Table of Contents

Air Cooled Condenser Units

Design Features that Assure Economical Operation

General

Model RAR-4 air-cooled condenser units meets the requirements of commercial, industrial and residential applications. All units are factory assembled, wired and tested and are provided with a holding nitrogen charge.

TAHVIEH air-cooled condenser units provide a clean, and architecturally attractive appearance suitable for rooftop or ground level installation. Condenser air intake is from the sides of the unit rather than from underneath. All components are enclosed within the cabinet and the condenser discharge grilles are fully recessed.

A mild ambient temperature control, which permits the units to start and operate at temperatures down to 25 ºC (-3.9 ºF), is option on all models.

All models of RAR condenser units are tested and rated in accordance with ARI 520 and conform to ANSI B9.1 Safety Code.

Versatility

RAR-4 new design series condenser units feature up to 2 refrigerant circuits, and can be matched with a wide variety of air-cooled chiller units.

Weather Resistant Construction

Aluminum extruded structure with heavy gage hot-dipped galvanized steel panel make unit proper for corrosive environment. For high corrosive ambient conditions, aluminum sheet panels could be used as an optional feature.
To facilitate installation, the units are mounted on a steel base channel equipped with lifting lugs. The base channels are coated with 3 layers of epoxy painting for mild humidity ambient condition (as standard) and for high humidity ambient air, hot-dipped galvanized coating is used. Galvanized steel internal bracing, limit the noise and vibration transmission.

Automatic Mild Ambient Temperature Control

A mild ambient temperature control, factory installed on each unit, automatically stages the condenser fans, allowing the unit to start and operate at ambient temperatures as low as 25 ºF (-3.9 ºC). It consists of temperature & pressure-actuated switches that shut off a number of condenser fans when the condensing pressure drops to a predetermined setting. As the pressure rises, the control automatically restarts the fans to maintain an optimum condenser pressure range.

Complete Operating Protection

A control circuit virtually protects the machine under any operating condition. Safety lockout circuits with manual reset, automatically shut down the unit signal from the motors safety devices. For immediate shut down, there is a separate main switch.

Condenser Coils

Aluminum plate fins are mechanically bonded on seamless 3/8″ OD copper tubes in a staggered configuration for maximum heat transfer efficiency. Copper plate fins is another coil option which is proper for moderate coastal ambient condition. This will improve cooling capacity of the units, too. (To discover the exact difference value contact TAHVIEH) Condenser coils are factory leak tested at 470 psig (33.0 Kg/cm^2) air pressure underwater and vacuum dehydrate. Over 10 ºF of liquid subcooling may be obtained, depending upon the difference between condensing temperature and the outside ambient temperature. Subcooling adds to the efficiency of the system and assures liquid refrigerant at the expansion valve even though vertical lifts or long runs of piping may be necessary.

Direct Driven Condenser Fans

Propeller-type condenser fans are direct driven. Using special propeller fan with airfoil shape blades cause reduction of noise as well as electrical energy consumption. There are no belts to adjust, no pulleys to align. Fan motors are three phase with permanently lubricated ball bearings.

High Starting Torque Motors

The direct driven fan motors are designed to provide more than sufficient starting torque to overcome windmilling . These motors are specifically selected to produce trouble-free,consistent performance for this rigorous duty.

Anti-Windmilling Design

A specific design target for this product has been to remove fan windmilling as a threat to trouble-free performance. This requirement was accomplished in four basic ways. First, the fans were recessed below the top profile of the unit to eliminate wind effects. Secondly, the multiple fans were arranged to be sequenced in-groups such that the static pressure differential at start-up is at a minimum. Thirdly, fans with blades least likely to "turbine" were selected. These steps, plus high starting torque fan motors, minimize windmilling problems.

Condenser Coil Guards

Inlet guards are available to protect the condenser coils from damage. They are fabricated from heavy gage steel mesh configuration, hot-dipped galvanized coated for corrosion resistance and painted to match the condenser coils.

Optional Equipment

Automatic Mild Ambient Temperature Control

A mild ambient temperature control, factory installed on each unit, automatically stages the condenser fans, allowing the unit to start and operate at ambient temperatures as low as 25 ºF (-3.9 ºC). It consists of temperature & pressure-actuated switches that shut off a number of condenser fans when the condensing pressure drops to a predetermined setting. As the pressure rises, the control automatically restarts the fans to maintain an optimum condenser pressure range.

Storage Receivers

Normally, receivers are not required in the RAR-4 refrigerant circuit. In those instances where the total system refrigerant circuit, the refrigerant charge exceeds the pump-down capacity of the condenser coil, storage receivers with capacities from 95 to 576 lbs. (43.1 to 261.3 Kg) are available for field installation. These are for refrigerant storage during off season or service operations and are manually operated. Each receiver is ASME constructed, with a working pressure of 425 psi (29.9 Kg/cm2), and includes a relief valve, saddles, drain valve connection and purge valve.

Isolator Pads

Laminated neoprene and cork isolator pads are available to minimize operating noise and vibration.

Model Nomenclature

Basic equipment, options and accessories are coded in fourteen positions by letters and numbers.In addition to the basic equipment,options should be indicated. The standard equipment coding key for RAR condenser units is listed below. Complete model nomenclature must be furnished with each order.

Example: R A R 4 0 2 5 A G R S L

Position : 1 2 3 4 5 6 7 8 9 10 11 12

position 1-3 : Product Name

Position 4 : Design Generation

Position 5-7 : Nominal Tonnage
016,024,029,046,055,068,083,097,122,
141,163

Position 8 :
Condenser fin material
A : Aluminum fin plate
C : Copper fin plate

Position 9 :
Panel material
G : Galvanized steel sheet panel
A : Aluminum steel sheet panel

Position 10-12 :
Accessories
- : Standard (No accessories)
R : Storage receiver & relief valve
S : Isolator pad
L : Low ambient control

Selection Procedure

Altitude Correction

Apply the multipliers shown to the charted tonnage figures when using RAR-4 units at high altitude.

Feet of altitude	0	5000	10000
Tonnage multiplier	1.0	0.933	0.843
KW input multiplier	1.0	1.015	1.026

Receivers

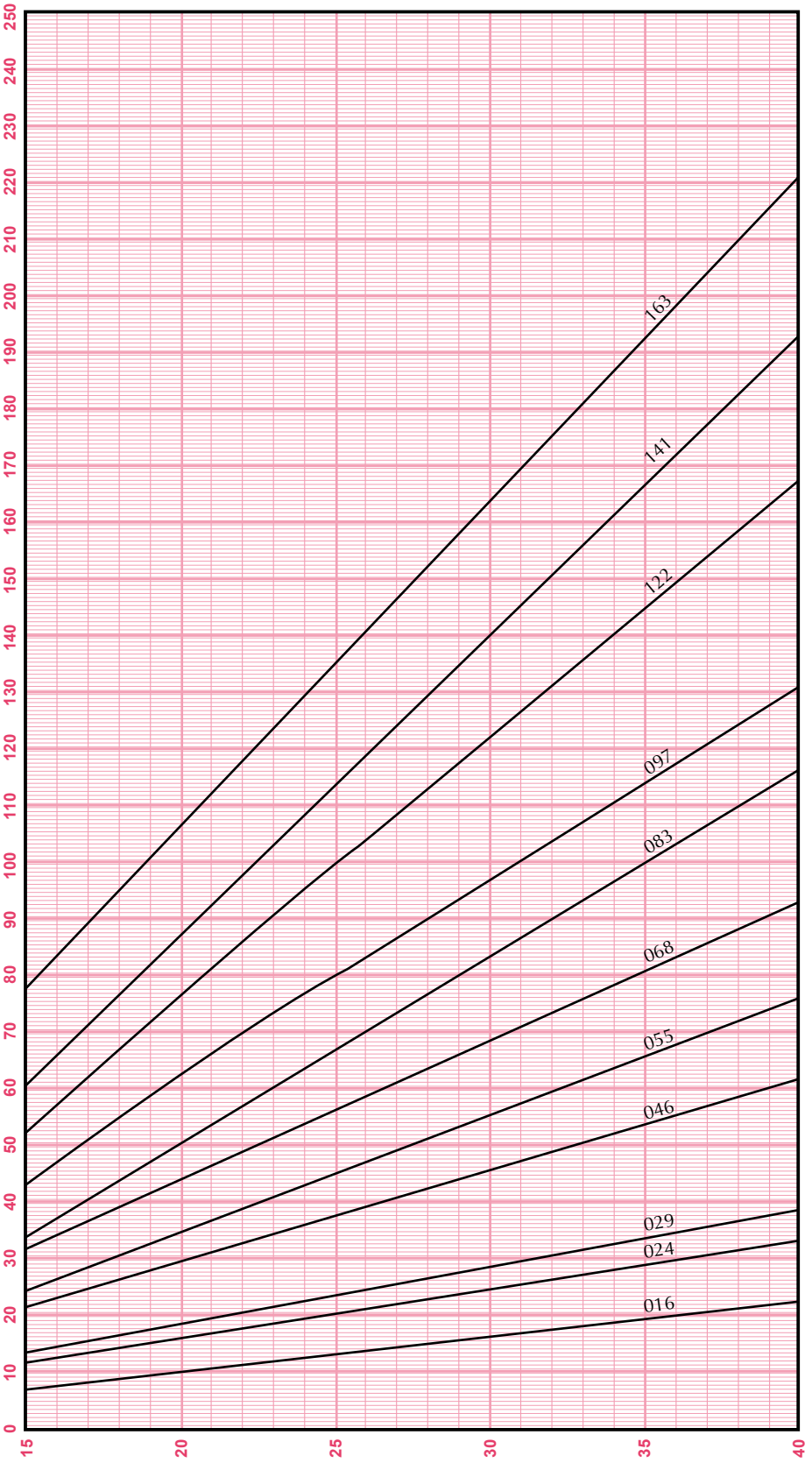
In those instances where the total system refrigerant charge exceeds the storage capacity of the condenser coil and the liquid to the evaporator solenoid valve, pump down receivers are offered for field installation. These are for refrigerant storage during off season or service operations and are manually operated.

Example (English shown, Metric similar) :

1 . Given following requirements :
A Capacity requirement 41 tons.
B Design condensing temperature 125° F.
C Outside design ambient = 95° F.
D Unit located at 5000 ft above sea level.

2 . RAR4046 will produce 45.8 tons at sea level so :
Total unit cooling capacity at 5000 ft (1524 m) = 45.8 x 0.933
= 44.6

Capacities


Heat Rejection (Tons)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
15
20
25
30
35
40
Temperature Difference (Condensing Temp. Minus Ambient Temp. ºF)
163
141
122
097
083
068
055
046
029
024
016

Physical Data

Model		RAR4016	RAR4024	RAR4029	RAR4046
General					
Nominal Capacity **	tons	16.2	24.5	28.6	45.8
	Kcal/h x 1000	49.0	74.1	86.5	138.5
Shipping Weight	lbs	1464	1595	1966	2108
	Kg	665	724	893	957
Total Pressure Noise Lvl. @ 1.5m Around Unit	db(A)	70	72	71	75
Condenser					
Number Of Fans		2	3	4	4
Fan Speed	rpm	900			
Fan Diameter	in	24.8			28
	mm	630			710
Fan Motor (Each)	Kw	0.55	0.55	0.55	0.75
Total Air Flow	cfm	13580	16320	24360	31760
	m³/h	23080	27740	41410	53990
Total R-22 Charge ¥	lbs	16.0	24.0	28.0	45.0
	Kg	7.3	10.9	12.7	20.4
Total Face Area	sq.ft.	33.3	33.3	58.0	58.0
	sq.m	3.1	3.1	5.4	5.4
Number Rows		2	3	2	3
Fin Spacing	FPI	14			
	mm	1.8			
Pump down Capacity ¥	lbs	36	54	63	94
	Kg	16	25	28	43
Refrigerant Connections					
ODF Liquid (Each circuit)	in	5/8	5/8	5/8	5/8
ODF Hot gas (Each circuit)	in	7/8	7/8	7/8	7/8

LEGEND :

** Nominal Capacity is at a 30 ° F temperature difference between condensing temperature and ambient air entering condenser (includes the effect of subcooling)

¥ All data based on units without liquid receivers and at 100 ° F liquid temperature and 90% full.

Physical Data

Model		RAR4055	RAR4068	RAR4083	RAR4097
General					
Nominal Capacity **	tons	55.2	68.5	82.8	96.8
	Kcal/h x 1000	166.9	207.1	250.3	292.7
Shipping Weight	lbs	2254	3085	3708	4090
	Kg	1023	1400	1683	1857
Total Pressure Noise Lvl. @ 1.5m Around Unit	db(A)	76	79	75	77
Condenser					
Number Of Fans		4	5	6	8
Fan Speed	rpm	900			
Fan Diameter	in	28			
	mm	710			
Fan Motor (Each)	Kw	0.75	1.1	0.55	0.55
Total Air Flow	cfm	29800	38300	46800	51200
	m^3/h	50660	65110	79560	87040
Total R-22 Charge ¥	lbs	54.0	67.0	81.0	94.0
	Kg	24.5	30.4	36.8	42.7
Total Face Area	sq.ft.	58	69.3	116.0	116.0
	sq.m	5.4	6.4	10.8	10.8
Number Rows		4	4	3	4
Fin Spacing	FPI	14			
	mm	1.8			
Pump down Capacity ¥	lbs	125	150	188	251
	Kg	57	68	85	114
Refrigerant Connections					
ODF Liquid (Each circuit)	in	5/8	7/8	7/8	7/8
ODF Hot gas (Each circuit)	in	7/8	7/8	7/8	1-1/8

LEGEND :

** Nominal Capacity is at a 30 ° F temperature difference between condensing temperature and ambient air entering condenser (includes the effect of subcooling)

¥ All data based on units without liquid receivers and at 100 ° F liquid temperature and 90% full.

Physical Data

Model		RAR4122	RAR4141	RAR4163
General				
Nominal Capacity **	tons	122.1	140.8	163.1
	Kcal/h x 1000	369.2	425.7	493.1
Shipping Weight	lbs	4250	4630	5050
	Kg	1931	2100	2290
Total Pressure Noise Lvl. @ 1.5m Around Unit	db(A)	79	81	82
Condenser				
Number Of Fans		10	12	12
Fan Speed	rpm	900		
Fan Diameter	in	28		
	mm	710		
Fan Motor (Each)	Kw	0.75	0.75	1.1
Total Air Flow	cfm	81000	95040	93480
	m^3/h	137700	161560	158910
Total R-22 Charge ¥	lbs	119	137.0	159.0
	Kg	54.0	62.2	72.2
Total Face Area	sq.ft.	154.7	174.0	174.0
	sq.m	14.4	16.2	16.2
Number Rows		3	3	4
Fin Spacing	FPI	14		
		1.8		
Pump down Capacity ¥	lbs	251	274	366
	kg	114	125	166
Refrigerant Connections				
ODF Liquid (Each circuit)	in	7/8	1-1/8	1-1/8
ODF Hot gas (Each circuit)	in	1-1/8	1-3/8	1-3/8

LEGEND :

** Nominal Capacity is at a 30 ° F temperature difference between condensing temperature and ambient air entering condenser (includes the effect of subcooling)

¥ All data based on units without liquid receivers and at 100 ° F liquid temperature and 90% full.

Electrical Data

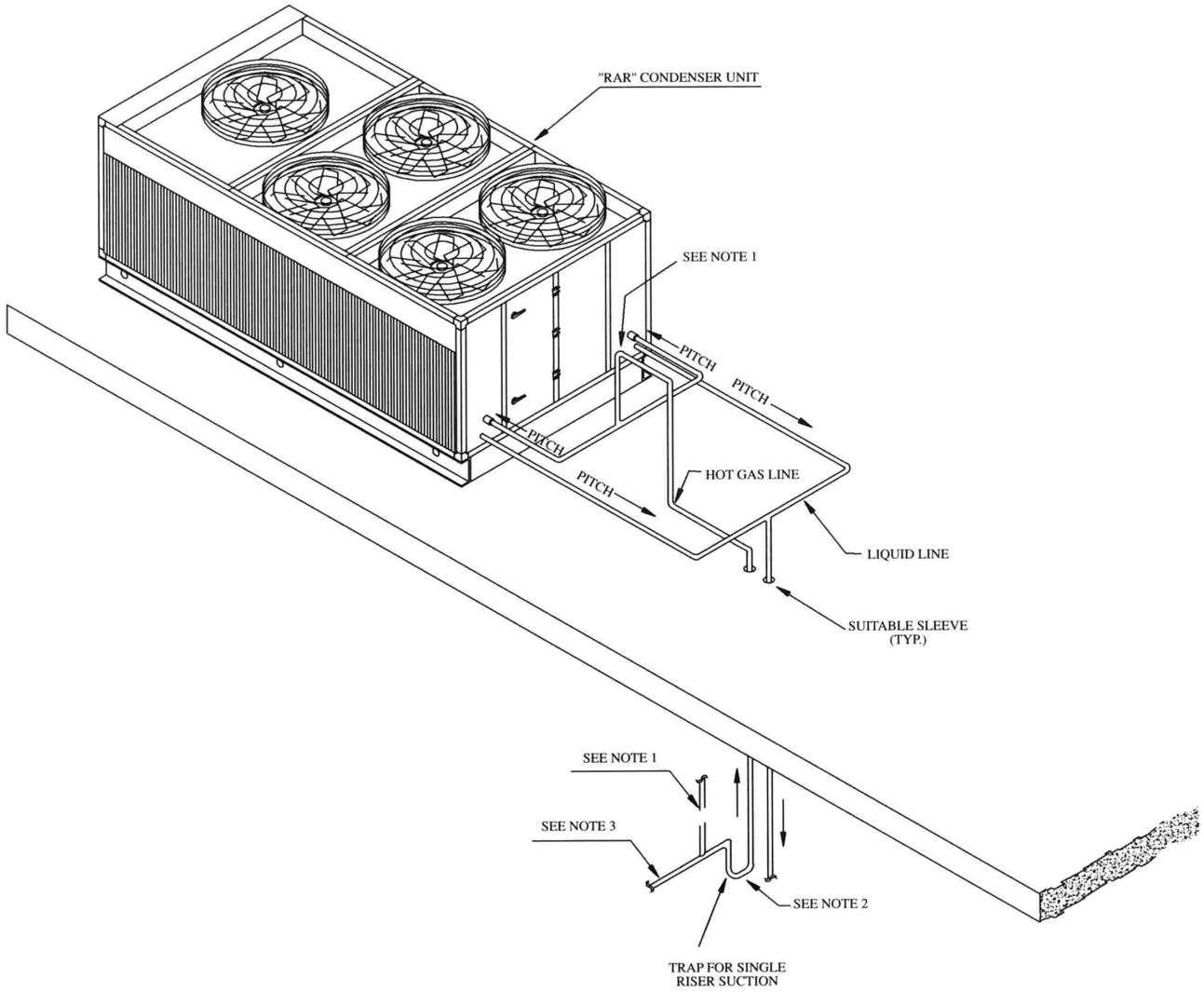
Model	Voltage Range	Fan Motor Amps (each) RLA	Fan Motor Qty.x(Kw)	Unit Total Amps	MFS	MCA
RAR4016	340-462	1.77	2 x 0.55	3.5	16	3.9
RAR4024		1.77	3 x 0.55	5.3	16	5.7
RAR4029		1.77	4 x 0.55	7.1	16	7.5
RAR4046		2.05	4 x 0.75	8.2	16	8.7
RAR4055		2.05	4 x 0.75	8.2	16	8.7
RAR4068		2.70	5 x 1.1	13.5	20	14.2
RAR4083		1.77	6 x 0.55	10.6	16	11.0
RAR4097		1.77	8 x 0.55	14.2	20	14.6
RAR4122		2.05	10 x 0.75	20.5	25	21.0
RAR4141		2.05	12 x 0.75	24.6	32	25.1
RAR4163		2.70	12 x 1.1	32.4	40	33.1

LEGEND :

RLA - rated Load Amps
FLA - Full Load Amps
MFS - Maximum Fuse Size
MCA - Minimum Circuit Amps

Typical Piping

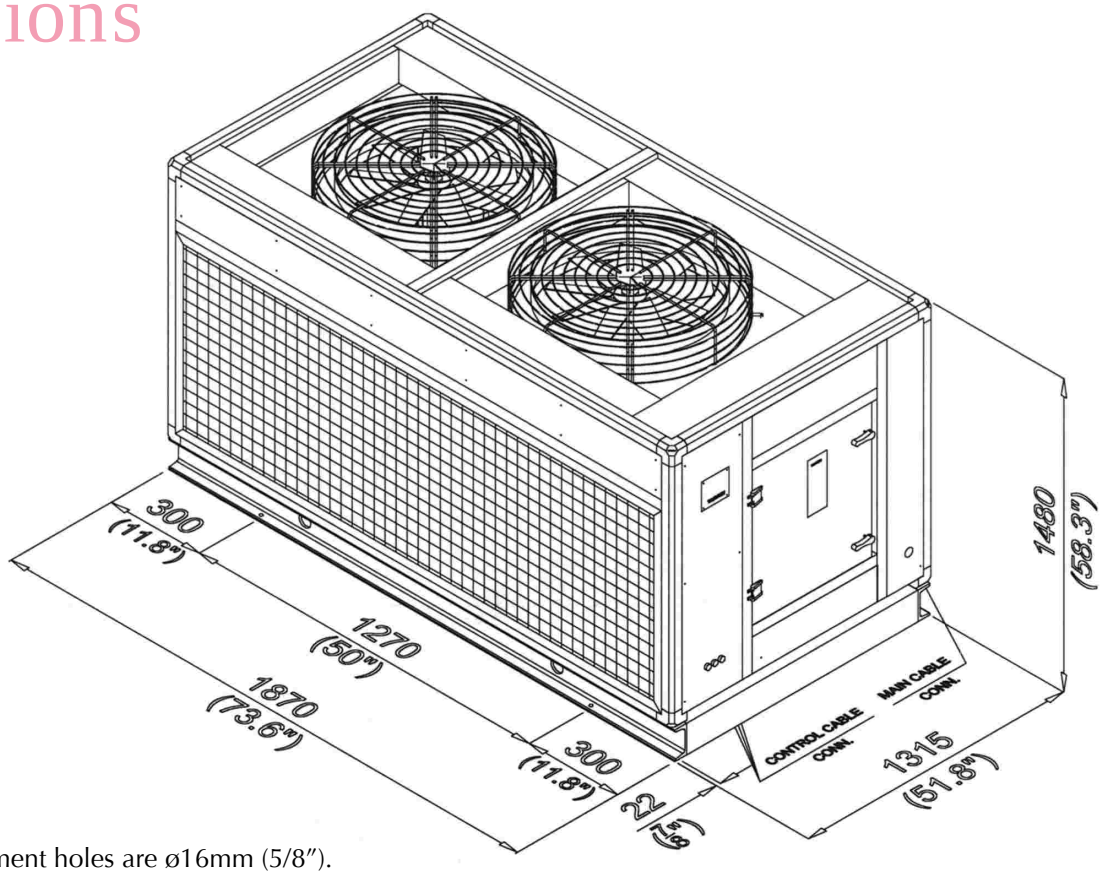
RAR Unit With Single System



1. Hot gas lines should rise above refrigerant level in condenser circuit. double riser may be required; check compressor minimum capacity.
2. Trap should be installed on hot gas lines to prevent condenser oil and refrigerant vapor from accumulating on compressor heads during off cycle.
3. Pitch all horizontal lines downward in the direction of refrigerant flow.
4. For piping length greater than 50 ft, provide support to liquid and gas lines near connection to coil.
5. All must follow standard refrigerant piping practices.

Dimensions

RAR4016



Note: All fixing basement holes are ø16mm (5/8").

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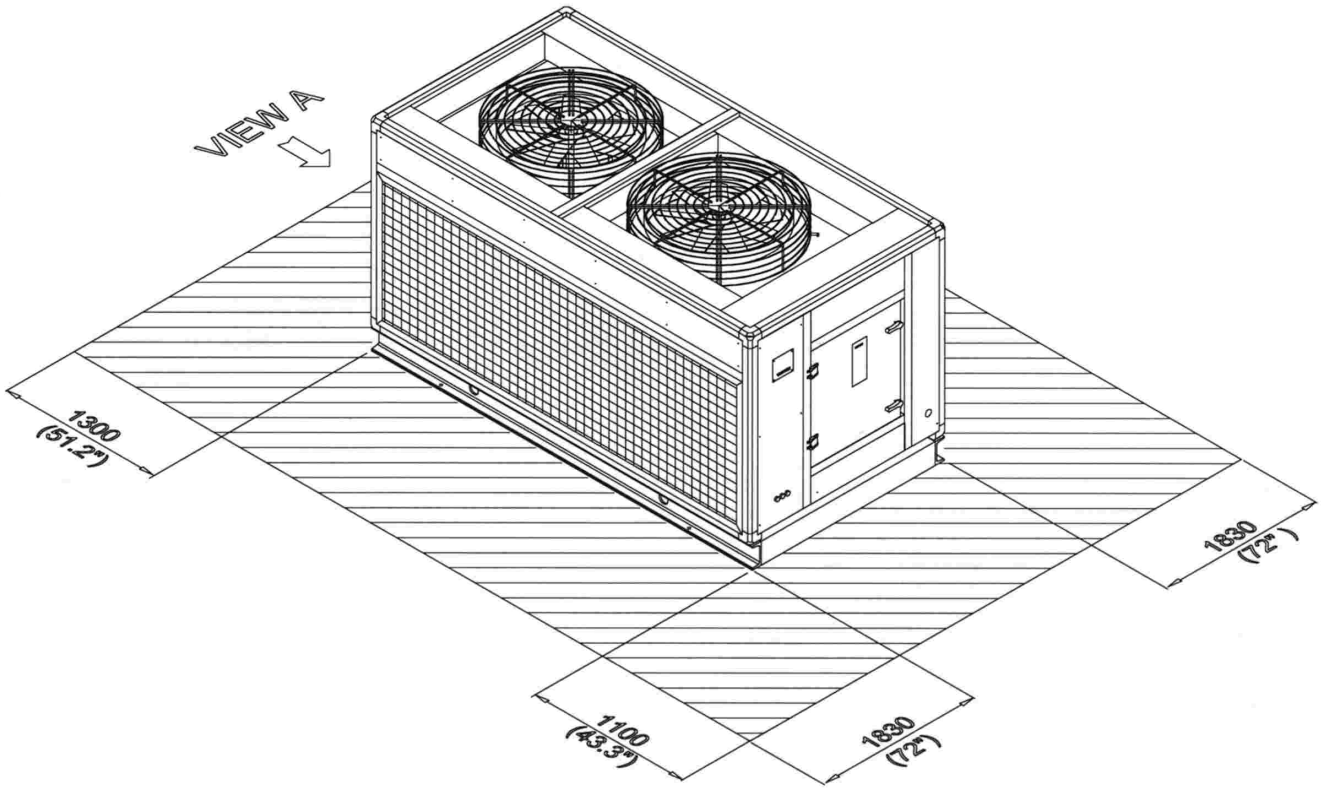
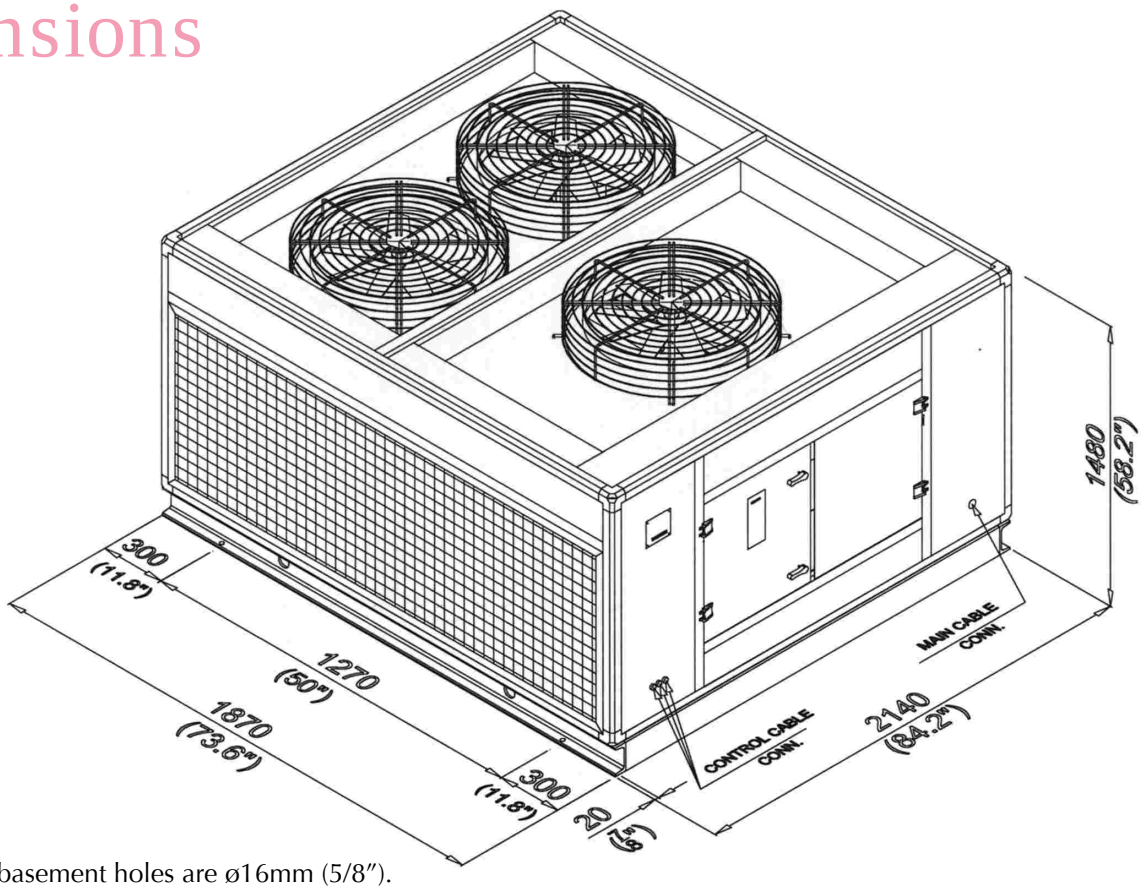


Dimensions

RAR4024



Note: All fixing basement holes are ø16mm (5/8").

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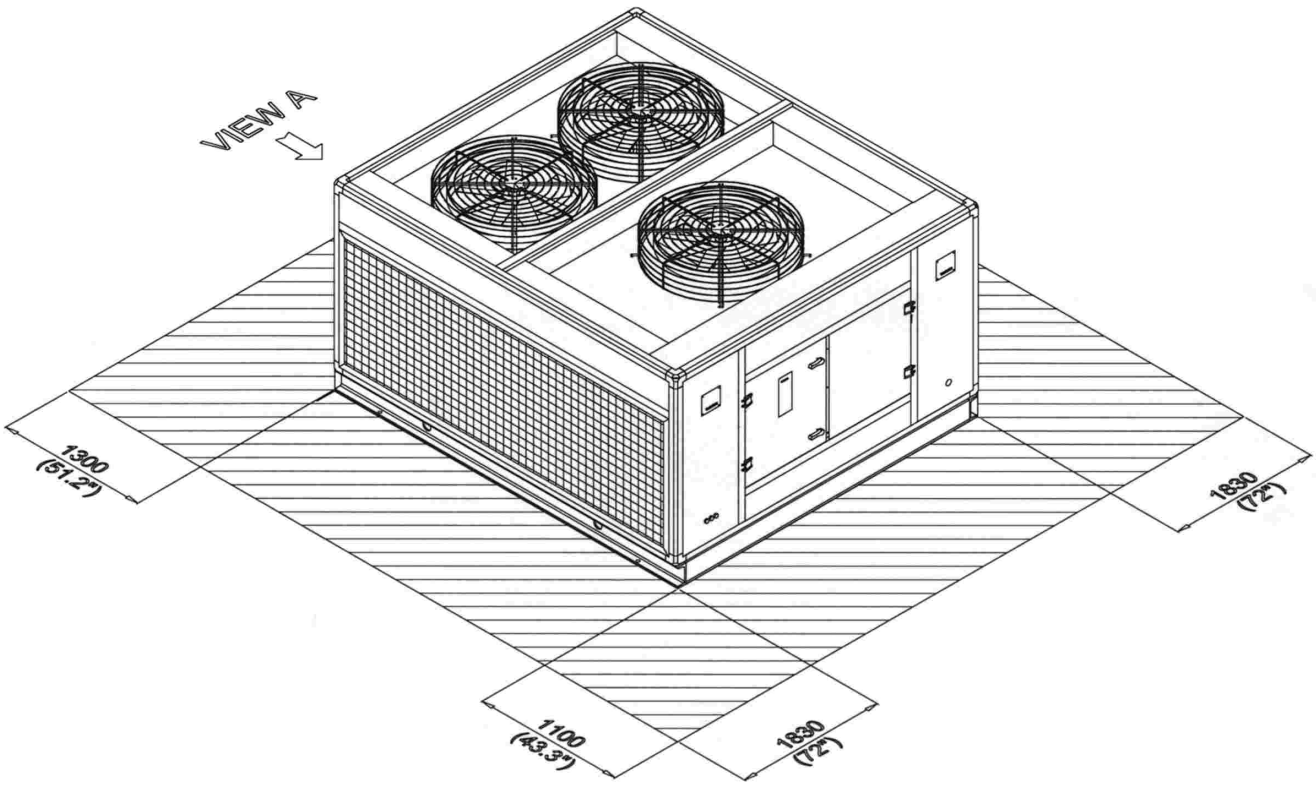
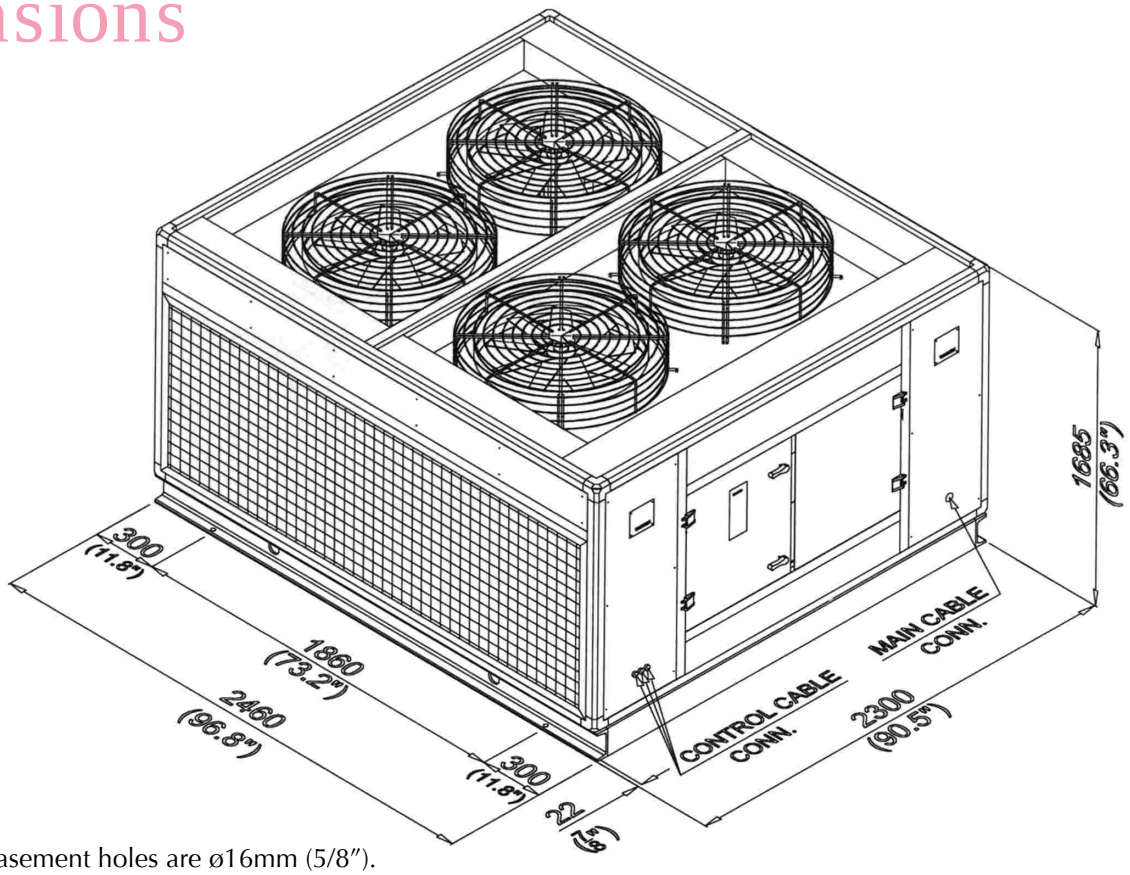


Dimensions

RAR4029
RAR4046
RAR4055



Note: All fixing basement holes are ø16mm (5/8").

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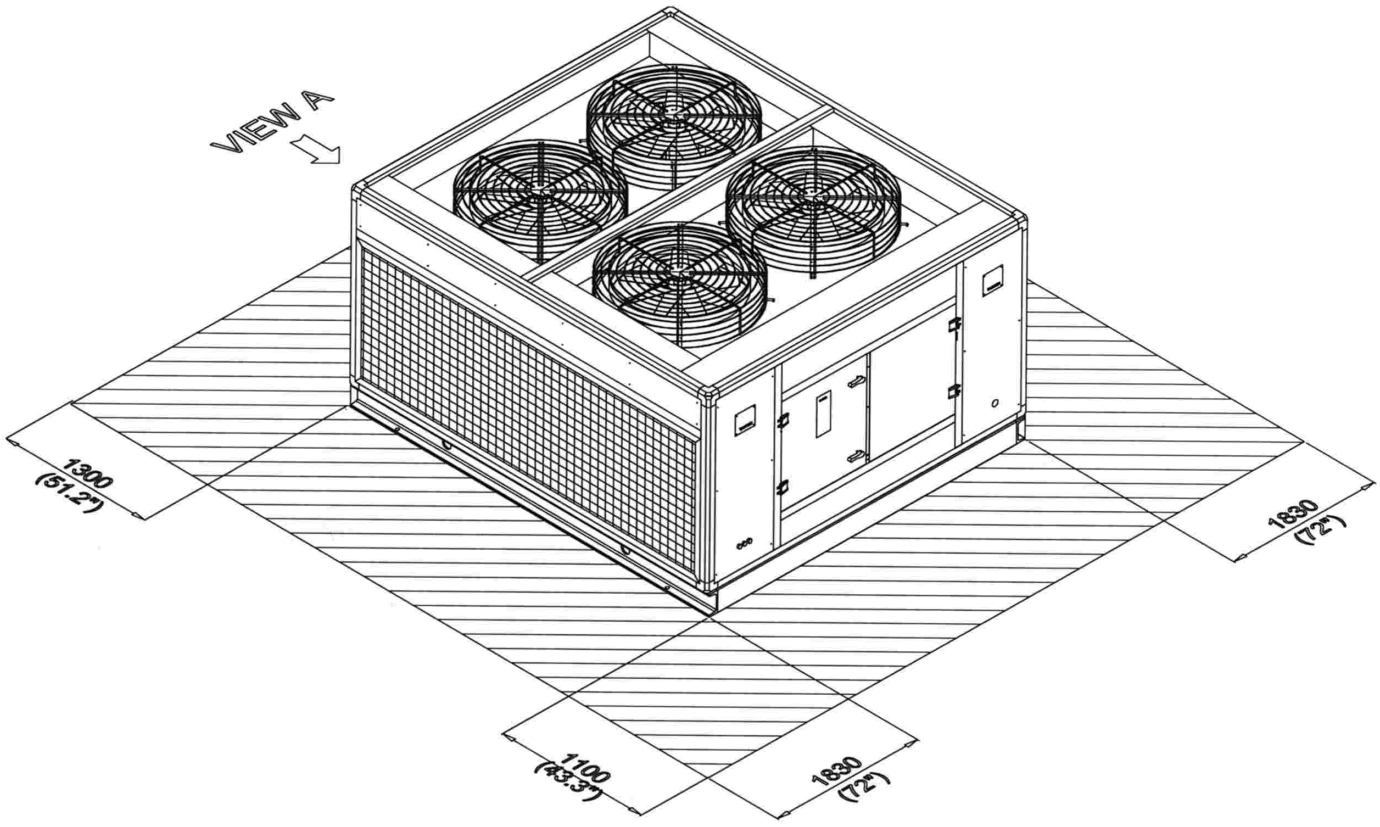
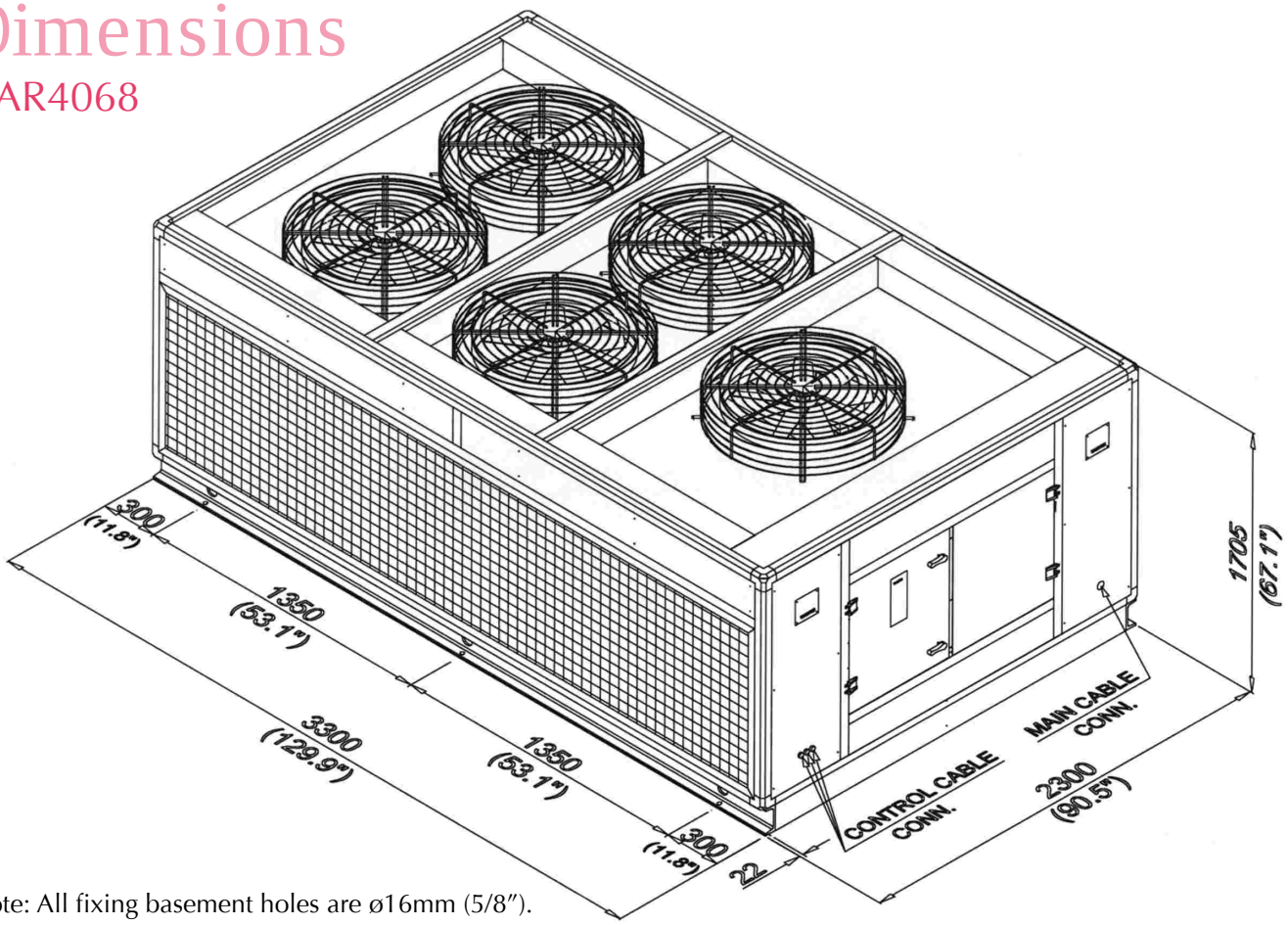


Dimensions

RAR4068



Note: All fixing basement holes are ø16mm (5/8").

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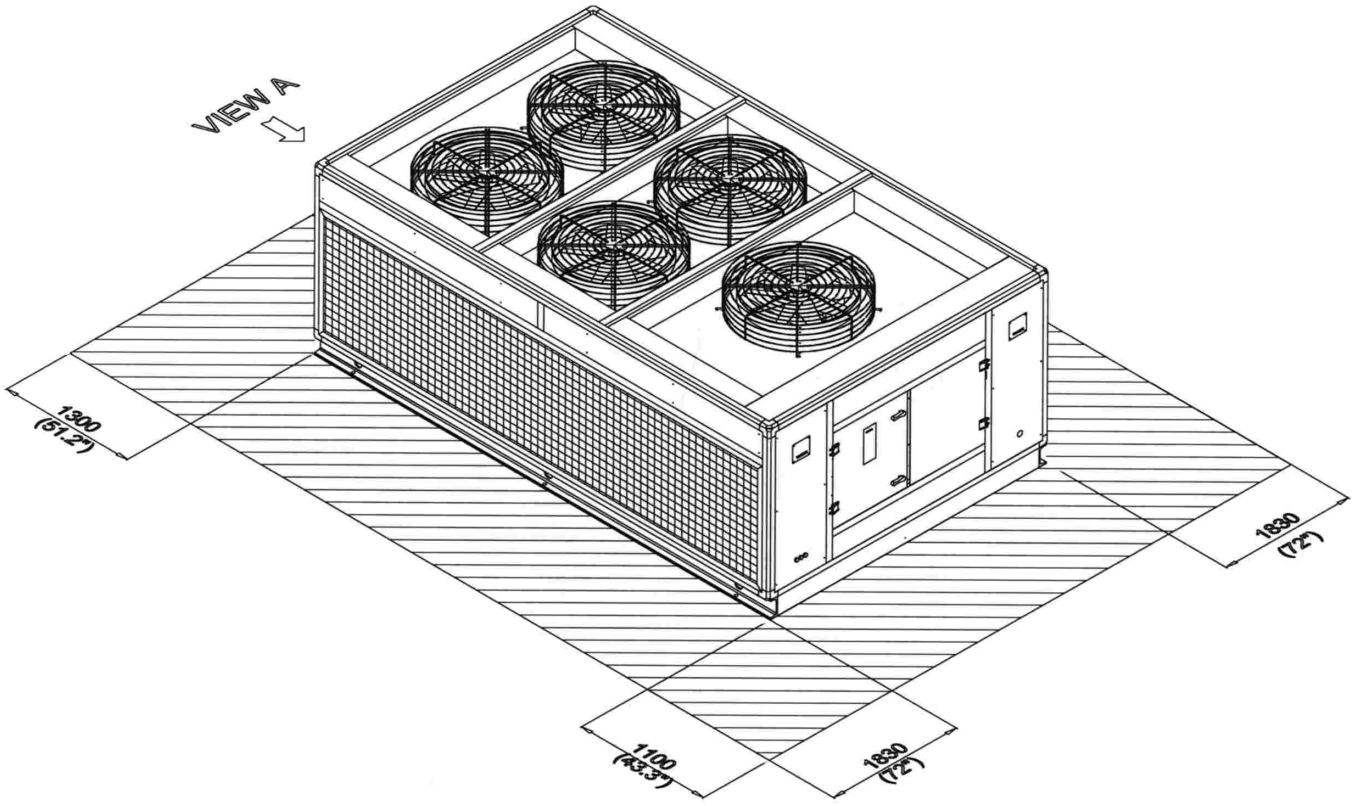
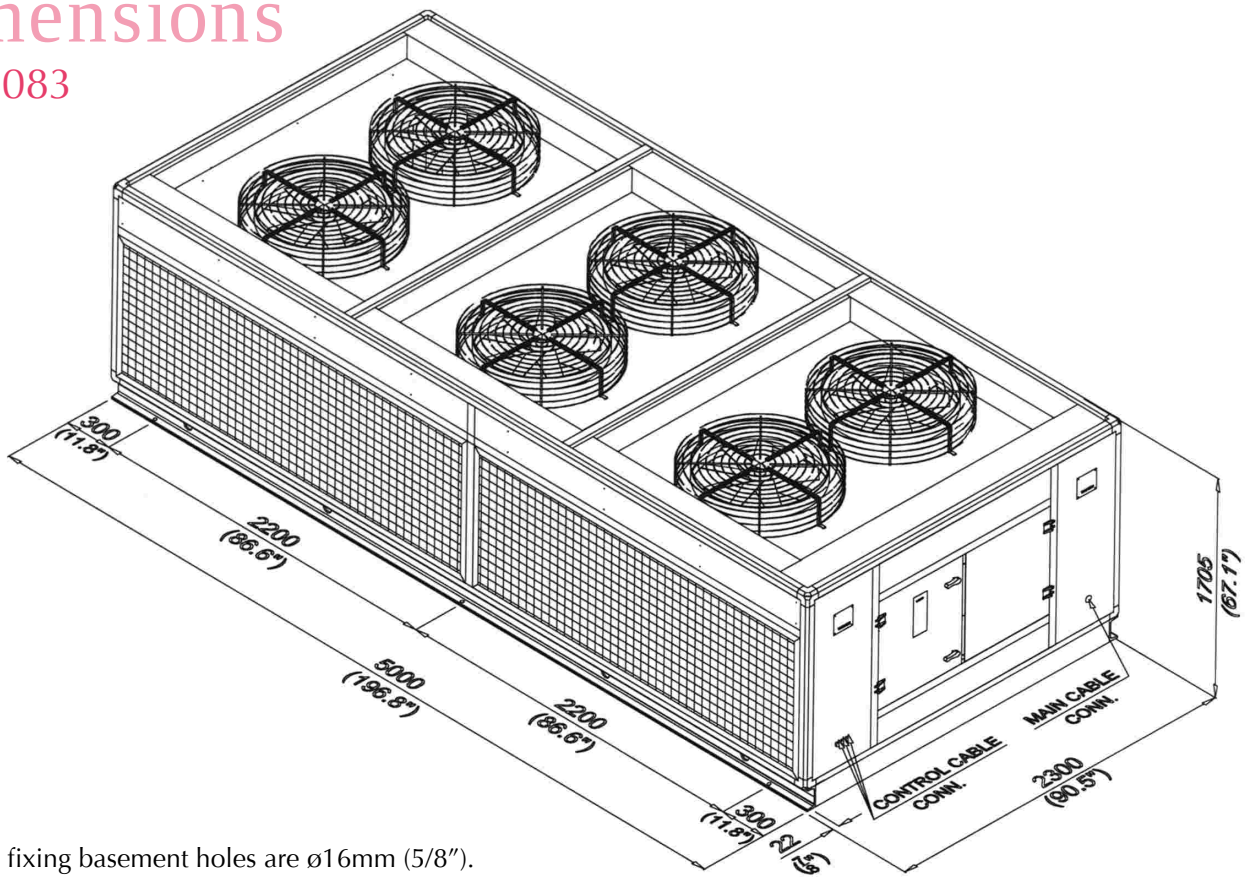


Dimensions

RAR4083



Note: All fixing basement holes are ø16mm (5/8").

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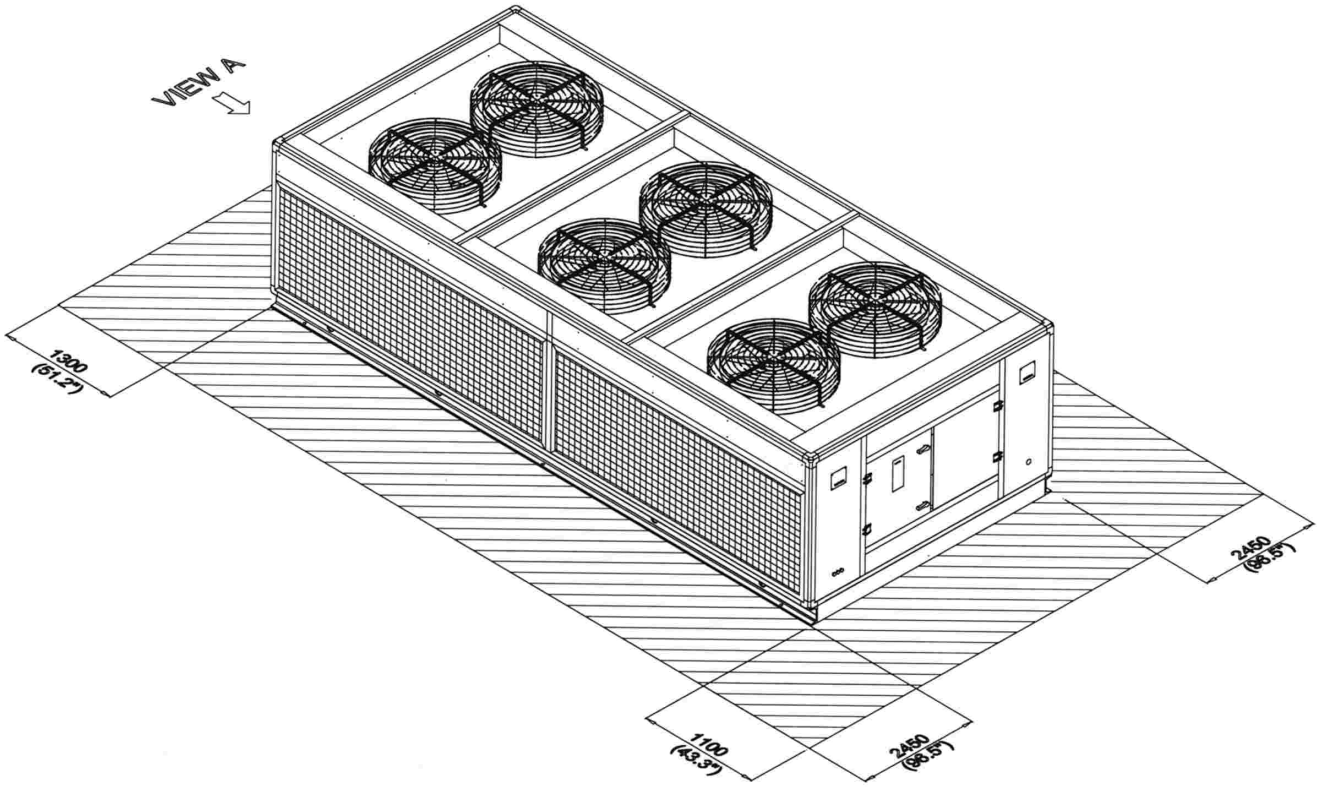
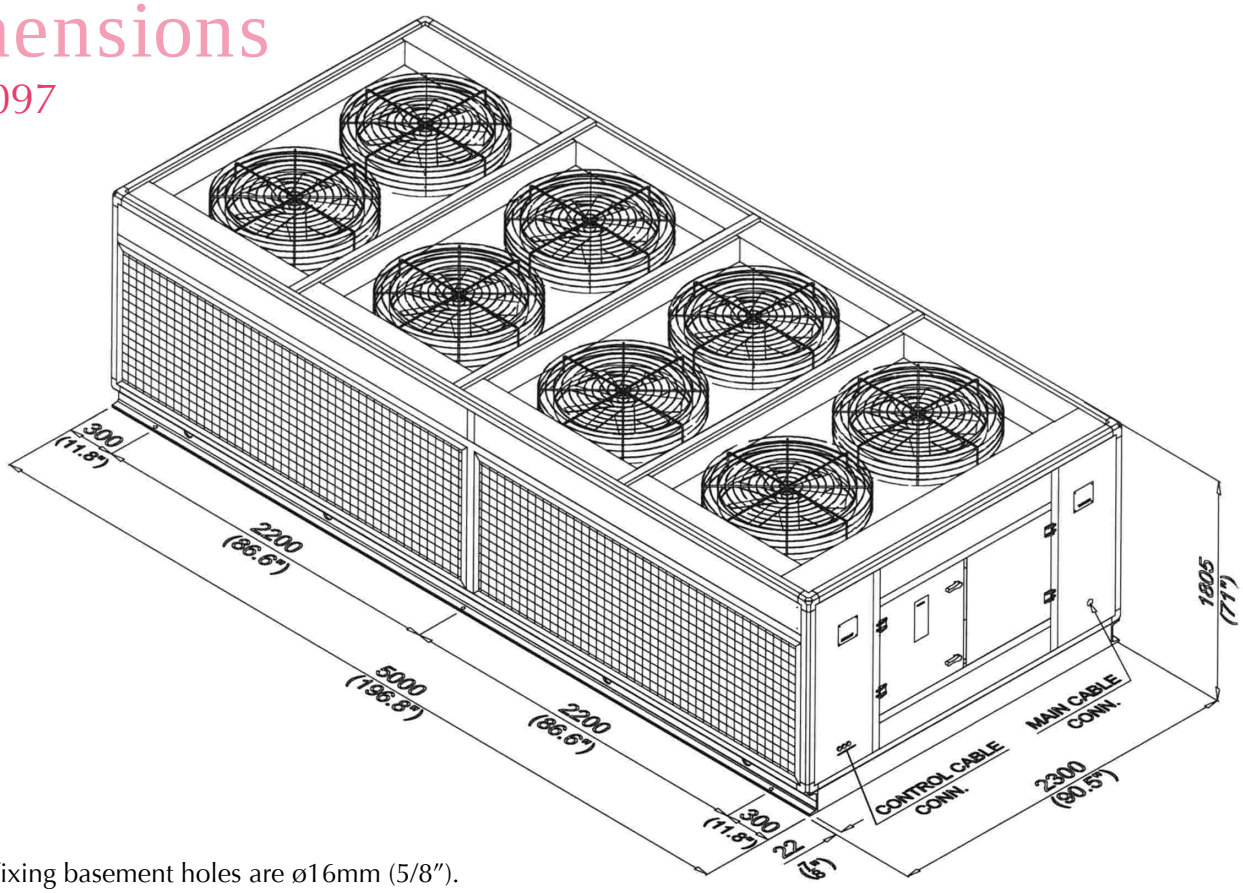


Dimensions

RAR4097



Note: All fixing basement holes are ø16mm (5/8″).

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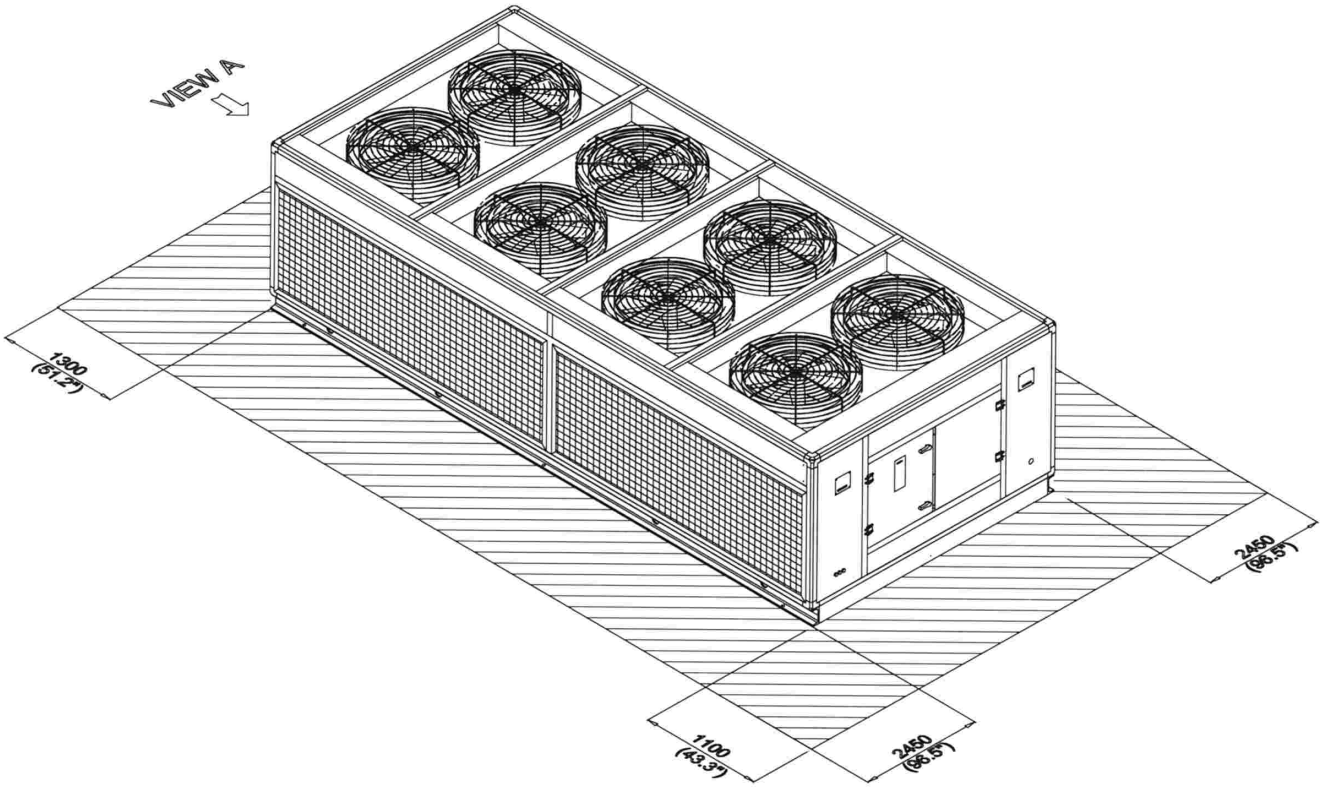
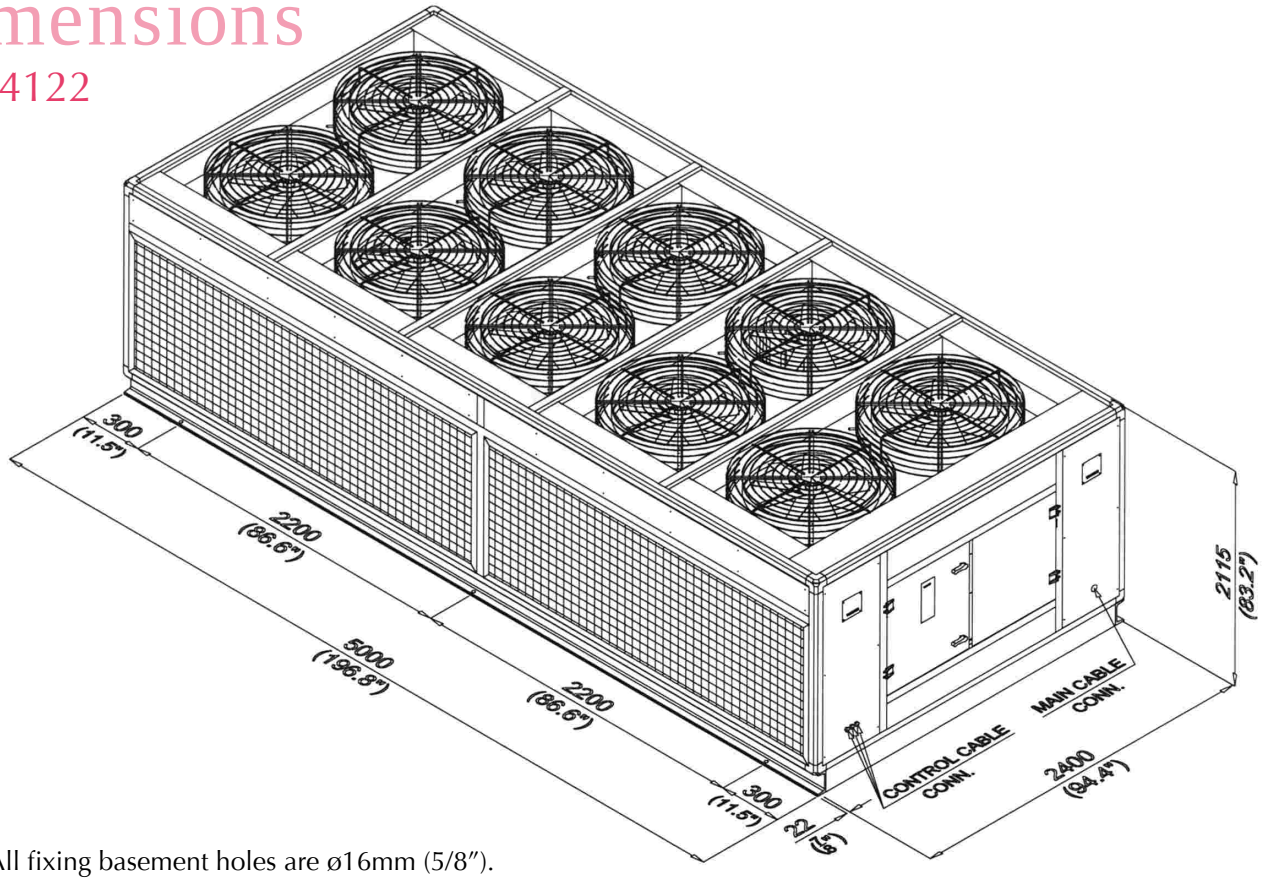


Dimensions

RAR4122



Note: All fixing basement holes are ø16mm (5/8").

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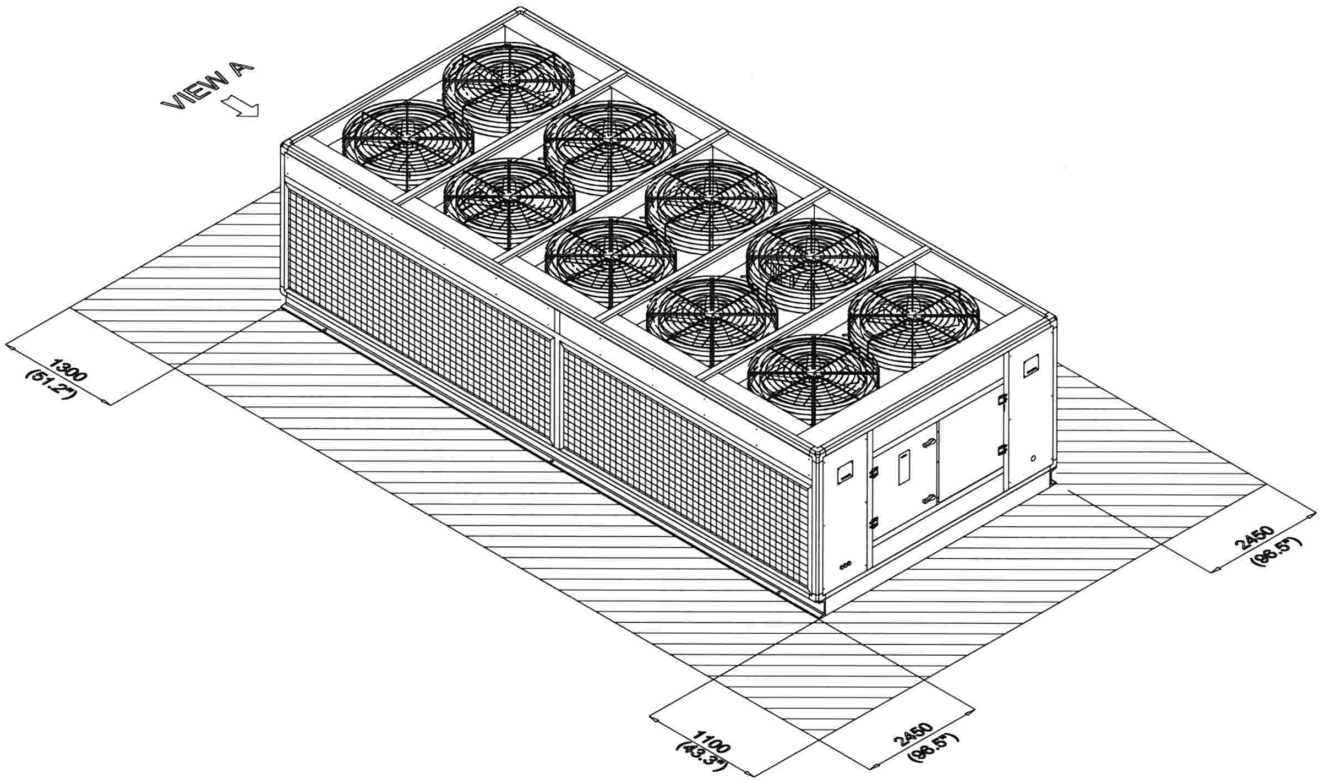
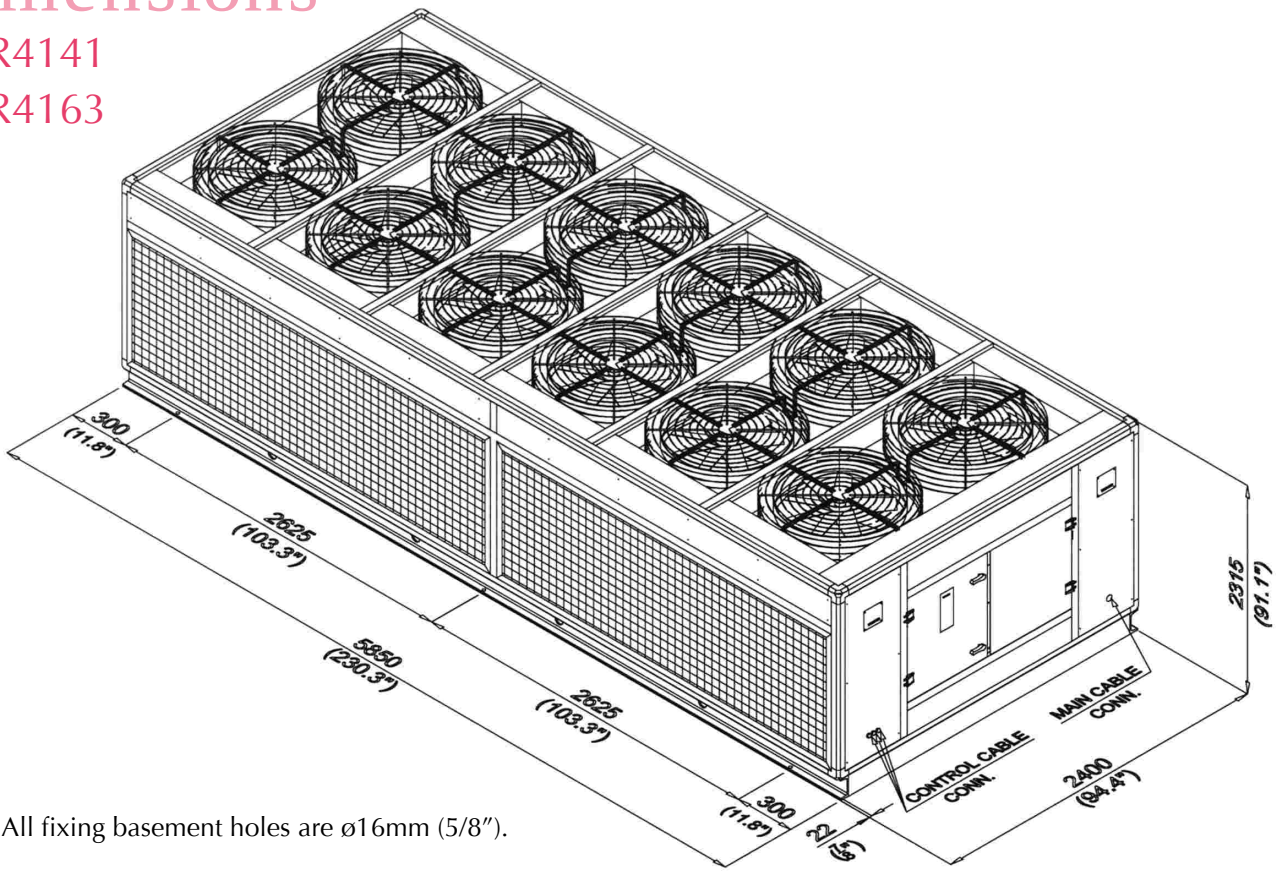


Dimensions

RAR4141
RAR4163



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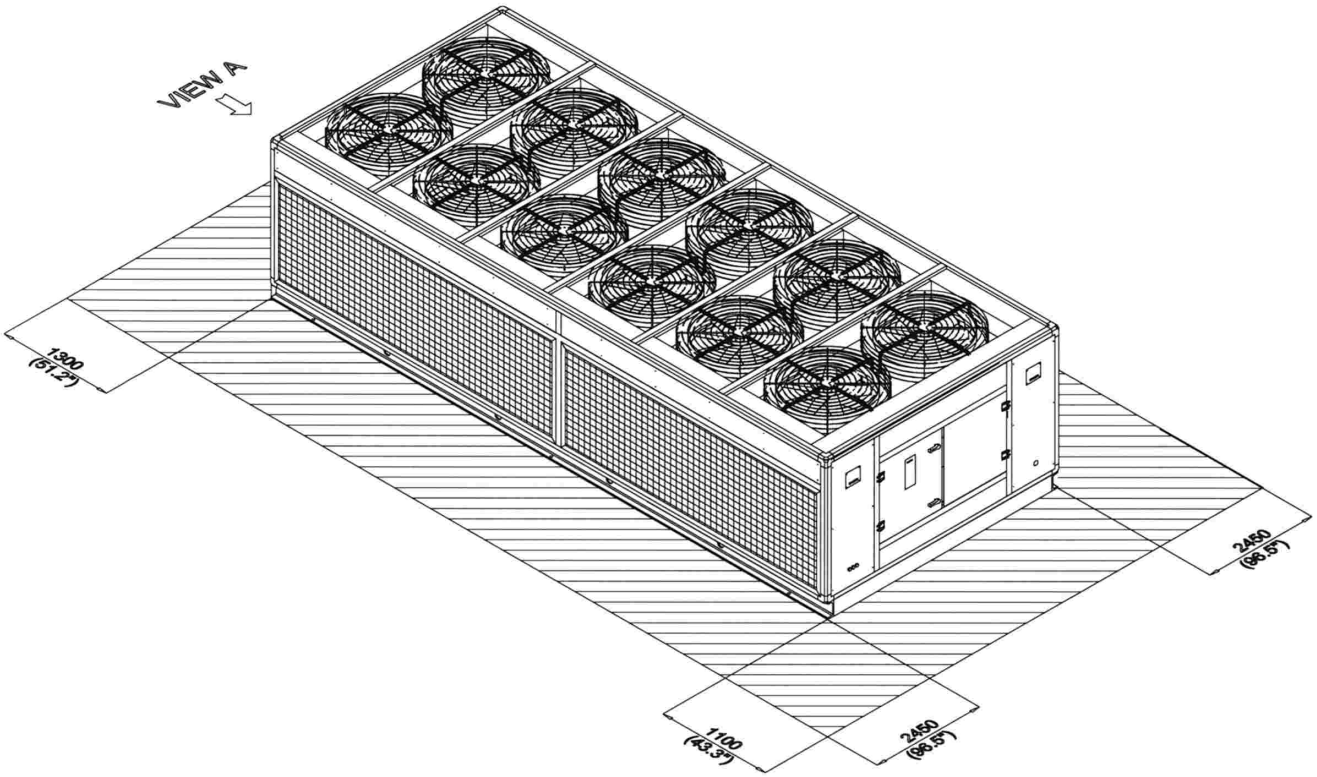
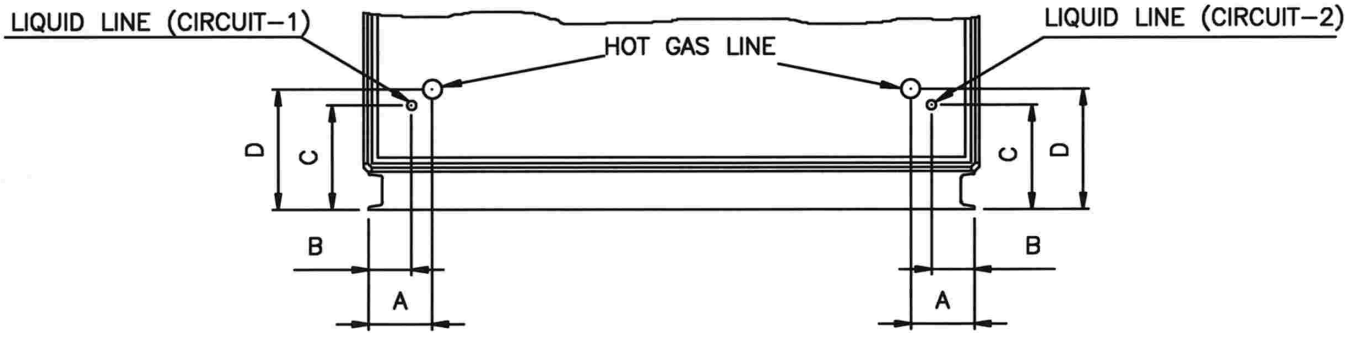


Pipe Position

RAR4016
THRU RAR4163



UNIT SIZE	Dimensions - mm (inch)			
	A	B	C	D
RAR4016 THRU RAR 4055	330 (13.0)	254 (10.0)	254 (10.0)	279 (11.0)
RAR 4068 THRU RAR 4122	330 (13.0)	254 (10.0)	274 (10.8)	299 (11.8)
RAR 4141 & RAR 4163	330 (13.0)	254 (10.0)	294 (11.6)	319 (12.6)

Application Consideration

Certain application constraints should be considered during sizing, selecting and installing TAHVIEH air-cooled condenser. Unit reliability is dependent upon these considerations. Where your application varies from the guidlines presented, it should be reviewed with TAHVIEH sales engineers.

Unit Placement

A base of foundation is not required if the selected unit location is level and strong enough to support the unit`s operating weight. Refer to the weights section for the weight of individual units. (as listed on page 7 thru 9).

Isolation and Sound Emission

The most effective method for noise isolation is proper unit location. Unit should be placed away from noise sensitive areas. Stracturally transmitted noise can be reduced with the use of spring isolators and they are recommended for acoustically sensitive applications. Flexible electrical conduit, for maximum isolation effectiveness, will reduce sound transmitted through electrical conduit. State and local codes on sound emissions should always be considered. Since the environment in which a sound source is located affects sound pressure, unit placement must be carefully evaluated.

Servicing

Recommended minimum space envelopes for servicing have been shown in the dimensional data section and serve as guidelines for providing adequate clearance. The minimum space envelopes also allow for control panel door swing and routine maintenance requirements.

Unit Location

Unobstructed flow of condenser air is essential to maintaining capacity and operating efficiency. When determining unit placement, careful consideration must be given to assure a sufficient flow of air across the condenser heat transfer surface. Two detrimental conditions are possible and must be avoided. Warm air recirculation and coil starvation. Warm air recirculation occurs when discharge air from the condenser fans is recycled back at the condenser coil inlet. Coil starvation occurs when free airflow to the condenser is restricted both warm air recirculation and coil starvation cause reductions in unit efficiency and capacity because of the higher head pressures associated with them. In more server cases, nuisance unit shutdowns will result from excessive head pressures. Cross winds, those perpendicular to the condenser, tend to aid efficient operation in warmer ambient condition. However, they tend to be detrimental to operation in lower ambient of when hot gas bypass is used due to the accompanying loss of adequate heat pressure. As a result, it is advisable to protect air-cooled condensers from continuous direct winds exceeding 10 miles per hour. Debris, trash, supplies, etc should not be allowed to accumulate in the vicinity of the air-cooled condenser. Supply air movement may draw debris in to the condenser coil, blocking spaces between coil fins and causing coil starvation. Special consideration should be given to low ambient units. Condenser coils and fan discharge must be kept free of snow or other obstructions to permit adequate airflow for satisfactory unit operation.

Clearance

Vertical condenser air discharge must be unobstructed. While it is difficult to predict the degree of warm air recirculation, a unit installed with a ceiling or other obstruction above it will lose capacity and the maximum ambient operation will be reduced. Nuisance high head pressure tripouts may also occur. The inlet to the coil must also be unobstructed. A unit installed closer than the minimum recommended distance to a wall or other vertical riser may experience a combination of coil starvation and warm air recirculation resulting in unit capacity and efficiency reductions, as well as possible excessive head pressures. The recommended lateral distances are listed in the Dimensional Data section.

Effect of Altitude

The tables in the Performance Data section are for use at sea level. At elevations substantially above sea level, the decreased air density will decrease condenser capacity. Refer to selection procedure to correct performance at other altitudes.

Standard Equipment

Condenser Section

Copper Tube and Aluminum fin condenser coils
Propeller airfoil blade shape fan
Protected motors with permanently lubricated bearings
Refrigerant Piping
Condenser coil filter and guard

Controls

On-Off reset switch
Phase protection control
Fan Motor Fuses
Fan motor safety switches

Guide Specifications

General

Units shall be tested and rated in accordance with ARI 520 and conform to ANSI B9.1 Safety Code.

Air Cooled Condenser

Condenser coils shall be 3/8″ OD copper tube, aluminum fin type Coils shall include a subcooling section and shall be designed for use with Refrigerant 22. Coil circuits shall be factory leak tested at 470 psig under water.

Fans

The propeller fans shall have air foil blade shape andbe directly driven by three phase motors. Motors shall run at 900 rpm and shall permanently lubricated type. They shall be dripproof with built-in overload protection. (Condenser coils shall be protected by factory installed aluminum fine mesh filter with steel mesh cover. Guards shall be hot-dipped galvanized coated for corrosion resistance and painted to match the coils.)

Operating and Safety Controls

Machine shall include a control panel containing an on-off reset switch, phase protection and terminal board.

Cold Weather Control

An automatic mild ambient control shall be factory installed to provide satisfactory operation at minimum ambient temperature down to 25 °F (-3.9 °C).