum distance must be defined around the whole unit to facilitate access for maintenance personnel.
4. If the unit is to be surrounded by protective walls, allow for a clearance space of 3600 mm in front of the condensation coils. In this case, the walls must not be higher than the machine. Discharged air from the fans must not be obstructed.
5. It is prohibited to install ducts for the fan discharge air (even short ones). This is because the fans supplied on standard units to not generate any additional static pressure.

Clearance

Allow for sufficient space around each unit so that installation and maintenance personnel have easy access to all the components. Also allow sufficient clearance for maintenance of the condensers as shown on the submittals.

Vibration isolators (option)

The vibration isolators must be positioned under the unit's fastening lugs. The unit is made level by placing shims between the floor and the isolators. Check the unit's level on the crosspieces of the compressor base. The unit must be bolted to the isolators, and these isolators must be securely anchored into the concrete slab.

Put the vibration isolators in place before positioning the unit.

The positioning of the vibration isolators is defined on the certified submittals supplied with the machine.

Verify that all the surfaces in contact with the floor isolators are flat. If necessary insert shims or perform finishing work, but make sure that the surfaces in contact with the isolator bases are perfectly flat. Do not overlap the isolators on the shims or on an uneven floor. The variation in level between isolators must not exceed 6 mm. The spring isolators can be adjusted according to the load supported.

Insulation

On RTWA and RTUA, the liquid lines are insulated from the evaporator to the expansion valve.

Solenoid valves and expansion valve

It is the installer's responsibility to supply the solenoid valves and expansion valves when they are not part of the evaporation and compression unit.

Drier filter

The drier filter (customer supply) must be mounted upstream of the evaporator if it is not part of the evaporation or compression unit. It will be selected in accordance with the manufacturer's technical data.

Electrical connections

Electrical wiring

Refer to tables 1-2 and 3 for the electrical characteristics. It is the installer's responsibility to supply the following wiring and components:

- 1) Power wiring to the power supply unit (or fuse disconnect switch in the unit control panel, optional).

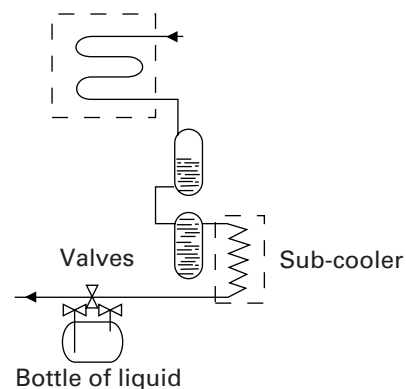
Warning: the wiring must comply with local and national legislation. The type and positioning of the circuit breakers must comply with local and national legislation.

- 2) Control system wiring to the power supply unit.

Warning: All the power and control connection wiring must be copper wire, since the connection terminals cannot accept any other type of wire. Use of aluminium for this wiring may cause galvanic corrosion resulting in over-heating at the connection point and then destruction of this connection.

Warning: The unit's power supply voltage must be the same as the voltage stipulated on the name plate +/-5%

A bottle can be used to collect the refrigerant by vacuum pumping or for maintenance. The diagram below illustrates the correct method for installing the bottle without losing the effect of sub-cooling.



Procedures before start-up

Once the unit has been installed, before starting it the following procedures must be carried out:

- 1) Check that all the wiring connections are clean and tightened to the required torques.

Caution: Before starting the unit, disconnect the power supply including the external disconnect switches, to prevent any risk of electrocution.

Warning: Check that all the connections in the compressor's power circuits have been tightened (disconnect switches, terminal strip, contactors, compressor connection boxes, etc.). Insufficiently tightened connections may cause overheating at the points of contact, and insufficient voltage in the compressor motor.

- 2) Check that all the refrigerant fluid and oil valves are open.

Warning: The unit must not be started when the valves for the compressor, oil evacuation and on the liquid line are closed. This may cause serious damage to the compressor.

- 3) Check the power voltage at the level of the main fuse disconnect switch. The voltage must be included in the operating range given on the unit's nameplate. The voltage unbalance must not exceed 2%. Refer to the "Phase voltage unbalance" section below.
- 4) Check the order of the phases.
- 5) Power up the oil sump heaters by closing the main disconnect switches. The disconnect switches mounted on the unit must also be closed. The UCM-CLD switch must be set to Stop/Reset.
- 6) Fill the evaporator's chilled water circuit. Refer to table 1 to find out the evaporator's liquid capacities. Vent the system during filling. Open the vent line on top of the evaporator during filling and close it when filling has terminated.

Warning: To avoid damaging the equipment, do not use untreated or inadequately treated water.

- 7) Drain and then fill the cooling tower if used, as well as the condenser and the piping. Air vent the entire system. Then close the vents on the condenser water boxes.

- 8) Start the chilled water pump so that water starts to circulate in the evaporator circuit. Check there are no leaks in the piping and make any repairs that are necessary.
- 9) Once the chilled water is circulating in the system, adjust the water flow and check the load losses through the evaporator comply with the flow specified in the purchase order. Refer to figure 8.
- 10) Adjust the chilled water flow switch (if the unit has one) to ensure the machine operates correctly.
- 11) Stop the chilled water pump.

Unit power supply voltage

Measure the power supply voltage across the main fuse disconnect switch terminals. If the voltage measured on a terminal is not within the tolerated values, carry out the necessary actions to correct this value before putting the unit into operation.

Warning: An inappropriate voltage may cause incorrect operation of the control components and reduce the operating life of the relay contacts, the compressor motors and the contactors.

Voltage unbalance

Excessive voltage unbalance between phases in a three-phase system may cause over-heating, or even failure of the motors. The maximum unbalance permitted is 2%. The voltage unbalance is determined by the following calculations:

$$\% \text{ of unbalance} = \frac{(V_x - V_{\text{mean}}) \times 100}{V}$$

$$V_{\text{mean}} = (V_1 + V_2 + V_3) / 3$$

V_x : Phase which is the most different from V_{mean} (regardless of the sign).

E.g., if the 3 voltages measured are 375, 388 and 389 Volts, the mean is:

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

The unbalance percentage is therefore:

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

This value exceeds the maximum authorised value (2%) by 0.34%.

System water flows

Balance the water flows in the evaporator and the condenser (figures 10 and 12). Below the minimum value, the water flow transforms into a laminar flow, which reduces the heat transfer and causes loss of control of the electronic expansion valve or repetitive failures, low temperature shutdowns, etc. If the flows are too high this causes erosion of tubes and damages the supports and baffles in the evaporator.

Pressure drops in the system

Measure the load losses through the evaporator and the condenser (RTWA only) on the pressure connection pieces installed on site on the chilled water piping. Refer to figures 10 and 12. Always use the same manometer for all measurements.

The pressure drops must be approximately the same as the values indicated in figures 10 and 12.

UCM-CLD operation.

Refer to the UCM-CLD user's manual, reference L80 IM 025 E, for instructions on operation of the UCM-CLD.

Start-up procedures

When the verification operations prior to start-up have been performed (see previous chapters), the unit is ready to start.

- Press the "Stop" key on the UCM-CLD.
- If necessary, define the set point values in the UCM-CLD reports (refer to the L80 IM 025 E manual).
- Close the disconnect switch for the chilled water pumps and the cooling water pumps. Power up the pumps to start the water circulating.
- Check that the service valves of the discharge line, suction line, oil line and liquid line on each circuit are open before starting the compressor.

Warning: To avoid damaging the compressor, the unit must not operate unless these service valves are open.

- Check that the chilled water pumps operate for one minute after you have pressed the "Stop" key.
- Press the "Auto" key. If the chiller control is in need of cooling and all the safety devices are closed ; the unit starts. The compressor loads and unloads according to the chilled water outlet temperature
When the unit has been operating for approximately 30 minutes and the system has stabilised, finalise the start-up procedure as follows:
- Check the refrigerant pressure in the evaporator and the condenser in the "Refrigerant report".
- Measure the system's overheating.
- Measure the system's sub-cooling.
- A lack of refrigerant is also indicated by low operating pressures and reduced sub-cooling. If the operating pressures, liquid sight glass, overheating and sub-cooling indicate the charge is too low, each circuit must be recharged with gas. When the unit is operating, add refrigerant vapour by connecting the load line to the service valve at suction until operating conditions return to normal.

Warning: If both the suction and discharge pressures are low and sub-cooling is normal, the problem is not a lack of refrigerant and it could cause overloading.

Warning: Only use the refrigerant specified on the nameplate.

- If the operating conditions indicate overloading, remove refrigerant at the liquid line service valve. Allow the refrigerant to come out slowly to minimize oil losses. Do not release the refrigerant into the atmosphere, use a certified procedure.

Warning: Avoid any refrigerant/skin contact, there is a risk of frostbite.

Overheating

Normal overheating for the circuit must be approximately 4°C for operation with full load. Overheating may vary slightly on the circuit if the system load is lower, when the slide valve is moving. Overheating must stabilise at approximately 4°C when the above components have stabilised.

Sub-cooling

Normal sub-cooling for the circuit must be between 4 and 7°C (depending on the units). If the sub-cooling of the circuit does not fall within these values, check the overheating of the circuit and adjust if necessary. If overheating is normal, but sub-cooling is not, contact a Trane after-sales service technician.

Shutdown procedures

Short duration shutdown and restart

Perform the following procedure to stop the unit for a short period.

- 1) Press the UCM-CLD's "Stop" key. The compressors continue to operate and will unload for 20 seconds and finally stop when the contactors open.
- 2) Stop the water circulating by disconnecting the power supply to the chilled water and cooling water pumps.

Long duration shutdown

The procedure below must be performed if the system has to be stopped for a prolonged period, for example seasonal shutdown.

- 1) Search for refrigerant leaks and repair them.
- 2) Open the water pump disconnect switches and lock them open.

Warning: The water pump disconnect switches must be blocked open to prevent damage to the pumps.

- 3) Close the water valves of the condenser and evaporator and empty the condenser and evaporator.
- 4) Open the unit's main disconnect switch and the disconnect switch installed on the unit (if it has one) and block them open.

Warning: Block the disconnect switches open to prevent accidental start-up and damage to the system.

- 5) At least once every quarter, check the refrigerant pressure in the unit to make sure the circuit is intact.

Re-starting after a long shutdown period

- 1) Make sure the service valves on the liquid line, the suction and discharge lines and on the oil line are open (in backseat position).

Warning: To avoid damaging the compressors, these valves must be open.

- 2) Check the oil separator oil level (figure 23).
- 3) Fill the evaporator's chilled water circuit and the condensation circuit. Vent the system during filling, open the vent line situated on top of the evaporator and on the condenser water box and close it when the circuit is full.

Warning: Do not use untreated or inadequately treated water.

- 4) Close the fuse circuit breaker which powers the water circulation pump.
- 5) Start the water pumps and inspect the piping to search for any leaks. Perform any repairs that are necessary before starting the unit.
- 6) When the water is circulating, check the flows and the pressure drops through the evaporator and the condenser.
- 7) Adjust the flow switch on the chilled water piping.
- 8) Stop the water pumps. The unit is now ready to start. Refer to the "Starting procedures" chapter above.

Maintenance

Periodic maintenance

General information

Perform all the maintenance procedures and inspections at regular intervals. This prolongs the equipment's operating life and reduces the need for expensive repairs.

Use the operating chart at the end of this manual to record the unit's operating conditions. These operating charts are a useful tool for maintenance personnel. A technician who is aware of how operating conditions have evolved can foresee a problem and solve it before it occurs.

Weekly maintenance

Allow the unit to operate for approximately 30 minutes so that the system stabilises, and check the operating conditions using the following procedure:

- Check the refrigerant pressure in the evaporator and in the condenser on the UCM reports. The pressures are given for atmospheric pressure at sea level.
- If the operating pressures seem to indicate there is a lack of refrigerant, measure the system's overheating and sub-cooling. (See the "Overheating" and "Sub-cooling" sections above).
- If the operating conditions indicate overloading, remove refrigerant at the liquid line's service valve. Allow the refrigerant to come out slowly to minimise oil losses. Do not release the refrigerant into the atmosphere. Use a certified procedure.

- Inspect the system to search for any abnormal conditions.

Monthly maintenance

- Carry out the weekly maintenance routine.
- Measure and record overheating of the system.
- Measure and record sub-cooling of the system.

Annual maintenance

- Carry out the weekly and monthly maintenance routines.
- A Trane technician must check the settings and the operation of each control. Verify the state of the compressors and contactors. Replace them if necessary.
- Search for leaks on all the piping systems and check their state. Replace the drier filter cartridges.
- Clean and repaint the corroded surfaces.
- Carry out an oil analysis

Replacing the oil filter

Two isolation valves make it possible to remove the oil filters without emptying the system of its refrigerant.

Chemical cleaning of the evaporator

The chilled water circuit is a closed circuit, and therefore should not accumulate scale or sludge. If the chiller becomes obstructed, you can attempt to unblock it by reversing the water flow direction. If unsuccessful after several attempts, clean the evaporator chemically.

Warning: Do not use an acid cleaning product which might damage steel, galvanised steel, polypropylene and copper parts.

Using this information, waer treatment companies can recommend a suitable chemical product for this unit. An example of a cleaning circuit is shown in figure 13. The supplier of the cleaning product must supply or approve:

- All the devices used in the circuit.
- The quantity of chemical product to use.
- The duration for which the product must circulate in the evaporator.
- The safety precautions and recommendations for using and handling the product.

Cleaning the condenser (RTWA)

Warning: Do not use untreated or inadequately treated water, to avoid damaging the equipment.

If the “approach” temperature (i.e. the difference between the refrigerant fluid condensation temperature and the leaving water teperature) is higher than normal, this may be a sign of clogging in the condenser tubes. If the annual inspection of the condenser tubes indicates clogging, a mechanical and chemical cleaning method can be used to eradicate the residual dirt.

Warning: An inadequate cleaning method may cause damage to the unit.

The company supplying the cleaning equipment or carrying out cleaning must approve the equipment used in the external circulation system, the periodicity of cleaning and any precautions necessary.

Note: Chemical cleaning of the tubes must be followed by mechanical cleaning.

Figure 22: Chemical cleaning circuit

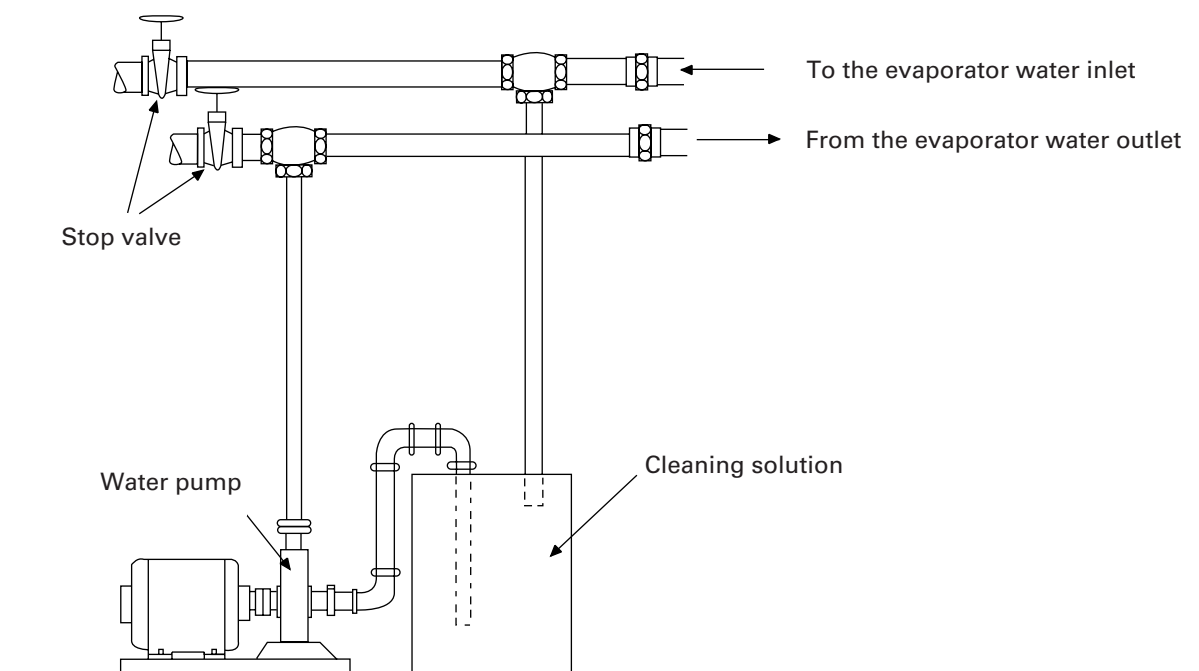
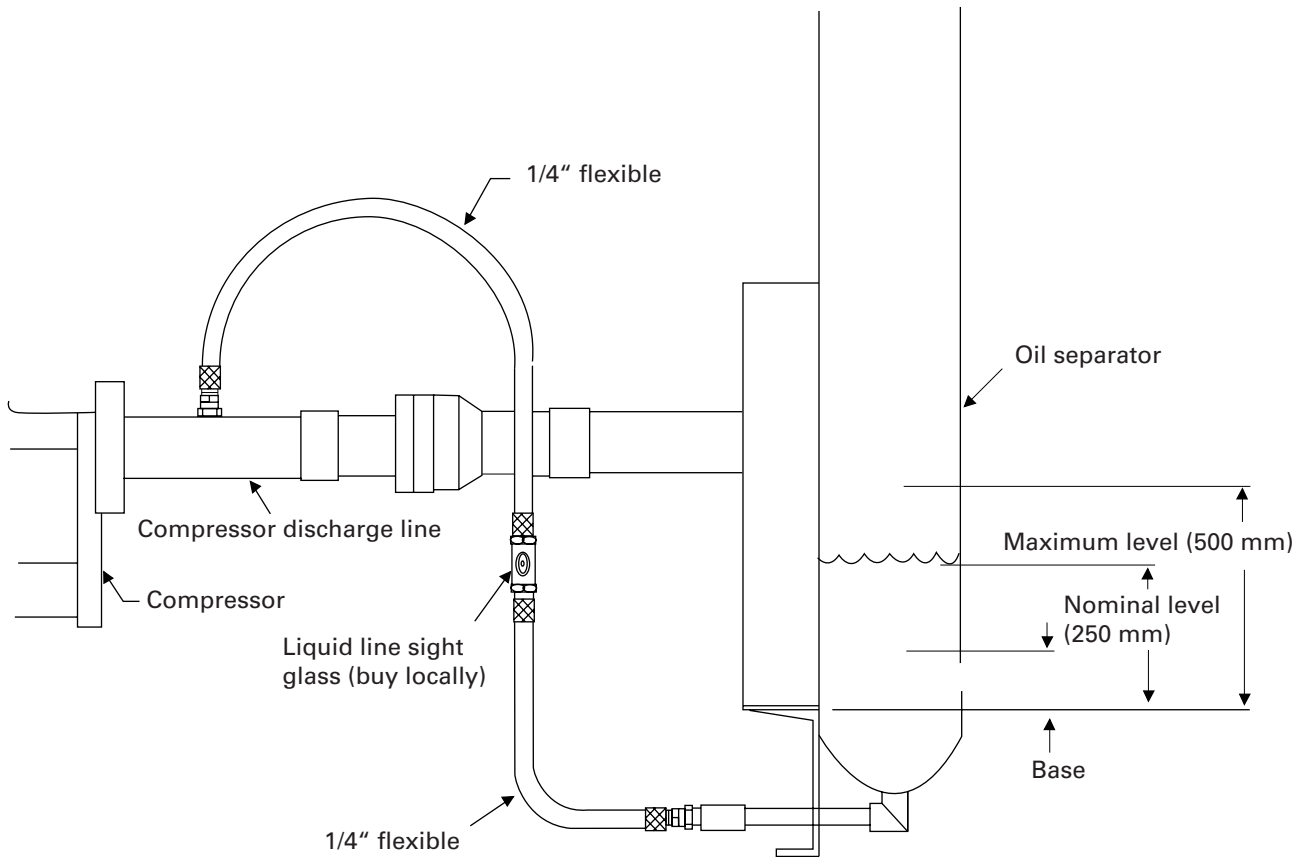


Figure 23: Oil level



Warning: Do not check the level when the unit is operating. There is a risk of losing a great quantity of oil.

Checking the separator oil level

An excessive oil charge will reduce the evaporator's efficiency.

An insufficient oil charge could damage the compressor or increase the unit's noise level."

Perform the following procedure, and refer to figure 23.

- 1) Stop the unit once it has operated for at least half an hour at full load.
- 2) Connect the 1/4" tube and the liquid sight glass between the drain valve of one or other of the oil separators and the Schrader valve on the compressor discharge line (figure 22). Vent the incondensable vapour.

We recommend you use a Schrader quick connection stop valve at the ends of the 1/4" tube. This will facilitate assembly and disassembly of the tubes and will minimise losses of oil and refrigerant.

- 3) When the unit has stopped for 10 minutes, move the liquid sight glass up or down until the oil level is visible.
- 4) When you have verified the oil level, remove the 1/4" tube and the liquid sight glass.

CHHB compressor oil filter replacement

Note: Routine changing of the oil or the oil filter is not recommended. The oil filter is oversized for this application and should not require replacement.

The oil should be replaced only if analysis reveals that coil is contaminated.

The filter should be replaced if the oil has to be removed or if the differential pressure switch sense a pressure drop across the oil filter over 3,5 bar.

To measure the pressure drop across the hydraulic circuit perform the following test.

Measure the high side pressure at the Schraeder valve on the oil cooler outlet.

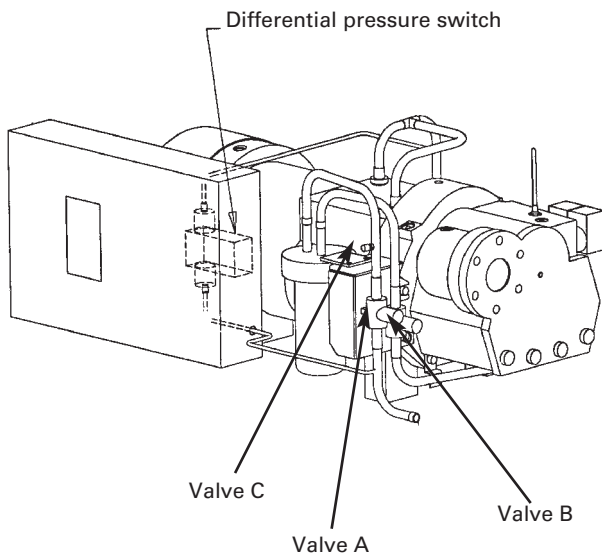
To measure the low side pressure, use the Schraeder valve located after the oil line solenoid valve.

The pressure difference at these points is the pressure drop the oil differential switch is sensing.

To change the oil filter, refer to figure 24 and follow the steps listed below :

1. Shut off the compressor and disconnect all electrical service to the compressor.
2. Shut off service valves A and B.
3. Recover oil from the Schraeder C.
4. Remove the oil filter element.
5. Install the new filter element filled with oil.
6. Coat the new gasket with refrigerant oil and tight the assembly.
7. Open valve A and B.

Figure 24: Oil filter change



CHHN Compressor oil filter change

Note: Routine changing of the oil or the oil filter is not recommended. The oil filter is oversized for this application and should not require replacement.

The oil and filter should be replaced only if analysis reveals that the oil is contaminated. Oil capacities are shown in Table 1.

Pressure drops across the oil filter is shown in figure 26. Oil filter pressure drop is the difference between the pressure at the filter cover plate Schraeder valve and the pressure at the compressor oil supply Schraeder valve on top of the compressor.

To change oil filter in the unit, refer to figure 25 and follow the steps listed below.

- 1) Shut off the compressor and disconnect all electrical service to the compressor.
- 2) Connect manifold gauge sets to the backseat ports of the suction and discharge service valves and the Schraeder valves on the oil filter cover plate.
- 3) Frontseat the suction and discharge service valves. Separate the valve coupling at the oil supply to the compressor or on late chillers frontseat the oil supply line angle valve.
- 4) Recover the refrigerant from the three connections in step 2.

Note: The Schraeder valve may have a high quantity of oil.

Warning: Insure that pressure is relieved from oil filter before proceeding to step 5.

- 5) Remove the seven bolts on the oil filter cover. A pan may be necessary to catch any oil that is released after the cover is loosened.

Note: Observe the placement of the copper gasket under one bolt head.

- 6) Remove the cover and oil filter element.
- 7) Install the new filter element.
- 8) Coat the new cover gasket with refrigerant oil.
- 9) Install the cover plate and cover plate gasket.

- 10) Install a new copper gasket under the bolt head that had one at a time of removal. Replace all other bolts and tighten 20m.kg.
- 11) Energize the three solenoid valves on the compressor by jumpering the proper terminals at the UCM.
- 12) Evacuate to 400 microns from the three ports in step 2).
- 13) De-energize the three solenoid valves in step 11.
- 14) Reconnect the Aeroquip coupling that was separated in Step 3 or, on later chillers, backseat the oil supply line angle valve.

Note: Insure that this step is performed before step 15, as this will insure that the oil filter housing is full of oil before the compressor is started.

- 15) Backseat the suction and discharge service valves.
- 16) Remove the manifold gauge set.

Caution: The Aeroquip valve must be completely tightened to open the valve. If the valve is not completely tightened the valve may remain closed, causing catastrophic damage to the compressor

Figure 25: Oil filter change

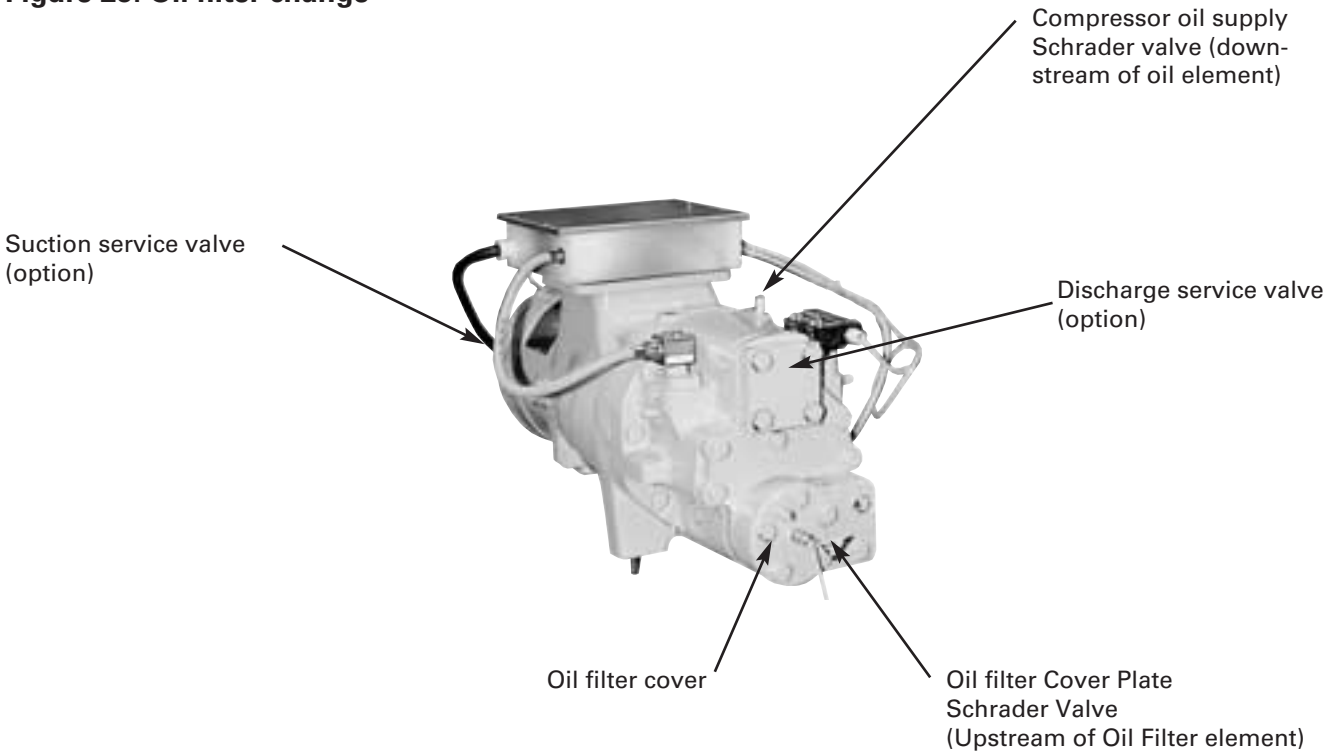
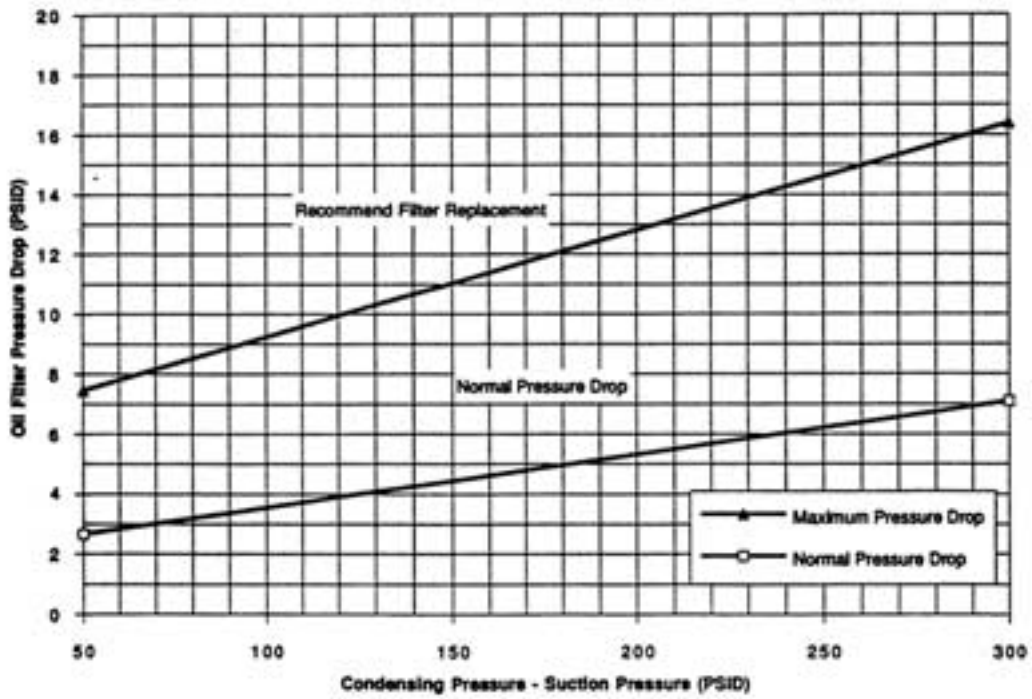
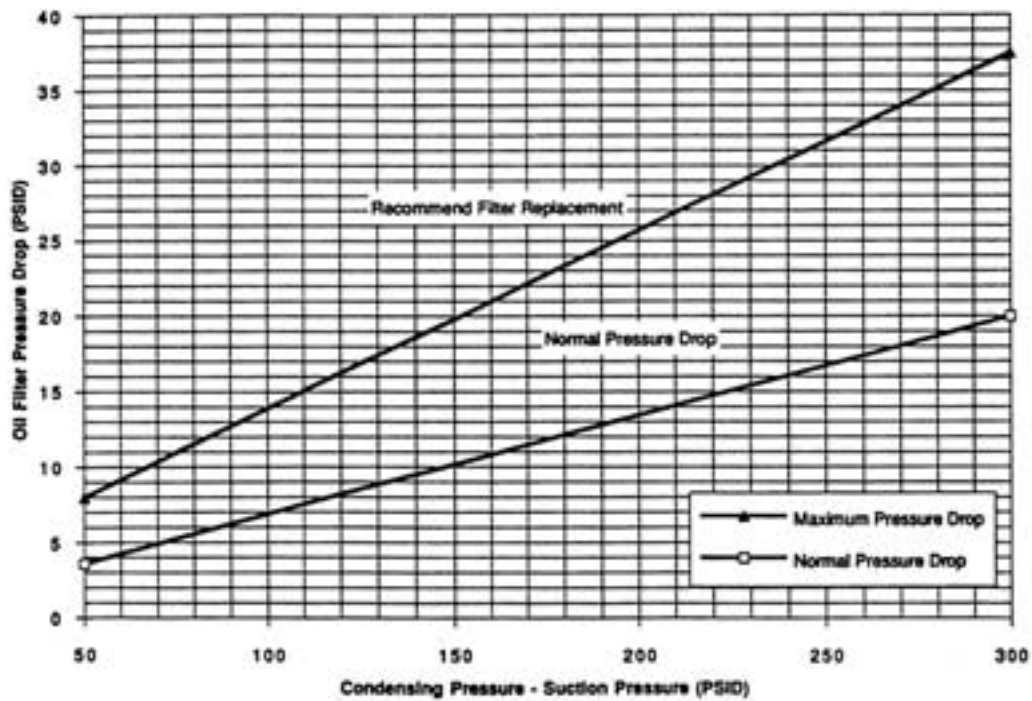


Figure 26 : Oil pressure drops

35 & 40 Ton Compressor Oil Filter Replacement Chart



50 & 60 Ton Compressor Oil Filter Replacement Chart



Installation check sheet

Air-cooled condenser: RTCA

This list must be filled out by the installer, to ensure the installation is correct before starting the unit.

Reception of the unit

- Check for any damage during transportation.
- Compare the equipment received with the shipment document.
- Correct lifting system.

Positioning the unit

- Remove the packing materials.
- Check the positioning of the unit.
- Check the horizontality of the unit (6 mm maximum).
- Check the clearance spaces around the condenser.
- Check the clearance spaces provided for maintenance.
- Check the positioning of the isolators.

Electrical equipment

- Check the wiring up to the control panel.
- Check the power supply voltage as specified on the name plate.
- Tighten and check the connections.
- Check direction of rotation of fan motors is correct.

Cooling circuit

- Water-tight connections, no leaks.
- Completed refrigerant charge.

Comments:

Signature:

Surname:

Order number:

Order number:

Return to the Trane office responsible for putting the unit into operation.

Installation check sheet

Trane RTWA - RTUA chiller

The installer must fill out this sheet in order to install the unit in compliance with normal trade practice.

Caution: Disconnect the power supply before inspecting the unit. If the power supply cannot be disconnected, work with extreme caution to prevent risk of electrocution.

Reception

- Search for any damage during transportation.
- Check whether any parts are missing.
- Check lifting apparatus is adequate, slings equipped with spacers.

Positioning the unit

- Position the unit.
- Make sure it is level (6 mm maxi).
- Sufficient clearance space.
- Vibration isolators fixed (option).

Chilled water circuit

- Search for leaks in piping.
- Thermometers or sensors installed.
- Water pressure control installed.
- Balance valves installed.
- Flow switch installed.
- System rinsed, cleaned and filled.
- Verify operation of the pump and load losses at the evaporator.

Condenser water circuit (RTWA only)

- Search for leaks in piping.
- Thermometers or sensors installed.
- Water pressure control installed.
- System's balance valves installed.
- System rinsed, cleaned and filled.
- Cooling water thermostat installed.
- Verify operation of the pump and load losses at the condenser.

Electrical equipment

- Correct direction of rotation of the cooling tower fan motors (RTWA).
- Correct direction of rotation of pump motors.
- Electrical connection of the control panel.
- Power supply voltage in conformity with name plate specifications.
- Start-up of the pump and flow switch circuit complete and in working order.
- All connections tightened.

General information

- Available cooling load, minimum 50%.
- Coordination between trades for final reception of unit.

Comments:

Signature:

Surname:

Order number:

Order number:

Return to the Trane office responsible for putting the unit into operation.

Weekly operating chart

Site name				Altitude				m						
Worksite name														
Model number				Shipment date										
Serial number		Name plate voltage												
Comp	Model number.	Operating amps			Dispswitch	ON	<table border="1" style="width: 100%; height: 20px;"> <tr><td></td><td></td><td></td><td></td><td></td></tr> </table>							
A	Serial number				Overload	OFF								
Comp	Model number.	Operating amps			Dispswitch	ON	<table border="1" style="width: 100%; height: 20px;"> <tr><td></td><td></td><td></td><td></td><td></td></tr> </table>							
B	Serial number				Overload	OFF								
Water evap		Planned				Actual								
Load loss		kPa	l/s		kPa		l/s							
Water cond		Planned				Actual								
Load loss		kPa	l/s		kPa		l/s							

Every 15 minutes

Circuit		1	2	1	2	1	2	1	2
Compressor		A	B	A	B	A	B	A	B
Voltage unit (V)	Phase	A-B							
		A-C							
		B-C							
Amps compressor (A)	Phase	1							
		2							
		3							
Operating mode									
Last diagnosis									
T° Evap Entering Water °C									
T° Evap Leaving Water °C									
T° Cond. Entering Water °C									
T° Cond. Leaving Water °C									
T° Outside air °C									
Comp mode									
T° Comp suction °C									
T° Evap Sat. °C									
Evap pressure									
T° Cond Sat. °C									
Cond pressure									
% compressor RLA									
% Line voltage									
Start-up Nbr									
Hours of operation									
Comments									

Date	Technician
------	------------

UCM-CLD SETTINGS LOG

OPERATOR SETTINGS	Set point source	
	Front panel chilled Wtr set pt	
	External chilled Wtr set point	
	Design delta temp set point	
	Differential to start set point	
	Chilled water pump	
	Chilled water pump OFF delay	
	Front panel current limit set pt	
	External current limit set pt	
	Low ambient lockout	
	Low ambient lockout set pt	
	Chilled water reset type	
	Type reset ratio	
	Type start reset set point	
	Type max reset set point	
	Ice machine control	
Panel ice termination set point		
SERVICE SETTINGS	Under/over voltage protection	
	Unit line voltage	
	Restart inhibit time	
	Balanced CPRSR starts & hours	
	Display units	
	Languages	
	Programmable relay set up	
	External circuit lockout	
SERVICE SETTINGS	Key pat display lock feature	
	ICS address	
	Lvg Wtr temp set pt	
	Low REGT temp cutout set pt	
	Low Wtr temp EXV air comp.	
	Condenser limit set point	
	Phase unbalance protection	
	Phase reversal protection	
	Superheat set point	
	EXV control response ckt1	
	EXV control response ckt2	
	Lvg Wtr temp cntrl resp set pt	
	Fan cntrl dead band bias ckt1	
Fan cntrl dead band bias ckt2		
SERVICE SETTINGS	Compressor model no prefix	
	Number of compressor	
	Oil loss differential set point	
	Compressor A ton	
	Compressor B ton	
	Compressor C ton	
	Compressor D ton	
	Fan control	
	Variable speed fan circuit 1	
	Variable speed fan circuit 2	
	Number of fan circuit 1	
	Number of fan circuit 2	
	Reduced inrush starting	
	Current ovrlid cprsr A	
	Current ovrlid cprsr B	
	Current ovrlid cprsr C	
	Current ovrlid cprsr D	
	Low amb unit half air flow fan	
	Low amb unit two speed motor	
	Night noise set back	
	Number of EXV ckt 1	
	Number of EXV ckt 2	
	Refrigerant type	

Safety recommendations

To avoid accidents and 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". Always provide a pressure regulator.

2. Disconnect the main supply 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.

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

The equipment described in this manual is the result of many years of research and continuous development. To assist you in obtaining the best use of it, and maintaining it in perfect operating condition over a long period of time, the constructor have at your disposal a refrigeration and air conditioning service school. The principal aim of this is to give operators and main-

tenance 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.

The constructor's policy is one continuous product improvement, and he reserves the right to alter any details of the products at any time without notice

This publication is a general guide to install, use and properly maintain our products. The information given may be different from the specification for a particular country or for a specific order. In this event, please refer to your nearest office.



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For additional information, contact :

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