Directflow

EBD SERIES

DIRECT GAS-FIRED MAKE-UP AIR SYSTEMS

SIX HORIZONTAL MODELS AVAILABLE

TWO STANDARD CABINET SIZES

AIR DELIVERIES:
3,200 - 40,000 SCFM.

UP TO 3” TOTAL STATIC PRESSURE STANDARD

HEAT INPUT FROM 117 TO 5,635 MBH

STANDARD CONTROL FEATURES

LOCATION:
OUTDOOR OR INDOOR

100% OUTSIDE AIR APPLICATIONS
Industrial & Commercial Make-Up Air

Indoor Air Quality Control is necessary for personnel comfort and safety. In many workplace environments high levels of ventilation are required to accomplish this task.

The removal of large quantities of indoor air can cause negative building pressure, creating secondary problems such as:
- Flue Back-drafts in Combustion Equipment
- Pilot Failures in Heating & Cooling Equipment
- Infiltration of Dirt and Contaminants
- Performance Reduction of Exhaust Ventilation Fans
- Difficulty Opening Doors and Windows
- Uncomfortable Working Conditions
- Odor Control Problems in Commercial Kitchens

To prevent these effects, provisions for adequate supplies of replacement air are essential.

The EBD Series

The EBD Series of Direct Gas-Fired Make-Up Air Systems furnishes fresh, clean and tempered air by the most fuel-efficient and cost effective means currently in existence.

EBD Systems utilize “Line” burner technology to heat incoming air. Combustion efficiency is 100%. Thermal efficiency is 92%, with 8% of released energy absorbed by the formation of water vapor during combustion.

Combustion products are limited to a 5 ppm (parts per million) of carbon monoxide and 0.5 ppm of NOX. These are the levels accepted by ANSI standards for Direct-Fired Heating Equipment.

EBD Units are constructed with Premium Energy Efficiency Motors and Forward-Curved Centrifugal Fans, Accurate Temperature and Air Control Systems, and Optional Filtration to provide a complete system to fit each application.

Typical Applications For EBD Series Units

- Exhaust Hoods for Commercial Kitchens
- Welding Fume Exhaust Equipment
- Foundry and Plating Area Ventilation
- Chemical Fume Exhaust Hoods
- Paint / Spray Booth Applications
- Grinding and Buffing Area Ventilation
- Wood, Metal and Plastic Working Areas
- Commercial Garage Ventilation
- General Factory Heating and Ventilation

Figure 1: Typical Application – For Every Cubic Foot of Exhaust Air – a Cubic Foot of Make-UP Air is Required.

Figure 2: Burner Combustion Pattern
EBD – 100% FRESH AIR APPLICATIONS

The basic EBD system is designed to introduce 100% outside air into a building to replace exhaust air and help reduce infiltration of cold air and contaminants.

During EBD operation, airflow is continuous. A modulating gas flame control regulates the burner. This control system provides operation at any point on its turndown range to provide a constant discharge air temperature.

Normally an exhaust system is interlocked with the EBD make-up air system. An auxiliary starter contact is supplied with the EBD for this function.

The EBD system’s primary application is to serve as a make-up air heater. In many industrial and commercial applications, this is both practical and economically sound.

EBD – TYPICAL INSTALLATION CONFIGURATIONS

The EBD system is designed for easy installation in multiple locations. This makes it flexible and adaptable if project design changes occur.

The HR-3, Vertical Up Discharge configuration is a fixed option.
Standard Equipment

General Features:
Two standard blower discharge arrangements are available:

HR-1: Horizontal and HR-2: Discharge Rigid Base Frame for mounting on roof curb or steel, suspended by vertical hangers or on a flat surface.

Cabinet:
18 Gauge Galvanized Steel Cabinet with 22 Gauge Liner.
Doublewall insulated panels provide easy access to motors, controls, piping, and filters.

Durable Blowers & Motors:
Forward curved, DWDI, Class 2 fan with solid turned ground shaft & 100,000 hour bearings.

Fans elastically mounted to unit rigid base frames to minimize vibration and provide for quiet operation.

Motor and drive mounted within unit protects motor and eliminates personnel safety hazards due to external drives.

Standard Adjustable V-Belt Drive – sized for 135% of motor HP.

Premium Efficient (E+), T-Frame, open drip-proof, 1800 RPM motors for all standard voltages.

Variable Pitch Motor Sheaves standard on 10 HP and below.

Dependable Gas and Safety Systems:
Gas and safety controls with:
- Fireye Flame Safeguard
- Flame Rod Sensor
- Gas Pilot Ignition
- High Temperature Limit Switch
- Electronic Discharge Air Temperature Controller
- Control System and Ignition Transformer
- Electrical Fuse Circuit Protection
- Main Gas Shut-off Valve
- High and Low Velocity Airflow Proving Switches
- Motor Starter and Overloads
- Auxiliary Starter Contact
- Compliance with ANSI Codes

Burners:
Direct Gas-Fired Line Burner for Natural Gas from 6 oz to 1 PSIG with up to 22:1 turndown ratio.

Basic Control Package / DC-1:
Maxitrol Series 14 Basic Modulating Discharge Air Sensor and Remote Temperature Selector Dial (Field Installed).

All Interfacing Selector Switches, Indicating Lights and Mild Weather Burner Cut-Out Control and Low Outlet Temperature Shut-off Control provided by others.
Options and Accessories

**General:**
HR-3 – Vertical Up-Blast Arrangement.

**Roof Curb:**
Shipped Knock-Down for Field Installation.

**Motors & Drives:**
Variable Pitch Motor Sheaves 15 HP and above. Total Enclosed Motors.
Two Speed 1800/1200 RPM Motors.
Extended Grease lines for blower shaft bearings located on cabinet exterior.

**Burners:**
Propane Firing in lieu of Natural Gas – Contact Factory.

**Electric & Gas Controls:**
High Gas Pressure Regulator.
Regulators Shipped Loose for Field Installed.
Low Pressure Gas Manifold – 7” to 10” w.c.
Insurance Approvals for Gas Controls:
GE-GAPS – Formerly IRI, Factory Mutual, or combined GE-GAPS/FM.
High and Low Gas Pressure switches.
Pre-Purge Timer prior to trial for ignition.
Disconnect Switch or Circuit Breaker – Field mounted and wired.
UV Scanner.

**Dampers:**
Motorized Intake Damper – Supplied with two position motor with internal damper proving end switch.
Recommended for indoor installations to isolate unit from outside air when not in operation.
Motorized Discharge Damper – Supplied with two position motor with internal damper proving end switch.
Recommended for outdoor installations to isolate unit from indoor air when not in operation, preventing heat loss and condensation within unit.

**Weather Hoods:**
Stormproof Weatherhood and Birdscreen.
Stormproof Weatherhood with Birdscreen with 2” Cleanable Filters.

**Other:**
**V-Bank Filter Sections:**
Filter Section – “V”-bank section for 2” deep filters.
Filters – Extended Surface or Cleanable Filters available.

External Vibration Isolation – Spring or Rubber-in-Shear Isolators. Shipped Loose.

**Expanded Basic Control Package / DC-2**
Remote Control Panel with Summer-Off-Winter Switch, Blower On-Off Switch, Indicating Lights for Blower On, Heat On, Flame Failure Alarm On, Blocked Intake Filter Alarm On (if filters are ordered) and Discharge Air Temperature Selector Dial.

**Basic System – HV-1** includes a solid state amplifier, high and low temperature discharge sensor, remote temperature selector dial/sensor and modulator/regulator gas valve. Temperature selector dial/sensor field mounted and wired.

**Expanded Basic System – HV-2** includes solid state amplifier, high and low temperature discharge sensor, modulating regulator gas valve, remote control station with indicator lights for blower on heat on, flame failure alarm on, blocked intake alarm on (if ordered), summer-off-winter switch, blower on-off switch, mild weather burner cut-out, low outlet shut-off and temperature selector dial/sensor (mounted on front of remote panel lid).

**Basic System – BMS-1** includes signal conditioner to modulate electronic modulating gas valve based on a 4-20 MA or 0-10 VDC signal from building management system with a fixed maximum discharge air temperature of 90 degrees F. regardless of customer’s “BMS” signal input. Building management system will monitor blower, on heat on, flame failure alarm on, blocked intake alarm on (if ordered), heating on function, blower on-off function and mild weather burner cut-out control function and low outlet temperature shut-off function.

**Expanded Basic System – BMS-2** includes signal conditioner to modulate electronic modulating gas valve based on a 4-20 MA or 0-10 VDC signal from building management system with a fixed maximum discharge air temperature of 90 degrees F. regardless of customer’s “BMS” signal input. Remote control station shall be provided with indicator lights for blower on, heat on, flame failure alarm on, blocked intake alarm on (if ordered), summer-off-winter switch, blower on-off-auto switch, mild weather burner cut-out controller and low temperature shut-off controller.
EBD SCHEMATIC PIPING DIAGRAMS

- Unlisted Unit
- GE Gap Under 1 MBH
- GE Gap & FM Under 1 MBH
- FM Under 12.5 MBH

- GE Gap Above 1 MBH
- FM & GE Gap Above 1 MBH

Optional, add installed by others
Furnished and installed by others
Factory furnished & installed

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⚠️ High Gas Pressure Switch Required For:
- FM Greater Than 2.5 MBH
- FM Any Size W/Gas Pressure Over 14" W.C.
- GE Gap or GE Gap & FM Over 150,000

⚠️ Low Gas Pressure Switch Required For:
- FM Greater Than 2.5 MBH
- GE Gap or GE Gap & FM Over 150,000

5
## MODEL SELECTION TABLE

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<th>Air Delivery - SCFM</th>
<th>Outlet Velocity - FPM</th>
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### Notes:
- Use Total Static Pressure column that will overcome total system resistance.
- Approximate pressure drop for components and necessary items: burner 1/8", filter (dirty) 1/4", intake hood 1/8", birdscreen 1/8", discharge louver 1/8". Damper resistance may be ignored.
- Weatherproof Intake Hood with Birdscreen and 2” cleanable filters available for: EBD-112 thru 118 up to 12,000 CFM and EBD-120 thru 128 up to 30,000 CFM.
- Shaded areas require Class 2 fans.
### MOTOR FRAME SIZE REFERENCE TABLE

<table>
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<tr>
<th>Motor HP</th>
<th>1800 RPM Dripproof or TEFC</th>
<th>1800/1200 RPM Two Winding Dripproof</th>
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### GAS MANIFOLD SIZE

Based on Standard 10" Inlet gas pressure
(Above 6900 MBH – C.H.O.)

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<th>Manifold Size NPT</th>
<th>Maximum MBH – Natural Gas</th>
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<td>Electronic Modulation &amp; FM</td>
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<tr>
<td>1&quot;</td>
<td>1000</td>
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<tr>
<td>1 ¼&quot;</td>
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Notes:
1. All motors 3 phase.
2. 15 HP and above will require variable speed drive for two speed applications.
SAFETY AND LIMIT CONTROLS OF EBD SYSTEMS

MODEL DESIGNATION

<table>
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<tr>
<th>EBD Model No.</th>
<th>Air Volume</th>
<th>Heating Cap.</th>
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<tr>
<td>112 - 128</td>
<td>SCFM/1000</td>
<td>MBH Input</td>
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SELECTION PROCEDURE:
1. Choose the EBD system for 100% outside air.
2. Determine unit model from ED Series Selection Table using SCFM of air and MBH input or air temperature rise in °F.
3. For model selected, determine required motor HP for total static pressure resistance. See Notes on page 6 below model selection table regarding statics.

Selection Example:
For a unit to heat 18,000 SCFM of 100% O.A. with an Air Temperature Rise of 100°F and External Static of 0.50": Determine – Roof mounted with Down Discharge, furnished with cleanable filters and intake hood. Fuel is natural gas at 1 PSIG inlet pressure, electric service is 460V/60Hz/3ph.
   1. EBD system is chosen for 100% outside air.
   2. At 18,000 SCFM and 100°F ΔT, select model ED125. MBH Input is 2,113.
   3. Total Static is 0.50” + Hood, Birdscreen, Filters, Burner, and Discharge = 1.63”.
   4. For TSP = 1.63”, selection table indicates that a 15 HP motor is required.
Selection is complete: Model EBD-125-18-2113 with 15 HP motor - Natural gas fired with 1 PSIG Gas Pressure, Rooftop Mounted, Weatherproof, 460/60/3 Power, HR-2 Arrangement, 2” Cleanable Filters, and Intake Hood.

MODEL SELECTION TABLE NOTES:
1. ΔT = (920 X MBH) ÷ (1.08 x SCFM) & MBH = (1.08 x SCFM x ΔT) ÷ 920
2. Use Total Static Pressure column that will overcome Total System Resistance. This will include External Static Pressure of System and Internal Static Pressure of EBD unit components. The following must be included, as applicable – Approximate pressure drop for components and accessory items: Burners – 1/2”; Filter (dirty) – 1/4”; Intake Hood – 1/8”; Birdscreen – 1/8”; Discharge Louver – 1/8”; Damper resistance – may be ignored.
3. NA – Not Available, CHO – Contact Home Office
Model EBD-112
Fan Performance
Max Fan RPM - 2200
Outlet Velocity (FPM) = SCFM/1.757
Model EBD-116
Fan Performance
Max Fan RPM - 1800
Outlet Velocity (FPM) = SCFM/2.767
Model EBD 118
Fan Performance
Maximum Fan RPM - 1600
Outlet Velocity (FPM) = SCFM/3.485
Model EBD-120
Fan Performance
Maximum Fan RPM - 1300
Outlet Velocity (FPM) = SCFM/4.381
Model EBD-128
Fan Performance
Maximum Fan RPM - 900
Outlet Velocity (FPM) = SCFM/8.68

K2 Series Fans
Engineer's Specifications

Furnish and Install the following Hastings HVAC, Inc. Direct Gas-Fired Make-Up Air System:

Blower and Cabinet:
A. Blower Wheel shall be statically and dynamically balanced forward curved, double width, double inlet, Class 2.
B. Blower Wheel shall be mounted on solid turned ground shaft with keyways for driven shaft.
C. Pillow Block ball bearings shall be L10 Rated for Min. 100,000 hours. Self Aligning, and Greasable, with Extended Grease Lines to Cabinet Exterior.
D. Blower housings, bearings and adjustable motor base shall be elastically mounted on a rigid unit base frame to minimize vibration transmission and ensure quiet operation.
E. The driver and driven sheaves shall be of the keyed hub type. The driven sheave shall be of a fixed pitch diameter and the driver sheave shall be of a variable pitch diameter through 10 HP and fixed pitched above 10 HP. V-belt drives shall be sized for 135% of motor horsepower.
F. Cabinet shall be constructed of high quality galvanized steel to ensure long rust-free life.
G. 1” double wall insulated cabinet constructed with 18 ga. exterior and 22 ga. interior galvanized steel.
H. Access panels shall be provided to allow easy access to motors, controls, piping, drives, and filters (if ordered).

Burner Assembly:
A. The burner shall be a direct gas-fired burner suitable for complete combustion of natural gas, propane or propane-air mixture, and having a turndown ratio of up to 22:1.
B. Burner combustion must be clean and odorless. Combustion efficiency must limit the products of combustion to a maximum of 5ppm carbon monoxide and a maximum of 0.5ppm nitrogen dioxide.
C. The burner shall have stainless steel combustion baffles, non-clogging gas ports, direct spark ignition and flame safeguard system.
D. Observation port shall be provided in cabinet.
E. Profile plates to control proper air velocity across the burner shall be factory installed, adjusted during a firing test, and locked in place before shipment.

Motor:
Premium Energy Efficient T-frame, ODP, 1800 RPM pre-lubricated ball bearing type motor shall be furnished for voltage as scheduled.

Gas and Electric Controls:
The following controls shall be furnished with the direct gas-fired make-up air system:
- Fireye Flame Safeguard.
- Flame Rod Sensor.
- Gas Pilot Ignition.
- High Temperature Limit Switch.
- Electronic Modulating Discharge Air Temperature Controller.
- Control System and Ignition Transformer.
- Electrical Fuses.
- Main Gas Shut-off Valves.
- Airflow Proving Switch.
- Motor Starter and Overloads.
- Auxiliary Starter Contact.

Assembly:
The system shall be factory assembled and wired with the exception of controls that are remote to the unit.

Options and Accessories:
The following items are to be furnished (Insert desired items from this bulletin.)
In order to maintain our policy of continuous product improvement, we reserve the right to change prices, specification, ratings or dimensions without notice or obligation.

3606 Yost Avenue  ●  Hastings, Nebraska 68901-1966
Phone (402) 463-9821  ●  Fax (402) 462-8006
www.hastingshvac.com  ●  sales@hastingshvac.com