DESERT AIRE

POOL DEHUMIDIFICATION
DEDICATED OUTDOOR AIR SYSTEMS

DOAS Performance Catalog

Foreword

Desert Aire has written this product summary catalog to provide engineers and contractors a summary of our expansive DX-DOAS product line to assist in selecting the appropriate solution for your outdoor air handler solution.

Desert Aire's DX-DOAS units are engineered and manufactured for excellent performance, dependability and serviceability. This system does not just utilize standard air conditioning components like many of the DOAS systems on the market. It consists of a specially designed evaporator coil along with refrigeration components that provides maximum moisture removal at the lowest energy consumption. Desert Aire's DOAS products provide the highest Integrated Seasonal Moisture Removal efficiency (ISMRE) and Integrated Seasonal Coefficient of Performance (ISCOP) in the industry.

If a heat pump unit is selected, the patented design of Desert Aire's heating circuit allows the designer to maintain discharge temperature at the lowest winter design conditions to provide the highest Integrated Seasonal Coefficient of Performance (ISCOP) and in many cases avoid using any other new energy source for heating.

Due to our expansive product selection this summary will be supplemented with our expertise from our rep network. Please contact your local rep or Desert Aire and we will provide you further details on your required selection.

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Overview

Several HVAC trade and professional organizations, including ASHRAE have documented the need for suitable indoor air quality. A primary requirement for maintaining proper IAQ is through the introduction of varying amounts of outdoor air. The down side of adding outdoor air is that it also admits excess moisture into the facility. If this condition is not controlled, it can create an environment for mold, mildew, viruses and other potentially hazardous organisms to flourish. The key to preventing mold formation and growth is to control the relative humidity within the space. A standard air conditioner cannot achieve this since it controls only temperature. Instead, a system must be implemented that can provide full control of both temperature and relative humidity.

All Desert Aire DX-DOAS units are designed around a reliable, efficient dehumidification system. There are two main reasons for using the dehumidifier as a base to build a complete ventilation system:

- Significant additional energy costs will result if the latent cooling provided by a standard air handler is used for dehumidification. In contrast, dehumidifiers are the only efficient means to regulate moisture removal.
- DX-DOAS dehumidifiers are configured for the easy addition of optional components needed for a complete solution, options that offer effective solutions that are not otherwise available.

Product Series Summary

Desert Aire's dehumidifiers provide you the most complete solution for your dedicated outdoor air system (DOAS). Our many options allow you to design and install the highest energy saving solution for your compliance to ASHRAE 62.1 code ventilation requirements for new construction and renovation projects. This system allows the engineer to separate the latent load of the building and deliver conditioned air to the space which will optimize the performance of the building's conventional heating and cooling systems.

Design Options

Desert Aire offers the widest range of performance options on its three product platforms while maintaining its main focus: Meeting the target dewpoint while attaining the lowest operational cost. In addition, the many options help to reduce the operating cost of the remainder of the building's sensible cooling and heating systems. The design engineer has the ability to configure the system with the following configuration options.

- Energy Recovery - An enthalpy wheel can recover energy from the exhaust air stream
- Control Strategy - Multiple choices allows better energy efficiency
- Choice of Condensers - Air, water or geothermal (or combinations)
- Auxiliary Heating -Many options including:
  - Gas-Electric
  - Hot water or Steam Coils
  - Geothermal
- Miscellaneous Options -Indoor/Outdoor systems, fan discharge direction, coated coils and better filtration are just a few of the many additional configuration options available.

AHRI 920 Performance Rating and Comparisons of DX-DOAS Unit Efficiency

Introduction to AHRI 920

In 2015, the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) introduced a performance rating for dedicated outside air systems. All references in this document refer to the AHRI Standard 920 (I-P) document. This was a very timely announcement as it corresponded with the increasing demands for measurable energy efficiency solutions and methods to reduce global warming. At the same time the ASHRAE SPC90.1- 2016 committee was updating their standard and wished to include minimum rating values for this type of product. This application note will provide the background on the AHRI 920 standard as well as an overview on how to use the rating values.

The latest versions of ASHRAE 90.1-2013 energy standard is emphasizing the importance of off-peak conditions. Keep in mind that design conditions occur less than 1% of the time, so the system functions for most of its operating life at part loads. Like the chiller product's integrated part load values (IPLV) and air-conditioners IEER and SEER, the new DOAS standard has introduced its own version of integrated values.

DX-DOAS Definition

DX-Dedicated Outdoor Air Systems (DX-DOAS) condition outdoor ventilation air independently from the building HVAC system. This approach to handling ventilation air results in superior humidity control by limiting the primary source of humidity in most buildings – ambient humidity carried in by the ventilation air – directly at its source before it enters the building. The decoupling of the ventilation air's requirements from the building's internal sensible requirements allows both systems to be designed for maximum energy efficiency. The energy savings can be obtained by running the separate, sensible cooling only, interior cooling system less often or at a higher evaporating temperature, thus improving the overall energy efficiency.

Further energy savings may be realized by providing only the amount of ventilation air necessary and/or by using energy recovery from the building exhaust air to precondition the ventilation air.

While the concept of introducing ventilation air is simple enough, in actual practice there are many different configurations that can be utilized to solve this goal. These different configurations have a significant impact on the energy efficiency of the DX-DOAS units, so the first step in the evaluation is to determine what configuration will be used at the specific jobsite. The category choices are:

- Energy recovery pre-conditioning.
  If exhaust air can be brought back to the DOAS unit, then pre-conditioning the outside air with an energy recovery wheel or plate heat exchanger will improve the energy efficiency of the system.

- Condenser
  There are several condenser types that impact the minimum efficiency of ASHRAE 90.1-2016
  - Air-cooled (either split or packaged)
  - Water-cooled (water temperature will impact system efficiency)

- Cooling Tower
  The dehumidification only system utilizes a cooling tower water loop for its condensing water source. The temperature of the fluid usually varies from 55°F to 90°F.

- Chilled Water
  The dehumidification only system utilizes a chilled water loop for its condensing water source. The temperature of the fluid usually varies from 40°F to 60°F

- Ground source, closed loop
  A heat pump that uses fluid circulated through a subsurface piping loop as a heat source/heat sink. The temperature of the fluid is related to climate and operating history conditions and usually varies from 25°F to 100°F.

- Ground-water source
  A heat pump that uses water pumped from a well, lake or stream as a heat source/heat sink. The temperature of the water is related to climate conditions and usually ranges from 45°F to 75°F for deep wells.

- Water source
  A heat pump that uses fluid circulated in a common piping loop as a heat source/heat sink. The temperature of the piping loop fluid is usually mechanically controlled within a moderate temperature range of 61°F to 89°F.

This rating standard has been developed to provide design engineers with a relative guide to quantify the energy a DX-DOAS system will consume while dehumidifying and reheating ventilation air to a neutral 70°F condition at several different outside air conditions. Unlike air conditioning systems, the dehumidification process requires the system to condition the air to the design dewpoint (this is established at a 55°F dewpoint in the case of this standard) in order to remove the moisture before it enters the space. The system then must use 75% to 90% site recovered energy, no new energy, to reheat to the neutral condition as stated in ASHRAE 90.1. Use of the hot gas reheat coil is a common solution utilized to achieve the site recovered requirement. The ambient conditions that the unit must be designed for vary throughout the year, so the AHRI standard utilizes four different dehumidification entering air conditions or rating points as a method to demonstrate the moisture removal efficiency (MRE) at part load conditions. This is expressed as the amount of moisture removed per kilowatt-hour of energy used.

Refer to Figure 1 for a psychrometric plot of the calculation of the total cooling required to meet the 55°F dewpoint and the amount of moisture that must be removed. In order to meet this demand, DOAS units must have a very low sensible heat ratio and have unique refrigeration circuits to handle this wide range of entering air conditions. A detail psychrometric review can be found in Desert Aire's *Technical Bulletin #3, Dehumidification and the Psychrometric Chart.*

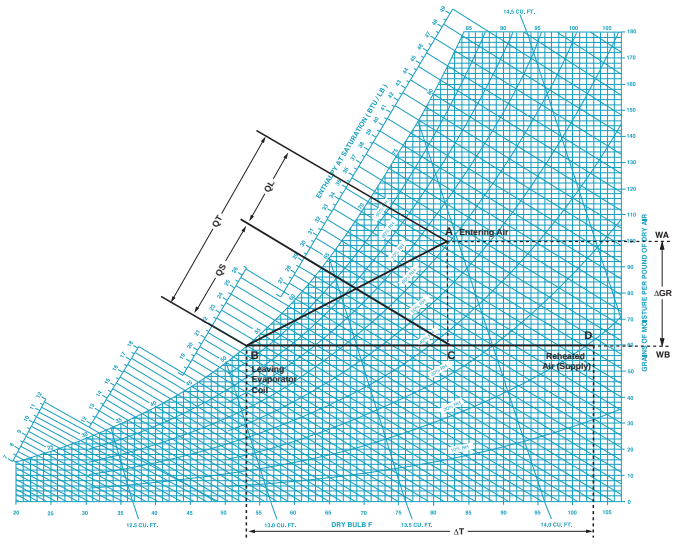


Figure 1. Calculation of Total Cooling Required for a DOAS Design.

If the system is a heat pump, the standard also defines two rating points for winter heating. The heating performance is stated as coefficient of performance (COP), which is units of watt output divided by the watt input. Refer to Tables 1 and 2 for the input values based on the configuration selected for the specific application.

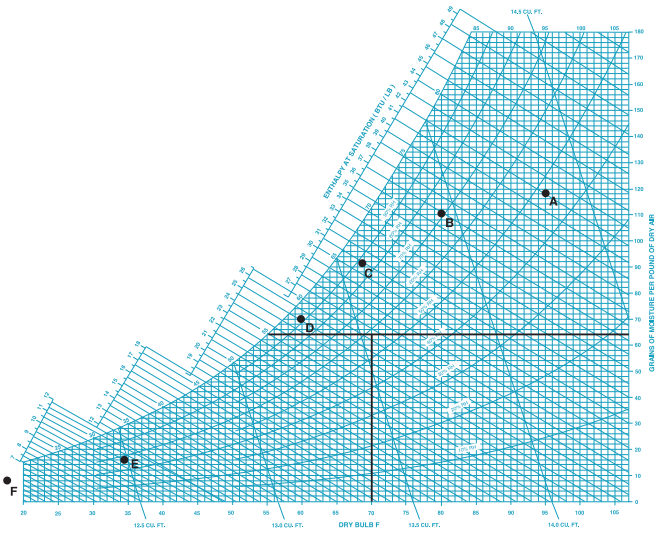


Figure 2.

To model real world conditions, the standard also has established an external static pressure for various supply air volumes and has added a pumping penalty to account for the energy consumption adder of water-cooled systems.

Rating Condition	Outdoor Air Entering Temperatures		Exhaust Air Temperatures		Inlet Fluid Temperatures		Ambient Air
	°Fdb	°Fwb	°Fdb	°Fwb	Cooling Tower	Chilled Water	°Fdb
Dehumidification							
A	95	78	75	62.5	85	45	95
B	80	73	75	62.5	80	45	80
C	68	66	75	62.5	68	45	68
D	60	58	75	59.6	55	45	60
Heating							
E	35	29	70	58.5	N/A	N/A	35
F	16	12	70	58.5	N/A	N/A	16
All temperatures are listed in °F							

Table 1. Operating Conditions for Air & Water-Cooled Systems (Table 2 - AHRI 920)

Rating Condition	Outdoor Air Entering Temperatures		Exhaust Air Temperatures		Inlet Fluid Temperatures		
	°Fdb	°Fwb	°Fdb	°Fwb	Closed Loop	Ground Water	Water Source
Dehumidification							
A	95	78	75	62.5	85	70	85
B	80	73	75	62.5	80	70	85
C	68	66	75	62.5	70	50	75
D	60	58	75	59.6	70	50	75
Heating							
E	35	29	70	58.5	41	70	75
F	16	12	70	58.5	32	50	70
All temperatures are listed in °F							

Table 2. Operating Conditions for Heat Pump Systems (Table 3 - AHRI 920)

Integrated Seasonal Ratings

The AHRI committee used a composite bin hour data set of multiple cities to provide a weighted value moisture removal efficiency and coefficient of performance value. This weighted value puts emphasis on the part load values in calculating the integrated seasonal ratings. Table 3 lists the weighting percentage values. The integrated seasonal values are defined as a weighted average of the individual rating point values and are expressed in pounds of moisture per kilowatt (MRE) in the dehumidification mode and in watts input per watts output (COP) in the winter heating mode if the system is a heat pump.

$ISMRE = (MRE_a \cdot 0.12) + (MRE_b \cdot 0.28) + (MRE_c \cdot 0.36) + (MRE_d \cdot 0.24)$

where

MRE_a = Standard Rating Condition A (95°Fdb / 78°Fwb)

MRE_b = Standard Rating Condition B (80°Fdb / 73°Fwb)

MRE_c = Standard Rating Condition C (68°Fdb / 66°Fwb)

MRE_d = Standard Rating Condition D (60°Fdb / 58°Fwb)

$ISCOP = (COP_e \cdot 0.77) + (COP_f \cdot 0.23)$

where

COPe = Standard Rating Condition E (35°Fdb)

COP_f = Standard Rating Condition F (16°Fdb)

MRE		COP	
Rating Point	**Weight %**	**Rating Point**	**Weight %**
Condition A	12%	Condition E	77%
Condition B	28%	Condition F	23%
Condition C	36%		
Condition D	24%		

Table 3. Weighting Percentages for Integrated Ratings

It is important to note that the rating standard adds the requirement that if the DOAS unit cannot bring the leaving air temperature back to 70°F with recovered energy, that a supplementary heat penalty be incorporated based on the use of an electric heater. An alternative method would be to utilize a larger compressor that provides excess capacity to reheat the air to 70°F at a higher input power.

In the dehumidification mode some systems need to increase their hot gas bypass capacity at the C and D conditions. These systems use the recovered energy to prevent the evaporator coil from freezing instead of directing the energy to the hot gas reheat coil, therefore not having enough energy to meet the 70°F requirement. This standard thus allows an appropriate comparison by allowing those systems to use more energy to reach the required leaving air temperature.

Likewise, in the winter heat pump mode some systems are unable to heat the winter outdoor air to the required 70°F minimum value listed in the standard. The penalty adds an electric heater to make up the difference. Such a system will have a lower COP, but be in compliance of the 70°F leaving air temperature specification.

For systems that are not equipped with a heat-pump mode of operation, the type and efficiency of supplementary heat sources will be published with manufacturers data. These heat source types and efficiency should be reviewed carefully when making comparisons between different types of manufacturers' equipment.

IAQ Product Series

The following table summarizes the three different product series that Desert Aire offers in its DOAS product line.

Common Features

Desert Aire's DOAS-DX product lines all share the following common features.

- Standard DOAS or Heat Pump (water or geothermal) option
- Modulating hot gas reheat system
- Auxiliary heat options
  - Electric
  - Hot water coils
  - Gas (not available on VerticalAire™)
- Electronic expansion valves
- Building management interfaces
- CO_2 Based Outside Air Modulation
- Dew Point Control Based Sequence of Operation
- Mixed Air Option

Aura™ Series Features

- Package Air-cooled option available
- 2 inch double wall roof & 1-1/2 side wall construction
- Enthalpy wheel option
- Plenum fan

TotalAire™ Features

- Package Air-cooled option available
- 1 inch double wall construction
- Enthalpy wheel option up to 30 ton

VerticalAire™ Features

- Compact size
  - 4 to 15 ton fits through standard 3' door
  - 20 to 30 ton fits on freight elevator

Aura™ (8 to 30 tons WITHOUT Exhaust Air Energy Recovery)

Used for	Airflow Range
• Outdoor Air-Cooled Package Applications (Staged Compressors)	960 to 12,000 CFM
• Indoor or Outdoor Water Source Applications (Inverter Compressor)	
• Recirculation / HOAS is available	

Aura™ (8 to 30 tons WITH Exhaust Air Energy Recovery)

Used for	Airflow Range
• Enthalpy Wheel for Exhaust Air Recovery	1,600 to 12,000 CFM
• Outdoor Air-Cooled Packaged Applications (Staged Compressors)	
• Indoor or Outdoor Water Source Applications (Inverter Compressor)	
• Recirculation / HOAS is available	

TotalAire™ (2 to 60 tons WITHOUT Exhaust Air Energy Recovery)

Used for	Airflow Range
• Small Outdoor Air-Cooled Packaged Applications (2 - 6 Ton)	960 to 12,000 CFM
• Indoor or Outdoor Installations	
• Air-Cooled, Water-Cooled, Water Source Heat Pump & Dry Coolers	

TotalAire™ (2 to 30 tons WITH Exhaust Air Energy Recovery)

Used for	Airflow Range
• Enthalpy Wheel for Exhaust Air Recovery	1,600 to 12,000 CFM
• Outdoor Air-Cooled Packaged Applications (Staged Compressors)	
• Indoor or Outdoor Water Source Applications (Inverter Compressor)	
• Recirculation / HOAS is available	
• Air-Cooled, Water-Cooled, Water Source Heat Pump & Dry Coolers	

VerticalAire™ (4 to 30 tons)

Used for	Airflow Range
• Indoor Small Footprint Applications	550 to 8,000 CFM
• Standard Door & Double Door Passage	
• Recirculation / HOAS is available	
• 8 - 30 ton Staged Compressors	
• Air-Cooled, Water-Cooled, Water Source Heat Pump & Dry Coolers	

Aura™ Series

Desert Aire's Aura™ Series DX-DOAS system provides four major option configurations to choose from:

- Air-Cooled Packaged
- Air-Cooled Packaged with Enthalpy Wheel
- Water-Cooled Heat Pump
- Water-Cooled Heat Pump with Enthalpy Wheel

The Aura™ Series features a double wall construction cabinet with a powder coated galvanneal steel outer wall and a sturdy galvanized inner panel. Hinged access doors allow easy access to internal components within each section. Each door has an adjustable cam operated latch and weatherproof compression gaskets between the door and unit casing to produce an airtight seal. The outdoor cabinet includes a rain hood and outside air dampers with actuator. The system eliminates standing roof seams by using a fully weatherproof membrane roof which is sloped to the secondary service side for water drainage. The roofing membrane is a thick laminate which is UV resistant and UL-790 approved.

The system uses an easily serviced plenum fan that provides uniform air distribution across the gas or electric heating elements.

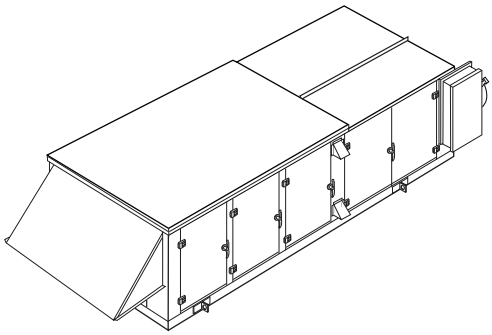
Desert Aire's enthalpy wheel recovers a significant amount of energy from exhaust air. This wheel is a rotary counterflow air-to-air device that transfers both sensible and latent heat between air streams. Filtered outdoor air encounters the upper half of the wheel while exhaust air flows through the lower half of the wheel. As the wheel rotates during ventilation, it recovers valuable energy. Except for its rotation, the wheel is a passive device. For more information read Desert Aire's *Technical Bulletin 19 -Energy Recovery Wheel Technology.*

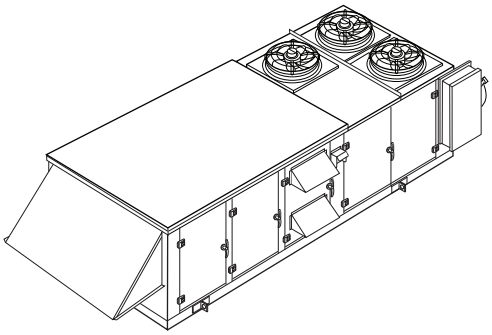
AURA™ Series
AHRI 920 Performance

Ton	MCA 208/3/60	MCA 460/3/60	Footprint (in) L	W	H	Airflow Range (cfm)	Avg. Wt. (lbs.)
8	50 to 100	30 to 60	159	74	50	960 to 3,200	2,500
10	60 to 120	35 to 70	159	74	50	1,200 to 4,000	2,700
12	65 to 135	40 to 70	159	74	50	1,400 to 4,800	2,600
15	80 to 160	40 to 80	159	74	50	1,800 to 6,000	2,800
20	85 to 170	45 to 90	185	106	74	2,400 to 8,000	4,600
25	105 to 210	50 to 110	185	106	74	3,000 to 10,000	4,700
30	120 to 250	55 to 120	185	106	74	3,600 to 12,000	5,100

Aura™ Water Source Heat Pump with Ground Source, Closed Loop

		Dehumidification Conditions (MRE)					Heating Conditions (COP)		
Ton	CFM	A	B	C	D	ISMRE	E	F	ISCOP
8	1,800	5.2	8.0	8.2	5.9	7.2	4.0	3.4	3.9
10	2,040	4.7	7.2	7.4	5.1	6.4	3.7	3.2	3.7
12	2,060	5.0	7.4	7.3	4.9	6.4	3.9	3.4	3.8
15	2,800	5.2	7.7	7.7	5.1	6.7	3.8	3.3	3.8
20	4,170	5.5	8.6	9.0	6.2	7.7	4.1	3.5	4.0
25	4,170	5.6	8.2	7.8	5.2	6.9	3.8	3.3	3.7
30	5,540	6.0	8.4	7.8	3.8	6.6	3.9	3.5	3.8
		ASHRAE 90.1 ISMRE Minimum **4.8**					ASHRAE 90.1 ISCOP Minimum **2.0**		





Aura™ Water Source Heat Pump with Water Source

		Dehumidification Conditions (MRE)					Heating Conditions (COP)		
Ton	CFM	A	B	C	D	ISMRE	E	F	ISCOP
8	1,800	5.2	7.3	8.2	5.9	7.0	6.0	6.2	6.1
10	2,040	4.7	6.6	7.4	5.1	6.3	5.6	5.8	5.6
12	2,060	5.0	6.8	7.3	4.9	6.2	5.8	6.0	5.8
15	2,800	5.2	7.1	7.7	5.1	6.5	5.8	5.9	5.8
20	4,340	5.3	7.7	9.0	6.1	7.5	6.9	6.7	6.9
25	4,330	5.5	7.4	7.9	5.2	6.7	6.1	6.2	6.1
30	5,810	5.8	7.8	7.8	3.6	6.36	5.6	5.7	5.6
		ASHRAE 90.1 ISMRE Minimum **4.0**					ASHRAE 90.1 ISCOP Minimum **3.5**		

Aura™ Water Source Heat Pump with Ground-water Source

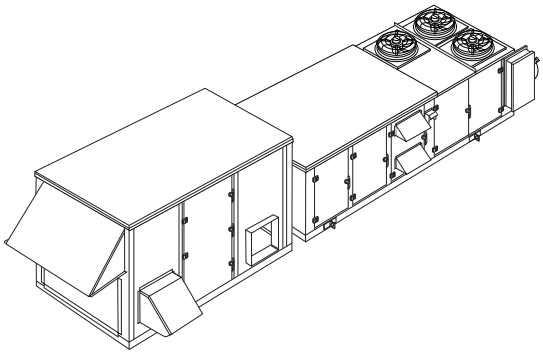
		Dehumidification Conditions (MRE)					Heating Conditions (COP)		
Ton	CFM	A	B	C	D	ISMRE	E	F	ISCOP
8	1,800	6.9	8.7	8.2	5.9	7.5	5.8	4.7	5.7
10	2,210	5.8	7.7	7.6	5.0	6.7	5.4	4.3	5.3
12	2,210	6.1	7.5	7.4	4.9	6.6	5.6	4.5	5.5
15	3,020	6.3	7.8	7.7	5.0	6.8	5.6	4.4	5.5
20	4,500	7.0	9.2	9.0	6.1	8.0	6.4	4.7	6.2
25	4,660	6.8	8.2	8.0	5.1	7.0	5.7	4.4	5.6
30	6,250	7.0	8.6	7.8	3.5	6.6	5.3	4.6	5.2
		ASHRAE 90.1 ISMRE Minimum **5.0**					ASHRAE 90.1 ISCOP Minimum **3.2**		

Aura™ Air-Cooled Packaged

		Dehumidification Conditions (MRE)					Heating Conditions (COP)		
Ton	CFM	A	B	C	D	ISMRE	E	F	ISCOP
8	1,440	4.6	6.3	7.5	5.8	6.4	N/A Air-Cooled System Only		
10	1,630	4.3	5.6	7.1	5.5	6.0			
12	1,900	4.4	5.6	7.1	5.6	6.0			
15	2,180	4.2	5.4	7.1	5.7	6.0			
20	3,340	4.7	5.9	7.6	6.0	6.4			
25	4,250	4.9	5.7	7.7	6.1	6.5			
30	5,150	5.0	6.6	8.0	6.2	6.8			
		ASHRAE 90.1 ISMRE Minimum **4.0**							

	MCA		Footprint (in)				
Ton	208/3/60	460/3/60	L	W	H	Airflow Range (cfm)	Avg. Wt. (lbs.)
8	50 to 75	30 to 45	310	74	72	1,600 to 3,200	4,600
10	60 to 90	35 to 50	310	74	72	2,000 to 4,000	4,600
12	65 to 100	40 to 55	310	74	72	2,400 to 4,800	4,700
15	80 to 120	40 to 60	310	74	72	3,000 to 6,000	4,700
20	85 to 130	45 to 70	332	106	99	4,000 to 8,000	8,100
25	105 to 160	50 to 80	332	106	99	5,000 to 10,000	8,300
30	120 to 185	55 to 90	332	106	99	6,000 to 12,000	8,700

AURA™ Series
AHRI 920 Performance *WITH* Energy Recovery Wheel



Aura™ w/wheel - Water Source Heat Pump with Water Source

		Dehumidification Conditions (MRE)					Heating Conditions (COP)		
Ton	CFM	A	B	C	D	ISMRE	E	F	ISCOP
8	3,200	9.4	10.6	8.2	6.4	8.4	7.9	10.6	8.2
10	3,900	7.3	8.6	7.1	5.1	6.9	7.0	9.3	7.2
12	4,140	8.1	9.2	7.2	5.7	7.3	7.4	10.0	7.6
15	5,500	7.5	8.6	6.5	4.5	6.5	6.2	8.4	6.4
20	8,000	8.8	10.2	8.2	6.0	8.1	8.1	10.8	8.4
25	9,080	8.9	10.0	7.6	5.9	7.8	7.6	10.3	7.9
30	11,310	8.3	9.2	7.0	4.7	7.0	6.2	8.4	6.4
		ASHRAE 90.1 ISMRE Minimum **4.8**					ASHRAE 90.1 ISCOP Minimum **4.8**		

Aura™ w/wheel - Air-Cooled Packaged

		Dehumidification Conditions (MRE)					Heating Conditions (COP)		
Ton	CFM	A	B	C	D	ISMRE	E	F	ISCOP
8	3,200	7.6	9.2	7.6	8.1	8.1	N/A Air-Cooled System Only		
10	3,280	7.2	8.1	6.8	8.3	7.6			
12	3,870	7.4	8.0	6.8	8.1	7.5			
15	4,590	7.0	7.8	6.4	7.1	7.0			
20	6,810	8.0	8.6	7.1	9.6	8.3			
25	8,700	8.0	9.0	6.7	8.2	7.8			
30	10,200	7.7	8.5	6.1	6.8	7.1			
		ASHRAE 90.1 ISMRE Minimum **5.2**							

Aura™ w/wheel - Water Source Heat Pump with Ground Source, Closed Loop

		Dehumidification Conditions (MRE)					Heating Conditions (COP)		
Ton	CFM	A	B	C	D	ISMRE	E	F	ISCOP
8	3,200	9.4	11.3	8.2	6.4	8.5	6.8	8.4	6.9
10	3,900	7.3	9.2	7.1	5.1	7.0	6.0	7.2	6.1
12	4,140	8.1	9.8	7.2	5.7	7.5	6.4	7.9	6.5
15	5,500	7.5	9.1	6.5	4.5	6.6	5.4	6.7	5.5
20	8,000	8.8	10.9	8.2	6.0	8.3	6.7	8.0	6.8
25	9,080	8.9	10.6	7.6	5.9	7.9	6.4	7.9	6.5
30	11,310	8.3	9.6	7.0	4.7	7.1	5.4	6.8	5.6
		ASHRAE 90.1 ISMRE Minimum **5.2**					ASHRAE 90.1 ISCOP Minimum **3.8**		

Aura™ w/wheel - Water Source Heat Pump with Ground-water Source

		Dehumidification Conditions (MRE)					Heating Conditions (COP)		
Ton	CFM	A	B	C	D	ISMRE	E	F	ISCOP
8	3,200	11.5	11.9	8.2	6.4	8.9	7.7	9.7	7.9
10	4,000	8.8	9.7	7.0	5.0	7.2	6.7	8.2	6.9
12	4,350	9.2	9.8	7.0	5.4	7.4	6.4	7.6	6.5
15	5,820	8.2	8.6	6.1	4.0	6.3	5.1	6.3	5.2
20	8,000	11.0	11.6	8.2	6.0	8.7	7.0	8.1	7.1
25	9,570	10.0	10.5	7.3	5.5	7.8	6.3	7.6	6.5
30	11,880	9.1	9.5	6.7	4.3	6.9	5.4	6.4	5.5
		ASHRAE 90.1 ISMRE Minimum **5.8**					ASHRAE 90.1 ISCOP Minimum **4.0**		

TOTALAIRE™
by Desert Aire

TotalAire™ Series

Desert Aire's TotalAire™ Series DX-DOAS system provides six major option configurations to choose from:

- Air-Cooled Packaged
- Air-Cooled Packaged with Enthalpy Wheel
- Air-Cooled Split
- Air-Cooled Split with Enthalpy Wheel
- Water-Cooled Heat Pump
- Water-Cooled Heat Pump with Enthalpy Wheel
- Water-Cooled Tower/Chiller
- Water-Cooled Tower/Chiller with Enthalpy Wheel

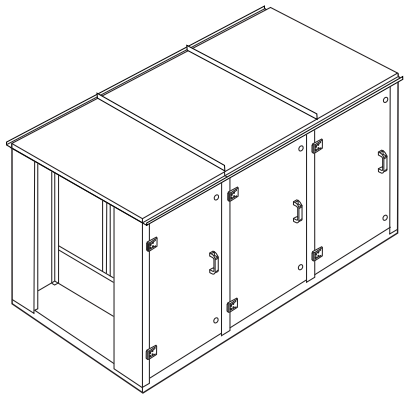
The TotalAire™ Series features a double wall construction cabinet with a powder coated galvanneal steel outer wall and a sturdy galvanized inner panel. Hinged access doors shall allow easy access to internal components within each section. Each door shall have a minimum of two cam latches. Weatherproof compression gaskets shall seal between the door and unit casing to produce an airtight seal. The unit is designed for complete access for service and maintenance from one side only. Outdoor cabinets include a rain hood and isolation dampers with actuator and have a fully weatherproof roof with a cross broken roof for water drainage.

TotalAire™ Series
AHRI 920 Performance

Ton	MCA 208/3/60	MCA 460/3/60	Footprint (in) L	W	H	Airflow Range (cfm)	Avg. Wt. (lbs.)
2	25 to 40	15 to 22	103	44	44	250 to 650	1,200
3	30 to 50	17 to 28	103	44	44	400 to 1,000	1,200
5	35 to 60	20 to 33	103	44	44	550 to 1,600	1,400
8	55 to 85	30 to 45	130	56	49	850 to 2,200	2,300
10	65 to 160	35 to 55	130	56	49	1,150 to 3,000	2,800
15	85 to 160	45 to 90	130	56	49	1,650 to 4,200	3,400
20	110 to 170	60 to 95	139	61	53	2,500 to 2,800	3,900
25	130 to 210	70 to 115	145	68	64	3,100 to 7,600	4,600
30	140 to 250	75 to 135	145	68	64	3,800 to 9,000	4,800
36	145 to 270	80 to 150	154	79	76	4,700 to 10,000	5,500
40	165 to 300	90 to 165	154	79	76	5,500 to 12,000	6,000
46	233 to 370	130 to 200	154	79	76	6,100 to 12,000	6,300
50	245 to 390	135 to 215	166	94	84	6,700 to 15,000	6,500
56	255 to 410	140 to 225	166	94	84	7,700 to 16,000	7,000
60	275 to 430	150 to 235	166	94	84	8,500 to 18,000	7,500

TotalAire™ Water Source Heat Pump with Ground Source, Closed Loop

Ton	CFM	Dehumidification Conditions (MRE) A	B	C	D	ISMRE	Heating Conditions (COP) E	F	ISCOP
2	410	5.3	6.1	6.1	4.4	5.6	2.8	1.2	2.4
3	655	6.1	7.1	6.9	5.0	6.4	3.2	1.5	2.8
5	1,130	6.1	7.1	6.9	5.2	6.5	3.3	1.5	2.9
8	1,650	6.1	7.3	6.9	5.3	6.5	3.4	1.6	3.0
10	2,020	6.0	7.0	6.1	4.7	6.0	3.1	1.6	2.8
15	2,900	5.7	6.8	6.0	4.6	5.8	3.2	1.7	2.9
20	3,940	6.1	7.2	6.4	5.1	6.3	3.4	1.8	3.0
25	5,200	6.2	7.2	6.7	5.1	6.4	3.4	1.6	3.0
30	6,060	6.0	7.1	6.4	4.9	6.2	3.4	1.6	3.0
36	6,700	6.0	7.1	6.4	5.1	6.2	3.2	1.8	2.8
40	8,140	6.1	7.3	6.4	4.9	6.2	3.1	1.6	2.8
46	9,050	6.0	7.1	6.3	4.9	6.2	3.1	1.6	2.8
50	9,980	5.8	6.9	6.1	4.8	6.0	3.1	1.7	2.7
56	10,360	5.5	6.5	5.7	4.7	5.6	3.0	1.9	2.8
60	11,690	5.6	6.6	5.7	4.5	5.7	2.9	1.7	2.7
						ASHRAE 90.1 ISMRE Minimum 4.8			ASHRAE 90.1 ISCOP Minimum 2.0



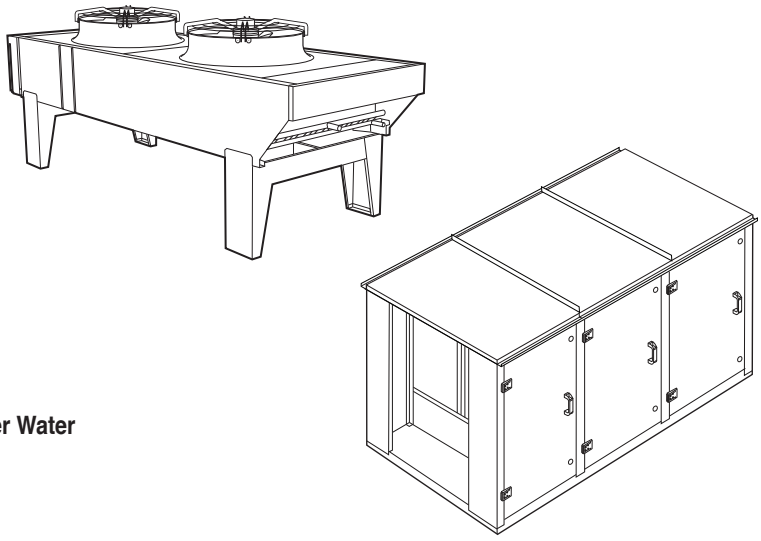
TotalAire™ Water Source Heat Pump with Water Source

Ton	CFM	Dehumidification Conditions (MRE) A	B	C	D	ISMRE	Heating Conditions (COP) E	F	ISCOP
2	410	5.3	5.8	6.1	4.4	5.5	5.1	4.7	5.0
3	655	6.1	6.6	6.9	5.0	6.2	5.8	5.3	5.7
5	1,130	6.1	6.7	6.9	5.2	6.3	5.7	5.3	5.6
8	1,650	6.1	6.7	6.9	5.3	6.3	6.2	5.6	6.0
10	2,020	6.0	6.5	6.1	4.7	5.9	5.7	5.2	5.6
15	2,900	5.7	6.3	6.0	4.6	5.7	5.6	5.1	5.5
20	3,940	6.1	6.6	6.4	5.1	6.1	5.6	5.3	5.6
25	5,200	6.2	6.8	6.7	5.1	6.3	5.6	5.3	5.6
30	6,060	6.0	6.7	6.4	4.9	6.1	5.4	5.1	5.3
36	6,700	6.0	6.6	6.4	5.1	6.1	5.4	5.4	5.4
40	8,140	6.1	6.7	6.4	4.9	6.1	5.1	5.2	5.1
46	9,050	6.0	6.6	6.3	4.9	6.0	5.3	5.2	5.3
50	9,980	5.8	6.4	6.1	4.8	5.8	5.1	5.1	5.1
56	10,360	5.5	6.0	5.7	4.7	5.5	4.9	4.9	4.9
60	11,690	5.6	6.2	5.7	4.5	5.5	4.7	4.8	4.7
						ASHRAE 90.1 ISMRE Minimum 4.0			ASHRAE 90.1 ISCOP Minimum 3.5

TotalAire™ Water Source Heat Pump with Ground-water Source

Ton	CFM	Dehumidification Conditions (MRE) A	B	C	D	ISMRE	Heating Conditions (COP) E	F	ISCOP
2	415	6.2	6.8	6.1	4.5	5.9	4.7	3.4	4.4
3	695	7.4	8.0	7.0	5.1	6.9	5.3	3.7	4.9
5	1,185	7.2	7.8	7.0	5.2	6.8	5.2	3.8	4.9
8	1,880	8.0	8.8	6.8	5.1	7.1	5.5	3.0	4.9
10	2,280	7.6	8.2	6.2	4.7	6.6	5.1	3.2	4.7
15	3,320	7.2	7.9	5.9	4.5	6.3	5.0	3.3	4.6
20	4,360	7.5	8.2	6.3	4.9	6.6	5.2	3.8	4.9
25	5,370	7.1	7.8	6.7	5.1	6.7	5.2	3.9	4.9
30	6,340	6.9	7.7	6.4	4.9	6.4	5.0	3.8	4.8
36	7,560	7.5	8.3	6.3	4.9	6.6	4.8	3.5	4.5
40	8,940	7.6	8.3	6.6	5.0	6.8	4.8	3.5	4.5
46	10,160	7.4	8.2	6.2	4.8	6.6	4.7	3.2	4.4
50	11,390	7.2	7.9	6.0	4.7	6.3	4.6	3.2	4.3
56	11,680	6.7	7.4	5.6	4.5	6.0	4.4	3.6	4.2
60	13,070	6.7	7.5	5.6	4.3	5.9	4.3	3.5	4.1
						ASHRAE 90.1 ISMRE Minimum 5.0			ASHRAE 90.1 ISCOP Minimum 3.2

TOTALAIRE™ Series AHRI 920 Performance



TotalAire™ Air-Cooled Split

		Dehumidification Conditions (MRE)				
Ton	CFM	A	B	C	D	ISMRE
2	365	4.8	6.8	7.8	5.6	6.6
3	585	5.4	7.9	8.9	6.2	7.5
5	1,010	5.6	7.9	8.9	6.4	7.6
8	1,490	5.3	8.0	10.2	8.0	8.5
10	1,820	5.5	8.0	9.5	7.4	8.1
15	2,620	5.4	7.8	9.7	7.8	8.2
20	3,580	5.7	8.3	9.8	8.0	8.4
25	4,690	5.8	8.1	10.3	8.2	8.6
30	5,510	5.8	8.1	9.9	7.9	8.4
36	6,110	5.7	8.3	10.5	8.6	8.9
40	7,400	5.9	8.5	10.4	8.3	8.8
46	8,210	5.6	8.2	9.7	7.8	8.3
50	9,020	5.6	8.1	10.1	8.3	8.6
56	9,420	5.4	7.8	9.6	8.1	8.3
60	10,650	5.6	8.0	9.5	7.9	8.2
		ASHRAE 90.1 ISMRE Minimum				**4.0**

TotalAire™ Water-Cooled using Cooler Tower Condenser Water

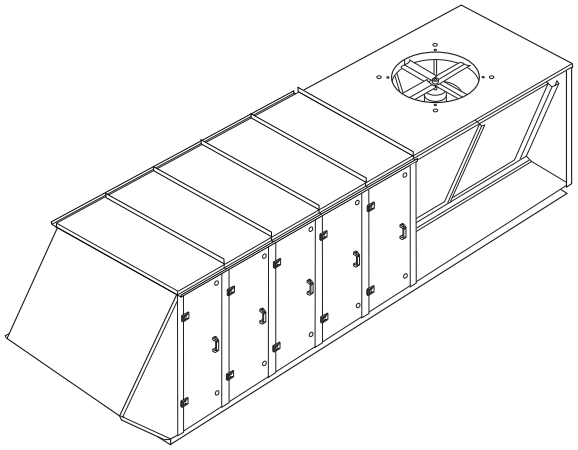
		Dehumidification Conditions (MRE)				
Ton	CFM	A	B	C	D	ISMRE
2	410	5.4	6.2	6.4	4.7	5.8
3	655	6.2	7.2	7.3	5.3	6.7
5	1,130	6.2	7.2	7.3	5.4	6.7
8	1,650	6.2	7.4	7.5	5.7	6.9
10	2,020	6.1	7.1	6.6	5.1	6.3
15	2,900	5.9	7.0	6.6	5.2	6.3
20	3,940	6.3	7.4	7.1	5.7	6.8
25	5,200	6.4	7.4	7.4	5.7	6.9
30	6,060	6.2	7.4	7.2	5.5	6.7
36	6,700	6.2	7.4	7.2	5.7	6.8
40	8,140	6.4	7.6	7.1	5.5	6.8
46	9,050	6.2	7.4	7.1	5.6	6.7
50	9,980	6.0	7.1	6.8	5.4	6.5
56	10,360	5.7	6.8	6.5	5.3	6.2
60	11,690	5.9	7.0	6.6	5.2	6.3
		ASHRAE 90.1 ISMRE Minimum				**4.9**

TotalAire™ Water-Cooled using Chilled Water

		Dehumidification Conditions (MRE)				
Ton	CFM	A	B	C	D	ISMRE
2	415	6.7	7.3	6.5	4.8	6.3
3	695	7.9	8.5	7.5	5.4	7.3
5	1,185	7.5	8.2	7.4	5.5	7.2
8	1,880	8.8	9.5	7.5	5.8	7.8
10	2,280	8.2	8.7	6.8	5.1	7.1
15	3,320	7.9	8.6	6.6	5.0	6.9
20	4,360	8.1	9.0	7.1	5.5	7.4
25	5,370	7.6	8.4	7.5	5.7	7.3
30	6,340	7.4	8.2	7.1	5.5	7.1
36	7,560	8.3	9.2	7.1	5.5	7.4
40	8,940	8.2	8.9	7.4	5.6	7.5
46	10,160	8.1	8.8	7.0	5.4	7.3
50	11,390	7.9	8.6	6.9	5.3	7.1
56	11,680	7.4	8.2	6.4	5.1	6.7
60	13,070	7.4	8.2	6.4	4.9	6.7
		ASHRAE 90.1 ISMRE Minimum				**6.0**

TotalAire™ Air-Cooled Packaged

		Dehumidification Conditions (MRE)				
Ton	CFM	A	B	C	D	ISMRE
2	365	4.0	5.6	6.0	4.4	5.3
3	585	4.8	6.8	7.4	5.2	6.4
5	1,010	4.8	6.7	7.2	5.1	6.3
8	1,490	4.6	6.8	7.1	5.6	6.4
10	1,820	5.1	7.3	7.7	6.1	6.9
15	2,620	4.9	6.9	7.4	6.0	6.6
20	3,580	5.0	7.2	7.2	5.9	6.6
25	4,690	5.2	7.2	8.0	6.3	7.1
30	5,510	5.2	7.1	7.5	6.0	6.7
		ASHRAE 90.1 ISMRE Minimum				**4.0**

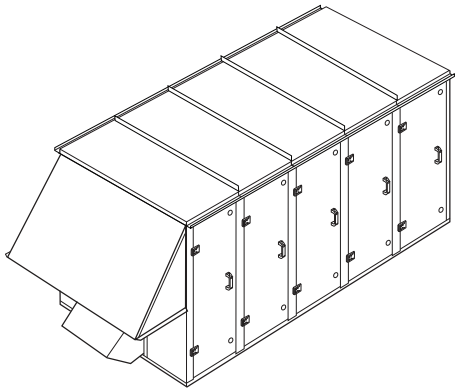


TotalAire™ Series
AHRI 920 Performance *WITH* Energy Recovery Wheel

Ton	MCA 208/3/60	MCA 460/3/60	Footprint (in) L	W	H	Airflow Range (cfm)	Avg. Wt., (lbs.)
2	20 to 30	12 to 18	49	124	50	550 to 1,250	1,800
3	25 to 40	13 to 20	49	124	50	900 to 1,750	1,900
5	40 to 55	20 to 30	130	60	55	1,500 to 3,000	2,300
8	60 to 75	30 to 40	138	68	64	2,000 to 4,100	3,400
10	70 to 110	35 to 55	141	79	76	2,700 to 5,400	5,000
15	100 to 130	50 to 65	154	94	84	3,900 to 8,000	6,700
20	130 to 170	65 to 85	165	97	93	5,500 to 10,800	7,500
25	160 to 215	80 to 110	165	97	93	6,800 to 12,500	10,000
30	190 to 250	95 to 125	165	97	93	6,800 to 12,500	11,000

TotalAire™ Water Source Heat Pump with Ground Source, Closed Loop

Ton	CFM	Dehumidification Conditions (MRE) A	B	C	D	ISMRE	Heating Conditions (COP) E	F	ISCOP
2	965	10.4	10.3	8.3	4.5	8.2	5.5	6.9	5.8
3	1,360	9.8	9.8	8.1	4.9	8.0	5.1	6.1	5.3
5	2,340	10.0	10.0	8.1	4.9	8.1	5.3	6.5	5.6
8	3,390	10.0	10.0	8.5	3.1	7.8	5.8	6.4	5.9
10	4,100	10.0	10.0	8.2	3.0	7.6	5.7	6.2	5.8
15	5,970	9.3	9.3	7.6	2.6	7.1	5.4	5.1	5.3
20	8,460	10.6	10.6	8.7	3.2	8.2	6.2	6.9	6.4
25	10,350	9.7	9.6	7.5	3.2	7.3	5.5	6.2	5.7
30	12,950	9.2	9.1	7.3	2.5	6.9	5.0	5.9	5.2
		ASHRAE 90.1 ISMRE Minimum **5.2**					ASHRAE 90.1 ISCOP Minimum **3.8**		



TotalAire™ Water Source Heat Pump with Water Source

Ton	CFM	Dehumidification Conditions (MRE) A	B	C	D	ISMRE	Heating Conditions (COP) E	F	ISCOP
2	965	10.4	9.7	8.3	4.5	8.0	7.2	8.7	7.6
3	1,360	9.8	9.2	8.1	4.9	7.8	7.1	8.2	7.4
5	2,340	10.0	9.4	8.1	4.9	7.9	7.0	8.2	7.3
8	3,390	10.0	9.5	8.5	3.1	7.6	7.4	8.6	7.6
10	4,100	10.0	9.4	8.2	3.0	7.5	7.3	8.4	7.6
15	5,970	9.3	8.8	7.6	2.6	6.9	6.6	8.3	7.0
20	8,460	10.6	10.0	8.7	3.2	8.0	7.5	8.6	7.7
25	10,350	9.7	9.3	7.5	3.2	7.2	6.7	7.8	6.9
30	12,950	9.2	8.7	7.3	2.5	6.8	5.9	7.3	6.2
		ASHRAE 90.1 ISMRE Minimum **4.8**					ASHRAE 90.1 ISCOP Minimum **4.8**		

TotalAire™ Water Source Heat Pump with Ground-water Source

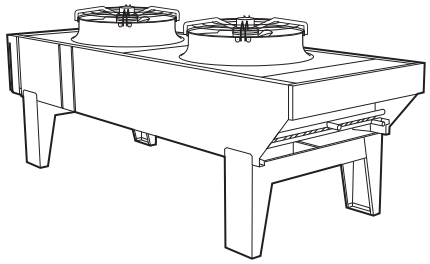
Ton	CFM	Dehumidification Conditions (MRE) A	B	C	D	ISMRE	Heating Conditions (COP) E	F	ISCOP
2	1,070	12.4	11.6	8.2	4.3	8.7	6.9	7.7	7.1
3	1,480	11.2	10.6	7.7	4.6	8.2	6.5	6.8	6.6
5	2,540	11.3	10.6	7.8	4.7	8.2	6.5	7.1	6.6
8	3,680	11.6	11.1	8.2	2.7	8.1	6.7	7.1	6.8
10	4,420	11.5	11.0	8.0	2.7	8.0	6.8	7.0	6.9
15	6,490	10.2	9.6	7.1	2.4	7.1	5.8	6.4	5.9
20	9,050	12.1	11.5	8.4	2.9	8.4	7.0	7.5	7.1
25	10,350	10.6	10.2	7.5	3.2	7.6	6.5	6.9	6.6
30	13,840	9.9	9.4	7.0	2.3	6.9	5.4	6.3	5.6
		ASHRAE 90.1 ISMRE Minimum **5.8**					ASHRAE 90.1 ISCOP Minimum **4.0**		

TOTALAIRE™ Series

AHRI 920 Performance

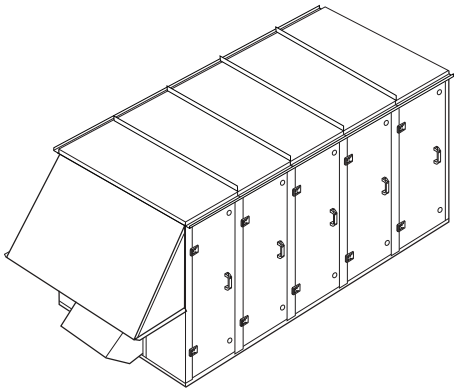
TotalAire™ Air-Cooled Split

		Dehumidification Conditions (MRE)					Heating Conditions (COP)		
Ton	CFM	A	B	C	D	ISMRE	E	F	ISCOP
2	895	10.0	11.7	10.7	6.0	9.8	N/A Air-Cooled System		
3	1,275	9.5	11.1	11.0	6.9	9.9			
5	2,200	9.8	11.3	10.8	6.8	9.9			
8	3,190	9.5	11.5	11.9	4.9	9.8			
10	3,850	9.8	11.3	11.0	4.5	9.4			
15	5,620	9.2	10.5	10.3	4.0	8.7			
20	7,960	10.5	12.2	11.3	4.7	9.9			
25	9,860	9.7	10.8	9.3	4.8	8.7			
30	12,230	9.3	10.5	9.0	3.6	8.1			
		ASHRAE 90.1 ISMRE Minimum **5.2**					ASHRAE 90.1 ISCOP Minimum		



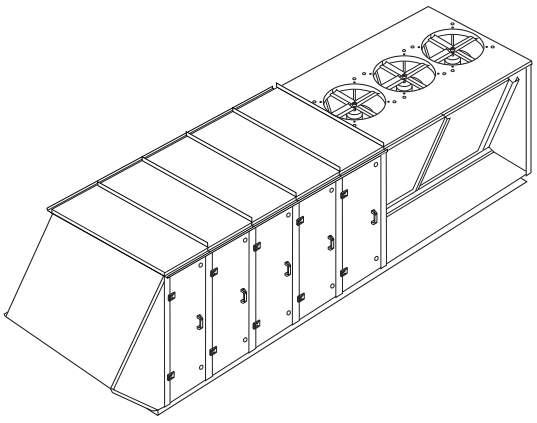
TotalAire™ Water-Cooled using Cooler Tower Condenser Water

		Dehumidification Conditions (MRE)					Heating Conditions (COP)		
Ton	CFM	A	B	C	D	ISMRE	E	F	ISCOP
2	965	10.5	10.5	8.7	4.8	8.5	N/A Air-Cooled System		
3	1,360	9.9	10.0	8.5	5.2	8.3			
5	2,340	10.1	10.1	8.6	5.2	8.4			
8	3,390	10.1	10.2	9.1	3.4	8.2			
10	4,100	10.1	10.1	8.6	3.2	7.9			
15	5,970	9.5	9.5	8.1	2.9	7.4			
20	8,460	10.9	11.0	9.3	3.4	8.6			
25	10,350	9.9	9.8	7.9	3.4	7.6			
30	12,950	9.4	9.4	7.7	2.8	7.2			
		ASHRAE 90.1 ISMRE Minimum **5.3**					ASHRAE 90.1 ISCOP Minimum		



TotalAire™ Water-Cooled using Chilled Water

		Dehumidification Conditions (MRE)					Heating Conditions (COP)		
Ton	CFM	A	B	C	D	ISMRE	E	F	ISCOP
2	1,070	13.1	12.3	8.6	4.5	9.2	N/A Air-Cooled System		
3	1,480	11.8	11.1	8.3	4.9	8.7			
5	2,540	11.8	11.1	8.2	4.9	8.7			
8	3,680	12.3	11.7	8.7	3.0	8.6			
10	4,420	12.2	11.6	8.5	2.9	8.4			
15	6,490	10.8	10.3	7.6	2.5	7.5			
20	9,050	13.3	12.8	9.4	3.5	9.4			
25	10,350	11.1	10.7	7.9	3.4	8.0			
30	13,840	10.4	9.9	7.4	2.4	7.2			
		ASHRAE 90.1 ISMRE Minimum **6.6**					ASHRAE 90.1 ISCOP Minimum		



TotalAire™ Air-Cooled Packaged

		Dehumidification Conditions (MRE)					Heating Conditions (COP)		
Ton	CFM	A	B	C	D	ISMRE	E	F	ISCOP
2	895	8.6	9.9	8.8	4.9	8.1	N/A Air-Cooled System		
3	1,275	8.6	9.9	9.6	6.0	8.7			
5	2,200	9.2	10.6	10.0	6.3	9.2			
8	3,190	8.8	10.4	10.5	4.1	8.8			
10	3,850	9.1	10.5	10.0	3.9	8.6			
15	5,620	8.4	9.5	9.2	3.4	7.8			
20	7,960	9.4	10.8	9.8	3.9	8.6			
25	9,860	8.3	9.1	7.6	3.6	7.2			
30	12,230	8.3	9.2	7.7	2.9	7.0			
		ASHRAE 90.1 ISMRE Minimum **5.2**					ASHRAE 90.1 ISCOP Minimum		

VERTICALAIRE™
by Desert Aire

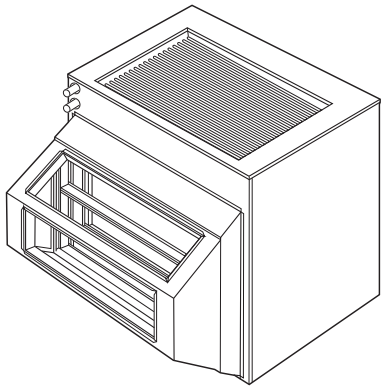
VerticalAire™ Series

Desert Aire's VerticalAire™ Series DX-DOAS system provides two major option configurations to choose from:

- Air-Cooled Split
- Water-Cooled Heat Pump
- Water-Cooled Tower/Chiller

The VerticalAire™ Series has a compact cabinet design that provides flexibility in locating the unit in a wide variety of indoor locations. It features a double walled steel construction cabinet design with galvanized outer and inner panels for the 20 to 30 ton systems. Our smaller VerticalAire™ systems are normally installed in close proximity to the room being conditioned, so these systems have their compressors in a separate section and avoids propagating noise through the duct work.

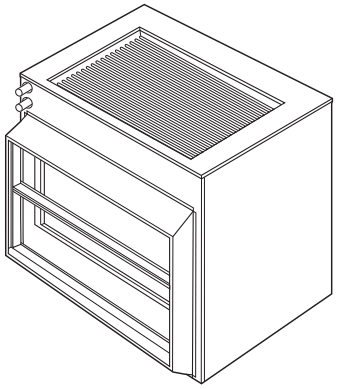
VERTICALAIRE™ Series
AHRI 920 Performance Heat Pump



	MCA		Footprint (in)				
Ton	208/3/60	460/3/60	L	W	H	Airflow Range (cfm)	Avg. Wt., (lbs.)
04	30 to 60	15 to 30	35	39	60	550 to 1,600	700
05	35 to 70	17 to 35	35	39	60	550 to 1,700	735
08	40 to 85	20 to 45	46	42	80	850 to 2,250	1,050
10	50 to 105	25 to 55	46	42	80	1,150 to 3,000	1,100
15	70 to 140	35 to 75	46	42	80	1,650 to 4,250	1,600
20	85 to 170	45 to 90	78	64	70	2,550 to 6,000	2,900
25	125 to 230	55 to 110	78	64	70	3,100 to 7,500	3,100
30	140 to 260	65 to 120	78	64	70	3,750 to 8,300	3,200

VerticalAire™ Water Source Heat Pump with Water Source

		Dehumidification Conditions (MRE)					Heating Conditions (COP)		
Ton	CFM	A	B	C	D	ISMRE	E	F	ISCOP
4	930	6.1	6.7	6.9	5.1	6.3	5.8	5.4	5.7
5	1,130	6.2	6.8	7.0	5.2	6.4	5.7	5.3	5.6
8	1,650	6.1	6.6	6.6	5.2	6.2	6.1	5.6	6.0
10	2,020	6.0	6.5	6.1	4.7	5.8	5.7	5.2	5.6
15	2,900	5.7	6.2	5.9	4.6	5.6	5.5	5.1	5.4
20	4,080	6.2	6.8	6.5	5.1	6.2	5.6	5.2	5.5
25	5,110	5.9	6.5	6.3	4.8	6.0	5.5	5.1	5.4
30	5,880	5.7	6.3	5.9	4.7	5.7	5.2	4.9	5.1
		ASHRAE 90.1 ISMRE Minimum **4.8**					ASHRAE 90.1 ISCOP Minimum **2.0**		



VerticalAire™ Water Source Heat Pump with Ground Source, Closed Loop

		Dehumidification Conditions (MRE)					Heating Conditions (COP)		
Ton	CFM	A	B	C	D	ISMRE	E	F	ISCOP
4	930	6.1	7.0	6.9	5.1	6.4	3.2	1.4	2.8
5	1,130	6.2	7.2	7.0	5.2	6.6	3.4	1.6	3.0
8	1,650	6.1	7.3	6.6	5.2	6.4	3.4	1.6	3.0
10	2,020	6.0	7.0	6.1	4.7	6.0	3.1	1.6	2.8
15	2,900	5.7	6.7	5.9	4.6	5.8	3.2	1.7	2.9
20	4,080	6.2	7.4	6.5	5.1	6.4	3.4	1.6	3.0
25	5,110	5.9	7.1	6.3	4.8	6.1	3.3	1.6	2.9
30	5,880	5.7	6.8	5.9	4.7	5.8	3.3	1.7	2.9
		ASHRAE 90.1 ISMRE Minimum **4.8**					ASHRAE 90.1 ISCOP Minimum **2.0**		

VerticalAire™ Water Source Heat Pump with Ground-water Source

		Dehumidification Conditions (MRE)					Heating Conditions (COP)		
Ton	CFM	A	B	C	D	ISMRE	E	F	ISCOP
4	935	7.2	7.8	6.9	5.1	6.8	5.4	3.8	5.0
5	1,185	7.3	8.0	7.2	5.3	7.0	5.3	3.9	5.0
8	1,880	8.0	8.7	6.8	5.1	7.1	5.5	3.0	4.9
10	2,280	7.6	8.2	6.2	4.6	6.5	5.1	3.1	4.7
15	3,320	7.2	7.9	5.9	4.4	6.2	5.0	3.3	4.6
20	4,430	7.6	8.2	6.5	5.1	6.8	5.2	3.7	4.8
25	5,590	7.1	7.8	6.2	4.8	6.4	5.0	3.5	4.7
30	6,580	6.8	7.6	5.8	4.4	6.1	4.8	3.4	4.4
		ASHRAE 90.1 ISMRE Minimum **4.8**					ASHRAE 90.1 ISCOP Minimum **2.0**		

VERTICALAIRE™ Series
AHRI 920 Performance

VerticalAire™ Air-Cooled Split

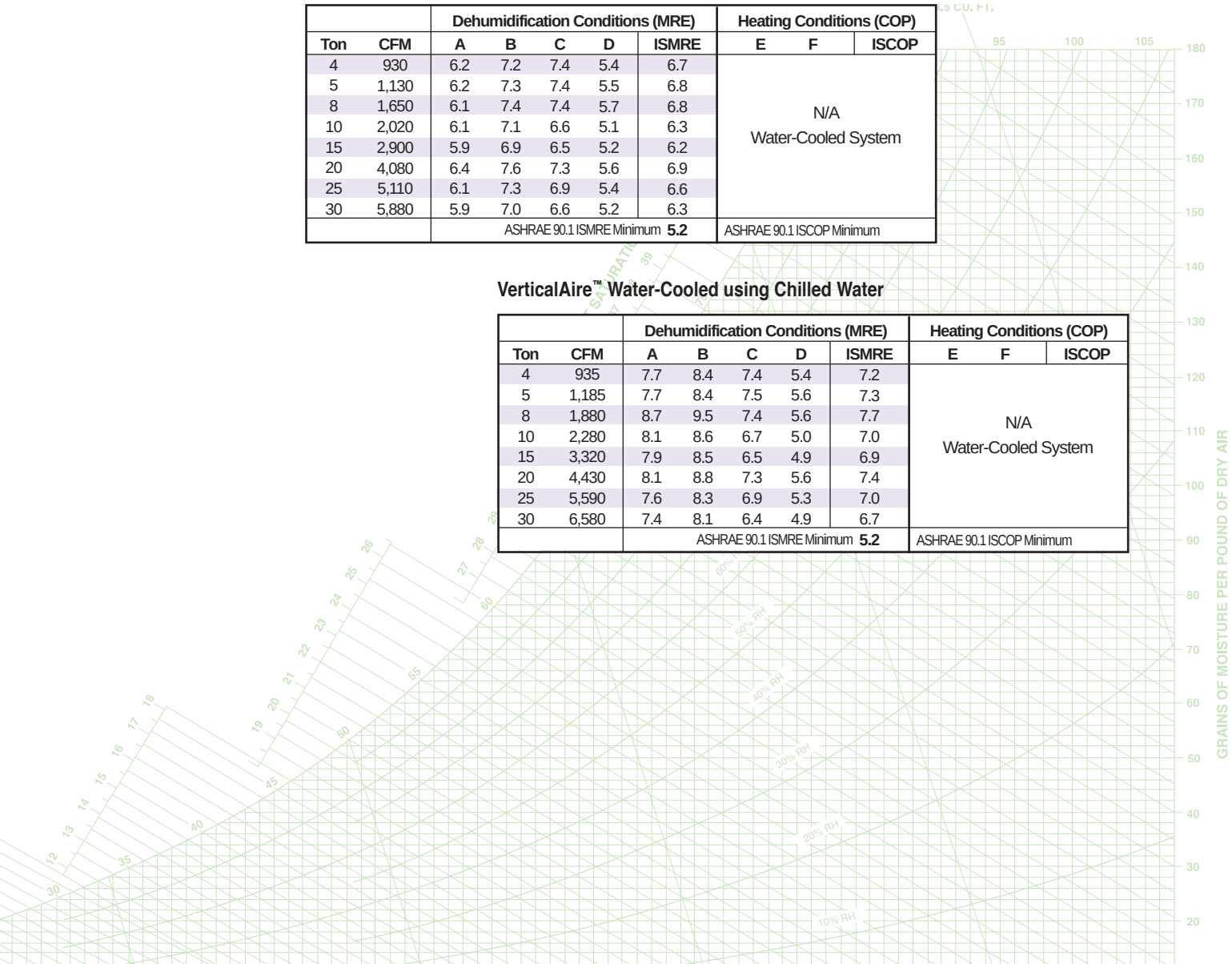
		Dehumidification Conditions (MRE)					Heating Conditions (COP)		
Ton	CFM	A	B	C	D	ISMRE	E	F	ISCOP
4	835	5.6	8.0	9.4	6.7	7.9	N/A Air-Cooled System		
5	1,010	5.6	8.0	9.0	6.4	7.7			
8	1,490	5.4	8.2	10.8	8.6	8.9			
10	1,820	5.5	8.0	9.4	7.4	8.0			
15	2,620	5.3	7.7	9.3	7.5	7.9			
20	3,700	5.8	8.4	9.9	7.9	8.5			
25	4,610	5.6	8.0	9.6	7.7	8.2			
30	5,340	5.5	7.9	9.0	7.4	7.9			
		ASHRAE 90.1 ISMRE Minimum **5.2**					ASHRAE 90.1 ISCOP Minimum		

VerticalAire™ Water-Cooled using Cooling Tower Condenser Water

		Dehumidification Conditions (MRE)					Heating Conditions (COP)		
Ton	CFM	A	B	C	D	ISMRE	E	F	ISCOP
4	930	6.2	7.2	7.4	5.4	6.7	N/A Water-Cooled System		
5	1,130	6.2	7.3	7.4	5.5	6.8			
8	1,650	6.1	7.4	7.4	5.7	6.8			
10	2,020	6.1	7.1	6.6	5.1	6.3			
15	2,900	5.9	6.9	6.5	5.2	6.2			
20	4,080	6.4	7.6	7.3	5.6	6.9			
25	5,110	6.1	7.3	6.9	5.4	6.6			
30	5,880	5.9	7.0	6.6	5.2	6.3			
		ASHRAE 90.1 ISMRE Minimum **5.2**					ASHRAE 90.1 ISCOP Minimum		

VerticalAire™ Water-Cooled using Chilled Water

		Dehumidification Conditions (MRE)					Heating Conditions (COP)		
Ton	CFM	A	B	C	D	ISMRE	E	F	ISCOP
4	935	7.7	8.4	7.4	5.4	7.2	N/A Water-Cooled System		
5	1,185	7.7	8.4	7.5	5.6	7.3			
8	1,880	8.7	9.5	7.4	5.6	7.7			
10	2,280	8.1	8.6	6.7	5.0	7.0			
15	3,320	7.9	8.5	6.5	4.9	6.9			
20	4,430	8.1	8.8	7.3	5.6	7.4			
25	5,590	7.6	8.3	6.9	5.3	7.0			
30	6,580	7.4	8.1	6.4	4.9	6.7			
		ASHRAE 90.1 ISMRE Minimum **5.2**					ASHRAE 90.1 ISCOP Minimum		



Conclusion

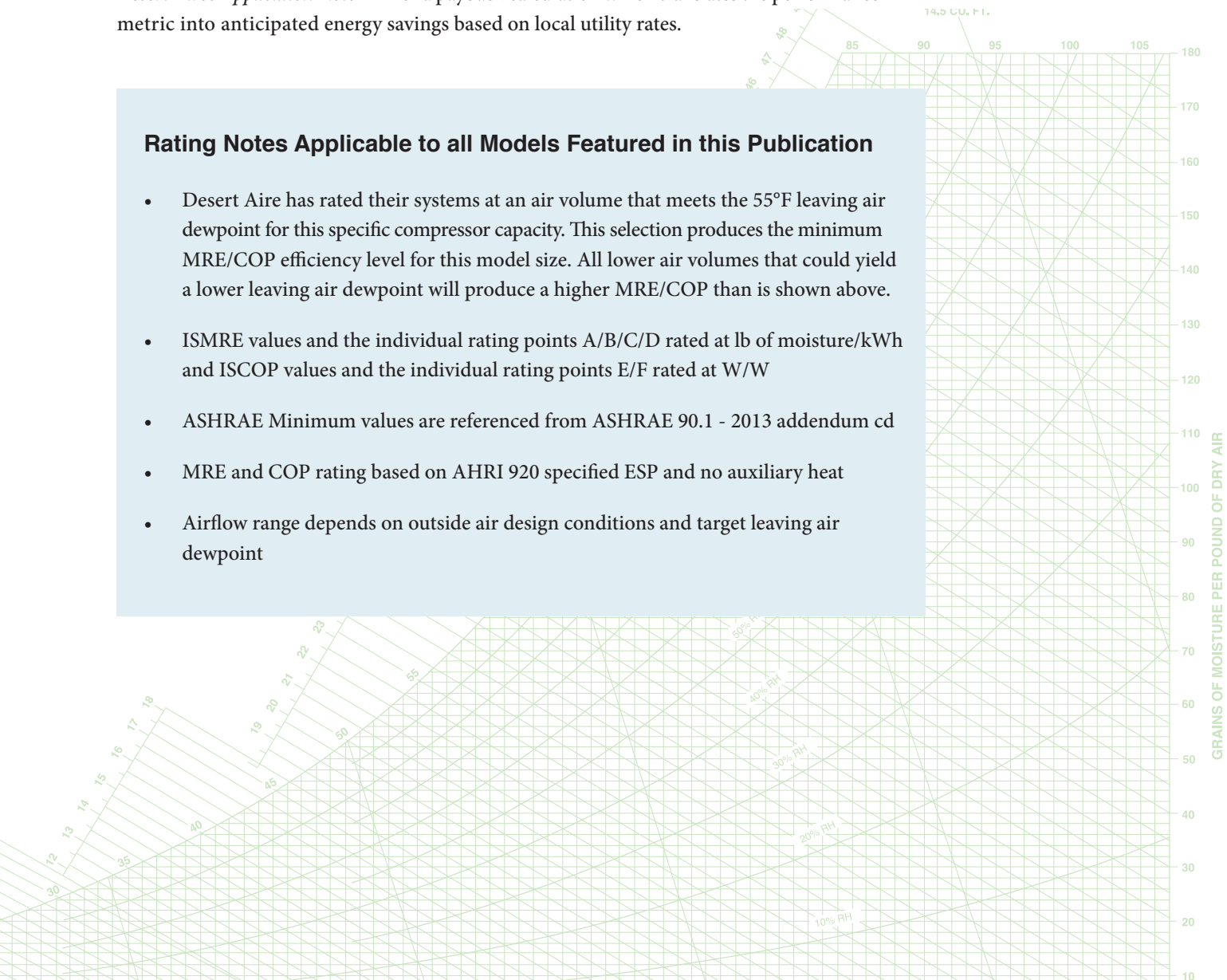
The introduction of ventilation air is required by local and national building codes. However, just delivering the air does not eliminate indoor air quality problems. The air must be conditioned to avoid impacting the performance of the internal heating and cooling equipment and to avoid the introduction of moisture into the space.

DOAS units operate in many different climates and can be selected with a wide variety of designs and condensing options. This makes it difficult to compare the energy efficiency of treating outside air from one design to another or from one manufacturer to another manufacturer. However, this is extremely important as the process of treating outside air to improve indoor air quality is energy intensive. The AHRI920 standard is a tool that can be used to compare the energy efficiency of different manufacturers' offerings to optimize the energy consumption for the end user.

In addition, ASHRAE has established minimum energy efficiency rating values for DOAS units. This provides the designer with a single metric value which can be added to the scope of work and specification in order to assure the performance of the DOAS unit. Refer to *Desert Aire's Application Note #24* for a payback calculation which translates the performance metric into anticipated energy savings based on local utility rates.

Rating Notes Applicable to all Models Featured in this Publication

- Desert Aire has rated their systems at an air volume that meets the 55°F leaving air dewpoint for this specific compressor capacity. This selection produces the minimum MRE/COP efficiency level for this model size. All lower air volumes that could yield a lower leaving air dewpoint will produce a higher MRE/COP than is shown above.
- ISMRE values and the individual rating points A/B/C/D rated at lb of moisture/kWh and ISCOP values and the individual rating points E/F rated at W/W
- ASHRAE Minimum values are referenced from ASHRAE 90.1 - 2013 addendum cd
- MRE and COP rating based on AHRI 920 specified ESP and no auxiliary heat
- Airflow range depends on outside air design conditions and target leaving air dewpoint



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