

# DN SERIES DOAS

### DEDICATED OUTDOOR AIR SYSTEMS AVAILABLE WITH PACKAGED REFRIGERATION & ENERGY RECOVERY



- DOAS units with static-plate total energy recovery
- 375-4,950 CFM
- Single-point connection, direct-drive EC fans, foam-injected panels
- Modular design
- · Low dew point supply air
- Indoor/Outdoor (outdoor available with Packaged Refrigeration)



# FOR EVERY APPLICATION

# **DN SERIES:** DEDICATED OUTDOOR AIR SYSTEMS WITH ENERGY RECOVERY

### DOAS: DECOUPLE OUTDOOR AND INDOOR AIR LOADS

Commercial buildings require outside air whenever a space is occupied to meet ventilation standards and maintain indoor air quality (IAQ). Incoming ventilation and make-up air typically account for more than 80% of a building's dehumidification load (ASHRAE).

Decoupling outdoor and indoor air load demand allows each system to operate independently and in parallel, which reduces ventilation energy use. This is possible via Dedicated Outdoor Air Systems (DOAS) that efficiently bring dehumidified outdoor air indoors to improve IAQ and thermal comfort



#### DEDICATED OUTDOOR AIR SYSTEM

### OPTIMIZE OPERATIONAL EFFICIENCY WITH DOAS

A DOAS uses separate equipment to condition the outdoor air brought indoors for ventilation, and then delivers the air to each occupied space. This is done either directly or in conjunction with terminal or central HVAC units serving those same areas, which maintain space temperature. This process optimizes operational efficiency.

### BENEFITS OF DOAS

There are many reasons to use DOAS, including some of the most common drivers:

- Improved humidity control
- Reduced energy consumption
- · Decreased installation and energy costs
- · Simplified ventilation design and control
- Maximized operational efficiency
- Ability to use heating and cooling systems that do not provide ventilation and/or dehumidification (e.g., radiant panels, chilled beams, VRF)



#### A PACKAGED DOAS IS BETTER

A DOAS configured with integrated refrigeration and a condenser is a packaged system, which is built in a controlled manufacturing facility. It offers many benefits over non-packaged options, including:

- More rigorous and environmentally sound management of refrigerants
   Less space used
- · More efficient to build
- · Easier and less costly to install

#### TRADITIONAL-DESIGN PROBLEMS & DOAS SOLUTIONS

- · Terminal Systems: Terminal systems, such as variable refrigerant flow (VRF) and chilled beam, can't handle the outdoor air's moisture load. DOAS can easily manage outdoor air load, allowing the terminal systems to manage the internal load.
- VAV Systems: Variable Air Volume (VAV) systems modulate airflow. Mixed air conditioning in central systems can't ensure that outdoor air will be supplied, which is how ventilation effectiveness is determined. DOAS solves this problem by providing a dedicated supply of 100% outdoor air.
- Outdoor Air: Today's designs require variable outdoor air, for which central systems may not have the capacity. DOAS can be designed to handle this variability.
- · Conventional Systems: These systems do not decouple sensible and latent loads. Thus, since most of the latent load comes from the outdoor air, their operation to satisfy internal thermal loads can lead to high indoor humidity. DOAS can accommodate 100% of the latent load and a portion of the sensible load
- costs. A packaged DOAS with integrated refrigeration avoids these problems.

### CODE REQUIREMENTS FOR ENERGY RECOVERY IN DOAS

Specific codes within various regions call for DOAS-type products to deliver 100% outside air to each occupied space. DOAS units incorporating energy recovery is a mandated feature for most code jurisdictions. ASHRAE standard 90.1 and IECC require a minimum of 50% of total effectiveness for the energy recovery component. Even when not mandated, it is one of the best ways to improve a building's energy efficiency.

### GREEN BUILDING TRENDS

High-performance, green-building standards seek to reduce energy use and increase ventilation to improve health, wellness, IAQ and indoor environmental quality (IEQ). Sustainable design initiatives like ASHRAE Standard 189.1, LEED, 2030 Challenge, Living Building Challenge and WELL Building Standard have grown in popularity among architects, engineers, contractors and building owners alike.

RenewAire ventilation technologies create healthier and more comfortable indoor environments, while optimizing energy efficiency. This is done by reusing otherwise-wasted total energy from the exhaust air to condition incoming outdoor air. The results are exceptional IAQ, IEQ, energy reductions and cost savings.

### **RENEWAIRE ERVS TEMPER THE AIR**

Our ERVs moderate the extremes of outdoor supply-air temperature and humidity year-round, providing a sustainable ventilation solution for every climate.



IN SUMMER THE WARM HUMID OUTSIDE AIR IS PRECOOLED AND DEHUMIDIFIED BY THE OUTGOING COOL INTERIOR AIR

## **RENEWAIRE CORE TECHNOLOGY**

#### CERTIFICATION

- Certified by the Air Conditioning, Heating and Refrigeration Institute (AHRI) for an industry-leading, low-to-zero Exhaust Air Transfer Ratio (EATR) at typical static pressure differentials
- Superior core flammability performance; passes UL-723 and UL-1812

### MAINTENANCE

 RenewAire cores are easy to clean without removing them from the unit, and they never require washing

### **INNOVATIVE CONSTRUCTION**

- Core exchanger material is cellulosic-based and doesn't contain or use halogenated flame retardants or PVCs
- Manufactured with a galvanized steel frame

#### RELIABILITY

• An industry-leading 10-year structural and performance warranty for the static-plate core, two-year warranty for commercial products and five-year warranty for residential products

#### **EXCEPTIONAL PERFORMANCE**

- Moderates heat and humidity via total energy recovery to maintain a comfortable indoor environment
- No need for frost protection or condensate pans
- Laminar airflow ensures that particulates do not accumulate in the core

### **REDUCED COSTS**

• Optimized energy efficiency via core energy transfer decreases ventilation energy requirements, which can result in smaller air conditioning and heating needs

- · Simpler to start up, commission and maintain
- A single source for warranty information and guality assurance

 Site Installation: A non-packaged DOAS (without integrated refrigeration and with remote condensers, called a split system) poses many challenges. It requires certified installation technicians, may leak, can be unreliable, needs considerable maintenance and generates high capital

IN WINTER. THE COLD. DRY OUTSIDE AIR IS PREHEATED AND HUMIDIFIED BY THE OUTGOING WARM INTERIOR AIR



# A CLOSER LOOK

### DN SERIES

RenewAire's DOAS effectively conditions outdoor air with efficient and sustainable technology. By **enabling HVAC units to operate independently**, depending on building load, our DOAS unit with **fixed-plate energy recovery**, **innovative packaged refrigeration/cooling** and heating features and hot-gas reheat will optimize your ventilation strategy. The results are downsized equipment, decreased capital costs and significant operating savings.





Map courtesy of International Code Council

## WHY ENERGY RECOVERY IS CRITICAL

The main responsibility of a 100% outdoor air unit is to dehumidify the incoming air. In this process, the system inherently handles large heating and cooling loads. Adding energy recovery significantly minimizes these loads and the HVAC equipment required to condition the air.

ASHRAE 90.1-2010 requires the use of energy recovery based upon a unit's supply airflow, outdoor air percentage, geographic location and hours of operation. The standard mandates the total effectiveness (sensible and latent) by a minimum of 50% when required.

The effectiveness of energy recovery devices varies depending on the type, material and airflow balance. This value is determined based on the test procedure outlined in the Air Conditioning, Heating and Refrigeration Institute's (AHRI) Standard 1060.

	PERCENTAGE OF OUTDOOR AIR AT FULL DESIGN AIRFLOW RATE (CFM)						
ZONE	30% ≤ 40%	40% ≤ 50%	50% ≤ 60%	60% ≤ 70%	70% ≤ 80%	80% ≥	
	Design Supply Fan Airflow Rate (CFM)						
3B, 3C, 4B, 4C, 5B	NR	NR	NR	NR	≥ 5,000	≥ 5,000	
1B, 2B, 5C	NR	NR	≥ 26,000	≥ 12,000	≥ 5,000	≥ 4,000	
6B	≥ 11,000	≥ 5,500	≥ 4,500	≥ 3,500	≥ 2,500	≥ 1,500	
1A, 2A, 3A, 4A, 5A, 6A	≥ 5,500	≥ 4,500	≥ 3,500	≥ 2,000	≥ 1,000	≥ 0	
7, 8	≥ 2,500	≥ 1,000	≥ 0	≥ 0	≥ 0	≥ 0	

# **DN MODELS AT A GLANCE**



			DN2	DN3	DN5		
		Airflow Range	375-1,650 CFM	750-3,300 CFM	1,125-4,950 CFM		
	Refrigeration Capacity (Packaged only)		2-10 tons	3.5–20 tons	5.5–30 tons		
	Installation Location		Indoor/Outdoor	Indoor/Outdoor	Indoor/Outdoor		
	Airflow Orientation		Vertical/Horizontal				
H	Available Voltages		208-230V 1P (EC DN-2 only)/3P (all); 460V 3P (all); 575V (VFD only)				
IND	Unit Disconnect		Single-point connection/fused (optional)				
	E	Energy Recovery	RenewAire enthalpic static-plate G5				
	Theoretical ISMRE	49°F/49°F	7.6	5.6	5.7		
		53°F/53°F	8.2	6.1	5.9		
	Internal Bypass of Energy Recovery		Yes, modulating bypass using face and bypass dampers				
	Refrigerant		R410A (DN Series with Packaged Refrigeration)				
	Wall Construction		1" or 2" double-wall, injected foam panels (2" optional)				
LET	Insulation		1" R-6.5/2" R-13.0				
CABIN	Panels with Thermal Break		Available on 2" double-wall units				
	Painted Cabinets		2,500-hour salt spray rated in white, grey or custom (optional)				
	Isolation Dampers		Low-leakage Class I dampers				
r fan	Supply Blower		High-efficiency plenum fans				
	Supply Fan Type		Direct-drive				
	Supply Fan Speed Control		ECM/VFD (optional)				
Sn	Supply Fan V	ibration Isolation		Neoprene/spring (VFD only)			
CHA		200-277V 1P	1.35 kW	N/A	N/A		
/EX	Supply/Exhaust	200-240V 3P	2.70 kW	2.70 kW	2.70 kW x2		
LY	Fan Motor HP (kW)	380-480V 3P	3.70 kW	3.70 kW	3.70 kW x2		
UPI		575V 3P	3 HP	5 HP	5 HP x2		
S		VFD	3 HP	5 HP	5 HP x2		
_	Unit ESP		2" WC at 1,500 CFM	2.5" WC at 3,000 CFM	3" WC at 4,500 CFM		
16/		Cooling Section		Direct expansion (R410A), chilled water, heat pump (optional)			
OOLIN	Heating Section		Electric heat (SCR), indirect gas furnace (5:1, 10:1 modulation), hot water, heat pump, steam (optional)				
0 -	Hot-Gas Reheat		Modulating (optional)				
1.12	Economizer/Defrost Capability		Modulating				
SIC	Microproc	Microprocessor Controller		Integrated programmable controller			
TRC	Control Hardware		Carel c.pC0 mini				
NO	Optional Communications		BACnet MS/TP or IP, Modbus RTU or TCP				
0	Airflow Monitoring		Yes				
	Recirculation Mode		Yes (optional)				
	GFCI Convenience Outlet		120VAC, 20A (field powered)				
	Roof Curbs		14" height				
SNO	Seismic and Wind-Rated Curbs		Yes				
TIC	MERV 8 (2" only), 13 and 14 Filters		Available in 2" and 4"				
OP	Mist Eliminator		3/8"				
	Drain-Overflow Switch		Yes				
	Coil Coatings		Yes				
Certifications			Tested to III	For Unit:			

# **MODULAR DESIGNS**

ERV	<ul> <li>Energy Recovery Ventilator</li> </ul>	
EH	- Electric Heater	
CC	- Cooling Coil	
нс	- Heating Coil	
GH	- Gas-Heat Module	
HGRH	- Hot-Gas Reheat Coil	
DX	<ul> <li>Direct Expansion (for DOAS units with Packaged Refrigeration)</li> </ul>	
вт	- Blow Thru	ERV ONLY
DT	- Draw Thru	





ERV + CC/ HC or DX (BT)

ERV + CC or DX + HGRH (BT)



ERV + CC or DX

+ EH

(BT)

**F** ₿

> ERV + CC or DX + HGRH + EH (BT)



ERV + CC or DX

+ HC

(BT)

ERV + CC or DX + HGRH + HC (BT)



+ GH

(DT)



ERV + CC or DX + HGRH + GH (DT)

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ERV + EH (BT)



ERV + GH (BT)





ERV + CC/ HC or DX (DT)



ERV + CC or DX + HGRH (DT)



8 

ERV + CC or DX + GH (BT)



ERV + CC or DX + HGRH + GH (BT)





ERV + CC or DX + EH (DT)



ERV + CC or DX + HGRH + EH (DT)



+ HC (DT)



ERV + CC or DX + HGRH + HC (DT)

# **APPLICATION STRATEGIES**

TERMINAL-UNIT SYSTEMS



### **DOAS DIRECT TO ZONE** WITH TERMINAL UNITS

- Variable refrigerant flow/volume
- Fan coils
- Heat pumps
- Chilled beam
- Radiant floor heating and cooling
- · Packaged terminal air conditioning



### **DOAS DIRECT TO ZONE** WITH ROOFTOP/CENTRAL AHU



### DOAS AIR SUPPLIED TO INTAKES OF TERMINAL UNITS

- Variable refrigerant flow/volume
- Fan coils
- Active chilled beam



### **DOAS 100% OUTDOOR AIR**

- Designed for high-performing buildings
- DOAS handles external and internal loads with low dew point supply conditions
- No recirculation units
- Lower capital costs, lower installed costs and lower operating costs

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# REFRIGERATION COMPONENTS



### SINGLE CIRCUIT WITH HOT-GAS REHEAT



### SINGLE CIRCUIT WITHOUT HOT-GAS REHEAT



### SECOND CIRCUIT IN A TWO-CIRCUIT ARRANGEMENT

# ACCESSORIES

### HEATERS



CONTROLS

### FILTERS



**EK Series Electric Duct Heater** (for indoor units only)



Curb Clip Kit



**Roof Curbs** 



2" or 4" MERV 13, 14 Filters



**CO2 Sensor Wall Mount** 



Temperature Sensor Duct Mount



Duct Static Pressure Sensor Wall/Duct Mount without Display



IAQ Sensor Wall Mount



Room Temperature & Humidity Sensor



Duct Static Pressure Sensor Wall/Duct Mount with Display



**CO2 Sensor Duct Mount** 



Occupancy Sensor Ceiling Mount



Smoke Detector Duct Mount



**IAQ Sensor Duct Mount** 



Occupancy Sensor Wall Mount



Remote Display Handheld or Wall Mount

### COIL ACCESSORIES





