



# PBGII PACKAGED GAS BURNER



### WARNING

These instructions are intended for use only by experienced, qualified combustion start-up personnel. Adjustment of this equipment and its components by unqualified personnel can result in fire, explosion, severe personal injury, or even death.

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These instructions are intended to serve as guidelines covering the installation, operation, and maintenance of Hauck equipment. While every attempt has been made to ensure completeness, unforeseen or unspecified applications, details, and variations may preclude covering every possible contingency. **WARNING: TO PREVENT THE POSSIBILITY OF SERIOUS BODILY INJURY, DO NOT USE OR OPERATE ANY EQUIPMENT OR COMPONENT WITH ANY PARTS REMOVED OR ANY PARTS NOT APPROVED BY THE MANUFACTURER.** Should further information be required or desired or should particular problems arise which are not covered sufficiently for the purchaser's purpose, contact Hauck Mfg. Co.



**WARNING**

This equipment is potentially dangerous with the possibility of serious personal injury and property damage. Hauck Manufacturing Company recommends the use of flame supervisory equipment and fuel safety shut-off valves. Furthermore, Hauck urges rigid adherence to National Fire Protection Association (NFPA) standards and insurance underwriter's requirements. Operation and regular preventative maintenance of this equipment should be performed only by properly trained and qualified personnel. Annual review and upgrading of safety equipment is recommended.

**A. GENERAL INFORMATION**

The Hauck PBGII Packaged Gas Burners are designed for applications where it is desirable to have all of the necessary components for a high turndown combustion system contained in one compact and easy-to-use assembly. Configured versions of the burner system are available with selections for fuel type, air control, fuel control, power supply and flame supervision and/or burner control. The basic burner and air pressure switch includes the burner assembly with spark igniter and flame rod, and the straight combustor alloy tile. Auxiliary tube selections are available to provide longer burner lengths or provide a 90° bend to the flame. Selections for the air control method include manual, 4-20mA controlled actuator, or VFD. Flame supervision and burner control is accommodated by the KromSchroder BCU 370. A pre-configured temperature control panel, PBGII-BCS, is also available that incorporates the BCU and customer settings to provide optimized burner control. Modifications can be made to these standard configurations to meet other customer specifications to provide a premier custom engineered product.

The PBGII Packaged Gas Burner is designed for operation in chambers with pressure ranging from 0.5 to -1.0 inches w.c. (1.2 to -2.5 mbar).

For further information on any components supplied with the package, see specific product literature available from Hauck.

**B. RECEIVING AND INSPECTION**

Upon receipt, check each item on the bill of lading and/or invoice to determine that all equipment has been received. A careful examination of all parts should be made to ascertain if there has been any damage in shipment.

**IMPORTANT**

If the installation is delayed and the equipment is stored outside, provide adequate protection as dictated by climate and period of exposure. Special care should be given to all motors and bearings, if applicable, to protect them from rain or excessive moisture.

**C. BURNER CAPACITY TABLES**

PBG BURNER		BURNER MODEL						
SPECIFICATIONS		300	500	750	1000	2000	3000	5000
Capacity	(BTUx10 <sup>3</sup> /hr)	310	520	750	1,030	2,040	3,000	5,040
	(kW)	82	138	198	272	540	794	1,333
Air Capacity	(scfh)	3,170	5,350	7,790	10,680	21,100	31,120	52,200
	(nm <sup>3</sup> /hr)	85	143	209	286	565	834	1,398
Body Air Pressure	(in.w.c.)	3.9	5.2	5.9	5.9	5.5	5.5	5.5
	(mbar)	9.7	12.9	14.7	14.7	13.7	13.7	13.7
Gas Inlet Pressure	(in.w.c.)	3.2	4.5	4.1	4.3	3.5	4.5	3.1
	(mbar)	8.0	11.2	10.2	10.7	8.7	11.2	7.7
Flame Length	(inches)	12	14	27	34	60	66	72
	(mm)	305	356	686	864	1524	1676	1829
Flame Diameter	(inches)	3	5	6	8	12	16	16
	(mm)	76	127	152	203	305	406	406

**Table 1. PBGII Burner Capacities**

NOTES:

1. Capacities based on Natural Gas with HHV of 1,034 BTU/ft<sup>3</sup> (Standard), and LHV of 36.74 MJ/nm<sup>3</sup> (Metric), 0.59 S.G., and a stoichiometric ratio of 9.74:1 with burner firing into chamber under no pressure at 10% excess air.
2. Air and fuel flows based on STP operating conditions at sea level and industry standard air and gas piping practices.
3. Gas Inlet Pressures supplied for natural gas. Pressures are for reference only, not for burner setup.
4. Flame lengths measured from end of burner tile.
5. The above operating specifications are achievable by the burner. Not all control systems or components will produce these results.
6. Consult gas manifold packages for expected performance.
7. Packaged blower will produce the above pressures and flow at neutral conditions.

PBG BURNER		CAPACITY AT PRESSURE CONDITIONS						
DUCT PRESSURE		300	500	750	1000	2000	3000	5000
-1.0"wc (2.5mbar)	(BTUx10 <sup>3</sup> /hr)	350	570	810	1,110	2,220	3,260	5,480
	(kW)	93	151	214	294	587	862	1,450
-0.5"wc (1.2mbar)	(BTUx10 <sup>3</sup> /hr)	330	540	780	1,070	2,130	3,130	5,260
	(kW)	87	143	206	283	563	828	1,391
-0.25"wc (0.6 mbar)	(BTUx10 <sup>3</sup> /hr)	320	530	770	1,050	2,090	3,070	5,150
	(kW)	85	140	204	278	553	812	1,362
Neutral Chamber	(BTUx10 <sup>3</sup> /hr)	310	520	750	1,030	2,040	3,000	5,040
	(kW)	82	138	198	272	540	794	1,333
+0.25"wc (0.6 mbar)	(BTUx10 <sup>3</sup> /hr)	300	510	730	1,010	1,990	2,930	4,920
	(kW)	79	135	193	267	526	775	1,301
+0.5"wc (1.2 mbar)	(BTUx10 <sup>3</sup> /hr)	290	490	720	990	1,950	2,860	4,810
	(kW)	77	130	190	262	516	757	1,272

**Table 2. Burner Capacities at Pressure Conditions**

#### **D. DIMENSIONS**

See appropriate section PBGII-3 through PBGII-3.6 Dimension sheet for detailed dimensional information.

#### **E. INSTALLATION**

1. The Hauck PBGII burner can fire in any position. Therefore, it can be installed to fire through side-walls, roofs or the bottoms of ovens, dryers, or furnaces. Note that Kromschroder Valvario components may not be installed with the solenoid actuator facing down. Note that KromSchroder GIK must be installed with the spring tower side facing down.

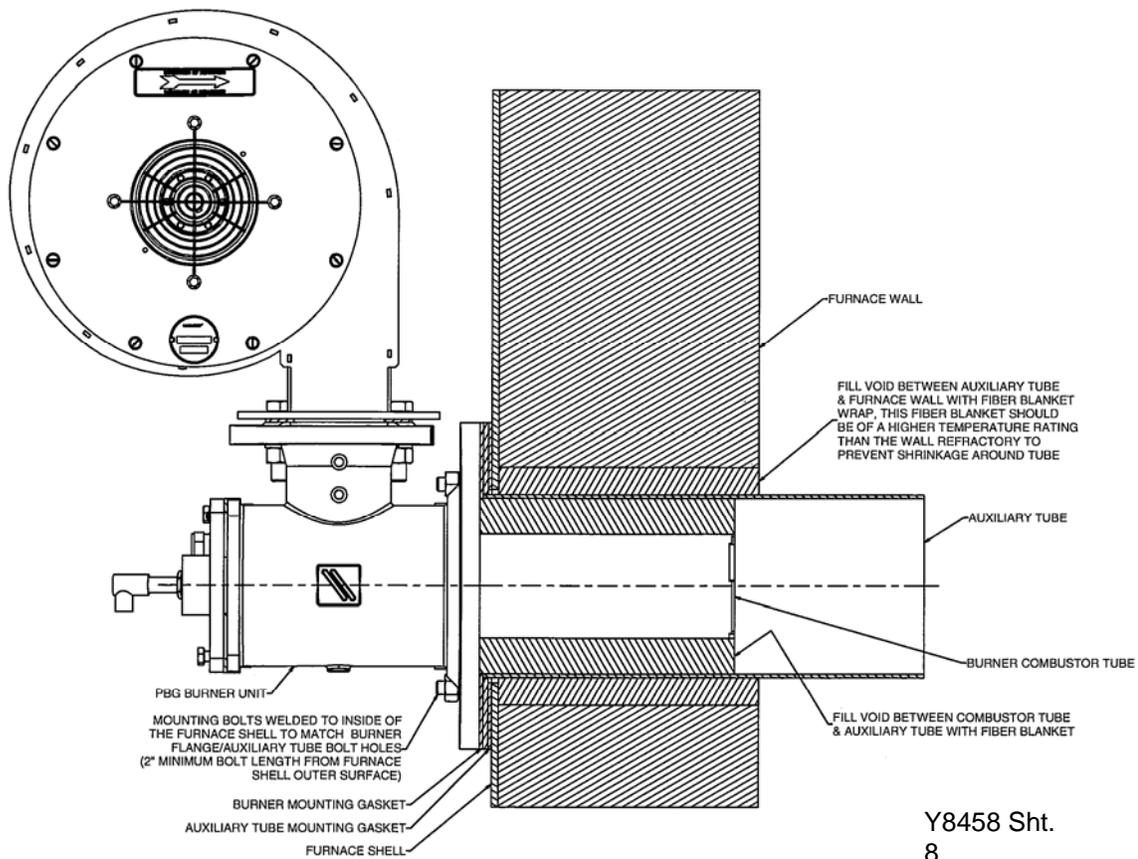
#### **IMPORTANT**

Using the PBGII basic burner configurations in chambers operating with vacuum or positive pressure will create conditions preventing normal operation according to these instructions. The high and low fire settings for gas and air will change along with the operating window of the burner. Under more extreme conditions, special components may need to be selected in order to manage burner performance.

2. The PBGII burners will bolt to the oven or furnace wall. Prepare the oven wall appropriately to support the weight of the burner and any other associated components. Install the burner combustor tube so that it is properly insulated in the furnace wall. For walls thicker than the standard length of the combustor alloy tile or in cross-flow applications the use of a straight or 90° auxiliary firing tube may be required (See Step 5).
3. For air heating installations where the burner will fire into a chamber under negative pressure, spacers may be installed between the burner mounting bracket and the oven/furnace wall to draw secondary air past the firing tube.
4. On installations where there is a positive pressure within the combustion chamber, the opening in the oven or furnace wall should be at least 1 inch (25mm) larger than the burner combustor tube/tile. Pack the space around the alloy tile with ceramic fiber suitable for the temperatures involved. Ceramic fiber packing should not extend past wall thickness. Installation of the high temperature gasket between the burner mounting plate/flange and the oven or furnace wall is recommended for all positive pressure ovens or furnaces.
5. On installations using the auxiliary firing tube, the area between the burner alloy tile and firing tube should be packed with ceramic fiber. Ceramic fiber packing should not extend past the wall thickness or the end of the alloy tile (See Figure 1).

#### **NOTE**

All rotating components were balanced from factory at a level meeting ISO 1940-2. A variety of external causes such as handling, installation, or misalignment may cause imbalance prior to use. To ensure the intended long life of the equipment and components, and to meet warranty requirements, equipment and vibration levels should be checked by experienced personnel and trim balanced if no longer meeting ISO 1940-2 requirements. Under no circumstances should equipment with excessive vibration be operated at the risk of damaging that equipment or the personnel operating it.



**Figure 1. Typical Installation Package Burner Unit**

6. If the burner will be located outdoors, protection should be provided to prevent rain and/or snow from being drawn into the blower. Properly select all accessory items for outdoor operation. A rain hood or other suitable protection is recommended for burners installed in areas of direct rain or snow exposure.
7. If the Hauck PBG burner is to be operated within an enclosed area, verify that an adequate fresh air supply is available to supply combustion air to the burner.

#### **F. ELECTRICAL POWER SUPPLY**

Local and national codes and/or standards should be adhered to. Voltage, phase and frequency must be compatible with the motor and electrical accessory nameplate ratings. All wiring to the burner blower, air control motor, and control accessories must be completed before the burner is ignited.

Every motor is dual rated for frequency/voltage however, any burner unit to be used with a 50 Hz power supply should also select a VFD. The VFD converts any incoming power supply to a 230 V, 3 phase supply. The VFD is directly connected to the blower, which uses a 230 V, 3 phase motor. Using the standard burner with a 50 Hz power supply will de-rate the burner capacity and require different burner settings.

#### **NOTE**

If the PBGII burner will be subjected to backpressure from the chamber or furnace into which it is firing, a larger blower motor may be required to achieve the desired heat input; consult Hauck.

## **G. FUEL GAS SUPPLY**

### **SPECIAL NOTE**

Hauck recommends the use of gas manifolds conforming to National Fire Protection Association (NFPA) standards. NFPA 86 standards for gas manifolds vary for burner capacity as well as single burner versus multiple burner installations. The Hauck PBGII with NFPA manifold contains all features required for burner capacity as well as single and multiple burner installations.

The Hauck PBGII Burners are designed to operate with a regulated gas supply pressure to the inlet of the burner manifold. Due to burner manifold options and differences between the sizes of burners, the gas pressure requirements for the burner may vary, but a nominal pressure of 1-3 PSI is suggested. **Failure to provide adequate fuel pressure will result in compromised burner performance, e.g. a reduction in capacity, reliability, or operating limits.**

### **NOTE**

Pressure testing of the manifold and combustion equipment is required by the customer after installation. Failure to do so may result in unsafe conditions and may violate local or national codes.

For multiple burner installations, consult Hauck for the design of a common pre-piped gas manifold. If supplied via third party, confirm that the gas supply pressures to the individual burners are within the required pressure range. For accurate burner control, the combustion air and gas should be controlled by the components packaged with the burners and not with central or common air and gas components.

## **H. INITIAL SET-UP**



### **WARNING**

Adjustment of this equipment by unqualified personnel can result in fire, explosion, severe personal injury, or even death.

### 1. Combustion Air

The PBGII air controls are factory adjusted to conform to capacity and ignition limits. Although the burner should require no adjustment upon initial set-up, several adjustments can be made in situations where the burner needs to be tuned to the application.

If using a combustion air valve and actuator, the valve travels 90° from closed to the fully open position. The valve is designed for use with a directly coupled IC40 actuator, which is controlled by a 4-20 mA input signal. The air valve must be at the ignition position to light the burner, which for most applications will be 20° to 30° open. For applications that require special control motor settings, the IC40 can be reprogrammed in a variety of different ways using Opticord adapter, (P/N 74960625) a laptop computer, and BCSoft (available on [www.Docuthek.com](http://www.Docuthek.com)).

If a third-party actuator is used, a connection kit is available for some popular options. Operationally, the actuator must control the valve in the same manner, and be able to provide the same ignition point. Either 4-20mA control or an adjustable shaft is required.

**NOTE**

The use of a third-party actuator without a Hauck BCS may require additional electronic components to be installed and wired by the customer.

If the air is controlled by VFD, the motor will operate between 60Hz at high fire and 15Hz at low fire. 15Hz is the minimum frequency that the motor should be run at. In certain applications, such as those operating under pressure, it may be necessary to increase the low fire frequency to satisfy the air pressure switch.

To operate the burner under vacuum may require the air pressure switch to be connected as a differential. Proper burner operation may also require the use of a characterized valve or regulator capable of sensing a differential pressure, instead of the standard NFPA or ratio regulated manifolds. For burners intended to be fired into high suction, the combustion blower may need to be fitted with a larger motor or replaced with a higher pressure blower. In applications with vacuum, consult Hauck.

Operating the burner under positive chamber pressure may require the air pressure switch to be reset to assure flow through the burner, or connected as a differential. Proper burner operation may also require the use of a limiting adjustable orifice and metering orifice in addition to the standard NFPA or ratio regulated manifolds. High chamber pressure may require boost air or the specification of a different combustion blower. In applications with positive pressure, consult Hauck.

Applications that have a 50 Hz supply voltage, should select the VFD option for the ability to fire at the rated high-fire capacity. Applications with a 50 Hz supply voltage that do not use a VFD will have a de-rated burner capacity and require different burner settings.

A manual air valve handle may be used to control the air flow to the burner. In a fuel-only control application, the manual handle has the ability to be fixed, and may be the desired method of air control.

## 2. Fuel Manifolds

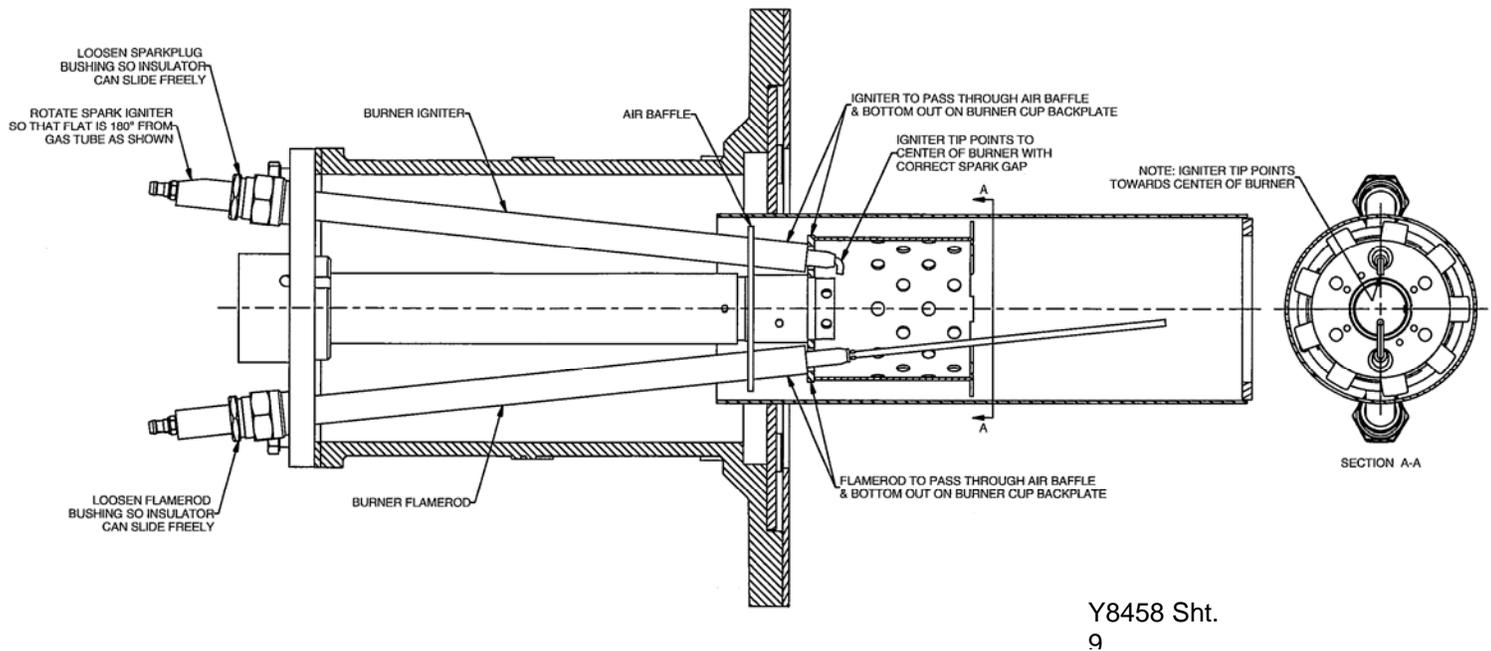
See additional literature instructions for the specific operation and setup for the fuel manifold included on the package. If no fuel manifold was ordered, operate according to the codes and requirements pertaining to the application.

## 3. Burner Control System

See additional literature instructions for the specific operation and setup for the control system included on the package. If no control system was ordered, operate according to the codes and requirements pertaining to the application.

### **I. IGNITION**

Each PBGII comes equipped with a spark igniter. Since PBGII burners are preset, no adjustment to the igniter should be necessary upon initial light-off. However, if ignition problems occur or a new igniter is installed, follow the procedure in Figure 3 to replace and adjust the igniter. Spark ignition requires the burner to be properly grounded to the oven/furnace. Note that a flat is ground on the spark igniter to indicate the position opposite the bent tip. This flat must be located 180° away from the gas connection.



**Figure 3. Spark Igniter & Flamerod Installation**

### **J. OPERATION**

Sequential operation of the PBGII burner will depend on the control method used on the burner and various component selections.

**NOTE**

Maintain electrical power supply to the blower motor until the chamber or furnace temperature is below 200°F (93°C). If the blower is shut off with a hot chamber, hot air may exhaust through the burner and damage internal components.

### **K. FLAME MONITORING**

The PBGII burner may be ordered with either a flame rod or an ultraviolet (UV) scanner. If UV scanners are used on an oven or furnace with multiple burners, care should be exercised so that the UV scanner from one burner does not sense the flame from another burner in the oven or furnace.



**WARNING**

If standard full wave coil ignition transformer is used along with the UV flame scanner, provisions must be made to eliminate the possibility of the ignition transformer falsely satisfying the UV scanner. Hauck designed flame supervisory panels eliminate this potential problem by timing out the spark igniter after the trial for ignition period.

**L. MAINTENANCE**

The Hauck PBGII Packaged Burner has no moving parts requiring lubrication. However, preventative maintenance can eliminate costly down time. Periodic maintenance should include the following:

1. Check all pressure switches, clean or replace if necessary. For recommended pressure settings see table below.

<b>Switch</b>	<b>Pressure Settings</b>
Air Pressure (valve/actuator)	2.4" w.c. (6 mbar)
Air Pressure (VFD)	0.2" w.c. (0.5 mbar)
High Gas Pressure	75" w.c. (185 mbar)
Low Gas Pressure	6.8" w.c. (17 mbar)

2. Check bolts and screws for tightness, including those on the burner and safety shut-off valves.
3. Check operation of flame safety equipment.
4. In addition to leak testing the entire manifold, the safety shut-off manifold should be leak tested on at least a yearly basis. Refer to the National Fire Protection Association's publication NFPA 86 for details on leak testing components per UL, ANSI, CSA, FM or EN standards.
5. If an optional air filter is supplied, periodic cleaning is required to keep the burner operating at maximum efficiency.
6. To remove the spark igniter for cleaning or inspection, the spark igniter must be inserted with the proper orientation to ensure ignition (see Figure 3). The flame rod inserts the same way as the spark igniter (see Figure 1); however, no particular orientation is required.

## **L. MAINTENANCE (Continued)**

### **BLOWER MOTOR REPLACEMENT**



#### **WARNING**

Local and national codes and standards should be strictly adhered to. Exposure to energy sources including potential electrical, kinetic rotating mass and combustible fuels will be encountered during this procedure outlined below. Applicable Lock Out/Tag Procedures should be followed to prevent fire, explosion, property damage, severe personal injury, or even death. All maintenance, repair and wiring to the burner blower, air control motor, and control accessories must be completed by qualified personnel.

### **A. BLOWER MOTOR REMOVAL**

1. Power down equipment (burner and blower assembly), disconnect and isolate from electrical power supply.
2. Verify that the burner and blower assembly is off and can not be restarted and also that the impeller is not rotating.
3. Open the motor wiring terminal box (A) and remove the electrical power supply wires from the motor leads. Take note of wiring connection for new motor installation. Refer to Figure 4 for component identification.
4. Remove the eight sheet metal screws (B) that hold the blower face plate (C) onto the blower body (I), exposing the impeller (D). Care should be taken not to tear the face plate gasket (E). If undamaged, the gasket may be reused, set the gasket on a flat surface and protect from damage.
5. Loosen the two set screws (F) in the impeller hub.
6. Remove the impeller from the motor shaft (penetrating oil or lubricant may be required). Note that care must be taken not to damage the impeller during this process. Damaging or bending the impeller will cause an imbalance that will result in excessive vibration when the impeller is rotating which can damage motor bearings and other coupled equipment.
7. Secure and support the motor (G) and remove the four bolts (H) that fasten the blower housing to the motor face. Note removing these bolts will decouple the motor from the blower housing, the motor must be secured or supported to prevent the motor from falling and damaging equipment and/or personnel.

#### **IMPORTANT**

If the installation is delayed and the equipment is stored outside, provide adequate protection as dictated by climate and period of exposure. Special care should be given to all motors and bearings, if applicable, to protect them from rain or excessive moisture.

### **IMPORTANT**

When replacing the blower motor, it is important to note that the PBGII 300-1000 size burners are designed for and should be equipped with either:

- Single Phase Motor = 1/3HP-T-3600RPM, 110-220V/1ph/60Hz, frame-56C , or
- Three Phase Motor = 1/3HP-T-3600RPM, 230-460V/3ph/60Hz, frame-56C

Replacement motor must meet these specifications to insure proper functionality of the system.



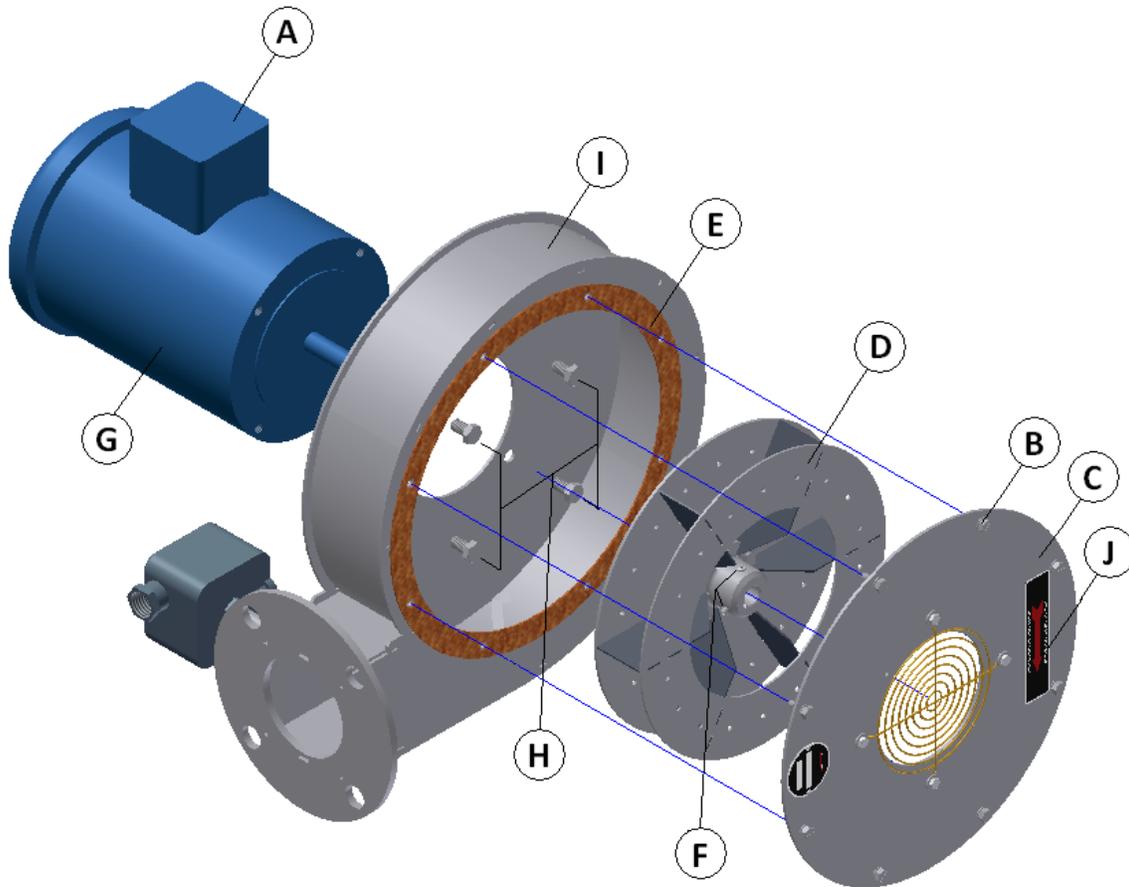
### **WARNING**

Local and national codes and standards should be strictly adhered to. Voltage, phase and frequency must be compatible with the motor and electrical accessory nameplate ratings. All maintenance, repair and wiring to the burner blower, air control motor, and control accessories must be completed by qualified personnel.

## **B. BLOWER MOTOR INSTALLATION**

1. Secure and support new motor (G) mounting face against the blower housing (I), with the motor shaft inserted through the shaft opening into the blower housing. Refer to Figure 4 for component identification.
2. Insert and tighten the four 3/8-16 UNC bolts (H) that fasten the motor to the blower housing, tighten to 20 ft-lbs.
3. Insert the impeller (D) onto the motor shaft, the open side of the impeller faces away from the motor (penetrating oil or lubricant may be required). Note the motor shaft is keyed, and the key must be aligned with the corresponding key opening on the impeller hub. Note that care must be taken not to damage the impeller or the motor bearings during this process. Damaging the impeller or motor bearings will cause an imbalance that will result in excessive vibration when the impeller is rotating which can damage motor bearings and other coupled equipment.
4. Align the end of the motor shaft flush with the face of the impeller hub (300-1000 burner sizes) and 1/8" forward of the face of the impeller hub (2000-5000 burner sizes). Tighten the two 1/4-20 screws (F) on the impeller hub into the motor shaft (55 in-lbs).
5. Spin the impeller by hand to confirm unimpaired rotation. The impeller and motor should spin freely with no contact with the blower housing or any fastener within.
6. Place the blower face plate gasket (E) onto the face plate (C), align the holes in the face plate and gasket with the corresponding holes in the blower housing face plate mounting flange. Insert and tighten the eight sheet metal screws (B). Care should be taken to keep the gasket properly aligned and flat for a proper seal.
7. Open the motor wiring terminal box (A); reconnect the electrical power supply wires to the appropriate motor leads. Close the motor wiring terminal box.
8. Verify the burner is off and reconnect the electrical power supply.
9. Momentarily energize the blower motor and verify proper rotational direction. Direction of rotation should correspond with the directional arrows (J) on the blower housing.
10. Verify blower and burner balance and vibration. Blower and burner assemblies are trim balanced to 0.26 in/sec. or less at motor speed (3600 rpm). Failure to trim balance and/or correct an imbalance will result in excessive vibration when the impeller is rotating which can damage motor bearings and other coupled equipment.

11. Prior to restarting the burner system refer to the following sections: Section H – Initial Setup, Section I – Ignition, Section J – Operation, Section L – Maintenance.



**Figure 4. Blower Assembly**

**M. RECOMMENDED SPARE PARTS**

ITEM	DESCRIPTION	QTY.	PART NO.
1	Spark Igniter Assembly (If Applicable)	1	See Parts List
2	Flame Rod Assembly	1	See Parts List
3	UV Scanner (If Applicable)	1	84315205
4	Opticord Adapter	1	74960625
5	GFK (NFPA Manifold)	1	See Parts List
6	OMG (If Applicable)	1	See Parts List