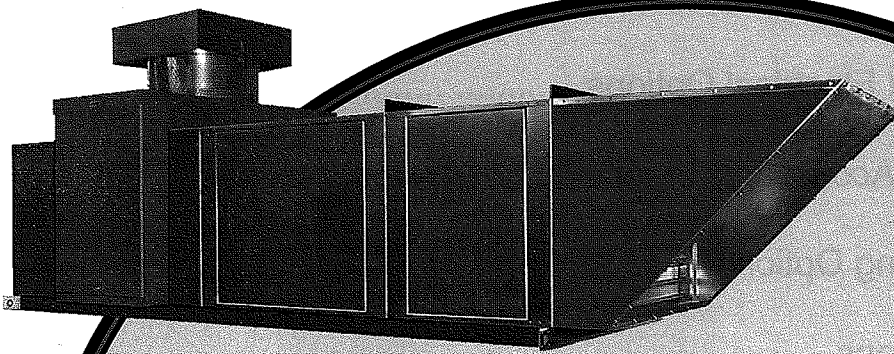
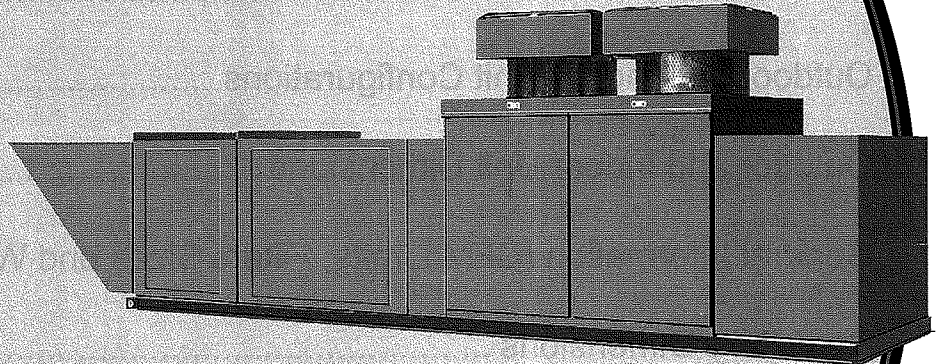


INDIRECT FIRED GAS MAKE-UP AIR HEATERS

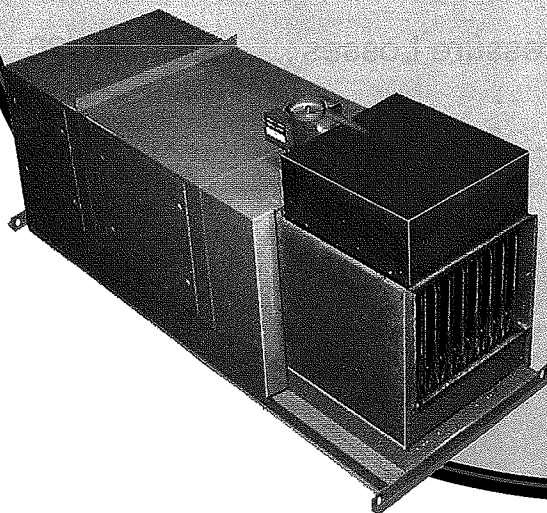
Model IFG



IFG - Indirect Fired Make-up Air Heater
- Single Heater -



IFG - Indirect Fired Make-up Air Heater
- Double Heaters -



IFG - Indirect Fired Make-up Air Heater
- Indoor Unit -

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KEES, Incorporated

Indirect Fired Gas Make-up Air Heater

The Need for Make-up Air

In an effort to exhaust contaminants and meet general ventilation requirements, a condition of "air starvation" may occur. "Air starvation" occurs when the demand for exhaust air exceeds the amount of available replacement air, resulting in negative pressure within the building. If left uncontrolled, the following unintended consequences may occur:

- The demand for replacement air will cause outside air to be drawn in through doors, windows, cracks and other building openings;
- Back drafts can occur in natural flues, ventilators and stacks;
- Exterior doors can be hard to open;
- The uncontrolled air may contain unwanted contaminants;
- Moisture may be drawn into the building, resulting in poor temperature control. This can cause discomfort or health problems for employees;
- The exhaust fans will strain to draw air through any available opening. Working against an elevated static pressure, they will not operate at their design points and their capacities will be reduced.

To avoid the consequences associated with air starvation, it is essential to replace exhausted air with controlled make-up air. Make-up air units will provide clean, filtered, dehumidified and tempered replacement air, while maintaining comfortable, healthy conditions. The control of make-up air will also assist in satisfying local standards, as OSHA and ASHRAE standards are often adopted by local authorities.

Meeting the Need

KEES has been meeting the demands of our customers for make-up air units since 1975. We strive to provide them economically while maintaining the highest quality standards. Our skilled work force will assemble them quickly in accordance with our reputation for the best lead times in the industry. When a project calls for something special or out of the ordinary, our knowledgeable and friendly staff will be there to assist you. Finally, we proudly back our units with a solid warranty.

This brochure will guide you in choosing an indirect fired make-up air unit for your application. Other KEES brochures are available upon request, including those describing units with direct-fired or electric heaters; water, steam or direct expansion coils; and evaporative coolers.



Model IFG – General Construction

HOUSING

- Heavy gauge galvanized steel housing for high corrosion resistance and long life
- Fiberglass insulation (1" thick, 3# density) to prevent condensation and provide a thermal and acoustic barrier
- Large gasketed access panels for easy servicing and weatherproofing
- Draw-tight, tooled access door fasteners assure positive sealing and discourage unauthorized access
- Heavy gauge base frame provides a solid foundation and creates a curb cap for easy installation over a curb
- Lifting lugs facilitate rigging and installation
- Watertight construction protects internal components from the elements
- Flexible design enables unit to be customized for specific applications

FILTER SECTION

- 1" or 2" filters are standard; others available (4"-24")
- Aluminum cleanable, fiberglass throw-away and pleated styles are standard; others available
- V-bank filter section for maximum filter area
- Multiple sections available (pre and final filters)

INTAKE WEATHERHOOD

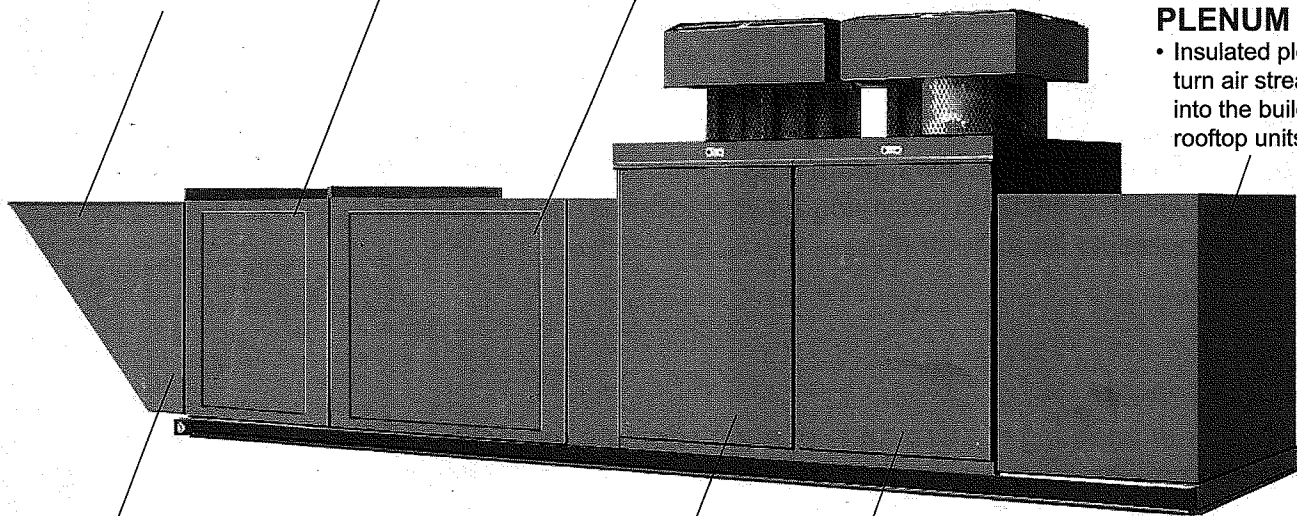
- Shields intake from rain and snow
- Birdscreen protects the opening
- Optional flat filter section located in the intake weatherhood is available (for space and cost savings)

FAN SECTION

- Forward curved, DWDI blowers are tested in accordance with AMCA 210 and have high efficiency and low sound levels
- Statically and dynamically balanced wheels for vibration free operation
- Precision machined steel shafts and sealed ball bearings for long life
- Adjustable motor mount and drives simplifies onsite belt tensioning and air balancing
- EPACT motors provide highly efficient power
- Blower & motor have vibration isolators to minimize noise transmission
- Multiple discharge arrangements allow for flexibility

DOWNTURN PLENUM

- Insulated plenum to turn air stream down into the building on rooftop units



MOTORIZED DAMPER (Optional)

- Two position spring return prevents outdoor air from entering the building during shutdown
- Intake or discharge location available
- Return air dampers are also available (not shown); descriptions of various damper arrangements and control choices are shown in this catalog

HEATER SECTION

- 80% thermally efficient furnace that is AGA and CGA certified, FM compliant and conforms to ANSI standards
- Gravity vented (shown) or power vented (available)
- Main gas regulator, combination gas valve, intermittent spark pilot and high limit switch are standard components
- Gas controls are available with multiple stages of firing per furnace, or electronic modulation

ELECTRICAL CONTROLS (Optional) – Located on the opposite side shown in this view

- Highest quality, UL approved controls assure reliable and safe operation
- Disconnect switch deactivates power for servicing the unit
- Motor control center is prewired to numbered terminal blocks for easy single point connection
- Motor control center contains motor starter(s), control transformer, disconnect switch & motor fusing
- Wiring completed in accordance with NEC standards
- Weatherproof control cabinet provides easy, unobstructed access to the controls
- Other electrical components are available upon request

General Options

HOUSING OPTIONS

Down or End Discharge

Down discharge units include a downturn plenum. End discharge units discharge directly out of the heater.

Painted exterior

Two-part polyurethane finish in common colors or to match a color chip. Special finishes are available. Unit may also be painted inside and out if required.

Stainless steel housing

Available for corrosive environments such as in coastal areas or in food processing plants that require washdown.

Foil faced insulation

Replaces standard matte face fiberglass insulation.

Double wall

Inner liner installed over the insulation.

Hinged Access Doors

Available with continuous hinges or lift-off hinges.

Housing Arrangement H1

Includes V-bank filter section and intake weatherhood.

Housing Arrangement H2

Includes flat filter section mounted in the intake weatherhood.

Housing Arrangement H3

Includes V-bank filter section; intake weatherhood not included.

FILTER OPTIONS

1 or 2-inch aluminum mesh filters (Merv 1-4) are available in a V-bank filter section or in a flat filter section in the intake weatherhood.

1 or 2-inch fiberglass throw-away, 30% efficient pleated filters or replaceable media in metal frames (Merv 5-8) are available in a V-bank filter section.

Special high performance filters (Merv 9-20) are available. They may be mounted in the filter section in a flat bank depending on their depth.

MOUNTING OPTIONS

Roof mounted

Indoor ceiling hung

Indoor or outdoor pad mounted

MOTOR OPTIONS

Open drip proof (ODP) motors are standard. All three phase motors 1 HP and larger are inverter rated and meet EPACT standards for efficiency.

Totally enclosed fan cooled (TEFC)

Premium efficiency

Variable frequency drives

ELECTRICAL OPTIONS

Motor control center

Includes main disconnect switch, one motor starter with short circuit and overload protection, control transformer and all necessary wiring for single point main and control power connection.

Additional motor starter(s)

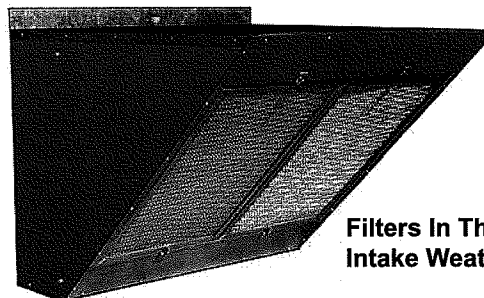
May be added to the motor control center for use with related exhaust or supply fans.

NEMA1 Indoor non-fusible disconnect switch

To be used when a disconnect switch is required on an indoor unit. Already included if a motor control center is ordered.

NEMA3R Outdoor non-fusible disconnect switch

To be used when a disconnect switch is required on an outdoor unit. Already included if a motor control center is ordered.



Filters In The
Intake Weatherhood

General Options (Continued)

CURB OPTIONS

Curb Arrangement A1

Modular curb and support rail to house both the supply fan and the exhaust fan. Used in kitchen applications to simplify the installation of the ventilation system and to ensure compliance with NFPA 96 requirements.

Curb Arrangement A2

Curb and support rail; curb is only under the fan section for a smaller roof penetration.

Curb Arrangement A3

Support rails; used on units that have the roof penetration in a different location from the unit. May also be used if the unit is mounted on a pad.

Curb Arrangement A4

Full perimeter roof curb.

Curb Arrangement A5

Indoor ceiling hung with standard base rail running the full length of the unit.

REMOTE PANEL OPTIONS

Standard remote control panels consist of a surface mounted plastic enclosure with identifying labels. Many combinations of switches and indicator lights are available.

Examples include:

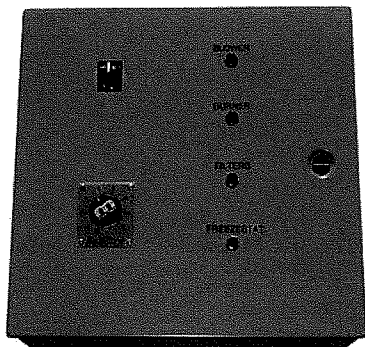
- Fan On/Off, Heat On/Off
- Summer-Off-Winter
- Fan On/Off, Heat-Off-Cool

Industrial duty panels are also available in NEMA1, 3R, 4 or 12 surface mounted enclosures with a terminal strip included to simplify field wiring. Thermostats, if ordered, may be mounted on the panel.

Occupied/Unoccupied Mode – otherwise known as Night Setback this option includes a time clock that controls two different settings depending on whether the space is occupied or unoccupied.



STANDARD



INDUSTRIAL DUTY

OTHER ACCESSORIES

Low Temperature Limit

Also referred to as a freezestat this discharge duct stat prevents cold air from entering the space if the tempering section does not provide sufficient heat.

Mild Weather Thermostat

Shuts off the heat when the inlet air temperature is above the set point. Used for comfort on mild weather days when it is preferable not to add heat to the space.

Clogged Filter Switch

Indicates when filters become dirty. The indicator light may be sent loose or mounted on a remote control panel.

Convenience Outlet

Consists of 115V receptacles in a NEMA3R enclosure for field service use. Powered by a separate 115V source.

Time Delay Relay

Available to delay the start-up or shut-down of a unit for a specific time period.

Time Clock

Electronic programmable 7-day time clock can be used to schedule the start/stop of a unit.

Smoke Detector

Field mounted in the duct; consists of a photoelectric detector and sampling tube.

Duct Adaptor

Eases connection of the ductwork to a factory supplied curb. Allows ductwork installation to occur before placing the unit on the curb.

Discharge Head

Three or four way diffuser mounts inside of space for simplified air distribution.

Vibration Isolators

Various types are available to supplement the standard rubber isolators under the blower and motor. These include floor rubber in shear, floor spring and hanger spring isolators. Also available are spring isolators under the blower and motor.

CO₂ and NO₂ Detectors

These are single units designed for 5,000 square foot applications.

General Options (Continued)

HEATER OPTIONS

Heat Exchanger

Standard 409 SS material can be upgraded to 321 SS. For a savings aluminized steel can be used if the outside air or mixed air temperatures do not fall below 40°F and if there isn't a cooling coil or evaporative cooler included with the unit.

Burners

409 SS available in lieu of standard aluminized steel.

Drip Pan

409 SS available in lieu of standard aluminized steel.

Power Vent

Utilized to mechanically exhaust flue gases. Eliminates the need for a vent cap on outdoor units, therefore lowering the overall height of the unit. Required for IRI compliance. Optional on outdoor units; standard on indoor units.

Propane Gas

Available in lieu of natural gas.

Separated Combustion (Indoor units only)

Air for combustion is mechanically induced from outside the building. Used when excessive dust, dirt, humidity or negative pressure is a concern. After combustion, the air is exhausted back to the outside.

De-rated Heater

Orifices can be changed to restrict the maximum output of the heater.

100% Lock-out Ignition

Provides manual reset requirement after ignition or flame failure. Required for IRI compliance.

High/Low Gas Pressure Switch

Safety switch with manual reset measures for low gas pressure entering the unit and high gas pressure before the burner.

Gas Pressure Regulator

Necessary when building pressure supplied to the unit is greater than 5 psi.

Compliance with IRI Requirements

Power venting and 100% lock-out ignition included for compliance.

Compliance with Illinois School Code

Additional safety components including high/low gas pressure switches, solenoid valves, manual shut-off valves, power venting on units over 250 MBH and a special remote control with alarm bell. Contact factory for further information.

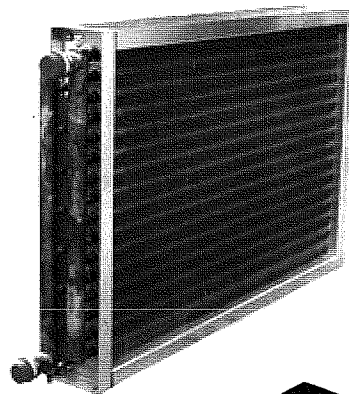
COOLING OPTIONS

Cooling Coil Section

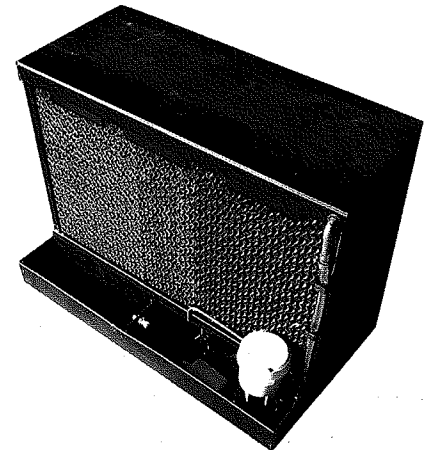
Chilled water or direct expansion cooling coil section with stainless steel drain pan and fitting. Built, tested and rated according to ARI 400. Constructed of copper tubes and aluminum fins spaced from 8 to 12 FPI. Refer to Model MUA brochure for more details.

Evaporative Cooler

Evaporative cooling section with 12" deep Munters CELdek® (GLASdek®) media for up to 90% efficiency. Freeze protection and automatic drain and fill kit are available. Refer to Model MUA brochure for more details.



Cooling Coil



Evaporative Cooler

As always, KEES can handle special requests. Contact your local KEES representative for any features not listed in this brochure.

Temperature Control Options

MULTI-STAGED TEMPERATURE CONTROL (SPACE OR DISCHARGE AIR CONTROL)

*

These temperature control systems provide staged heating; more stages reduce the likelihood of cycling and increase the range of outputs. If space temperature control is selected then the system responds to a room thermostat. If discharge air control is required then a sensing bulb monitors the discharge air temperature and switches on the stages to maintain the desired set point.

Two stages: 50-100% of the rated input
Three stages: 33-100% of the rated input
Four stages *: 25-100% of the rated input
Six stages: 16-100% of the rated input

Note: Two stage discharge air temperature control is only recommended for return air units or units in warm climates due to the likelihood of cycling.

* Four stage control is standard on double and triple furnace units.

ELECTRONIC MODULATION DISCHARGE AIR TEMPERATURE CONTROL

**

The Maxitrol Series 21 (single heater) and Series 31 (multiple heaters) are electronic modulating discharge air temperature control systems. The discharge temperature sensor monitors the temperature at the fan discharge and controls the modulating gas valve to maintain the desired set point. Modulation occurs from 40-100% of the rated input happening quickly, smoothly and accurately.

Note: Double and triple heater units can modulate down to 20% and 16% of the rated input, respectively.

An optional room override thermostat can be added to these systems.

** Electronic modulation with discharge temperature control is standard on single heater units.

ELECTRONIC MODULATION SPACE TEMPERATURE CONTROL

The Maxitrol Series 20 (single heater) and Series 30 (multiple heaters) are electronic modulating room temperature control systems. The room thermostat monitors the space temperature and controls the modulating gas valve to maintain the desired set point. Modulation occurs from 40-100% of the rated input happening quickly, smoothly and accurately.

Note: Double and triple heater units can modulate down 20% and 16% of the rated input, respectively.

ELECTRONIC MODULATION DDC COMPATIBLE CONTROL

The DDC compatible control system is an electronic modulating control system that utilizes either a 0-10 Vdc or 4-20 mA input signal (by others) that is compatible with the building management system. This signal is converted and used to electronically modulate the gas valve from 40-100% of the rated input to maintain the desired set point.



Maxitrol Series 21 shown

Temperature Selector (may be remote mounted)

Spark Ignition

Amplifier

Modulating Gas Valve

Combination Main and Pilot Gas Valve

Slide Out Burner Drawer

Gas Inlet Point

Air Control Options

Standard units have an air control configuration of 100% outside air at a constant volume.

Return air is recommended when the air handler provides the primary means of heating or cooling the space. Recirculation of the air results in a cost savings due to reduced heating or cooling loads. These systems require room temperature control.

Variable air volume is recommended on make-up air applications where exhaust volumes vary. In these applications, the amount of make-up air can be made to vary accordingly resulting in savings as the units run at less than full capacity. Not only is there a reduction in heating and cooling costs but also blower motor power usage is reduced. All of the outside air damper options described below are available with variable air volume.

DAMPER CONTROLS

100% Outside Air Intake Damper

Two position spring return low leakage damper located at the air intake of the unit.

100% Outside Air Discharge Damper

Two position spring return low leakage damper located at the discharge of the unit. Field installed in the roof curb or the discharge ductwork.

100% Return Air

May use a duct or pull air directly into the filter section.

OA/RA Dampers with Manual Control

Locked into position with manual quadrants to provide constant mix of air. Field adjustable.

OA/RA Dampers with Two Position Control

Two position spring return actuator with interlocked low leakage dampers. Remote switch or time clock controls position for either 100% OA or 100% RA.

OA/RA Dampers with DDC Control

Modulating spring return actuator with interlocked low leakage dampers provides proportional control in response to a building management system. Requires an external input of 0-10 VDC or 4-20 mA.

OA/RA Dampers with Pressure Control

Modulating spring return actuator with interlocked low leakage dampers responds to sensed building pressure usually maintaining a positive building pressure in order to eliminate infiltration.

OA/RA Dampers with Potentiometer

Modulating spring return actuator with interlocked low leakage dampers manually controlled with a remote potentiometer.

VOLUME CONTROLS

Variable Frequency Drive

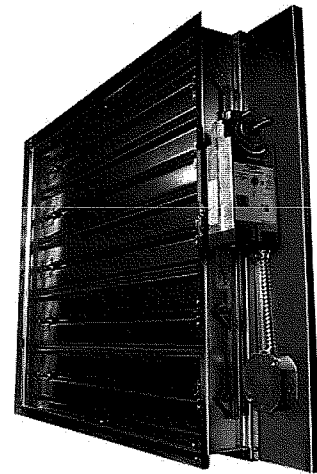
Programmed in the field to respond to inputs from controls that are provided by others.

Variable Frequency Drive with Pressure Control

Programmed in the field to respond to sensed building pressure usually maintaining a positive building pressure in order to eliminate infiltration. Pressure controls included.

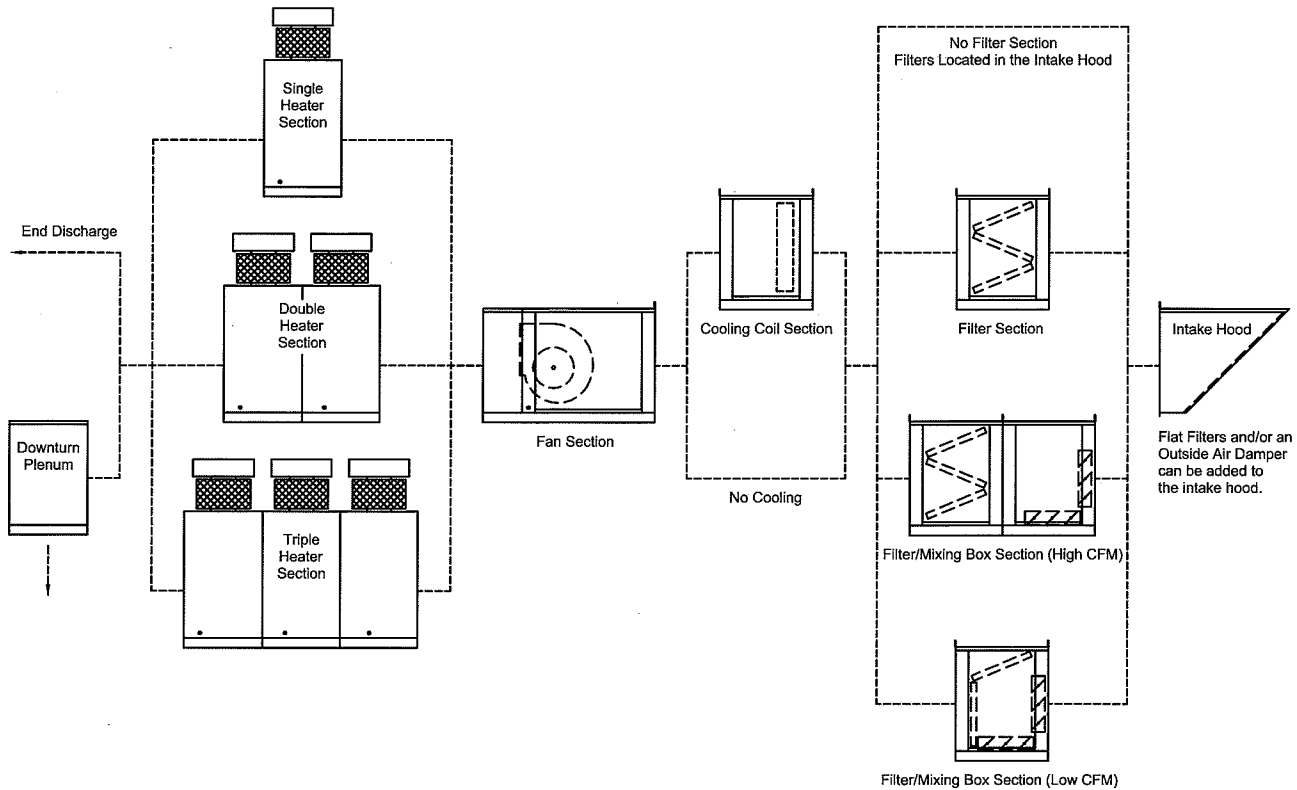
Variable Frequency Drive with Potentiometer

Programmed in the field to respond to the manually controlled remote potentiometer that is provided.

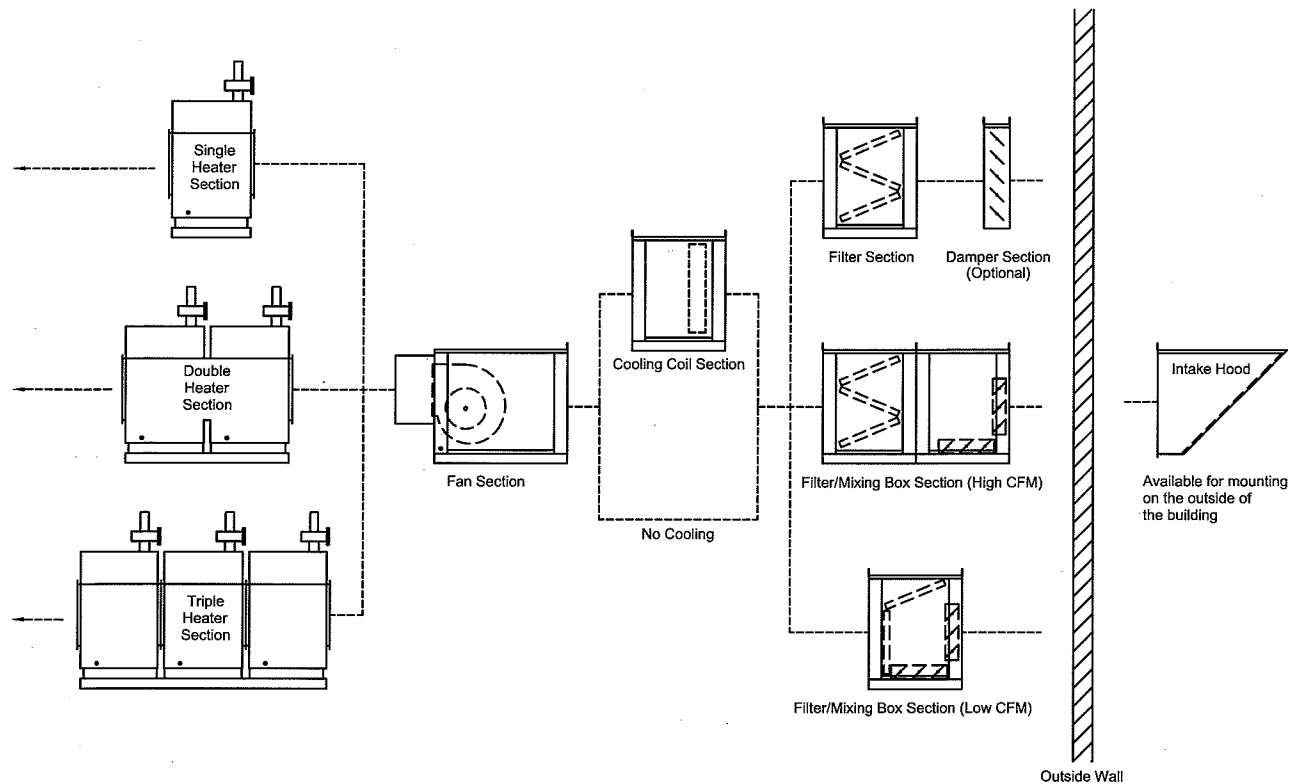


**Motorized
Damper**

Model IFG Outdoor Unit Configurations

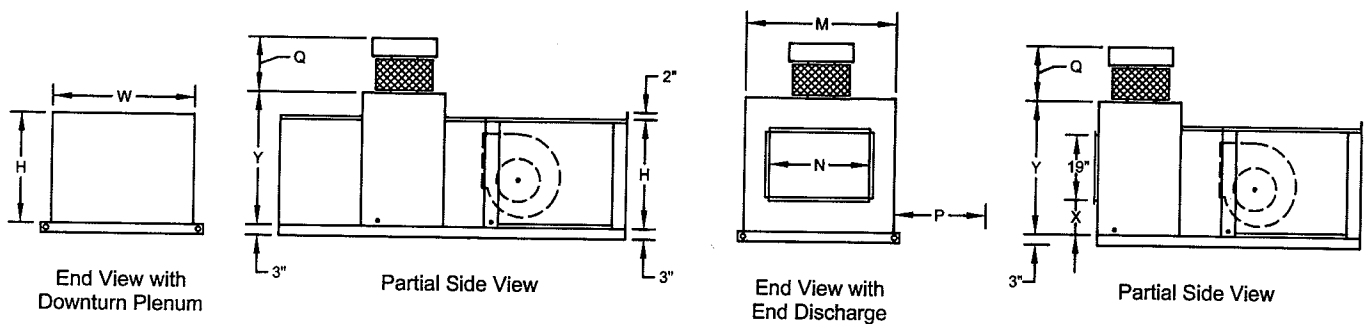
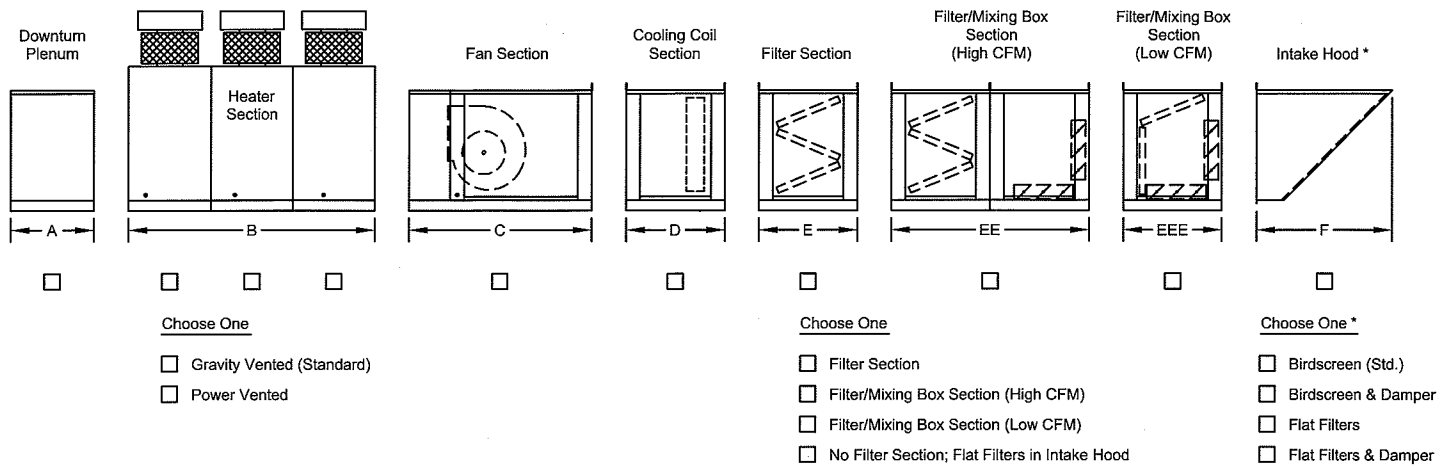


Model IFG Indoor Unit Configurations



The dashed lines that connect the various sections can be used to determine all of the possible unit configurations. If a path can be followed from the air intake to the air discharge (right to left on this page) then the combination of sections through that path is available as a unit configuration.

Model IFG Outdoor Indirect Fired Make-up Air Heater

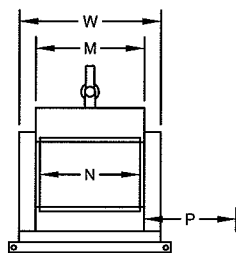
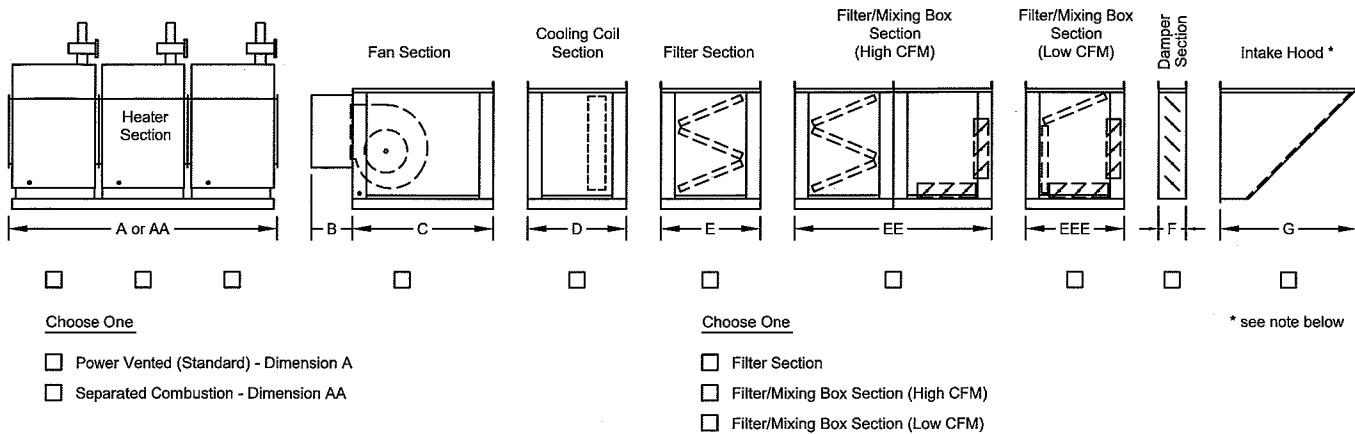


- Access doors typical on both sides.
- Intake hood and vent cap(s) are shipped loose.
- Gas inlet size: 1/2" NPT for 200 MBH and below; all others 3/4" NPT.
- Temperature rise for single heater; 20°F minimum, 90°F maximum.
- Temperature rise for double heater; 40°F minimum, 120°F maximum.
- Temperature rise for triple heater; 60°F minimum, 180°F maximum.
- The gas and electrical connections are indicated by black dots on the side views of the heater and blower sections. The side that is shown is where they are normally located.
- Dimension "P" shows the direction of access and indicates the minimum clearance for burner service.
- Dimension "Q" is the height of the vent cap. Power vented units do not have one.
- See page 13 for the minimum and maximum allowable air flow (CFM).
- See page 13 for the unit weights and for filter sizes and quantities.
- The intake hood is available in four configurations; with birdscreen, with birdscreen & OA damper, with flat filters and with flat filters & OA damper.
- Within a housing size, any combination of models and heater sizes is available (e.g. IFG-118 with 350 MBH heater in a #3 housing).

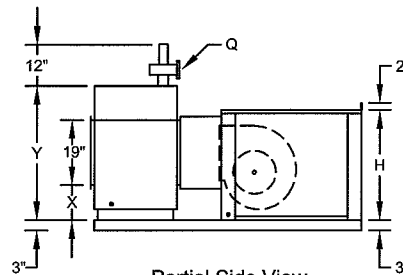
Heater Information				
Size (MBH)	M	N	P	Q
100	33.00	15.50	19.50	11.00
150	33.00	18.25	20.50	16.00
200	44.00	23.75	26.50	16.00
250,500	44.00	29.25	34.50	16.00
300,600,900	55.00	34.75	37.50	17.50
350,700,1050	55.00	40.25	45.50	17.50
400,800,1200	60.50	45.75	51.00	17.50

Model	Housing	Heater Sizes	A	B	C	D	E	EE	EEE	F	H	W	X	Y
IFG-109-SM	#1	100,150,200,250	24.00	26.00	45.00	28.00	28.00	56.00	28.00	34.00	31.00	33.20	10.13	39.00
IFG-109														
IFG-110														
IFG-110	#2	200,250,300	24.00	26.00	53.00	28.75	28.75	57.50	28.75	40.00	32.00	41.20	10.13	39.00
IFG-112		500,600		52.00										
IFG-115														
IFG-209-SM	#2W	300,350,400	24.00	26.00	53.00	28.75	28.75	57.50	28.75	40.00	32.00	52.70	10.13	39.00
IFG-209		600,700,800		52.00										
IFG-210														
IFG-115	#3	300,350,400	24.00	26.00	69.23	28.25	28.25	56.50	28.25	54.00	46.00	52.70	17.13	46.00
IFG-118		600,700,800		52.00										
IFG-120														
IFG-120-HD		900,1050,1200		78.00										

Model IFG Indoor Indirect Fired Make-up Air Heater



End View



Partial Side View

- Access doors typical on both sides.
- Gas inlet size: 1/2" NPT for 200 MBH and below; all others 3/4" NPT.
- Temperature rise for single heater; 30°F minimum, 80°F maximum.
- Temperature rise for double heater; 60°F minimum, 160°F maximum.
- Temperature rise for triple heater; 90°F minimum, 180°F maximum.
- The gas and electrical connections are indicated by black dots on the side views of the heater and blower sections. The side that is shown is where they are normally located.
- Standard indoor units have side access to the burner. Dimension "P" shows the direction of access and indicates the minimum clearance for service.
- Separated combustion units have bottom access. Minimum clearance for burner service is 25" below the unit.
- Single heater units are built and shipped on a single base.
- Multiple heater units are built and shipped in two sections; split after the heaters.
- See page 13 for the minimum and maximum allowable air flow (CFM).
- See page 13 for the unit weights and for filter sizes and quantities.
- An intake hood is available for field mounting on the outside of the building.
- Dimension "Q" is the flue discharge opening on all units. Separated combustion units also have an air inlet opening of the same size. A concentric duct adaptor with an 8" diameter termination is available to combine the two openings.
- Within a housing size, any combination of models and heater sizes is available (e.g. IFG-118 with 350 MBH heater in a #3 housing).

Heater Information				
Size (MBH)	M	N	P	Q
100	17.88	15.50	23.88	4.00
150	20.63	18.25	26.63	4.00
200	26.13	23.75	32.13	5.00
250,500	31.63	29.25	37.63	5.00
300,600,900	37.13	34.75	43.13	6.00
350,700,1050	42.63	40.25	48.63	6.00
400,800,1200	48.13	45.75	54.13	6.00

Model	Housing	Heater Sizes	A	AA	B	C	D	E	EE	EEE	F	G	H	W	X	Y
IFG-109-SM	#1	100,150,200,250	26.00	40.00	12.00	33.00	28.00	28.00	56.00	28.00	8.00	34.00	31.00	33.20	10.13	38.75
IFG-109																
IFG-110																
IFG-110	#2	200,250,300	26.00	40.00	12.00	41.00	28.75	28.75	57.50	28.75	8.00	40.00	32.00	41.20	10.13	38.75
IFG-112		500,600	52.00	80.00												
IFG-115																
IFG-209-SM	#2W	300,350,400	26.00	40.00	12.00	41.00	28.75	28.75	57.50	28.75	8.00	40.00	32.00	52.70	10.13	37.75
IFG-209		600,700,800	52.00	80.00												
IFG-210																
IFG-115	#3	300,350,400	26.00	40.00	12.00	57.23	28.25	28.25	56.50	28.25	8.00	54.00	46.00	52.70	17.13	47.31
IFG-118		600,700,800	52.00	80.00												
IFG-120																
IFG-120-HD																

Model IFG General Information

CFM Limitations - Blower

Model	Housing	Blower Limits		Cooling Coil	Evaporative Cooler
		Minimum	Maximum	Maximum	Maximum
IFG-109-SM	#1	800	1,600	2,200 CFM	2,700 CFM
IFG-109		1,000	2,600	21"X31"	24"X29"
IFG-110		1,200	3,600	4.4 Sqft.	4.9 Sqft.
IFG-110	#2	1,600	3,600	3,700 CFM	4,300 CFM
IFG-112		1,800	5,000	27"X39"	30"X37"
IFG-115		3,000	7,000	7.3 Sqft.	7.8 Sqft.
IFG-209-SM	#2W	2,400	3,200	4,800 CFM	5,600 CFM
IFG-209		2,400	5,200	27"X50"	30"X49"
IFG-210		3,000	7,000	9.4 Sqft.	10.2 Sqft.
IFG-115	#3	3,400	7,000	7,200 CFM 42"X50" 14.6 Sqft.	8,200 CFM 44"X49" 14.9 Sqft.
IFG-118		4,000	10,000		
IFG-120		5,000	12,000		
IFG-120-HD		5,000	14,000		

CFM Limitations - Heater

Heater Size (MBH)	CFM Limits	
	Minimum	Maximum
100	800	3,500
150	1,200	3,600
200	1,600	7,000
250	2,000	7,000
300	2,400	11,000
350	2,800	13,000
400	3,200	14,000
500	3,000	7,000
600,900	3,700	11,000
700,1050	4,500	13,000
800,1200	5,000	14,000

Filter Information

Model	Housing	V-bank Filter Section		Filters in Intake Hood		Filter/Mixing Box (Low CFM)		Filter/Mixing Box (High CFM)		Special Filters*	
		Qty. / Area	CFM @ 500 FPM	Qty. / Area	CFM @ 500 FPM	Qty. / Area	CFM @ 500 FPM	Qty. / Area	CFM @ 500 FPM	Qty. / Area	CFM @ 500 FPM
IFG-109-SM	#1	(4) 16x20 7.2 Sqft.	3,600	(2) 16x25 4.5 Sqft.	2,250	(4) 16x16 5.8 Sqft.	2,900	(4) 16x20 7.2 Sqft.	3,600	(2) 16x20 3.6 Sqft.	1,800
IFG-109											
IFG-110											
IFG-110	#2	(6) 20x20 13.5 Sqft.	6,750	(4) 20x20 9.0 Sqft.	4,500	(2) 16x20 (2) 20x20 8.1 Sqft.	4,050	(6) 20x20 13.5 Sqft.	6,750	(2) 20x24 5.4 Sqft.	2,700
IFG-112											
IFG-115											
IFG-209-SM	#2W	(6) 16x20 (3) 20x20 17.6 Sqft.	8,800	(4) 20x25 11.3 Sqft.	5,650	(2) 16x25 (2) 20x25 10.2 Sqft.	5,100	(6) 16x20 (3) 20x20 17.60 Sqft.	8,800	(2) 24x24 6.5 Sqft.	3,250
IFG-209											
IFG-210											
IFG-115	#3	(8) 16x20 (4) 20x20 23.4 Sqft.	11,700	(6) 20x25 16.9 Sqft.	8,450	(4) 16x25 (2) 20x25 14.7 Sqft.	7,350	(8) 16x20 (4) 20x20 23.4 Sqft.	11,700	(4) 20x24 10.8 Sqft.	5,400
IFG-118											
IFG-120											
IFG-120-HD											

* Examples of special filters include 4", 6" and 12" deep high efficiency filters. These would be mounted in a flat rack in a standard filter section.

Weight Information - for each of the sections and the heater

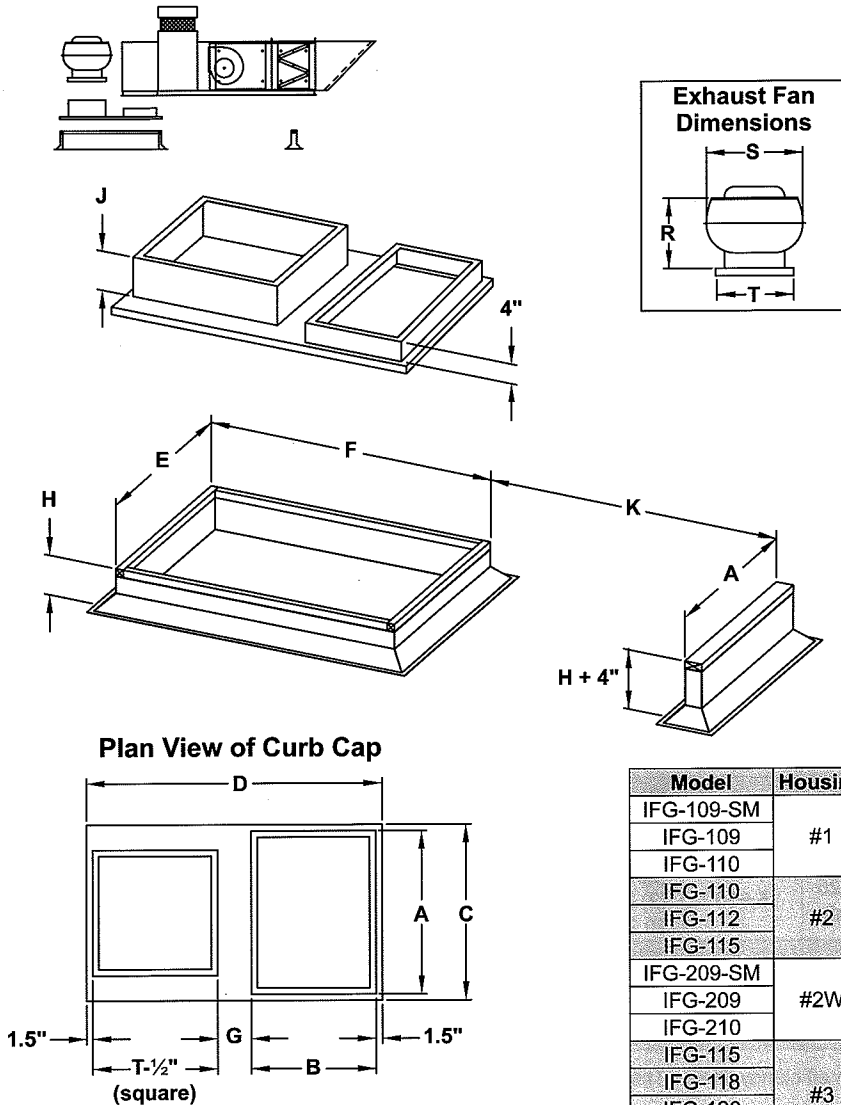
Model	Housing	Fan Section	Coil Section	V-Bank Filter Section	Filter/Mixing (Low)	Filter/Mixing (High)	Two Position Damper	Intake Hood	Downturn Plenum
IFG-109-SM	#1	350#	80#	80#	100#	180#	50#	70#	70#
IFG-109		360#							
IFG-110		370#							
IFG-110	#2	450#	90#	90#	120#	210#	60#	80#	80#
IFG-112		470#							
IFG-115		510#							
IFG-209-SM	#2W	610#	100#	110#	150#	260#	70#	160#	90#
IFG-209		630#							
IFG-210		650#							
IFG-115	#3	760#	120#	120#	180#	300#	80#	180#	100#
IFG-118		800#							
IFG-120		900#							
IFG-120-HD		930#							

Heater Size	Weight	
	Outdoor	Indoor
100	220#	170#
150	250#	200#
200	300#	230#
250	330#	260#
300	380#	320#
350	410#	360#
400	460#	400#
500	660#	520#
600	760#	640#
700	820#	720#
800	920#	800#
900	1,140#	960#
1050	1,230#	1,080#
1200	1,380#	1,200#

Model IFG Roof Curb Information

Arrangement A1

Modular Roof Curb and Support Rail



Equations

$$C = A + 3" \text{ or } (T - \frac{1}{2} ") + 3" \text{ (largest)}$$

$$D = B + G + (T - \frac{1}{2} ") + 3"$$

$$E = C - 1"$$

$$F = D - 1"$$

$$G = (S - T) / 2 + 3"$$

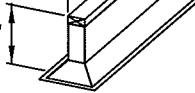
$$H = \text{Height of Curb}$$

$$J = 40" - H - R \text{ (4" min.) see note 1}$$

$$K = \text{Distance between edges of curb and rail}$$

Notes:

1. Per NFPA96 the discharge of the exhaust fan must be a minimum of 40" from the roof (H+J+R).
2. Use the equation for Dimension G to ensure adequate clearance between the two fans.
3. Dimensions CxD are the curb cap OD.
4. Dimensions ExF are the roof curb OD.
5. Dimension T is the exhaust fan curb cap ID.
The riser for the exhaust fan is undersized by 1/2"



			V-bank Filter Section		No Filter Section, Filters in Intake Hood	
			Without Cooling	With Cooling	Without Cooling	With Cooling
Model	Housing	Heater Sizes	K		K	
IFG-109-SM	#1	100,150,200,250	82.00	110.00	54.00	82.00
IFG-109						
IFG-110						
IFG-110	#2	200,250,300	91.25	120.00	62.50	91.25
IFG-112						
IFG-115						
IFG-209-SM	#2W	300,350,400	91.25	120.00	62.50	91.25
IFG-209						
IFG-210						
IFG-115	#3	300,350,400	107.00	135.25	78.75	107.00
IFG-118						
IFG-120						
IFG-120-HD						
		900,1050,1200	159.00	187.25	130.75	159.00

Model	Housing	A	B	C	D	E	F	G	H	J	K	Exhaust Fan Make & Model (or R,S and T)	Options	Tag
IFG-109-SM	#1	31.50	23.50											
IFG-109														
IFG-110														
IFG-110	#2	39.50	23.50											
IFG-112														
IFG-115														
IFG-209-SM	#2W	51.00	23.50											
IFG-209														
IFG-210														
IFG-115	#3	51.00	23.50											
IFG-118														
IFG-120														
IFG-120-HD														

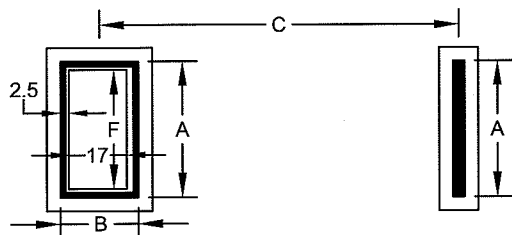
Notes:

1. Standard construction is 18 gauge galvanized steel with fiberglass insulation and 12" height; other materials, gauges, finishes & heights are available.
2. Standard roof curb and support rail have a flat base and are for flat roofs; canted bases and/or pitched curb and rail are available.
3. The support rail is 4" higher than the roof curb to compensate for the 4" high supply fan riser.
4. Additional support underneath the center of the unit is recommended whenever Dimension "K" is greater than 110".

Model IFG Roof Curb Information

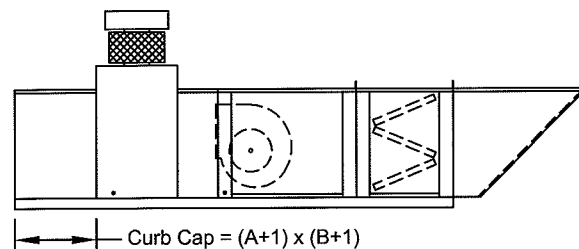
Arrangement A2

Roof Curb and Support Rail



Supply Opening = F x 17"
Centered side to side
2.5" from front edge of curb

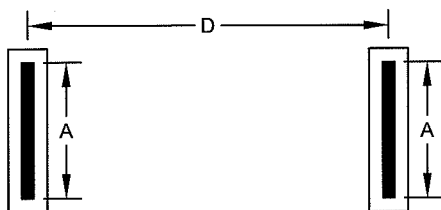
Down Discharge
Roof Curb and Rail
Arrangement A2



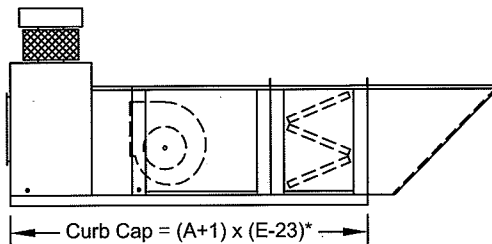
Curb OD = A x B

Arrangement A3

Support Rails



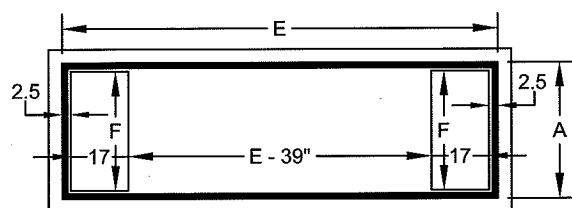
End Discharge
Support Rails
Arrangement A3



* see note 4

Arrangement A4

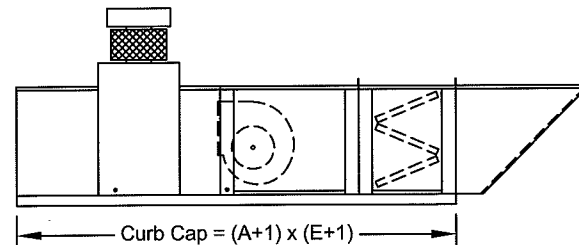
Full Perimeter Roof Curb



Supply Opening = F x 17"
Centered side to side
2.5" from front edge of curb

Return Opening = F x 17"
Centered side to side
2.5" from back edge of curb

Down Discharge
Full Perimeter Curb
Arrangement A4



Curb OD = A x E

Model	Housing	Heater Sizes	A	B	C	D	V-bank Filter or Filter/Mixing (Low CFM)		Filter/Mixing (High CFM)		No Filter Section, Filters in Intake Hood		F
							Without Cooling	With Cooling	Without Cooling	With Cooling	Without Cooling	With Cooling	
IFG-109-SM	#1	100,150,200,250	31.00	23.00	E-25	E-50	121.00	149.00	149.00	177.00	93.00	121.00	26.00
IFG-109													
IFG-110													
IFG-110	#2	200,250,300	39.00	23.00	E-25	E-50	129.75	158.50	158.50	187.25	101.00	129.75	34.00
IFG-112													
IFG-115													
IFG-209-SM	#2W	300,350,400	50.50	23.00	E-25	E-50	129.75	158.50	158.50	187.25	101.00	129.75	45.50
IFG-209													
IFG-210													
IFG-115	#3	300,350,400	50.50	23.00	E-25	E-50	145.50	173.75	173.75	202.00	117.25	145.50	45.50
IFG-118		600,700,800					171.50	199.75	199.75	228.00	143.25	171.50	
IFG-120		900,1050,1200					197.50	225.75	225.75	254.00	169.25	197.50	
IFG-120-HD													

Notes:

- Standard construction is 18 gauge galvanized steel with fiberglass insulation and 12" height; other materials, gauges, finishes & heights are available.
- Standard roof curbs are 1.5" thick; standard support rails are 3.5" thick.
- Standard roof curb and support rail have a flat base and are for flat roofs; canted bases and/or pitched curb and rail are available.
- The curb cap for end discharge units is 24" less in length because the down discharge plenum is deleted. Length is E-23 versus E+1.
- Additional support underneath the center of the unit is recommended whenever Dimension "C" is greater than 121" or "D" is greater than 110".

Performance Tables - Housing Size #1

9" Light Duty Blower			Total Static Pressure (in. w.g.)															
Available Models	CFM	O.V.	0.25		0.50		0.75		1.00		1.25		1.50		1.75		2.00	
			RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
IFG-109-SM♦	800	1,570	913	0.24	1060	0.31	1162	0.35	1243	0.39	1314	0.44	1383	0.48	1453	0.53	1522	0.58
♦100 MBH	1,000	1,960	1054	0.40	1198	0.50	1311	0.56	1401	0.62	1475	0.67	1538	0.73	1595	0.78	1651	0.84
♦150 MBH	1,200	2,350	1201	0.62	1338	0.74	1451	0.84	1546	0.92	1627	1.00	1697	1.06	1759	1.13	1813	1.19
	1,400	2,750	1358	0.92	1481	1.06	1590	1.19	1686	1.30	1770	1.40	1844	1.49	1912	1.57	1972	1.64
	1,600	3,140	1517	1.30	1627	1.46	1730	1.62	1824	1.76	1909	1.89	1985	2.01	2054	2.12	2118	2.21

9" Blower			Total Static Pressure (in. w.g.)															
Available Models	CFM	O.V.	0.25		0.50		0.75		1.00		1.25		1.50		1.75		2.00	
			RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
IFG-109♦	1,000	1,140	565	0.14	769	0.21												
♦100 MBH	1,200	1,360	595	0.18	778	0.26	943	0.36										
♦150 MBH	1,400	1,590	638	0.25	796	0.34	947	0.44	1089	0.55								
♦200 MBH	1,600	1,820	690	0.34	823	0.43	962	0.54	1090	0.64	1216	0.76						
♦250 MBH	1,800	2,050	748	0.45	860	0.55	985	0.66	1106	0.77	1219	0.89	1331	1.03				
	2,000	2,270	811	0.59	905	0.68	1014	0.80	1128	0.93	1237	1.06	1340	1.19	1442	1.34		
	2,200	2,500	875	0.75	957	0.85	1052	0.97	1154	1.11	1256	1.25	1354	1.38	1447	1.52	1540	1.67
	2,400	2,730	941	0.94	1015	1.05	1096	1.16	1187	1.31	1282	1.46	1375	1.61	1464	1.76	1551	1.92
	2,600	2,950	1009	1.18	1075	1.28	1148	1.41	1227	1.55	1312	1.70	1400	1.86	1486	2.03	1569	2.19

10" Blower			Total Static Pressure (in. w.g.)															
Available Models	CFM	O.V.	0.25		0.50		0.75		1.00		1.25		1.50		1.75		2.00	
			RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
IFG-110♦	1,200	1,130	504	0.15	676	0.24												
♦100 MBH	1,400	1,320	527	0.20	688	0.29	827	0.41										
♦150 MBH	1,600	1,510	554	0.26	706	0.36	836	0.48	955	0.61								
♦200 MBH	1,800	1,700	586	0.33	727	0.44	851	0.57	964	0.70	1068	0.84						
♦250 MBH	2,000	1,890	619	0.42	752	0.54	870	0.67	978	0.81	1079	0.96	1174	1.11				
	2,200	2,080	655	0.52	779	0.66	891	0.79	995	0.94	1092	1.09	1182	1.25	1268	1.42		
	2,400	2,260	693	0.63	807	0.78	915	0.93	1014	1.08	1107	1.24	1195	1.41	1279	1.59	1358	1.77
	2,600	2,450	732	0.76	838	0.93	940	1.09	1035	1.25	1125	1.41	1210	1.59	1290	1.77	1367	1.96
	2,800	2,640	772	0.92	871	1.10	967	1.27	1059	1.44	1145	1.61	1227	1.79	1305	1.98	1381	2.18
	3,000	2,830	814	1.09	906	1.28	997	1.47	1084	1.66	1168	1.84	1247	2.02	1323	2.21	1397	2.42
	3,200	3,020	856	1.29	942	1.49	1029	1.69	1112	1.89	1193	2.08	1269	2.28	1343	2.48	1414	2.69
	3,400	3,210	898	1.52	980	1.72	1062	1.94	1142	2.15	1219	2.36	1293	2.56	1364	2.77	1433	2.98
	3,600	3,400	942	1.76	1018	1.98	1095	2.20	1172	2.43	1246	2.66	1317	2.87	1387	3.08	1454	3.30

Note: See page 20 for General Notes regarding these performance tables.

Accessory Pressure Loss Data (inches of water)

		V-Bank Filter Section				Filter/Mixing (Low CFM)				Filter/Mixing (High CFM)				Filters in Intake Hood		Intake Hood	OA or RA Damper	Downturn Plenum ²	100 MBH Heater	150 MBH Heater	200 MBH Heater	250 MBH Heater	Evap Cooler	1 Row Coil ⁴	2 Row Coil ⁴	4 Row Coil ⁴	6 Row Coil ⁴
CFM	1" Mesh	2" Mesh	1" T.A. ¹	2" T.A. ¹	1" Mesh	2" Mesh	1" T.A. ¹	2" T.A. ¹	1" Mesh	2" Mesh	1" T.A. ¹	2" T.A. ¹	1" Mesh														
800	.03	.04	.04	.04	.04	.05	.05	.05	.05	.06	.06	.06	.02	.03	.01	.02	.01	.10 ³	NA	NA	NA	.01	.04	.08	.15	.23	
1,200	.04	.06	.05	.06	.08	.10	.09	.10	.08	.10	.09	.10	.04	.06	.02	.02	.01	.18 ³	NA	NA	NA	.01	.06	.12	.23	.35	
1,600	.05	.07	.06	.08	.13	.15	.14	.16	.12	.14	.13	.15	.06	.08	.03	.03	.04	.21	.15 ³	.10 ³	NA	.03	.08	.15	.31	.46	
2,000	.06	.09	.07	.10	.18	.21	.19	.22	.16	.19	.17	.20	.08	.11	.05	.04	.07	.32	.15	.15 ³	.10 ³	.08	.10	.19	.38	.58	
2,400	.07	.10	.09	.12	.26	.28	.29	.31	.22	.25	.24	.27	.11	.13	.06	.05	.10	.46	.18	.20 ³	.14 ³	.12	.12	.23	.46	.69	
2,800	.08	.11	.10	.14	.33	.36	.36	.40	.28	.31	.3	.34	.13	.16	.08	.05	.14	.64	.25	.14	.20 ³	.16	.13	.27	.54	.81	
3,200	.09	.13	.11	.16	.42	.45	.45	.49	.36	.40	.38	.43	.15	.18	.09	.06	.17	.84	.33	.19	.14	.20	.15	.31	.62	.92	
3,600	.10	.14	.12	.17	.51	.55	.54	.60	.44	.48	.46	.51	.17	.21	.11	.07	.20	1.06	.41	.25	.16	.24	.17	.35	.69	1.04	

1. Same pressure loss for 30% efficient pleated filters.

2. Only for units with downturn plenum - do not include on end discharge units.

3. These losses reflect the addition of an air baffle at the entrance of the heater on high temperature units.

4. Pressure losses for cooling coils are for 8 FPI, add 30% for 10 FPI and 60% for 12 FPI.

Performance Tables - Housing Size #2

Note: This is a non-standard combination of blower and housing size. Use it only if a 10" blower is required but the standard Housing Size #1 is too small. This may occur when cooling is required.

10" Blower			Total Static Pressure (in. w.g.)															
Available Models	CFM	O.V.	0.25		0.50		0.75		1.00		1.25		1.50		1.75		2.00	
			RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
IFG-110+	1,600	1,510	544	0.25	695	0.36	827	0.48	945	0.59								
♦200 MBH	1,800	1,700	570	0.32	713	0.44	838	0.56	953	0.68	1059	0.83						
♦250 MBH	2,200	2,080	634	0.49	758	0.63	873	0.77	978	0.91	1075	1.06	1167	1.23	1254	1.39		
♦300 MBH	2,600	2,450	709	0.73	816	0.90	918	1.06	1014	1.21	1105	1.37	1191	1.55	1273	1.74	1352	1.92
	3,000	2,830	789	1.05	881	1.23	972	1.42	1060	1.60	1144	1.78	1225	1.97	1303	2.16	1376	2.36
	3,400	3,210	869	1.44	950	1.64	1032	1.86	1113	2.08	1192	2.28	1267	2.49	1339	2.69	1409	2.90

12" Blower			Total Static Pressure (in. w.g.)															
Available Models	CFM	O.V.	0.25		0.50		0.75		1.00		1.25		1.50		1.75		2.00	
			RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
IFG-112+	1,800	1,220	444	0.22	593	0.33	719	0.44										
♦200 MBH	2,200	1,490	478	0.33	613	0.45	730	0.58	836	0.72								
♦250 MBH	2,600	1,760	518	0.48	636	0.60	746	0.75	843	0.90	935	1.06						
♦300 MBH	3,000	2,030	566	0.67	666	0.81	767	0.97	861	1.13	948	1.31	1029	1.48	1106	1.66	1179	1.84
♦500 MBH	3,400	2,300	621	0.92	703	1.07	794	1.23	883	1.41	965	1.61	1042	1.80	1116	2.00	1187	2.20
♦600 MBH	3,800	2,570	679	1.23	747	1.39	826	1.56	907	1.75	985	1.95	1060	2.17	1130	2.38	1198	2.60
	4,200	2,840	738	1.60	796	1.78	864	1.96	937	2.15	1010	2.36	1080	2.59	1148	2.82	1214	3.06
	4,600	3,110	798	2.04	848	2.24	907	2.44	973	2.64	1041	2.85	1107	3.08	1172	3.34	1235	3.60
	5,000	3,380	861	2.57	905	2.78	956	3.00	1014	3.22	1075	3.44	1137	3.67	1199	3.92	1258	4.20

15" Blower			Total Static Pressure (in. w.g.)															
Available Models	CFM	O.V.	0.25		0.50		0.75		1.00		1.25		1.50		1.75		2.00	
			RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
IFG-115+	3,000	1,440	439	0.41	550	0.56	646	0.72	730	0.90								
♦200 MBH	3,400	1,630	468	0.53	569	0.71	662	0.88	744	1.06								
♦250 MBH	3,800	1,830	498	0.69	593	0.88	680	1.06	759	1.26	832	1.48						
♦300 MBH	4,200	2,020	529	0.86	618	1.07	699	1.28	776	1.49	847	1.71	912	1.94	972	2.19		
♦500 MBH	4,600	2,210	561	1.07	645	1.30	721	1.53	794	1.76	863	1.99	927	2.23	986	2.48	1041	2.73
♦600 MBH	5,000	2,400	594	1.32	673	1.56	745	1.81	814	2.06	880	2.31	942	2.56	1001	2.81	1056	3.08
	5,400	2,600	628	1.61	703	1.86	772	2.13	837	2.41	899	2.68	960	2.94	1018	3.20	1073	3.49
	5,800	2,790	665	1.94	735	2.21	801	2.50	863	2.79	922	3.08	979	3.37	1036	3.65	1089	3.94
	6,200	2,980	702	2.32	768	2.61	831	2.91	891	3.23	947	3.54	1002	3.84	1055	4.15	1107	4.45
	6,600	3,170	741	2.76	802	3.05	863	3.37	920	3.70	974	4.03	1026	4.36	1077	4.69	1127	5.02
	7,000	3,370	777	3.23	834	3.54	892	3.88	947	4.22	1000	4.57	1050	4.92	1099	5.27	1147	5.62

Note: See page 20 for General Notes regarding these performance tables.

Accessory Pressure Loss Data (inches of water)

CFM	V-Bank Filter Section				Filter/Mixing (Low CFM)				Filter/Mixing (High CFM)				Filters in Intake Hood		Intake Hood	OA or RA Damper	Downturn Plenum ²	200 MBH Heater	250 MBH Heater	300 MBH Heater	500 MBH Heater	600 MBH Heater	Evap Cooler	1 Row Coil ⁴	2 Row Coil ⁴	4 Row Coil ⁴	6 Row Coil ⁴
	1" Mesh	2" Mesh	1" T.A. ¹	2" T.A. ¹	1" Mesh	2" Mesh	1" T.A. ¹	2" T.A. ¹	1" Mesh	2" Mesh	1" T.A. ¹	2" T.A. ¹	1" Mesh	2" Mesh													
1,800	.04	.06	.05	.06	.07	.09	.08	.08	.07	.09	.08	.09	.04	.05	.01	.02	.01	.12 ³	NA	NA	NA	NA	.01	.05	.11	.22	.33
2,200	.05	.06	.05	.07	.09	.10	.09	.12	.09	.10	.09	.11	.05	.07	.02	.03	.03	.18 ³	.11 ³	NA	NA	NA	.01	.07	.13	.27	.40
2,600	.05	.07	.06	.08	.12	.14	.14	.17	.12	.14	.13	.15	.06	.09	.03	.03	.05	.12	.15 ³	.11 ³	NA	NA	.04	.08	.16	.32	.48
3,000	.06	.08	.07	.10	.15	.17	.18	.22	.15	.17	.16	.19	.08	.10	.04	.04	.07	.17	.22 ³	.15 ³	.28	NA	.07	.09	.18	.37	.55
3,400	.07	.09	.08	.11	.18	.20	.21	.26	.18	.20	.19	.22	.09	.12	.05	.04	.09	.22	.15	.19 ³	.30	NA	.09	.10	.21	.41	.62
3,800	.07	.10	.09	.12	.21	.24	.28	.30	.21	.24	.23	.26	.11	.13	.06	.05	.11	.28	.18	.15	.36	.30	.12	.12	.23	.46	.70
4,200	.08	.11	.09	.13	.25	.28	.31	.35	.25	.28	.26	.30	.12	.15	.07	.05	.12	.34	.22	.16	.44	.32	.14	.13	.26	.51	.77
4,600	.09	.12	.10	.14	.29	.32	.34	.39	.29	.32	.30	.34	.13	.16	.08	.06	.14	.40	.26	.19	.52	.38	.17	.14	.28	.56	.84
5,000	.09	.13	.11	.15	NA	NA	NA	NA	.33	.37	.35	.39	.15	.18	.09	.06	.16	.47	.31	.22	.62	.44	.20	.15	.30	.61	.91
5,400	.10	.13	.12	.17	NA	NA	NA	NA	.38	.41	.40	.45	.16	.19	.10	.07	.18	.55	.36	.26	.72	.52	.22	.16	.33	.66	.99
5,800	.11	.14	.13	.18	NA	NA	NA	NA	.43	.46	.45	.50	.17	.21	.11	.07	.20	.64	.42	.30	.84	.60	.25	.18	.35	.71	1.06
6,200	.11	.15	.13	.19	NA	NA	NA	NA	.48	.52	.50	.56	.19	.23	.12	.08	.22	.74	.48	.34	.96	.68	.28	.19	.38	.76	1.13
6,600	.12	.16	.14	.20	NA	NA	NA	NA	.54	.58	.56	.62	.20	.24	.13	.08	.24	.84	.54	.38	1.08	.76	.30	.20	.40	.80	1.21
7,000	.13	.17	.15	.21	NA	NA	NA	NA	.60	.64	.62	.68	.22	.26	.14	.09	.26	.94	.62	.43	1.24	.86	.33	.21	.43	.85	1.28

1. Same pressure loss for 30% efficient pleated filters.
2. Only for units with downturn plenum - do not include on end discharge units.
3. These losses reflect the addition of an air baffle at the entrance of the heater on high temperature units.
4. Pressure losses for cooling coils are for 8 FPI, add 30% for 10 FPI and 60% for 12 FPI.

Performance Tables - Housing Size #2W

Twin 9" Lt. Duty Blowers			Total Static Pressure (in. w.g.)															
Available Models	CFM	O.V.	0.25		0.50		0.75		1.00		1.25		1.50		1.75		2.00	
			RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
IFG-209-SM	2,400	2,350	1201	1.21	1338	1.44	1451	1.64	1546	1.81	1627	1.95	1697	2.08	1759	2.21	1813	2.32
300 MBH	2,600	2,550	1279	1.48	1409	1.74	1520	1.97	1616	2.16	1699	2.33	1773	2.47	1838	2.62	1895	2.75
350 MBH	2,800	2,750	1358	1.80	1481	2.07	1590	2.33	1686	2.55	1770	2.75	1844	2.92	1912	3.08	1972	3.23
400 MBH	3,000	2,940	1438	2.16	1553	2.45	1661	2.73	1756	2.98	1840	3.21	1914	3.42	1983	3.59	2046	3.77
	3,200	3,140	1517	2.56	1627	2.88	1730	3.18	1824	3.47	1909	3.73	1985	3.97	2054	4.17	2118	4.36

Twin 9" Blowers			Total Static Pressure (in. w.g.)															
Available Models	CFM	O.V.	0.25		0.50		0.75		1.00		1.25		1.50		1.75		2.00	
			RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
IFG-209	2,400	1,360	609	0.36	790	0.52												
300 MBH	2,800	1,590	652	0.50	811	0.67	959	0.86										
350 MBH	3,200	1,820	704	0.67	840	0.86	979	1.07	1107	1.27	1231	1.52						
400 MBH	3,600	2,050	763	0.90	878	1.09	1004	1.31	1123	1.55	1238	1.78	1349	2.05				
600 MBH	4,000	2,270	826	1.18	923	1.36	1034	1.60	1146	1.86	1254	2.11	1356	2.37	1458	2.66		
700 MBH	4,400	2,500	891	1.51	976	1.70	1071	1.95	1173	2.22	1275	2.50	1372	2.77	1465	3.05	1559	3.37
800 MBH	4,800	2,730	957	1.90	1033	2.12	1117	2.36	1209	2.64	1305	2.94	1397	3.25	1485	3.53	1572	3.84
	5,200	2,950	1027	2.36	1096	2.59	1169	2.84	1251	3.12	1337	3.43	1425	3.77	1510	4.10	1592	4.41

Twin 10" Blowers			Total Static Pressure (in. w.g.)															
Available Models	CFM	O.V.	0.25		0.50		0.75		1.00		1.25		1.50		1.75		2.00	
			RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
IFG-210	3,000	1,420	551	0.45	705	0.65	839	0.87										
300 MBH	3,400	1,600	576	0.58	722	0.78	849	1.02										
350 MBH	3,800	1,790	609	0.73	745	0.96	866	1.21	976	1.48								
400 MBH	4,200	1,980	647	0.92	773	1.18	888	1.43	993	1.72	1092	2.03						
600 MBH	4,600	2,170	685	1.14	803	1.43	912	1.70	1013	1.99	1108	2.32	1196	2.64				
700 MBH	5,000	2,360	725	1.39	835	1.71	939	2.01	1035	2.31	1124	2.64	1210	2.98	1292	3.34		
800 MBH	5,400	2,550	765	1.68	868	2.02	967	2.35	1059	2.68	1145	3.01	1229	3.37	1307	3.74		
	5,800	2,740	806	2.01	903	2.38	996	2.74	1085	3.09	1169	3.44	1249	3.80	1327	4.19	1402	4.60
	6,200	2,920	849	2.39	939	2.78	1027	3.17	1112	3.55	1194	3.92	1271	4.29	1345	4.69		
	6,600	3,110	894	2.82	977	3.23	1061	3.65	1142	4.05	1220	4.45	1295	4.84				
	7,000	3,300	939	3.31	1018	3.74	1097	4.18	1175	4.61	1249	5.04						

Note: See page 20 for General Notes regarding these performance tables.

Accessory Pressure Loss Data (inches of water)

CFM	V-Bank Filter Section				Filter/Mixing (Low CFM)				Filter/Mixing (High CFM)				Filters in Intake Hood		Intake Hood	OA or RA Damper	Downturn Plenum ²	300 MBH Heater	350 MBH Heater	400 MBH Heater	600 MBH Heater	700 MBH Heater	800 MBH Heater	Evap Cooler	1 Row Coil ⁴	2 Row Coil ⁴	4 Row Coil ⁴	6 Row Coil ⁴
	1" Mesh	2" Mesh	1" T.A. ¹	2" T.A. ¹	1" Mesh	2" Mesh	1" T.A. ¹	2" T.A. ¹	1" Mesh	2" Mesh	1" T.A. ¹	2" T.A. ¹	1" Mesh	2" Mesh	Intake Hood	OA or RA Damper	Downturn Plenum ²	300 MBH Heater	350 MBH Heater	400 MBH Heater	600 MBH Heater	700 MBH Heater	800 MBH Heater	Evap Cooler	1 Row Coil ⁴	2 Row Coil ⁴	4 Row Coil ⁴	6 Row Coil ⁴
2,600	.04	.06	.05	.07	.12	.13	.13	.14	.11	.13	.12	.14	.05	.06	.02	.02	.02	.11 ³	NA	NA	NA	NA	NA	.01	.06	.12	.26	.37
3,000	.05	.07	.06	.08	.15	.17	.16	.18	.14	.16	.15	.17	.06	.08	.03	.03	.03	.15 ³	.11 ³	NA	NA	NA	NA	.02	.07	.14	.29	.43
3,400	.05	.07	.06	.09	.18	.20	.19	.23	.16	.18	.17	.20	.07	.09	.03	.03	.05	.19 ³	.15 ³	.10 ³	NA	NA	NA	.04	.08	.16	.32	.49
3,800	.06	.08	.07	.09	.22	.24	.23	.25	.20	.22	.21	.23	.08	.10	.04	.04	.06	.15	.18 ³	.15 ³	.30	NA	NA	.06	.09	.18	.36	.54
4,200	.06	.09	.08	.10	.26	.28	.29	.29	.23	.26	.25	.27	.09	.11	.05	.04	.08	.16	.20 ³	.17 ³	.32	NA	NA	.08	.10	.20	.40	.60
4,600	.07	.09	.08	.11	.30	.32	.31	.35	.27	.29	.28	.31	.10	.12	.06	.04	.10	.19	.15	.20 ³	.38	.30	NA	.10	.11	.22	.44	.66
5,000	.07	.10	.09	.12	.35	.38	.38	.41	.31	.34	.33	.36	.11	.14	.07	.05	.11	.22	.16	.14	.44	.32	.28	.13	.12	.24	.48	.71
5,400	.08	.11	.09	.13	.40	.43	.42	.46	.36	.39	.37	.41	.12	.15	.07	.05	.13	.26	.19	.15	.52	.38	.30	.15	.13	.26	.51	.77
5,800	.09	.12	.10	.14	.45	.48	.46	.51	.41	.44	.42	.46	.13	.16	.08	.06	.14	.30	.22	.17	.60	.44	.34	.17	.14	.28	.55	.83
6,200	.09	.12	.11	.15	.51	.54	.54	.58	.46	.49	.48	.52	.14	.17	.09	.06	.16	.34	.25	.19	.68	.50	.38	.19	.15	.30	.59	.89
6,600	.10	.13	.11	.16	.57	.61	.59	.65	.52	.55	.53	.58	.15	.19	.10	.06	.17	.38	.28	.22	.76	.56	.44	.21	.16	.31	.63	.94
7,000	.10	.14	.12	.17	.63	.67	.66	.71	.57	.61	.59	.64	.16	.20	.10	.07	.19	.43	.32	.25	.86	.64	.50	.23	.17	.33	.67	1.00

1. Same pressure loss for 30% efficient pleated filters.

2. Only for units with downturn plenum - do not include on end discharge units.

3. These losses reflect the addition of an air baffle at the entrance of the heater on high temperature units.

4. Pressure losses for cooling coils are for 8 FPI, add 30% for 10 FPI and 60% for 12 FPI.

Performance Tables - Housing Size #3

Note: This is a non-standard combination of blower and housing size. Use it only if a 15" blower is required but the standard Housing Size #2 is too small. This may occur when cooling is required.

15" Blower			Total Static Pressure (in. w.g.)															
Available Models	CFM	O.V.	0.25		0.50		0.75		1.00		1.25		1.50		1.75		2.00	
			RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
IFG-115♦	4,000	1,920	497	0.74	591	0.94	676	1.14	755	1.34	828	1.55	894	1.78	957	2.01	1028	2.61
♦300 MBH	4,500	2,160	535	0.97	622	1.20	700	1.42	774	1.64	845	1.86	911	2.10	971	2.35	1043	3.02
♦350 MBH	5,000	2,400	575	1.27	655	1.51	729	1.75	798	2.00	864	2.25	927	2.50	988	2.75	1062	3.51
♦400 MBH	5,500	2,640	618	1.62	691	1.87	761	2.15	826	2.42	888	2.70	948	2.97	1006	3.24	1081	4.09
♦600 MBH	6,000	2,880	662	2.04	729	2.31	794	2.60	856	2.90	915	3.20	972	3.50	1027	3.80	1081	4.09
♦700 MBH	6,500	3,130	707	2.53	767	2.81	828	3.12	888	3.44	944	3.77	997	4.09	1049	4.41	1100	4.73
♦800 MBH	7,000	3,370	752	3.10	806	3.39	865	3.71	921	4.06	975	4.40	1026	4.75	1076	5.10	1124	5.45

18" Blower			Total Static Pressure (in. w.g.)															
Available Models	CFM	O.V.	0.25		0.50		0.75		1.00		1.25		1.50		1.75		2.00	
			RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
IFG-118♦	4,000	1,380	318	0.49	409	0.69												
♦300 MBH	4,500	1,550	334	0.63	418	0.85	496	1.07										
♦350 MBH	5,000	1,720	350	0.79	430	1.04	502	1.27	571	1.53								
♦400 MBH	5,500	1,900	367	0.98	443	1.25	511	1.51	575	1.78	637	2.06						
♦600 MBH	6,000	2,070	385	1.19	458	1.50	522	1.78	583	2.07	641	2.36	697	2.69				
♦700 MBH	6,500	2,240	405	1.44	474	1.79	536	2.10	593	2.40	648	2.71	702	3.04				
♦800 MBH	7,000	2,410	426	1.73	491	2.11	551	2.45	605	2.78	657	3.10	708	3.44	757	3.79		
♦900 MBH	7,500	2,590	447	2.06	509	2.46	567	2.85	619	3.20	668	3.54	716	3.89	764	4.26	810	4.63
♦1050 MBH	8,000	2,760	469	2.43	527	2.86	583	3.28	634	3.67	681	4.04	727	4.40	772	4.78	817	5.17
♦1200 MBH	8,500	2,930	491	2.84	546	3.30	600	3.76	650	4.19	696	4.59	740	4.97	783	5.36	825	5.75
	9,000	3,100	513	3.31	566	3.79	617	4.27	666	4.74	711	5.18	754	5.59	795	5.99	835	6.41

20" Blower			Total Static Pressure (in. w.g.)															
Available Models	CFM	O.V.	0.25		0.50		0.75		1.00		1.25		1.50		1.75		2.00	
			RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
IFG-120♦	5,000	1,280	308	0.67	386	0.92	455	1.22	517	1.54								
♦300 MBH	6,000	1,530	344	1.02	410	1.31	473	1.62	531	1.97	583	2.34						
♦350 MBH	7,000	1,790	380	1.48	437	1.80	494	2.14	548	2.51	598	2.91	645	3.33	690	3.78	733	4.23
♦400 MBH	8,000	2,050	417	2.06	469	2.43	519	2.80	568	3.20	616	3.62	661	4.07	703	4.53	743	5.01
♦600 MBH	9,000	2,300	455	2.78	503	3.22	548	3.63	593	4.05	637	4.50	679	4.97	719	5.45	758	5.96
♦700 MBH	10,000	2,560	494	3.67	540	4.18	581	4.63	621	5.09	661	5.56	701	6.06	739	6.57	776	7.10
♦800 MBH	11,000	2,810	533	4.73	578	5.32	616	5.82	652	6.32	689	6.83	725	7.36	762	7.90	797	8.45
♦900 MBH	12,000	3,070	573	5.99	616	6.65	653	7.23	687	7.77	720	8.32	753	8.87	787	9.45	820	10.03
♦1050 MBH	13,000	3,320	613	7.47	654	8.19	690	8.85	723	9.45	753	10.03	783	10.62	815	11.23	846	11.85
♦1200 MBH	14,000	3,580	655	9.19	692	9.95	728	10.70	760	11.38	788	12.00	816	12.62	845	13.27	874	13.92
	15,000	3,840	696	11.16	732	11.98	766	12.79	797	13.55	825	14.25	851	14.92	878	15.58	904	16.27

Note: See page 20 for General Notes regarding these performance tables.

Accessory Pressure Loss Data (inches of water)

	V-Bank Filter Section				Filter/Mixing (Low CFM)				Filter/Mixing (High CFM)				Filters in Intake Hood																		
CFM	1" Mesh	2" Mesh	1" T.A. ¹	2" T.A. ¹	1" Mesh	2" Mesh	1" T.A. ¹	2" T.A. ¹	1" Mesh	2" Mesh	1" T.A. ¹	2" T.A. ¹			1" Mesh	2" Mesh	Intake Hood	OA or RA Damper	Downturn Plenum ²	300 MBH Heater	350 MBH Heater	400 MBH Heater	600 MBH Heater	700 MBH Heater	800 MBH Heater	900 MBH Heater	1050 MBH Heater	1200 MBH Heater	Evap Cooler	1 Row Coil ⁴	2 Row Coil ⁴
4,000	.04	.06	.05	.07	.09	.11	.10	.12	.08	.10	.09	.11	.05	.07	.02	.02	.02	.14	.19 ³	.15 ³	.28	NA	NA	.42	NA	NA	.01	.06	.13	.26	.39
5,000	.05	.07	.06	.09	.13	.15	.14	.18	.11	.13	.12	.15	.07	.09	.03	.03	.05	.22	.17	.13	.44	.34	.26	.66	.51	.39	.04	.08	.16	.32	.49
6,000	.06	.09	.07	.10	.17	.19	.19	.20	.14	.17	.15	.18	.09	.11	.05	.04	.08	.32	.24	.18	.64	.48	.36	.96	.72	.54	.08	.10	.19	.39	.58
7,000	.07	.10	.08	.12	.21	.24	.22	.27	.18	.21	.19	.23	.10	.13	.06	.06	.10	.43	.32	.25	.86	.64	.50	1.29	.96	.75	.11	.11	.23	.45	.68
8,000	.08	.11	.10	.13	.26	.29	.29	.32	.22	.25	.24	.27	.12	.15	.07	.08	.13	.57	.42	.33	1.14	.84	.66	1.71	1.26	.99	.15	.13	.26	.52	.78
9,000	.09	.12	.11	.15	.32	.35	.35	.39	.27	.30	.29	.33	.14	.17	.09	.10	.15	.73	.54	.41	1.46	1.08	.82	2.19	1.62	1.23	.18	.15	.29	.58	.88
10,000	.10	.13	.12	.16	.38	.41	.41	.45	.32	.35	.34	.38	.16	.19	.10	.12	.18	.90	.67	.51	1.80	1.34	1.02	2.70	2.01	1.53	.22	.16	.32	.65	.97
11,000	.11	.14	.13	.18	NA	NA	NA	NA	.38	.41	.40	.45	.18	.21	.11	.15	.21	1.08	.82	.62	2.16	1.64	1.24	3.24	2.46	1.86	.25	.18	.36	.71	1.07
12,000	.12	.16	.14	.20	NA	NA	NA	NA	.44	.48	.46	.52	.19	.23	.13	.18	.23	NA	.97	.75	NA	1.94	1.50	NA	2.91	2.25	.29	.19	.39	.78	1.17
13,000	.13	.17	.15	.21	NA	NA	NA	NA	.50	.54	.52	.58	.21	.25	.14	.21	.26	NA	1.12	.88	NA	2.24	1.76	NA	3.36	2.64	.32	.21	.42	.84	1.27
14,000	.14	.18	.16	.23	NA	NA	NA	NA	.57	.61	.59	.66	.23	.27	.15	.24	.28	NA	1.01	NA	NA	2.02	NA	NA	3.03	.36	.23	.45	.91	1.36	
15,000	.14	.19	.17	.24	NA	NA	NA	NA	.64	.69	.67	.74	.25	.30	.16	.27	.31	NA	NA	NA	NA	NA	NA	NA	NA	.39	.24	.49	.97	1.46	

1. Same pressure loss for 30% efficient pleated filters.
2. Only for units with downturn plenum - do not include on end discharge units.
3. These losses reflect the addition of an air baffle at the entrance of the heater on high temperature units.
4. Pressure losses for cooling coils are for 8 FPI, add 30% for 10 FPI and 60% for 12 FPI.

Performance Tables - Housing Size #3 (Con't.)

20" Heavy Duty Blower			Total Static Pressure (in. w.g.)															
Available Models	CFM	O.V.	0.25		0.50		0.75		1.00		1.25		1.50		1.75		2.00	
			RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
IFG-120-HD	5,000	1,180	293	0.57	373	0.84	450	1.17										
300 MBH	6,000	1,410	321	0.85	392	1.14	458	1.48	522	1.86	582	2.29						
350 MBH	7,000	1,650	351	1.21	415	1.53	474	1.89	530	2.29	586	2.73	639	3.21	689	3.69		
400 MBH	8,000	1,880	383	1.67	441	2.03	494	2.41	545	2.82	595	3.28	644	3.77	692	4.29	737	4.83
600 MBH	9,000	2,120	416	2.25	469	2.65	518	3.06	564	3.49	610	3.96	654	4.46	698	4.99	741	5.57
700 MBH	10,000	2,350	450	2.96	499	3.41	545	3.85	588	4.31	630	4.79	670	5.31	710	5.85	750	6.43
800 MBH	11,000	2,590	486	3.81	531	4.32	574	4.80	614	5.29	653	5.80	691	6.33	728	6.89	765	7.48
900 MBH	12,000	2,820	522	4.82	564	5.39	604	5.91	642	6.43	679	6.97	715	7.54	749	8.12	783	8.72
1050 MBH	13,000	3,060	558	6.00	598	6.62	635	7.20	671	7.76	706	8.33	740	8.92	773	9.53	804	10.16
1200 MBH	14,000	3,290	595	7.36	632	8.04	667	8.67	701	9.28	734	9.88	767	10.50	798	11.14	828	11.80
	15,000	3,530	633	8.92	668	9.66	701	10.35	733	11.01	764	11.66	795	12.31	825	12.97	854	13.65

General Notes:

1. Performances shown are for units with an outlet duct and include drive losses.
2. At higher elevations use the appropriate air density correction factor or contact the factory for assistance.
3. The internal static pressure losses for the fan section are included in the tables.
4. Any additional losses from external sources or from optional accessories must be added in.
5. Units with total static pressure greater than 2.0" are available. Contact the factory for fan performance information.
6. Fan curves and sound and efficiency information are available from the factory upon request.

Example of Fan Selection (see AHU Fan Selection Guide for more detailed information)

Indirect fired heater is specified

2,800 CFM at 0.50" ESP

Design Temperature Rise = 65°F

Intake hood with flat filters (2" mesh)

Downturn plenum

Required BTU = $2,800 \times 65 \times 1.08 \div 0.80 = 245,700$ BTU

Required MBH = $245,700 \text{ BTU} \div 1,000 = 246$ MBH

250 MBH heater is required

Step #1 - Determine the model

Model IFG is required.

Step #2 - Determine the air flow

2,800 CFM is given.

Step #3 - Determine the housing size and verify heater availability

Either Housing Size #1 or #2 could be selected since the air flow is in the normal range and the 250 MBH heater is available with both. Choose Housing Size #1 for it's lower cost and smaller footprint.

Step #4 - Determine the TSP

Use the accessory pressure loss chart at the bottom of page 16.

0.16" filters

0.08" intake

0.14" downturn

0.13" IFG Heater (250 MBH)

0.51" internal losses

Total static pressure = $0.50" + 0.51" = 1.01"$

Step #5 - Select the blower

From the tables on page 16 it can be seen that only the 10" blower is recommended at 2,800 CFM and 1.02" TSP.

The 10" blower performance table shows the fan will operate at slightly less than 1059 RPM and 1.44 BHP.

Step #6 - Adjust for non-standard conditions

Standard conditions exist - no adjustment necessary

Step #7 - Determine the motor size

1-½ HP motor is required.

Model IFG Typical Specifications

General

Provide KEES Model IFG Indirect Fired Heater designed for (indoor) (outdoor) installation with (down) (end) discharge. Performance shall be as scheduled on the plans.

Heater

The indirect fired gas heater shall be AGA and CGA certified to conform with the latest ANSI standards for efficient and safe performance and shall be compliant with FM (IRI) (Illinois School Code) requirements. It shall be 80% efficient and equipped for use with (natural) (propane) gas.

Each heater (Single on units 100-400 MBH, Dual on units 500-800 MBH and Triple on units 900-1,200 MBH) will contain its own heat exchanger, flue collector, venting, burners, safety and ignition controls.

Burners will be die formed, individually removable for servicing and constructed of (aluminized steel) (409 stainless steel).

Heat exchanger will consist of (409 stainless steel) (321 stainless steel) (aluminized steel) tubes and headers.

On Outdoor Units, (gravity venting) (power venting) shall provide outside air for combustion and removal of the products of combustion.

On Indoor Units, power venting shall provide indoor air for combustion and removal of the products of combustion to the outside.

On Separated Combustion Units, the combustion air shall be mechanically induced into the unit from the outside and the products of combustion shall be removed to the outside.

Main gas pressure regulator, main gas valve, intermittent spark pilot (with timed lock-out), and high limit switch shall be included.

Temperature Control

The heater output shall be controlled by:

- Staged gas valve(s) that offer (two) (three) (four) (six) stages of heat in response to a (discharge ductstat) (room thermostat).
- Electronic modulating gas valve with (discharge ductstat) (discharge ductstat and room override thermostat) (space temperature controller) (DDC compatible controller).

Housing

The housing shall be fabricated from heavy-gauged G90 galvanized steel with all joints caulked for weather protection. Base rail to run the entire length and width of the unit excluding the intake hood and will form a curb cap. Gasketed panels will provide access to all of the components. Continuous hinged doors or lift-off hinged doors will be provided if specified. Exterior of unit to be painted if specified.

Insulation

The unit shall be lined with 1" thick matte faced fiberglass insulation that is in accordance with NFPA 90A and UL 181. Foil faced insulation or double wall construction shall be provided if specified.

Blower, Motor and Drives

The entire blower and motor assembly shall be mounted on a common base with vibration isolators to prevent noise transmission.

The unit shall be provided with a forward curved, DWDI centrifugal blower that has been statically and dynamically tested. The blower shaft shall be ground and polished steel designed for a maximum operating speed not to exceed 75% of its first critical speed. Bearings are heavy duty and pre-lubricated.

V-belt drives are to be cast iron, sized for 150% of driven horsepower and are adjustable up to 10 HP.

(Single speed) (Two speed) motor in (ODP) (TEFC) enclosure shall be energy efficient, EPACT compliant, matched to the fan load and furnished at the specified voltage and phase. Motors shall be inverter duty rated and have class B insulation.

Electrical

All electrical components shall be UL listed, recognized or classified. (NEMA1 indoor) (NEMA3R outdoor) disconnect switch shall be mounted and wired to the motor if specified.

When specified, a motor control center shall include a main disconnect switch, motor starter with short circuit and overload protection, control transformer with all necessary wiring completed in accordance with NEC and pre-wired for single point power and control connection to numbered terminal blocks.

Model IFG Typical Specifications (Continued)

Filters

Filters shall be provided in a (V-bank section) (filter/mixing box section) (flat filter rack in the intake hood) and shall be easily accessible. Velocities across the filters shall not exceed 500 FPM. (1" thick) (2" thick) (fiberglass throw-away) (aluminum cleanable) (30% efficient pleated) filters shall be provided. Optional metal frame filter holders with throw-away media and high efficiency filters with a pre-filter mounted in a flat bank in the filter section shall be provided if specified.

Intake Hood (Optional)

Intake hood shall be fully assembled and provided with (birdscreen) (moisture eliminators) (filters) at the intake.

Mounting (Optional)

The unit will be mounted on a factory supplied (roof curb and support rail) (full perimeter roof curb) (modular roof curb and support rail) (set of support rails).

The unit will be (ceiling hung) (mounted on a slab).

Outside Air Damper (Optional)

The unit shall be provided with a low leakage damper and a two position spring return actuator mounted directly to it. The damper shall be (factory mounted at the intake) (sent loose for field mounting at the discharge of the unit).

Return Air (Optional)

Return air shall enter the unit through the V-bank filter section (100% RA).

- or -

Return air opening shall be provided in the bottom of a filter/mixing box section (combination of OA and RA).

- or -

Return air opening shall be provided in the bottom of a mixing box section located upstream of the V-bank filter section (combination of OA and RA).

The unit shall be provided with low leakage outside and return air dampers. These dampers shall be controlled by:

- Manual quadrants (field adjustable).
- Two position spring return actuator (100% OA or 100% RA).
- Modulating spring return actuator with external input.
- Modulating spring return actuator with pressure control.
- Modulating spring return actuator with potentiometer.

Variable Air Volume (Optional)

The unit shall be provided with a variable frequency drive (with controls by others) (with pressure controller) (with remote potentiometer).

Cooling Coil (Optional)

Chilled water or direct expansion cooling coil shall be built, tested and rated according to ARI 400. Sloped stainless steel drain pan with drain fitting shall extend 12 inches downstream of the coil. Construction shall consist of copper tubes and aluminum fins spaced from 8 to 12 FPI. Direct expansion coils shall have distributors and nozzles selected for the exact application.

Evaporative Cooling (Optional)

Evaporative cooling section shall contain 12" deep Munters CELdek® (GLASdek®) media for 90% efficiency. Self-cleaning corrosion resistant design with water distribution plumbing, re-circulating pump, bleed off and float assembly. Freeze protection and automatic drain and fill kit shall be provided if specified.

Accessories

The unit shall be provided with the following accessories:

- Remote control panel
- Occupied/Unoccupied mode
- Low temperature limit (freezestat)
- Mild weather thermostat (inlet air sensor)
- Clogged filter switch with indicator light
- Convenience outlet
- Time delay relay
- Time clock (7-day)
- 7-day programmable thermostat with sensor
- Smoke detector/Firestat
- (3-way) (4-way) discharge head
- Floor rubber in shear isolators
- Floor spring isolators
- Hanger spring isolators
- High/low gas pressure switch
- High gas pressure regulator
- Damper end switch
- Interlocking relays - SPDT, DPDT - can be used to interlock other fans or heating or cooling controls that are provided by others.
- CO and/or NO₂ Detectors (5,000 sqft. applications)
- Alarm horn

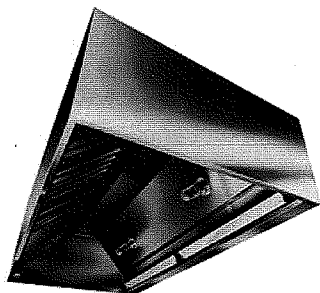
Warranty

KEES warrants all products to be free from defects in material and workmanship for a period of one year from the date of purchase. Any units which prove defective during the warranty period will be repaired or replaced at our option when returned to our factory, transportation prepaid. KEES will not be responsible for any installation or removal costs.

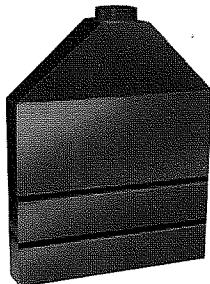
To maintain KEES' policy of continuous product improvement, we reserve the right to change prices, specifications, ratings or dimensions without notice or obligation.

Other KEES Products Available

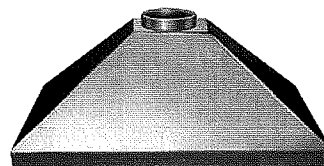
KITCHEN EXHAUST HOODS



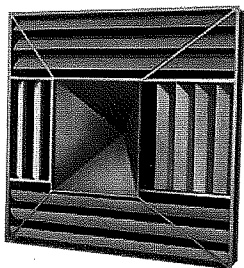
SLOTTED HOODS



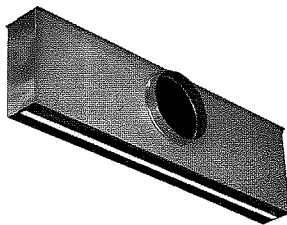
OVERHEAD INDUSTRIAL HOODS



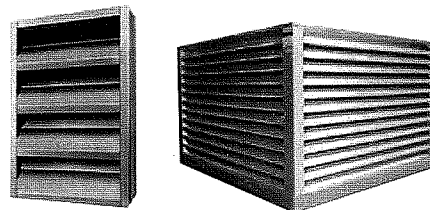
AIR MIXERS



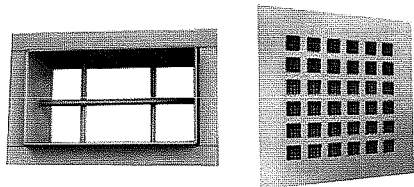
CEILING SLOT DIFFUSERS



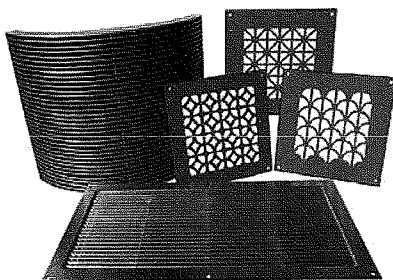
WALL LOUVERS & PENTHOUSES



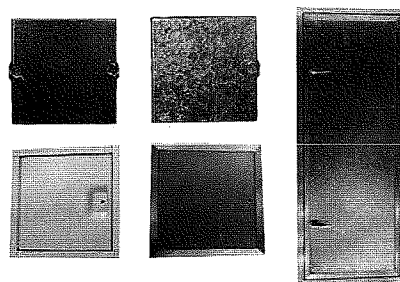
**SECURITY GRILLES,
GRATES & DIFFUSERS**



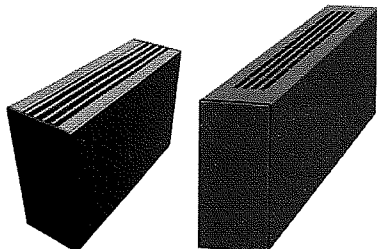
ARCHITECTURAL GRILLES



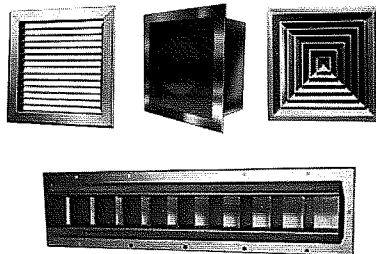
ACCESS DOORS



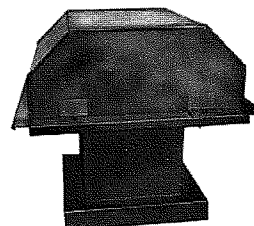
AIR BASEBOARD



**STAINLESS STEEL REGISTERS,
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ROOF HOODS



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