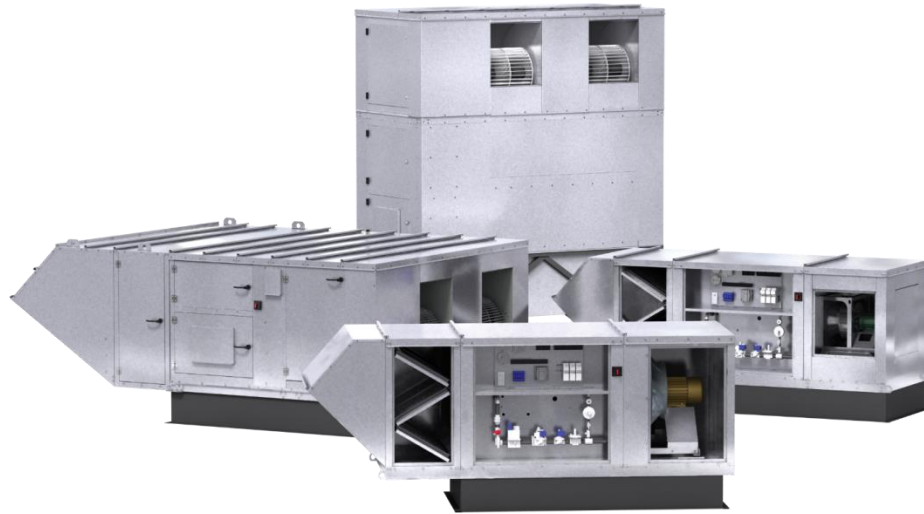


Direct Gas-Fired Heating



Today's Objectives

- What is “Direct Gas-Fired” Heating
- Applications
- Other Benefits and Ease of Selections
- Demonstrations



Make-Up Air

- Main function is to replace exhausted air
- Switching from heating to cooling is typically a manual switch or it is based on outdoor air temperature
- Heating and cooling capacities are a result of outdoor air temperatures and the airflow amount
- Units have discharge temperature control



Direct Gas-Fired Heating

- What is the efficiency?
 - 92%
- What is the burner construction?
 - Cast Aluminum Manifold and SS mixing plates
- What is the turndown ratio?
 - 30:1



Additional Information

Governing Test Standards

- ANSI Z83.4 – Non-Recirculating Direct Gas-Fired Heaters
- ANSI Z83.18 – Recirculating Direct Gas-Fired Heaters

ANSI standards regulate acceptable levels of combustion byproducts in the airstream

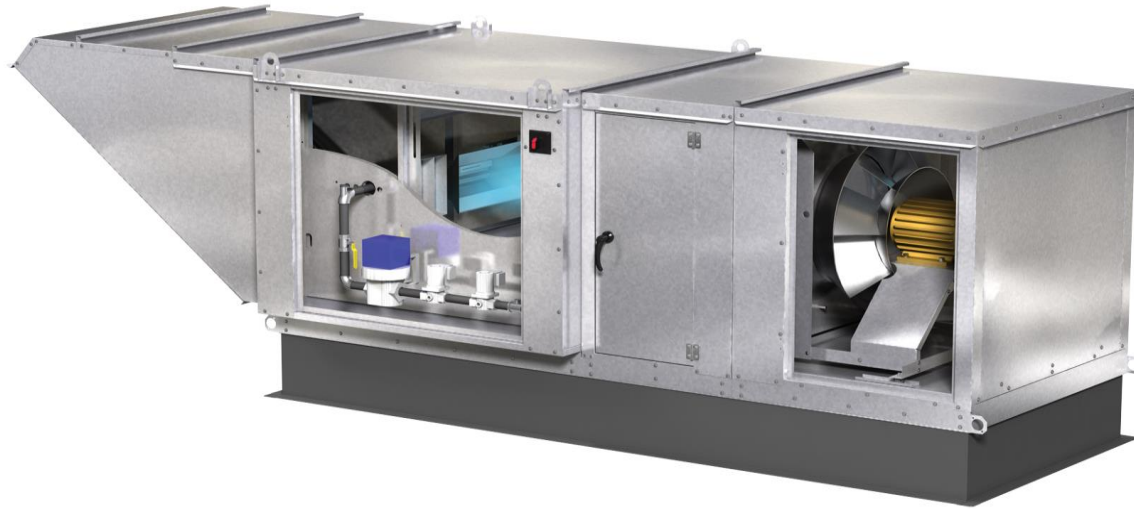
Combustion Byproduct	ANSI Allowance (ppm)	OSHA Allowance (ppm)
Carbon Monoxide (CO)	5	50
Carbon Dioxide (CO ₂)	4,000	5,000
Aliphatic Aldehydes	1	N/A
Nitrogen Dioxide (NO ₂)	0.5	5

ETL / CSA listing ensures compliance with ANSI Z83.4 and ANSI Z83.18

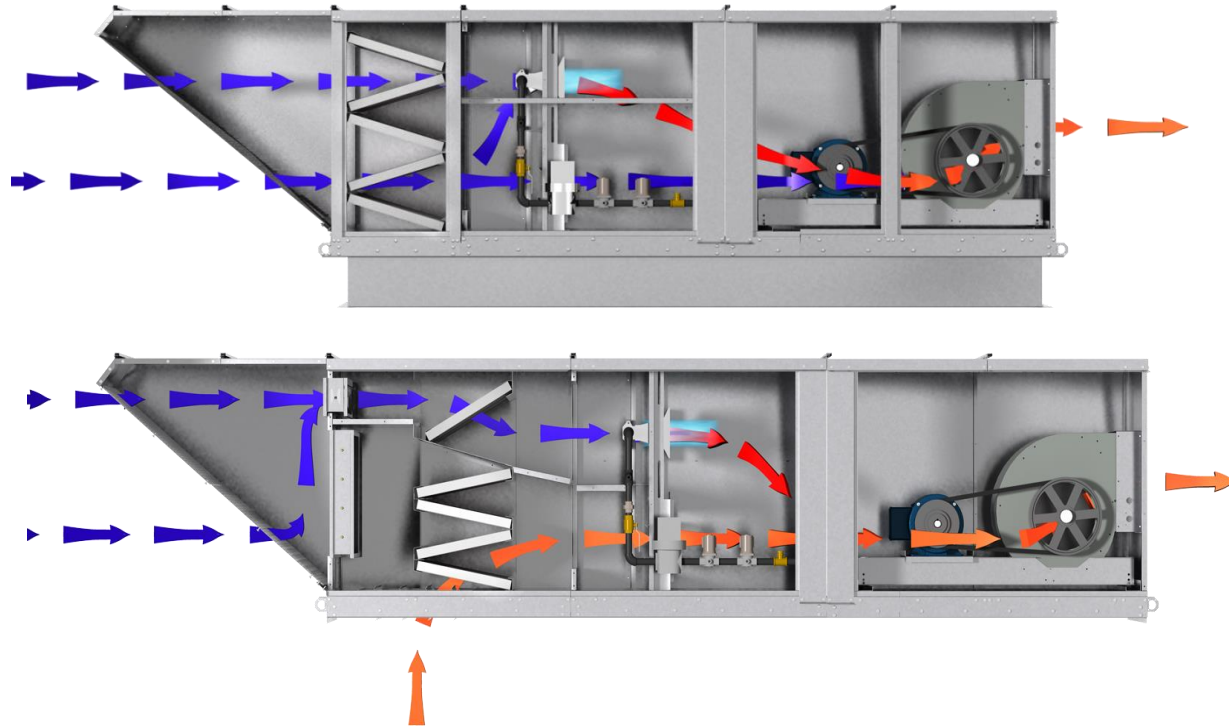


100% Outdoor Air (Constant Volume)

- 100% Outdoor Air Units
 - For use in applications where varying the airflow is not required



Alternate Airflow Configurations

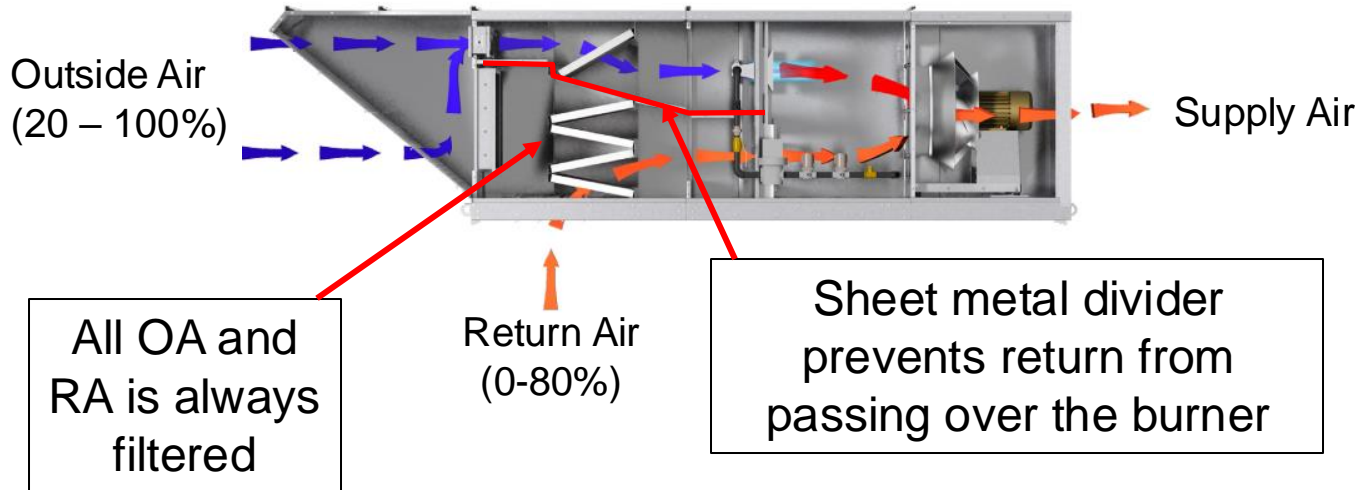


Direct Gas Variable Volume

- Air velocity through the burner is critical to operation
- Patented barometric bypass damper design
 - Operates entirely on air pressure and gravity
 - Completely passive with no field set-up required
 - Instantaneous adjustment with no control loop delay
 - Up to 50% airflow reduction



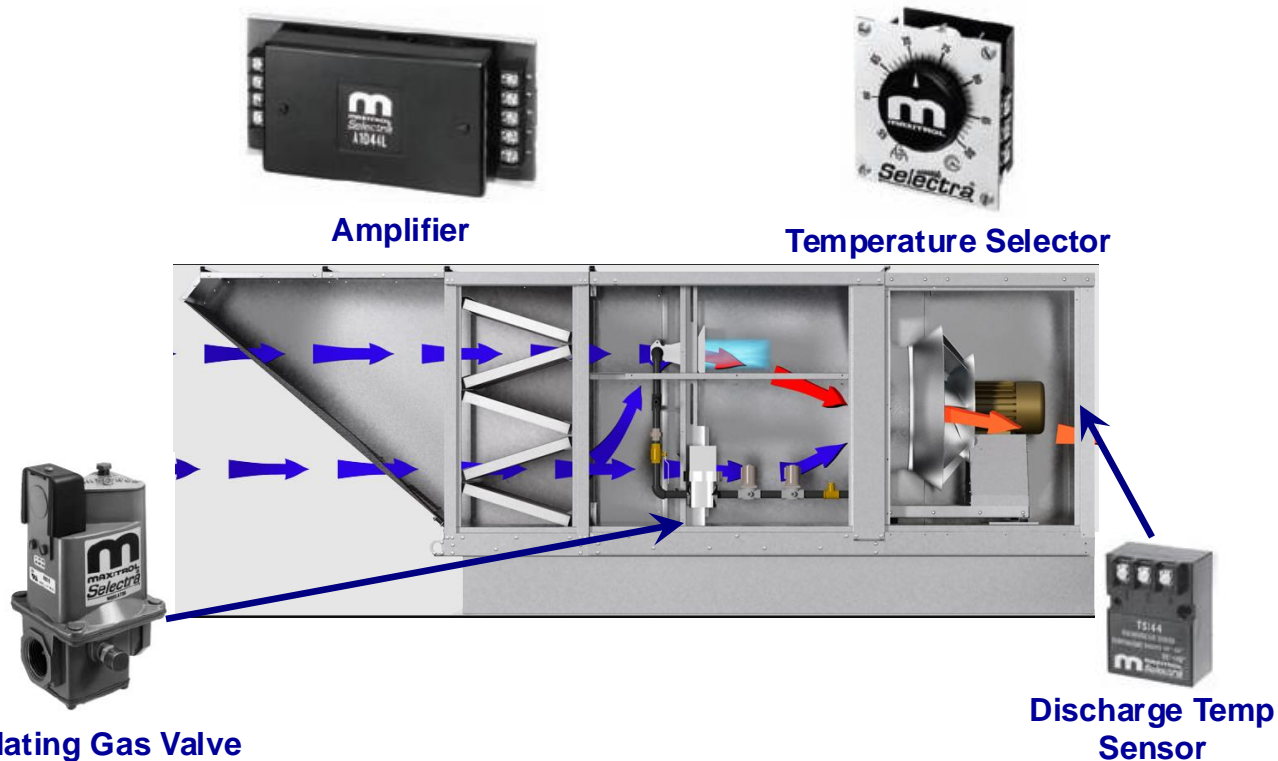
Direct Gas Recirculating Design



Specify:

- No return air may pass through the burner
- Outdoor air and return air must be filtered

Direct Gas Temperature Controls



Direct Gas Burner Controls

- Discharge control
 - The Maxitrol series 14 electronic gas modulation system is designed for use with direct-fired equipment. It is used in applications where a constant discharge temperature is desired.
- Space control
 - The Maxitrol series 44 electronic gas modulation system is designed for use with direct-fired equipment. It is used in applications where room sensing is desired.
- DDC control
 - 2-10VDC
 - 4-20 mA signal



Remote Temperature Selector



Thermostat



Selectrastat



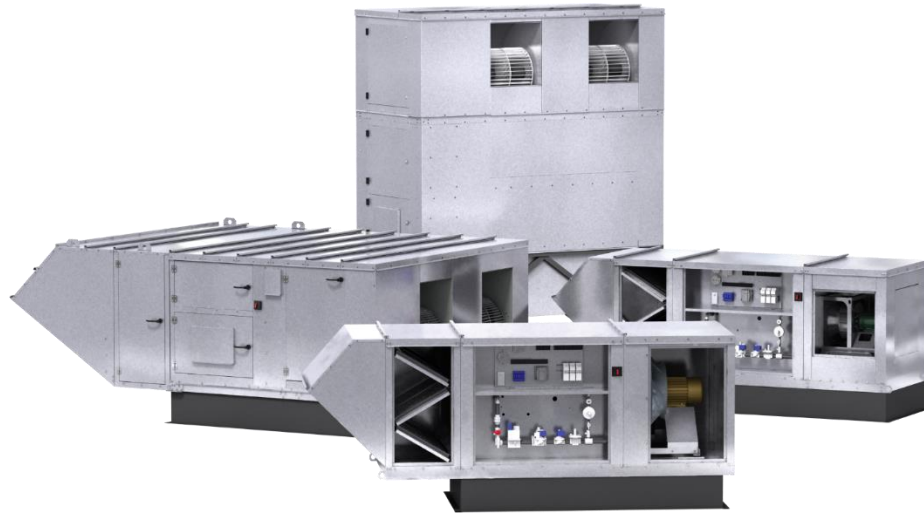
Temp. Sensor



Temp. Selector



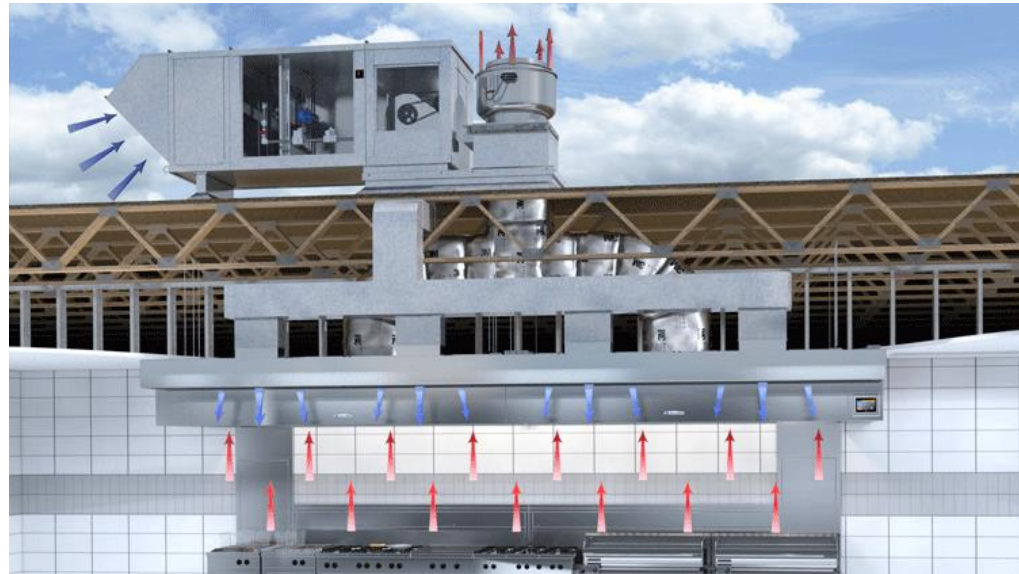
Applications



Typical Make-Up Air Applications

Make-up air (MUA) equipment provides conditioned, outdoor air to replace exhausted air (typically from a process).

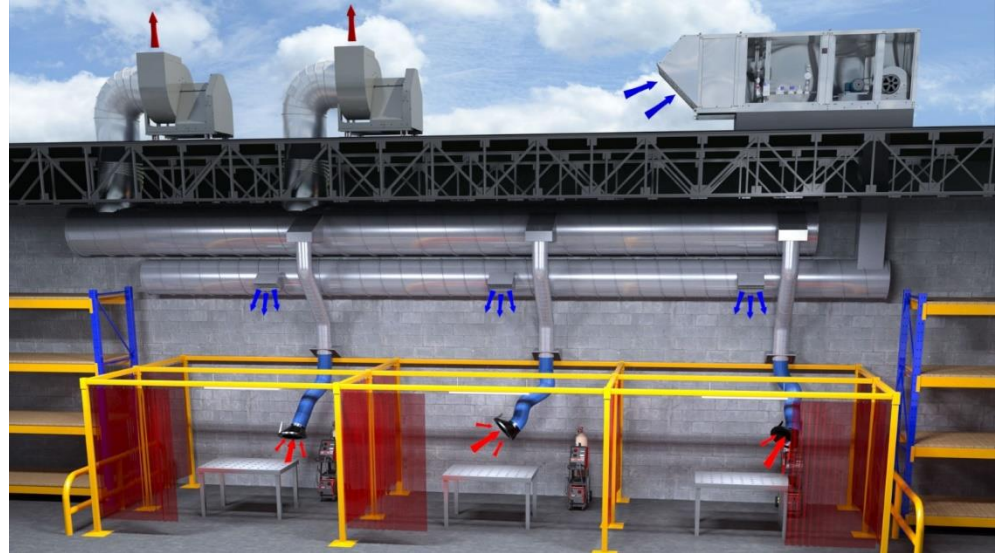
- **Kitchens**



Typical Make-Up Air Applications

Make-up air (MUA) equipment provides conditioned, outdoor air to replace exhausted air (typically from a process).

- **Industrial**



Typical Make-Up Air Applications

Make-up air (MUA) equipment provides conditioned, outdoor air to replace exhausted air (typically from a process).

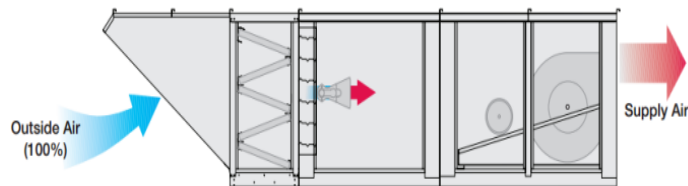
- **Warehouse**



Space Heating Products

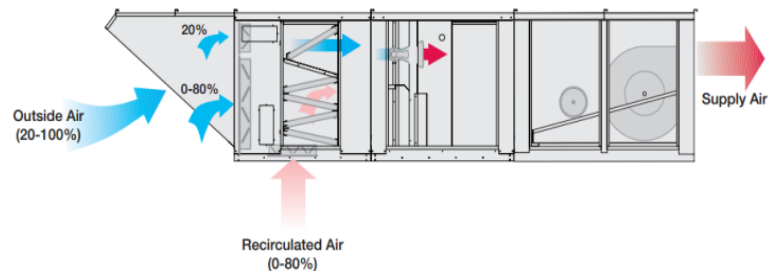
Greenheat MUA Products

- High temperature, direct fired space heaters
- 140F discharge temperature
- Cycle on a call for heat
- Available in 100% OA



80/20 Recirculation Units

- Direct fired heating and ventilating units
- 20 – 100% OA
- Modulate to respond to maintain positive building pressure

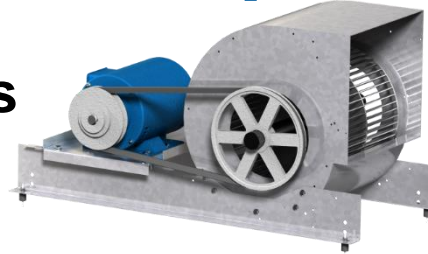


Direct Gas Make-Up Air Other Features and Advantages



Make-Up Air Fan Options

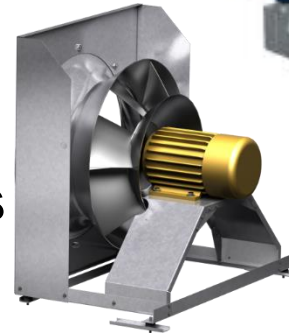
- **Forward Curved Fans**



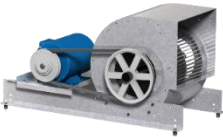

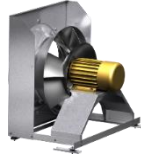
- **Backward-Curved Plenum Fans**



- **Mixed Flow Plenum Fans**



Make-up Air Fan Breakdown

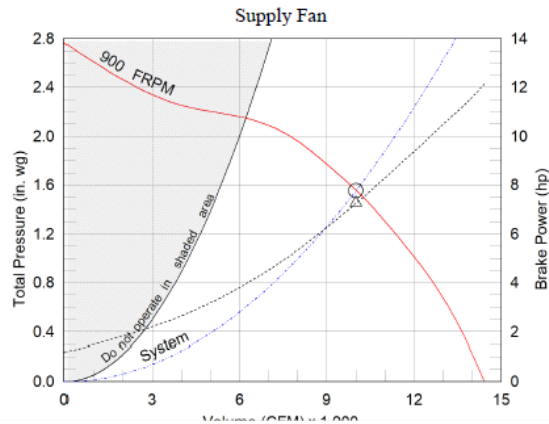
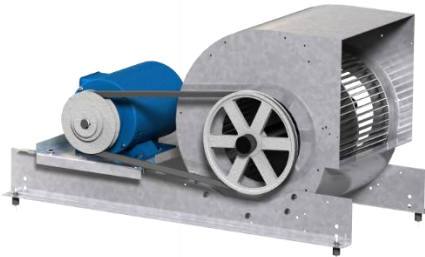
	Forward Curved	Backward Curved	Mixed Flow
Pros			
Cons			
			
Drive Arrangement	Belt	Direct	Direct
Airflow Range (CFM)	500 - 64,000	500 - 48,000	500 - 25,000
Total Static Pressure Max Limit	Up to 3" w.g.	Up to 5" w.g.	Up to 3" w.g.
Peak Total Efficiency	45%	75%	70%
Applications	Kitchens, warehouses, commercial & Industrial applications with limited ductwork	Commercial & industrial applications with high external static pressure, long duct runs, final filters	Kitchens, warehouses, commercial & Industrial applications with limited ductwork
First Cost	\$	\$\$	\$

Air & Sound Performance – Forward Curved

Supply Fan Performance									
Total Volume (CFM)	External SP (in. wg)	Total SP (in. wg)	RPM	Operating Power (hp)	Motor		Fan		
					Qty	Size (HP)	Qty	Type	Drive-Type
10,000	0.5	1.554	900	7.26	1	7-1/2	1	Forward Curve	Belt

Pressure Drop (in. wg)						
Weatherhood	Filter	Damper	Cooling	Heating	External	Total
0.208	0.109	0.113	-	0.625	0.5	1.554

Sound Performance in Accordance with AMCA										
Sound Power by Octave Band								Lwa	dBA	Sones
62.5	125	250	500	1000	2000	4000	8000			
100	89	87	85	84	83	80	75	90	79	33

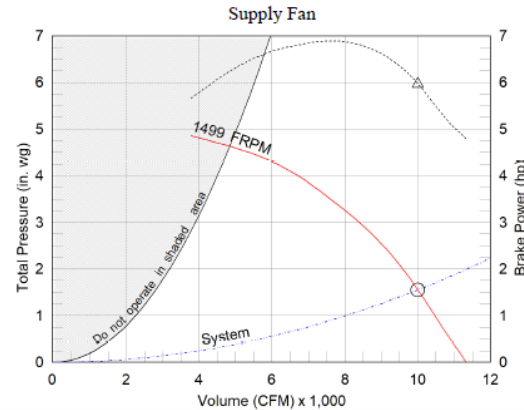


Air & Sound Performance – Backward Curved

Supply Fan Performance									
Total Volume (CFM)	External SP (in. wg)	Total SP (in. wg)	RPM	Operating Power (hp)	Motor		Fan		
					Qty	Size (HP)	Qty	Type	Drive-Type
10,000	0.5	1.554	1499	5.96	1	7-1/2	1	Plenum	Direct

Pressure Drop (in. wg)						
Weatherhood	Filter	Damper	Cooling	Heating	External	Total
0.208	0.109	0.113	-	0.625	0.5	1.554

Sound Performance in Accordance with AMCA										
Sound Power by Octave Band								Lwa	dBA	Sones
62.5	125	250	500	1000	2000	4000	8000			
56	70	84	88	91	84	81	77	93	82	43

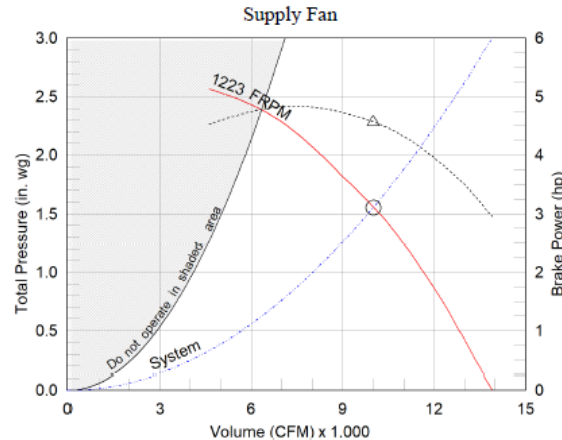


Air & Sound Performance – Mixed Flow

Supply Fan Performance									
Total Volume (CFM)	External SP (in. wg)	Total SP (in. wg)	RPM	Operating Power (hp)	Motor		Fan		
					Qty	Size (HP)	Qty	Type	Drive-Type
10,000	0.5	1.554	1223	4.56	1	5	1	Mixed Flow	Direct

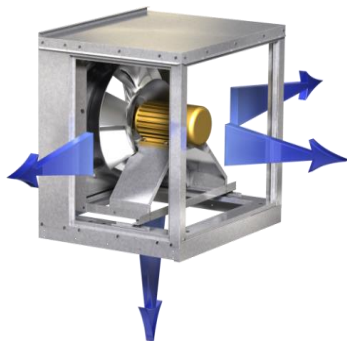
Pressure Drop (in. wg)						
Weatherhood	Filter	Damper	Cooling	Heating	External	Total
0.208	0.109	0.113	-	0.625	0.5	1.554

Sound Performance in Accordance with AMCA											
Sound Power by Octave Band									Lwa	dBA	Sones
62.5	125	250	500	1000	2000	4000	8000				
93	87	83	83	80	75	70	63	85	74	24	



Mixed Flow Plenum Supply Fan

- Discharge arrangements:
 - Horizontal (End)
 - Bottom
 - Left
 - Right
 - Top



- Direct drive arrangement
- 800 - 20,000 cfm
- Reduced sound power (LwA)
- Lower operating power

Supply Fan Operating Power

	Initial Cost	Housing-12 2,000 cfm @ 0.75 in. wg	Housing-22 6,000 cfm @ 1.5 in. wg	Housing-32 14,500 cfm @ 1.25 in. wg
Forward-Curved	\$	0.59 hp	4.03 hp	11.38 hp
Backward-Curved	\$\$	0.53 hp	3.4 hp	10.33 hp
Mixed Flow	\$	0.43 hp	2.43 hp	5.75 hp

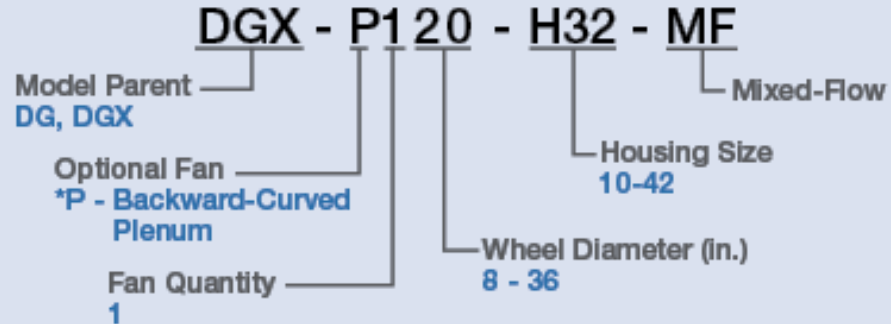


Product Nomenclature

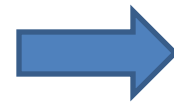
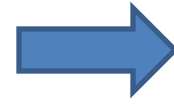
Model Number Code

The model number code is designed to completely identify the unit. The correct code letters must be specified to designate the configurations and size.

**If no P is shown, then a forward-curved fan is provided.*



Future MUA Simplification - Controls



Microprocessor

- Models: DGX, IGX, MSX, TSU & VSU
- Allows for stand-alone controls
 - Heating controls
 - Cooling controls – required for digital scroll
 - VFD controls
 - Recirculation damper controls
- Available on:
 - Constant Volume, 100% Outside Air
 - Variable Air Volume
 - Recirculation
- BACnet & MODbus



Product Selections Made Easy

CAPS and eCAPS

Greenheat Selections - Mark 1

Model: GREENHEAT Best Available: 5 Day Kitchen Pass: Yes

Model Configuration SDRs / Notes Summary

▼ Selection

Design Parameters ?

Summer Outdoor Dry-bulb (F)	<input type="text" value="88.1"/>	Winter Outdoor Dry-bulb (F)	<input type="text" value="-13.6"/>
Summer Outdoor Wet-bulb (F)	<input type="text" value="74.5"/>	Elevation (ft)	<input type="text" value="1198"/>

Select Tempering ?

Heating Type	<input type="text" value="Greenheat"/>	Cooling Type	<input type="text" value="No Cooling"/>
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Performance Corrections ?

Unit Configuration	<input type="text" value="Constant Volume 100% OA"/>	Weatherhood	<input type="text"/>
Unit Orientation	<input type="text" value="Horizontal"/>	Outdoor Air Filters	<input type="text"/>
Diffuser	<input type="text" value="No Diffuser"/>	Damper	<input type="text"/>

Airflow ?

Total Air Volume (CFM)	<input type="text"/>	Volume will be selected on the heating tab.
Ext. SP (in. wg)	<input type="text" value="0.00"/>	

Available Models ?

DGX	Selections on subsequent tabs may invalidate some models
-----	--

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Thank you for your time.

Questions?





The mission of Greenheck is to be the market leader in the development, manufacture and worldwide sales of quality air moving, control and conditioning equipment with a total commitment to customer service.

