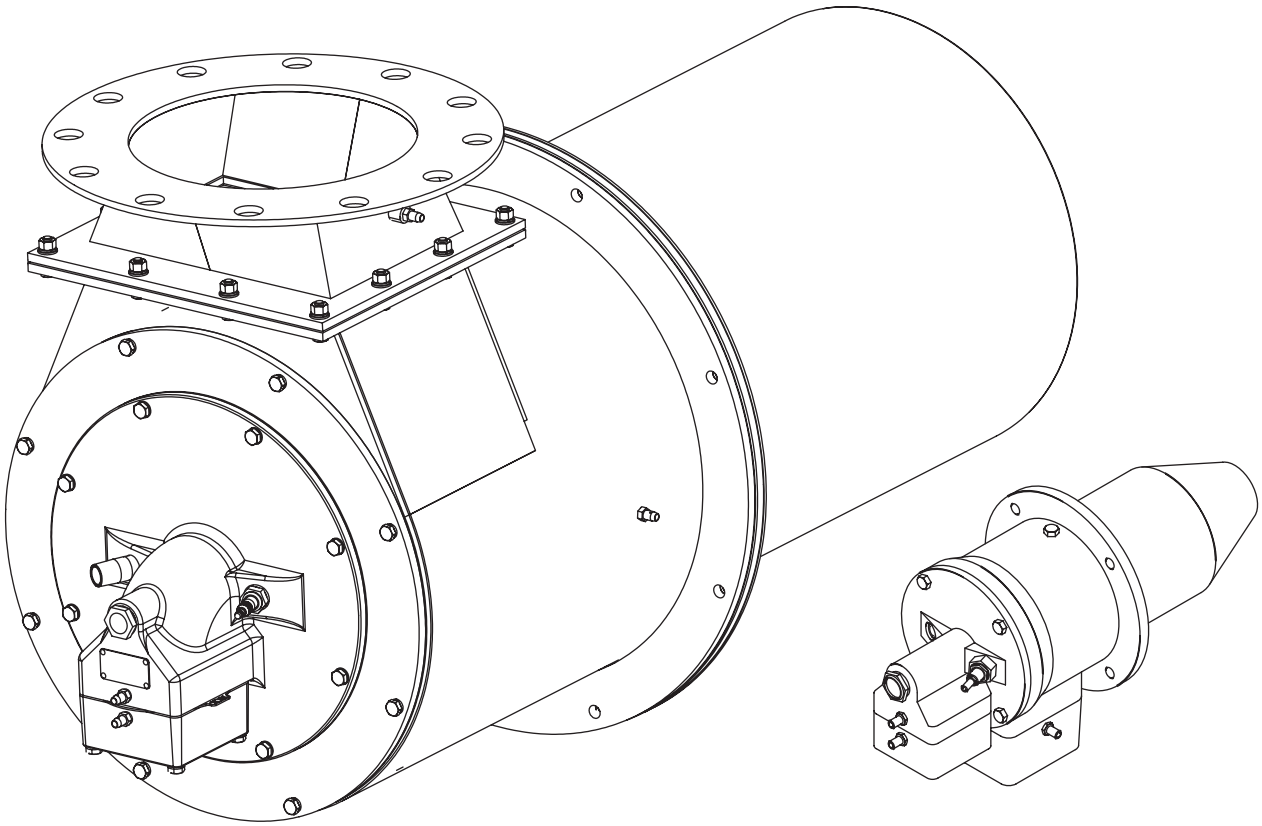
Installation Guide 206
11/12/2010

Eclipse ThermJet Burners for Preheated Combustion Air

Models TJPCA0015 - TJPCA2000

Version 2



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Innovative Thermal Solutions

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Document Conventions

There are several special symbols in this document. You must know their meaning and importance.

The explanation of these symbols follows below. Please read it thoroughly.

How To Get Help

If you need help, contact your local Eclipse representative.

2011 Williamsburg Road

Richmond, VA 23231 U.S.A.

Phone: 804-236-3800 Fax: 804-236-3882

http://www.peconet.com

Please have the information on the product label available when contacting the factory so we may better serve you.

ECLIPSE • www.peconet.com
Product Name
Item #
S/N
DD MMM YYYY

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE Is used to address practices not related to personal injury.

NOTE Indicates an important part of text. Read thoroughly.

Table of Contents

Introduction 1

Product Description

The ThermJet PCA (preheated combustion air) is a nozzle-mix burner that is designed to fire an intense stream of hot gases through a combustor using preheated combustion air temperatures up to 1000°F. (Models TJPCA0500 through TJPCA1000 are rated for use with preheated combustion air temperatures up to 700°F.)

The high velocity of the gases improves temperature uniformity, product quality and system efficiency. ThermJet PCA burners use medium velocity TJPCA combustors providing velocities from 250 ft/s to 750 ft/s depending on the temperature of the preheated combustion air.

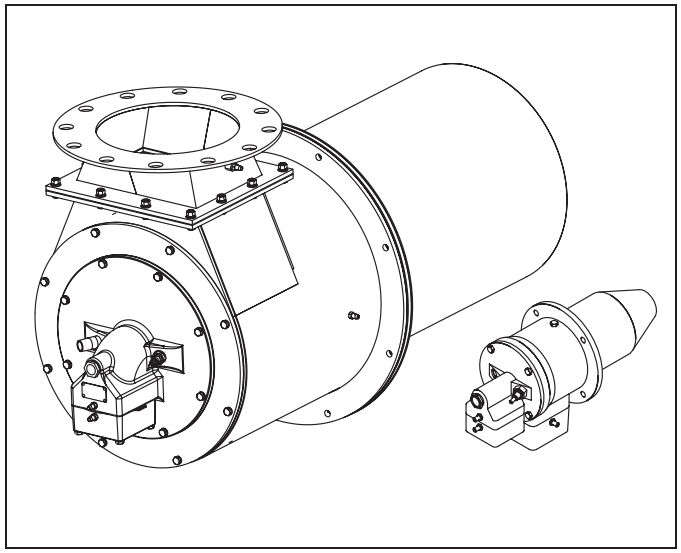


Figure 1.1. ThermJet PCA Burner

Audience

This manual has been written for people who are already familiar with all aspects of a nozzle-mix burner and its add-on components, also referred to as “the burner system”.

These aspects are:

- Installation
- Use
- Maintenance

The audience is expected to have previous experience with this type of equipment.

ThermJet PCA Documents

Installation Guide No. 206

- This document

Datasheet, Series No. 206-1 through 206-13

- Available for individual ThermJet PCA models
- Required to complete installation

Design Guide No. 206

- Used with Datasheet to complete installation

Related Documents

- EFE 825 (Combustion Engineering Guide)
- Eclipse Bulletins and Info Guides: 610, 710, 720, 730, 742, 744, 760, 930, I-354

Purpose

The purpose of this manual is to ensure that you carry out the installation of a safe, effective, and trouble free combustion system.

Safety

2

Important notices about safe burner operation will be found in this section. Read this entire manual before attempting to start the system. If any part of the information in this manual is not understood, contact Eclipse before continuing.

Safety

DANGER

- **The burners covered in this manual are designed to mix fuel with air and burn the resulting mixture. All fuel burning devices are capable of producing fires and explosions when improperly applied, installed, adjusted, controlled or maintained.**
- **Do not bypass any safety feature. Fires and explosions can be caused.**
- **Never try to light the burner if the burner shows signs of damage or malfunctioning.**

WARNING

- **The burner might have HOT surfaces. Always wear protective clothing when approaching the burner.**
- **Eclipse products are designed to minimize the use of materials that contain crystalline silica. Examples of these chemicals are: respirable crystalline silica from bricks, cement or other masonry products and respirable refractory ceramic fibers from insulating blankets, boards, or gaskets. Despite these efforts, dust created by sanding, sawing, grinding, cutting, and other construction activities could release crystalline silica. Crystalline silica is known to cause cancer, and health risks from the exposure to these chemicals vary depending on the frequency and length of exposure to these chemicals. To reduce this risk, limit exposure to these chemicals, work in a well-ventilated area and wear approved personal protective safety equipment for these chemicals.**

NOTICE

- **This manual provides information in the use of these burners for their specific design purpose. Do not deviate from any instructions or application limits described herein without written advice from Eclipse.**
- **Read entire manual before attempting to start this system. If you do not understand any part of the information contained in this manual, contact Eclipse before continuing.**

Capabilities

Adjustment, maintenance and troubleshooting of the mechanical and the electrical parts of this system should be done by qualified personnel with good mechanical aptitude and experience with combustion equipment.

Operator Training

The best safety precaution is an alert and trained operator. Train new operators thoroughly and have them demonstrate an adequate understanding of the equipment and its operation. A regular retraining schedule should be administered to ensure operators maintain a high degree of proficiency.

Replacement Parts

Order replacement parts from Eclipse only. All Eclipse approved, customer supplied valves or switches should carry UL, FM, CSA, CGA, and/or CE approval, where applicable.

Installation 3

In this section you will find the information and instructions that you need to install the burner.

Handling

- Make sure that the area is clean.
- Protect the components from the weather, damage, dirt and moisture.
- Protect the components from excessive temperatures and humidity.
- Take care not to drop or damage components.

Storage

- Make sure that the components are clean and free of damage.
- Store the components in a cool, clean, dry room.
- After you have made sure that everything is present and in good condition, keep the components in the original package as long as possible.

NOTICE

- **When the refractory combustion block is supplied with the burner, it is critical that the instructions for handling and storage are followed. The refractory should be considered fragile; improper handling and storage will cause premature failure.**

Position of Components

The position and amount of components are determined by the kind of control method chosen. All the control methods can be found in Design Guide 206. Follow one of the schematics in the System Design chapter to build your system.

Approval of Components

Limit Controls & Safety Equipment

All limit controls and safety equipment must comply with all applicable local codes and/or standards and must be listed for combustion safety by an independent testing agency. Typical application examples include:

- American: NFPA 86 with listing marks from UL, FM, CSA
- European: EN 746-2 with CE mark from TuV, Gastec, Advantica

Electrical Wiring

All the electrical wiring must comply with all applicable local codes and/or standards such as:

- NFPA Standard 70
- IEC60364
- CSA C22
- BS7671

Gas Piping

All the gas piping must comply with all applicable local codes and/or standards such as:

- NFPA Standard 54
- ANSI Z223
- EN 746-2

Where to Get the Standards:

The NFPA Standards are available from:
National Fire Protection Agency
Batterymarch Park
Quincy, MA 02269
www.nfpa.org

The ANSI Standards are available from:
American National Standard Institute
1430 Broadway
New York, NY 10018
www.ansi.org

The UL Standards are available from:
333 Pfingsten Road
Northbrook, IL 60062
www.ul.com

The FM Standards are available from:
1151 Boston-Providence Turnpike
PO Box 9102
Norwood, MA 02062
www.fmglobal.com/approvals

Information on the EN standards and where to get them is available from:
Comité Européen de Normalisation
Stassartstraat 36
B-1050 Brussels
Phone: +32-25196811
Fax: +32-25196819
www.cen.eu

Comité Européen de Normalisation Electronique
Stassartstraat 36
B-1050 Brussels
Phone: +32-25196871
Fax: +32-25196919
www.cenelec.org

Checklist Before Installation

Intake

To admit fresh combustion air from outdoors, provide an opening in the room of at least one square inch per 4,000 BTU/hr. If there are corrosive fumes or materials in the air, then supply the burner with clean air from an uncontaminated area, or provide a sufficient air filtering system.

Exhaust

Do not allow exhaust to accumulate in the work area. Provide some positive means for exhausting them from the furnace and the building.

Access

Make sure that you install the burner in such a way that you can get easy access for inspection and maintenance.

Environment

Make sure the local environment matches the original operating specifications. Check the following items:

- Voltage, frequency and stability of the electrical power
- Type and supply pressure of the fuel
- Availability of enough fresh, clean combustion air
- Humidity, altitude and temperature of air
- Presence of damaging corrosive gases in the air

Prepare the Burner

Several components must be installed on a burner before it can operate. Installation instructions follow.

It is possible to change the relative position of the gas inlet with respect to the air inlet. This can be convenient for the routing of the piping.

Rotate the Rear Cover (Optional)

To rotate the rear cover, do the following (see Figure 3.1):

1. Disconnect the piping at a union in the piping or the inlet flanges ❶ provided on the burner.

NOTE: Be careful not to lose or damage the orifice plate or the o-rings.

2. Remove the four bolts ❷.
3. Remove the rear cover ❸ from the burner housing ❹.
4. Rotate the rear cover ❸ to the position that you want.
5. Put the rear cover ❸ in position against the burner housing ❹.
6. Install the four bolts ❷.
7. Reconnect the piping. Make sure that the o-rings show no signs of damage.

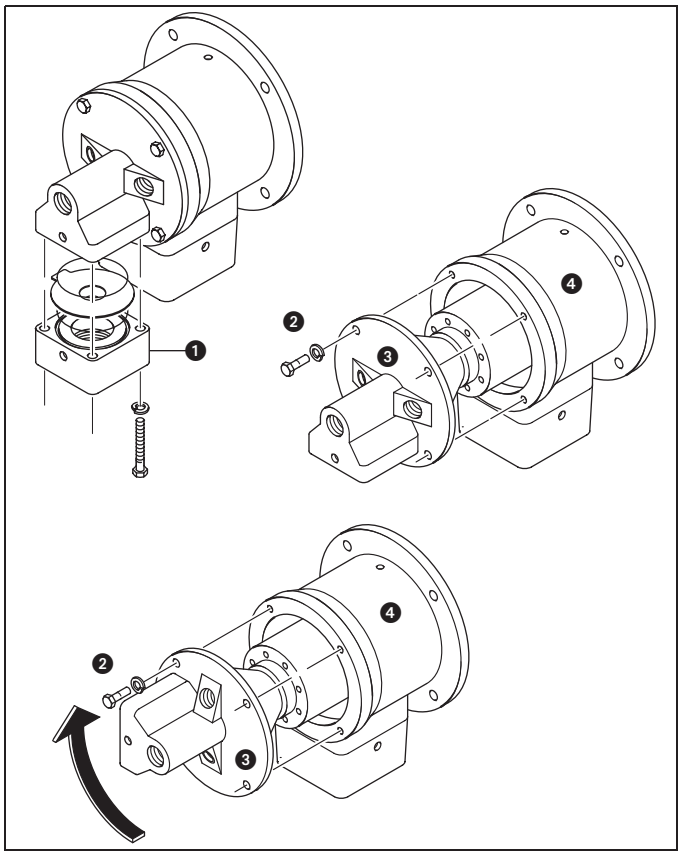


Figure 3.1. Rotate the Rear Cover

Installing the Flame Sensor

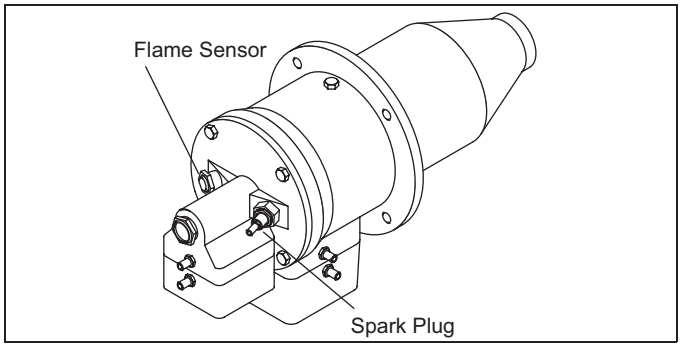


Figure 3.2. Installing the Flame Sensor

1. Install the flame sensor into the 1/2" NPT opening in the rear cover.

2. Make sure that you connect the flame sensor of a burner to the electrical circuit of that burner.

⚠ DANGER

- **If you connect the flame sensor of a burner to the electrical circuit of the wrong burner, then you can cause fires and explosions.**

NOTICE

- **Adjustments may vary from Eclipse published values if the flame controls other than those recommended in the Design Guide are used. Consult with the engineer who specified the alternate control for limitations.**

UV Scanner

All ThermJet PCA burners operate with UV Scanners only. A UV Scanner can be used with all combustor types. For detailed information on how to install and connect a UV scanner, refer to scanner information guide.

NOTE: Ambient temperature limits for the scanners are likely to be exceeded. An insulated coupling, heat block seal or scanner cooler may be required. See Bulletins 832 & 834.

Installing the Spark Plug

Install the spark plug into the opening in the rear cover.

NOTE: Do ***not*** apply any grease to the threads of the spark plug. You can cause bad grounding of the spark plug if you apply grease to it. Bad grounding of the spark plug results in a weak spark.

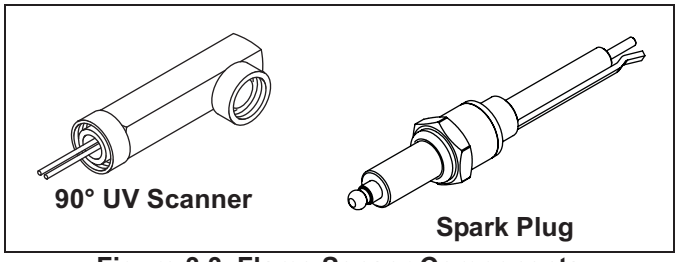


Figure 3.3. Flame Sensor Components

Burner Installation

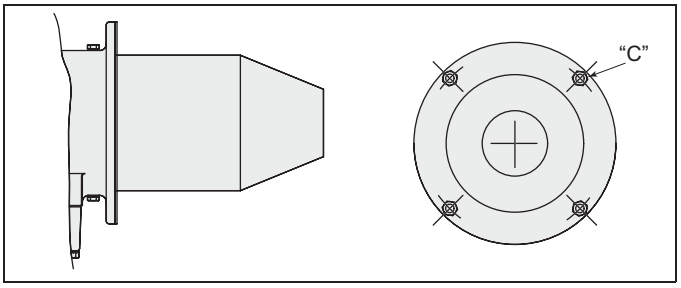


Figure 3.4. Burner Attachment

Dimensions

The burner attaches to the wall of the chamber with bolts through holes “C”. For full information on the burner dimensions, refer to specific datasheets.

Chamber Wall

Make sure that the wall of the chamber is strong enough to support the weight of the burner. If necessary, reinforce the area where you plan to install the burner to support the weight of the burner.

Refractory furnace walls must allow for thermal expansion as recommended by the refractory supplier – the wall should apply no stress on the burner block or refractory layer surrounding the burner block. Expansion joints built into the furnace wall should permit the furnace shell, burner block holder, combustor or burner block and surrounding refractory to move as a unit in the event of unequal expansion of the refractory wall and furnace shell.

The combustor or combustion block must not extend beyond the inside of the furnace wall more than 1". Beyond this length it is necessary to add a spacer on the outside of the furnace to keep the end of the combustor or combustion block within 1/2" of the end of the wall.

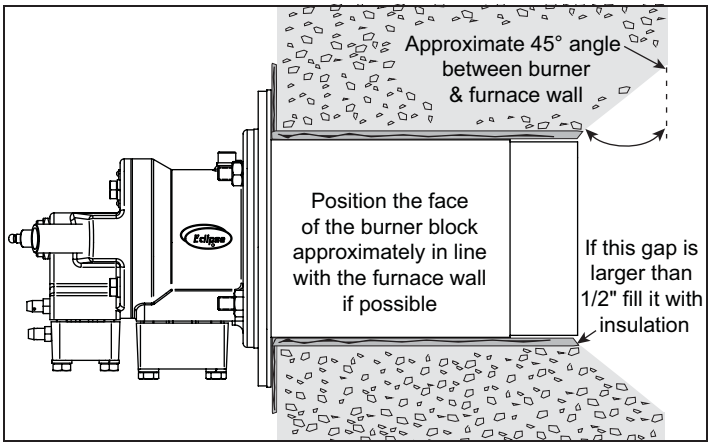


Figure 3.5. ThermJet PCA Combustor Position

If the combustor or burner block is shorter than the furnace wall thickness the block or combustor should be recessed into the wall. To prevent refractory overheating, a 45° chamfer should be applied.

Avoid Losses

To make sure that heat does not go back to the casing of the chamber, it is important that the radial clearance around the firing tube is filled with ceramic fiber.

Alloy Combustor (Figure 3.6)

1. Make sure the gasket ❶ is installed between the burner and the chamber wall ❷.

2. Make sure that gasket ❶ does not leak.

3. Check the size of the clearance. If the gap ❸ around the firing tube is larger than 1/2", then pack the gap with ceramic fiber ❹.

NOTE: Do not insulate the end of the combustion tube "tip". Do not recess the combustion tube into the furnace wall.

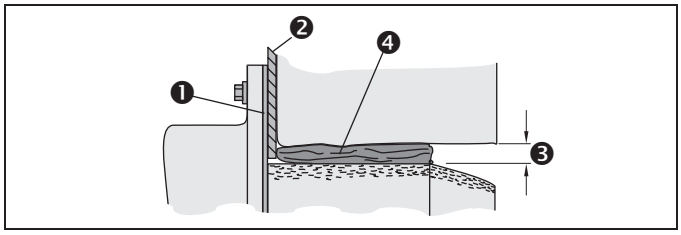


Figure 3.6. Alloy Combustor

Silicon Carbide (SiC) Combustor Only (Figure 3.7)

Make sure the gasket ❶ is installed between the burner flange and chamber wall ❷.

1. Make sure gasket ❺ is installed between SiC tube and flange ❻.

2. Make sure neither gasket ❶ nor ❺ leaks.

3. Check the size of the clearance. If the gap ❸ around the firing tube is larger than 1/2", pack the gap with ceramic fiber ❹ over a maximum length of 4" (100mm). Maintain a clearance of at least 3/16" (5mm) over the remaining straight length of the firing tube. Do not wrap the cone.

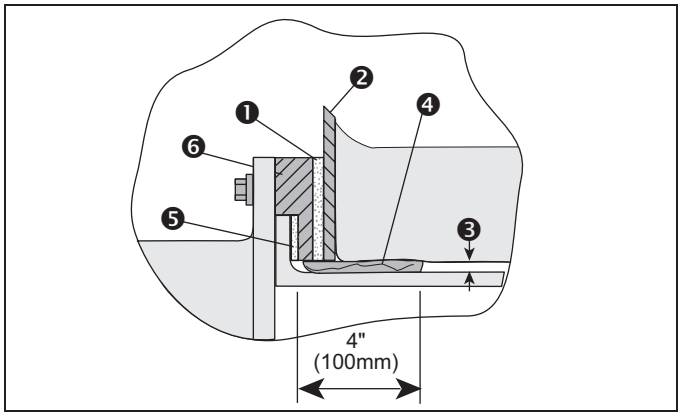


Figure 3.7. Silicon Carbide

Refractory Block (Figure 3.8)

1. Make sure gasket ❶ is installed between burner ❸ and block holder ❹.

2. Make sure gasket ❺ is installed between block holder ❹ and chamber wall ❷.

3. Support the weight of refractory block ❻ with hard brick work anchored to the furnace shell ❼. Fill the 1/2" space around the block ❻ and the three unsupported sides with soft gasket material ❽.

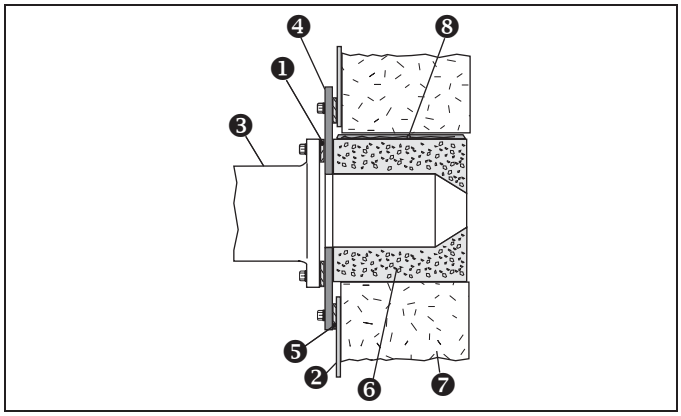


Figure 3.8. Refractory Block

Large Refractory Blocks

On sizes TJPCA0500 thru TJPCA2000; the block must be tightly surrounded by a collar made of brick, plastic refractory, or a castable refractory of at least 4" (10 cm) minimum thickness on all sides of the block. If the collar is cast around the block, a thin plastic film (i.e. Saran Wrap® or Glad Wrap®) should be wrapped around the block to keep moisture from leaching into it. The collar should be

anchored to the furnace shell with suitable anchors and must be constructed to rest on a surface capable of supporting its weight, such as a hearth or a solid refractory or brick wall. For furnaces that are unable to support the weight of the refractory block, a stainless steel shelf can be welded to the shell to support the collar.

NOTE: All refractory blocks are cured at a minimum temperature of 550°F (300°C) prior to shipment.

NOTE: The correct insulation of burner combustion blocks in furnaces results in longer block life and adds value by reducing downtime and maintenance.

Vertical Down Firing Blocks (Figure 3.9)

1. Down firing blocks may be suspended by customer supplied hangers ❷ attached to the burner body mounting bolts.

2. Hangers should be attached to structural support ❶.

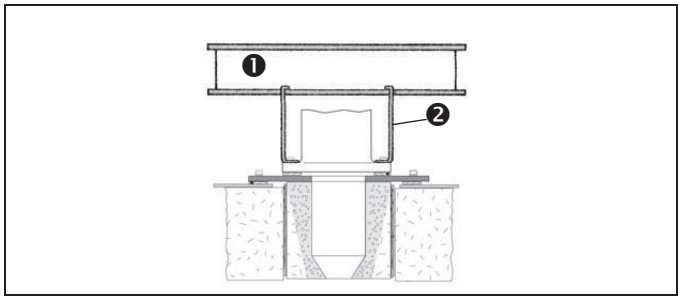


Figure 3.9. Vertical Down Firing Block

Piping Installation

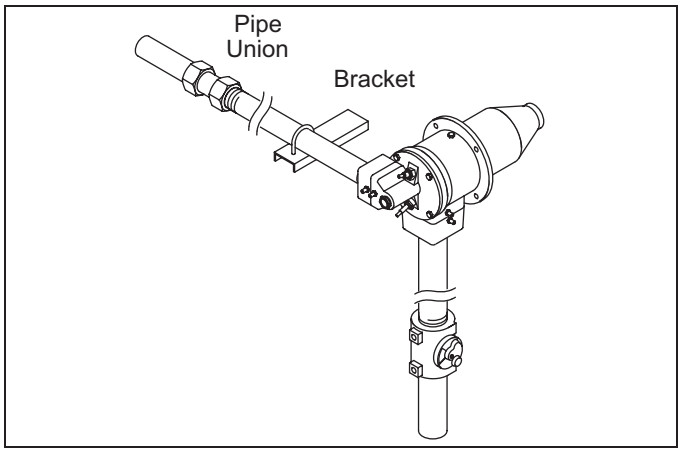


Figure 3.10. Piping Installation

Layout

Install the piping as shown in the schematics. Refer to Chapter 3 of the ThermJet PCA Design Guide No. 206.

Support the Piping

Use brackets or hangers to support the gas piping. If you have questions, consult your local gas company.

Straight Run of Pipe Before a Metering Orifice

NOTE: There must be a run of pipe with a straight length of at least 10 pipe diameters before the burner metering orifice. If you do not do this, the pressure readings ***will*** be inaccurate.

Pipe Connections

Install a pipe union in the gas line to the burner. This simplifies removal of the burner.

The use of flexible pipe nipples in the gas line to the burner is optional. Flexible nipples can absorb stress due to heat expansion and slight misalignment.

NOTE: Flexible pipe nipples will cause inaccurate metering orifice readings and may cause higher pressure drops than equivalent standard pipe. Consider this when you size the gas lines.

Avoid Large Pressure Drops

NOTE: The pressure drop of the gas in the piping is a critical parameter. Make sure that the size of all the piping is large enough to prevent excessive pressure losses.

Valve Installation

Valve Orientation

Install all the valves in such a way that the arrow (if present) on the valve body points in the direction of flow.

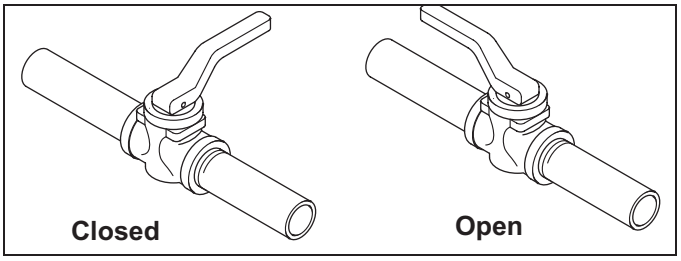


Figure 3.11. Valve Orientation

Gas Cocks

Make sure that the handle of a gas cock is at a right angle to the valve body when the valve is in the closed position. This is an important position indicator. If you do not do this, someone may think that the gas cock is in the closed position, while it is actually in the open position.

Gas Balancing Valves

A gas balancing valve is typically the same as a manual butterfly valve. For more information, refer to "Manual Butterfly Valves" below.

Manual Butterfly Valves

1. Install manual butterfly valves in accordance with Bulletin/Info Guide 720.

2. Install manual butterfly valves in the air line in accordance with Bulletin 722 or manufacturer's instructions.

NOTE: It is recommended that there is a run of pipe with a length of at least 10 pipe diameters between any flow altering device and metering orifice on the burner.

Automatic Butterfly Valve

An automatic butterfly is driven by an actuator (actuator and mounting bracket not illustrated). Install the control valve in accordance with Bulletin/Info Guide 720.

Ratio Regulator

- Connect an impulse line to the ratio regulator and air supply line.
- Install the ratio regulator in accordance with manufacturer's instructions.

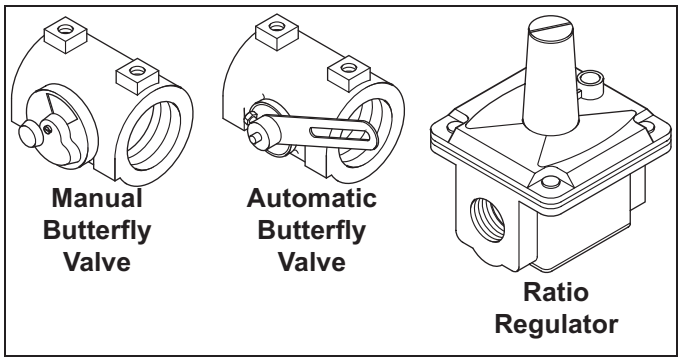


Figure 3.12. Valves

Checklist After Installation

To verify proper system installation, do the following:

1. Make sure that there are no leaks in the gas and air lines.

2. Make sure all the components of the flame monitoring control system are properly installed. This includes verifying that all switches are installed in correct locations and all wiring, pressure and impulse lines are properly connected.

3. Make sure components of spark ignition system are installed and functioning properly.

4. Make sure that the blower rotates in the correct direction. If incorrect, have a qualified electrician rewire the blower to reverse its rotation.

5. Make sure all valves are installed in the proper location and correctly oriented relative to the gas or air flow direction.

Prepare for Adjustment

After installation of the burner system components is complete, the following steps should be followed in order to prepare for adjustment:

1. Set the air pressure switch so that it drops out at 4" w.c. (10 mbar) below the pressure rating of the blower.

2. Set the low gas pressure switch at 4" w.c. (10 mbar) below the gas pressure measured at the inlet to the main gas valve train.

3. Set the high gas pressure switch so that it comes on at 4" w.c. (10 mbar) above the gas pressure measured at the inlet to the main gas valve train.

4. Close all the burner gas cocks.

5. Try to light a burner before the purge and other timers have finished their cycles. Make sure that the flame monitoring system indicates a flame failure.

6. Trip out pressure switches and other limit interlocks. Make sure that the main gas valve train closes.

⚠ DANGER

- **If simulated limits or simulated flame failures do not shut down the fuel system within the required failure response time, immediately correct the problem before proceeding.**

Adjustment, Start & Stop

4

In this chapter you will find instructions on how to adjust a system, and how to start and stop a system.

⚠ DANGER

- **Do not bypass any safety feature. You can cause fires and explosions.**

Modulating Gas & Air Ratio System

If you adjust an on-ratio system for the first time, you must follow these steps: (Refer to Figures in the ThermJet PCA Design Guide No. 206)

Step 1: Reset the System

1. Close the automatic gas valves and gas cocks.
2. Fully open the manual air butterfly valve at each burner.
   a. Drive the automatic zone air control valve to high fire.
   b. Adjust the automatic zone air control valve so that it is fully open.
3. Start the blower.

NOTICE

- **Make sure that the blower rotates in the correct direction. If incorrect, have a qualified electrician rewire the blower to reverse its rotation.**

4. Adjust the eductor flow valve to set the flow measured across the orifice to the flow specified by Eclipse for your application.

Step 2: Set High Fire Air

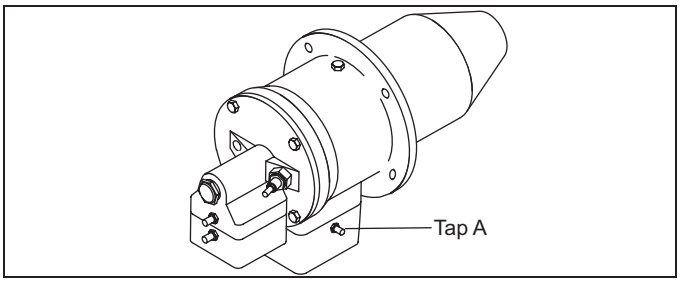


Figure 4.1. Set High Fire Air

1. Set the system to high fire, but **DO NOT** ignite the burner(s).
2. Use the orifice flow data (provided by orifice manufacturer) to determine the pressure drop across the orifice necessary for high fire air flow.

NOTE: If using single diaphragm ratio regulator control, set air flow to 35% excess air to account for temperature changes in combustion air.

3. Set high fire air using the manual combustion air butterfly to achieve the pressure differential determined in Step 2.

NOTE: A pressure tap is open when the screw inside the tap is unscrewed approximately half a turn.

Burner system:

a. Open all pressure tap(s) A.
b. Measure and note the static pressure at Tap A for all the burners.
c. If all the measured static pressures are within 0.3" w.c. (0.75 mbar) of each other, then proceed to the next section. If the variation is greater than 0.3" w.c. (0.75 mbar) it will be necessary to adjust the manual air butterfly valve at each burner to improve the balance.
d. Make sure that all the pressure taps are closed.

4. Repeat ***the proceeding*** for other zones (if any).

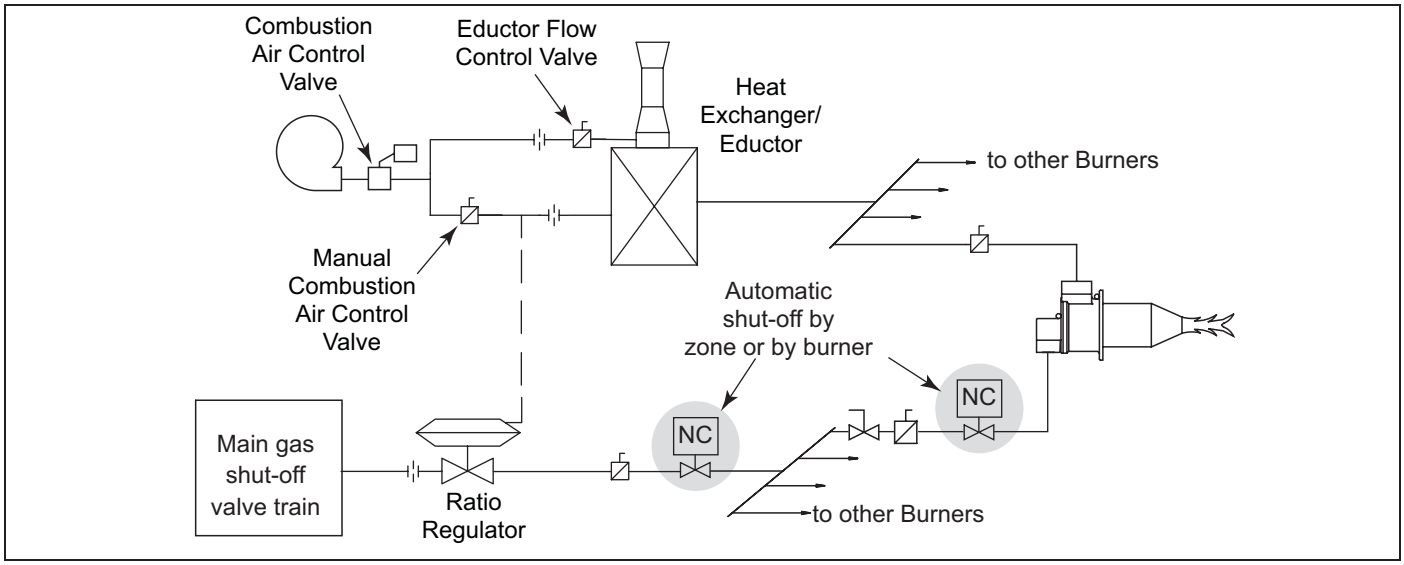


Figure 4.2. Burner System

Step 3: Set Low Fire Air

1. Set the system to low fire.
2. Connect the manometer to tap A (air inlet pressure tap).
3. Adjust the automatic zone air control valve until the low fire static air pressure is 0.2" w.c. This is the initial setting only. Further adjustment may be required.
4. Repeat 2 and 3 for the other zones (if any).

Step 4: Verify the Air Settings

Make sure all the settings are still the same after you cycle the system several times between high and low fire.

Step 5: Ignite the Burners

⚠ WARNING

- **This procedure assumes that a flame monitoring control system is installed and is serviceable. It also assumes that normal low fire start is being used. If low fire gas is too low to be used for ignition, refer to options in "Set the Bypass Pilot Gas (Optional)" on page 14.**

1. Drive the zone air automatic control valve to low fire.
2. Make sure the combustion air blower is running.
3. Set the manual gas butterfly valve at each burner to 50% open.

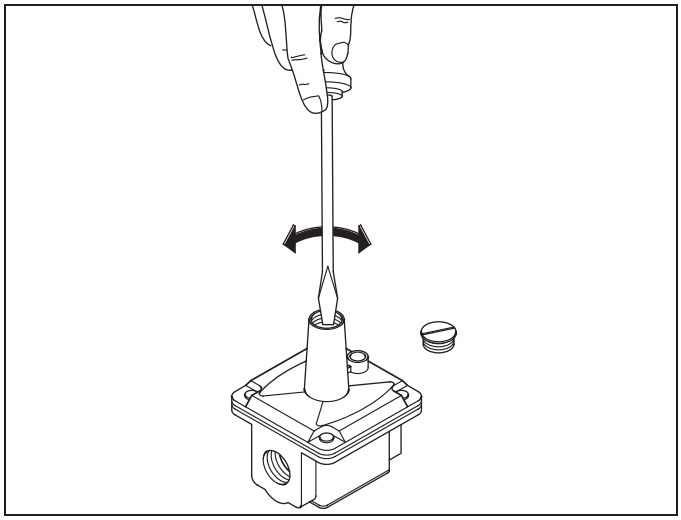


Figure 4.3. Adjusting Ratio Regulator Screw

4. Adjust the ratio regulator as required for low fire.
5. Open manual gas cock at each burner.
6. Initiate the ignition sequence through the flame monitoring control system.
7. Check that all the burners in the zone have ignited. If all the burners have ignited, drive the combustion air butterfly valve to high fire. Verify flame is present at each burner. If burners do not light, increase the gas flow by adjusting the ratio regulator, repeat step 6.
8. Recheck the high fire air settings.

NOTE: As application temperature increases, pressure will change. Depending on control method, readjustment of the manual combustion air butterfly valve may be necessary.

Step 6: Set High Fire Gas (Figure 4.4)

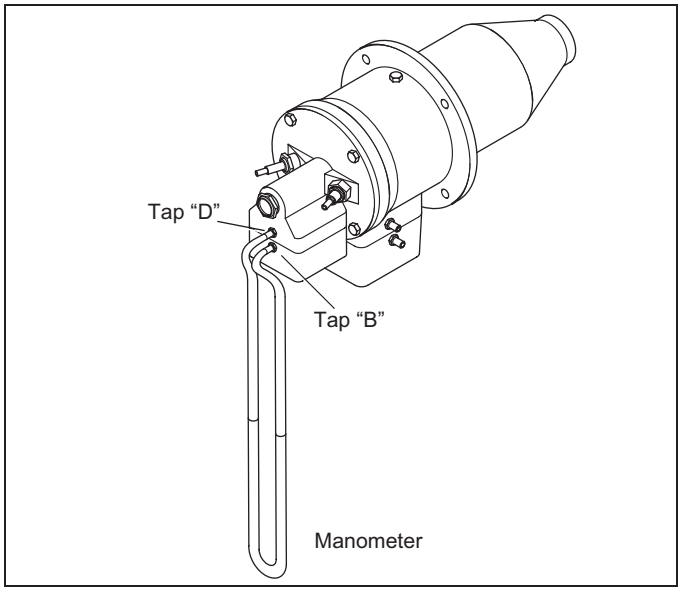


Figure 4.4. Set High Fire Air

1. Use the gas curve from the appropriate ThermJet PCA datasheet for the gas being used to find the differential gas pressure needed at high fire. This is the target value for high fire.

2. Connect the manometer to taps B and D (across the gas orifice).

3. Measure the high fire differential gas pressure for the first burner.

4. Adjust the gas butterfly valve at the burner until the gas flow is at the target value.

5. Repeat 3 thru 4 for the other burners in the zone.

6. Check the gas pressure at the inlet to the zone ratio regulator. This should be at least 5" w.c. (12.5 mbar) higher than the loading line pressure. It should not exceed the maximum pressure rating of the ratio regulator.

⚠ WARNING

- **Insufficient gas inlet pressure may cause the proportionator to remain fully open as the burner system turns down from high fire, causing excess fuel operation and possible accumulation of unburned fuel in the chamber. In extreme cases, this may cause explosions or fires.**

Step 7: Set Low Fire Gas

1. Drive the system to low fire.

2. Use the gas curve from the appropriate ThermJet PCA datasheet for the gas being used to determine the differential gas pressure required for low fire. This is your target value for low fire.

3. Measure the gas pressure at the first burner.

4. Adjust the ratio regulator until the gas flow is on the target value.

NOTE: It is very difficult to measure the very low pressures experienced at low fire, and it may be necessary to rely on visual inspection. This is especially true when gas turndowns in excess of 10:1 are being used. The main intent is to provide a clean stable flame with a good flame signal that will not cause the furnace temperature to overshoot.

If the pressure required is too low to be measured, adjust the ratio regulator until a gas flow is obtained that will provide a clean stable flame with a strong flame signal.

Step 8: Verify the Gas Settings

Make sure that all settings are still the same after cycling the system several times between high and low fire.

Step 9: Readjust Settings

As application temperature increases, setting may vary. Recheck and readjust as temperatures increase.

NOTE: When all the settings have been completed, mark the position of the indicator on the butterfly valves to indicate valve position.

Set the Bypass Pilot Gas (Optional)

1. Set the system to low fire.

2. Make sure that the blower is on.

⚠ WARNING

- **Before you perform this procedure, make sure the flame monitoring control system is working.**

3. Use the flame monitoring control system to start the ignition and the bypass pilot gas for all the burners in the zone.

4. Adjust the manual butterfly valve in the bypass line until you obtain reliable ignition within the required trial for ignition time limit.

5. Repeat 4 for all the other burners and zones (if any).

Start Procedure

1. Start the blower.

2. Open all the gas cocks.

3. Start the ignition sequence.

4. Verify that flame is present at each burner.

⚠ DANGER

- **If a burner does not light, and the system does not shut down automatically, then you must close the main gas cock. An uncontrolled flow of gas can cause fires and explosions.**

- **Do not touch the ignition plug or the ignition wire when the ignition is on. You will get a shock.**

Stop Procedure

1. Close the following valves:
   - The manual gas cock for each burner or zone
   - The manual gas cock at the main control valve
   - All the manual shut-off valves in the gas line upstream of the burner gas cock

2. Let the burners cool down. Keep the blower on until the chamber temperature is less than 1000°F (500°C) and then stop the blower.

NOTICE

- **Keeping the blower on after the burner is off protects the burner and the other components from hot gases that flow back through the burner.**

Maintenance & Troubleshooting

5

This chapter is divided into two sections:

- Maintenance procedures
- Troubleshooting guide

Maintenance

Preventive maintenance is the key to a reliable, safe and efficient system. The core of any preventive maintenance system is a list of periodic tasks. The following are suggestions for a monthly list and a yearly list.

NOTE: The monthly list and yearly lists are an average interval. If your environment is dirty, the intervals may be shorter.

Monthly Checklist

1. Test (leak test) safety shut-off valves for tightness of closure.
2. Test air pressure switch settings by checking switch movements against pressure settings and comparing with actual impulse pressure.
3. Visually check ignition cable and connectors.
4. Inspect impulse piping for leaks.
5. Clean and inspect all the burners.
6. Make sure that the following components are not damaged or distorted:
   - burner nozzle
   - spark plugs
   - flame sensors
   - flame tube or combustion block
7. If applicable, remove and clean all the orifice plates.

Yearly Checklist

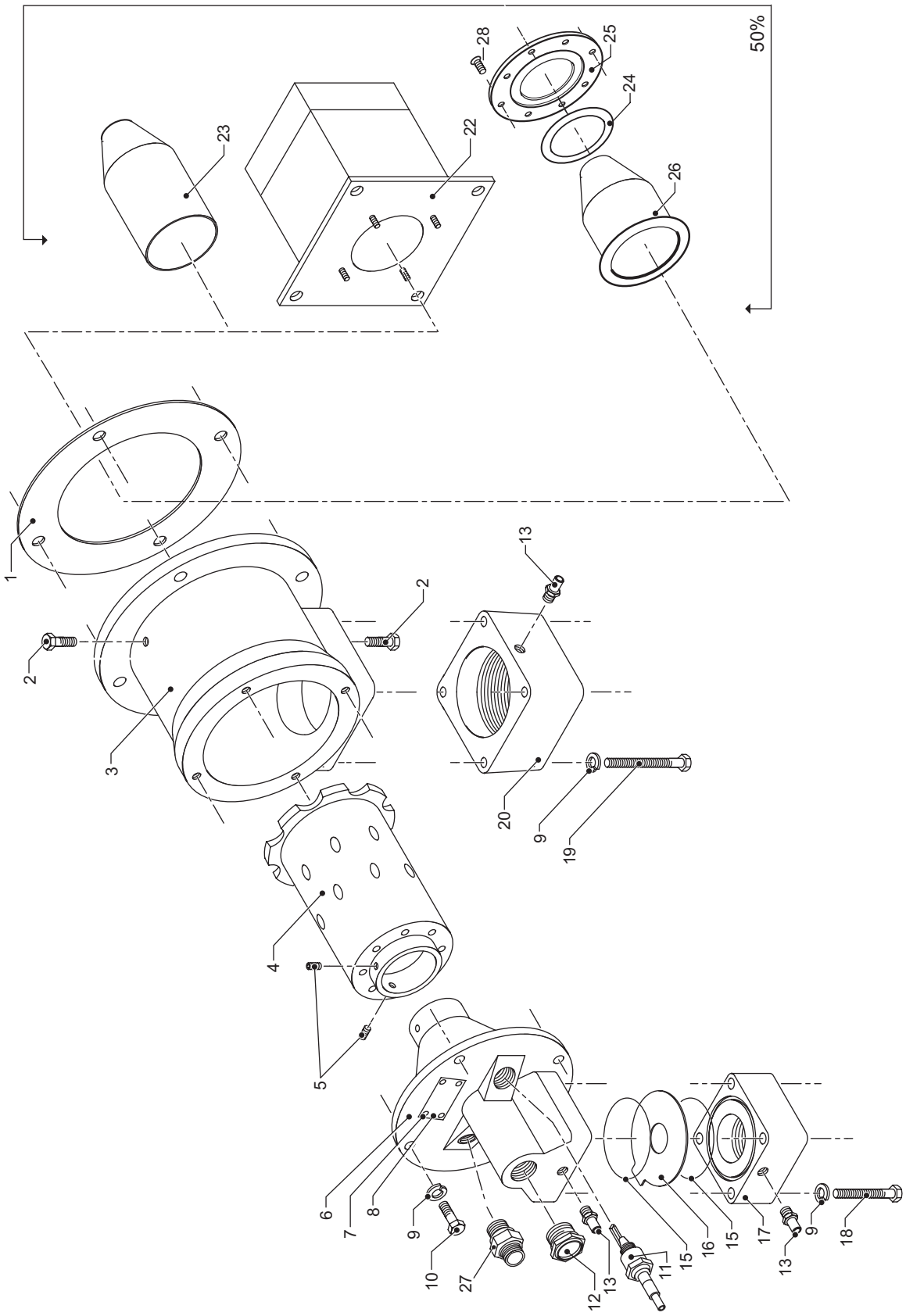
1. Inspect flame-sensing devices for good condition and cleanliness.
2. Check for proper inlet air/gas ratios.
3. Test all the alarm systems for proper signals.
4. Check ignition spark plugs and check proper gap.
5. Check valve motors and control valves for free, smooth action and adjustment.
6. Check for proper operation of the ventilating equipment.
7. Test the interlock sequence of all safety equipment; manually make each interlock fail, noting that related equipment closes or stops as specified by the manufacturer.
8. Test flame monitoring control system by manually shutting off gas to burner.
9. Test main fuel hand-valves for operation.
10. Clean or replace the combustion air blower filter.

Troubleshooting Procedures

Problem	Possible Cause	Solution
Cannot initiate start sequence *(continued on next page)*	Air pressure switch has not made contact	Check air pressure switch adjustment. Check air filter. Check blower rotation. Check outlet pressure from blower.
	High gas pressure switch has tripped	Check incoming gas pressure. Adjust gas pressure if necessary. Check pressure switch setting and operation.
	Low gas pressure switch has tripped	Check incoming gas pressure. Adjust gas pressure if necessary. Check pressure switch setting and operation.
	Malfunction of flame monitoring control system such as shorted out flame sense or electrical noise in the sensor line	Have a qualified electrician investigate and rectify.

Problem	Possible Cause	Solution
Cannot initiate start sequence	Purge cycle not completed	Check flame monitoring control system or purge timer.
	Main power is off	Make sure power is on to control system.
	No power to control unit	Call qualified electrician to investigate.
Start-up sequence runs but burner does not light	No ignition: There is no power to the ignition transformer	Restore power to the ignition transformer.
	No ignition: Open circuit between the ignition transformer and the spark plug	Repair or replace the wiring to the spark plug.
	No ignition: The spark plug needs cleaning	Clean the spark plug.
	No ignition: The spark plug is not correctly grounded to the burner	Clean the threads of the spark plug and the burner. Do not apply grease to the thread of the spark plug.
	Too much gas: Improper gas valve train sequence	Verify solenoid valve is down-stream of proportionator.
	Too much gas: Manual gas butterfly valves have been opened too far	Check pressures and settings against start-up report and adjust as necessary.
	Too much gas: Gas pressure out of the main gas pressure regulator is too high	Check start-up setting. If necessary, remove regulator and investigate.
	Not enough gas: The gas pressure out of the main gas pressure regulator is too low	Check start-up setting. Check regulator and adjust if necessary.
	Not enough gas: Start gas solenoid valve does not open.	Check solenoid valve coil for proper orientation. Replace if necessary.
	Not enough gas: Gas valve not open	Check wiring to the automatic gas shut-off valve.
	Not enough gas: Air in the gas line	Check output from the flame safeguard. Open gas cock. Purge gas line.
The low fire flame is weak or unstable	Low fire adjusted too slow	Increase low fire gas setting.
	Not enough gas	Check start-up settings and adjust to increase low gas flow.
	Not enough air	Check start-up settings. Investigate any change, i.e. blocked filter, loose connections.
The burner goes off when it cycles to high fire	Insufficient air (flame too rich)	Check start-up settings. Check air filter, clean or replace if required.
The burner is erratic and does not respond to adjustment	Flame signal weak	Check condition of flame monitoring device.
	Internal damage to the burner. Some parts inside the burner may be loose or dirty.	Contact Eclipse.
The burner is unstable or produces soot or smoke	The air/gas ratio is out of adjustment	Measure all gas pressures and air pressures. Compare to initial start-up settings, and adjust them where necessary.
Cannot achieve full capacity	Air filter is blocked	Clean or replace the air filter.
	Gas pressure is too low into the main gas pressure regulator	Adjust gas pressure.
	Increase furnace/chamber pressures	Re-check setup pressures.
	Poor piping practices	Contact Eclipse.

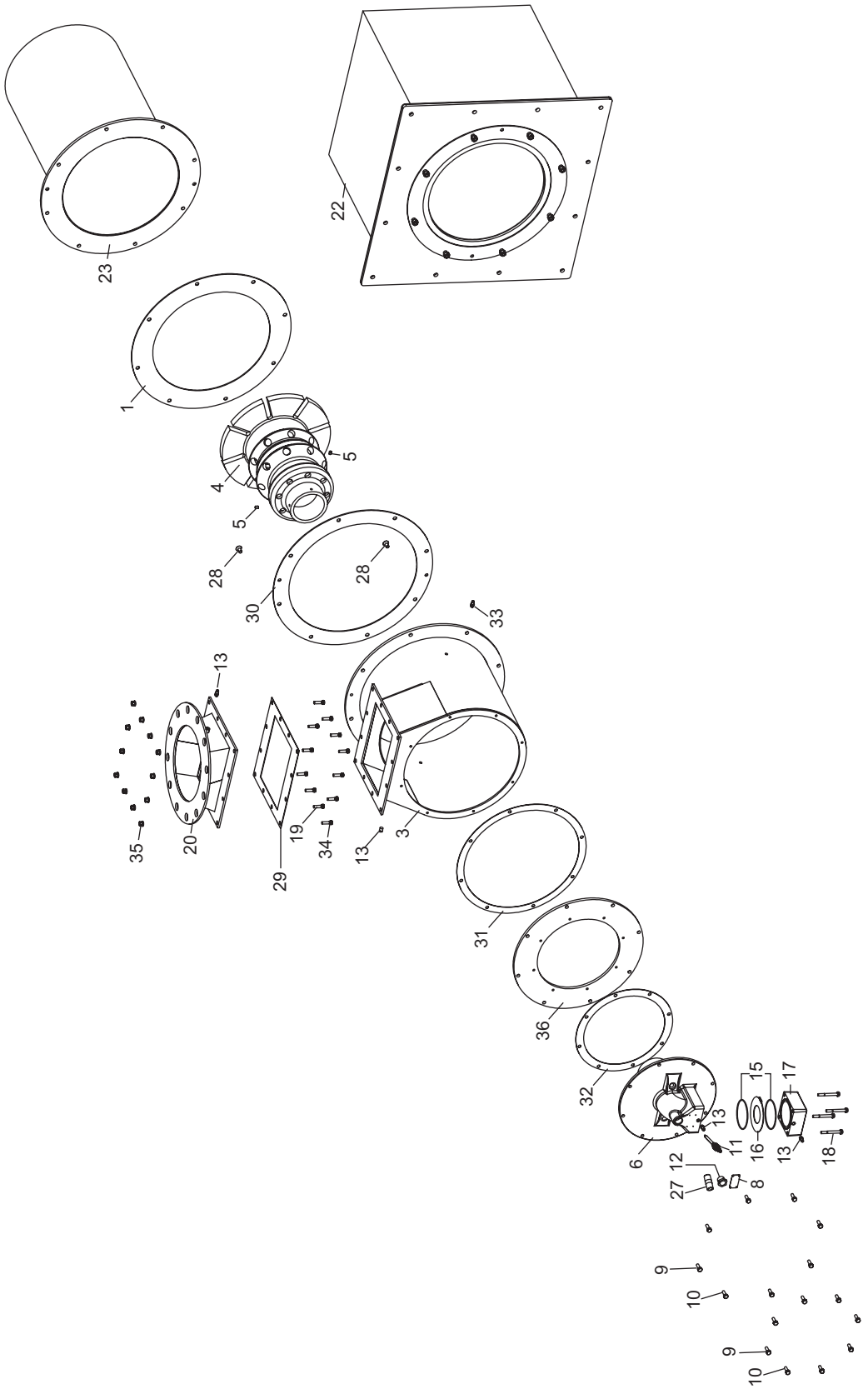
Parts List Models TJPCA0015 thru TJPCA1000



Parts List Models TJPCA0015 thru TJPCA0150

Ref No	Part Description	Qty	TJPCA0015	TJPCA0025	TJPCA0040	TJPCA0050	TJPCA0075	TJPCA0100	TJPCA0150
1	Gasket, Mounting	1	17054	17054	17054	20422	20422	14932	14932
2	Screw	2	16022	16022	16022	16022	16022	16022	16022
3	Body	1	7031-1	7031-1	7118-1	7046-1	7046-1	3994	3994
4	Nozzle, Cast Iron	1	7033-1	7033-2	7033-3	7133-1	7133-2	3997-1	3997-1
4	Nozzle, Stainless Steel	1	7125-1	7135-1	7125-2	7126-1	7137-1	7127-1	7127-1
4	Nozzle for Flamerod, Cast Iron	1	10026919	10026920	10026921	10026923	10026924	10026925	10026925
4	Nozzle for Flamerod, Stainless	1	10026926	10026927	10026928	10026929	10026930	10026931	10026931
5	Set Screw	2	19969	19969	19969	15885	15885	15885	15885
5	Stainless Set Screw	2	10024662	10024662	10024662	10024356	10024356	10024356	10024356
6	Rear Cover	1	7032-1	7032-1	7032-1	3998-1	3998-1	3995	3995
7	Screw #2 Drive	4	18933	18933	18933	18933	18933	18933	18933
8	Nameplate	1	20729	20729	20729	20729	20729	20729	20729
9	Lock Washer M8	13	15222	15222	15222	15222	15222	15222	15222
10	Screw M8	4	15886	15886	15886	16021	16021	15886	15886
11	Spark Plug	1	23045	23045	23045	10019728	10019728	10019728	10019728
12	Peepsight	1	10509	10509	10509	10509	10509	10509	10509
13	Pressure Tap	4	13445	13445	13445	13445	13445	13445	13445
14	Flamerod	1	10002242-1	10002242-1	10002242-1	10002242-1	10002242-1	10002242-2	10002242-2
15	O-ring	2	14777	14777	14777	17037	17037	14778	14778
16	Orifice Plate, NG	1	14191-13	14191-8	14191-6	14934-17	14934-10	14188-4	14188-9
16	Orifice Plate, PR	1	14191-14	14191-13	14191-8	14934-13	14934-3	14188-7	14188-4
16	Orifice Plate, BU	1	14191-14	14191-13	14191-8	14934-12	14934-2	14188-7	14188-8
17	Inlet Block, Gas NPT	1	3974-4	3974-4	3974-2	7001-1	7001-1	3973-3	3973-3
17	Inlet Block, Gas Rc	1	3974-3	3974-3	3974-1	7001-3	7001-3	3973-1	3973-1
18	Screw M8	4	15887	15887	15887	15893	15893	15893	15893
19	Screw M8	4	15893	15893	15893	20890	20890	15888	15888
19	Thread Insert	8	N/A	N/A	N/A	N/A	N/A	N/A	N/A
20	Inlet Block, Air NPT	1	7001-2	7001-2	3973-2	7108-2	7108-2	3996-1	3996-1
20	Inlet Block, Air Rc	1	7001-4	7001-4	3973-10	7108-3	7108-3	3996-2	3996-2
20	Inlet, Welded Air	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A
20	Inlet, Flanged Air	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A
21	Orifice Plate, Air	1	14934-6	14934-7	14188-5	20362-5	20362-6	14802-1	14802-3
22	Block & Holder Asy, HV	1	187265-1	187265-2	100234-1	187329-68	187328-68	187302-68	187299-68
22	Block & Holder Asy, MV	1	187265-2	187265-3	100234-2	187328-68	187330-68	187300-68	187298-68
22	Down Fired Block & Holder HV	1	N/A	N/A	N/A	10025728	10025726	10025724	10025722
22	Down Fired Block & Holder MV	1	N/A	N/A	N/A	10025726	10025727	10025725	10025723
23	Combustor, Alloy HV	1	108715-1	108715-2	108715-3	21747-2	21747-1	17182	15214
23	Combustor Alloy MV	1	108715-2	108715-3	108715-4	21747-1	21747-3	17183	15213
24	Silicon Carbide Gasket	1	19971	19971	19971	10005080	10005080	10005	10005
25	Retaining Ring, SiC	1	19970	19970	19970	20464	20464	10003	10003
26	Combustor, SiC HV	1	17046-1	17046-2	17046-3	21793-2	21793-1	17180	15217
26	Combustor, SiC MV	1	17046-2	17046-3	17046-4	21793-1	21793-3	17181	15216
27	UV Scanner Adapter	1	18720	18720	18720	18720	18720	18720	18720
28	Screw FH	4	10001	10001	10001	10001	10001	10001	10001
29	Gasket, Air Inlet	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A
30	Gasket, Alloy Tube, Body	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A
31	Gasket Body, Adapter Plate	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A
32	Gasket Rear Cover	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A
33	1/8" Plug	1	N/A	N/A	15398	15398	15398	15398	15398
34	Flat Washer	12	N/A	N/A	N/A	N/A	N/A	N/A	N/A
35	Nut M8	12	N/A	N/A	N/A	N/A	N/A	N/A	N/A
36	Rear Cover Adapter Plate	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Parts List Models TJPCA0500 thru TJPCA2000



Parts List Models TJPCA0200 thru TJPCA2000

Ref No	Part Description	Qty	TJPCA0200	TJPCA0300	TJPCA0500	TJPCA0750	TJPCA1000	TJPCA1500	TJPCA2000
1	Gasket, Mounting	1	14932	10027	20151	10002831	10002831	10007206	10007206
2	Screw	2	16022	N/A	N/A	N/A	N/A	N/A	N/A
3	Body	1	3994	7036-1	7111-1	7124-3	7124-3	10006927	10006927
4	Nozzle, Cast Iron	1	3997-1	7038-1	7116-1	10002813-1	10002813-1	10006112	10006112
4	Nozzle, Stainless Steel	1	7127-1	7128-1	7129-1	10007413-1	10007413-1	10007512	10007512
4	Nozzle for Flamerod, Cast Iron	1	10026925	N/A	N/A	N/A	N/A	N/A	N/A
4	Nozzle for Flamerod, Stainless	1	10026931	N/A	N/A	N/A	N/A	N/A	N/A
5	Set Screw	2	15885	15885	15885	21598	21598	21598	21598
5	Stainless Set Screw	2	10024356	10024356	10024356	10024663	10024663	10024663	10024663
6	Rear Cover	1	3995-1	7037-1	7037-2	10002812	10002812	10002812	10002812
7	Screw #2 Drive	4	18933	18933	18933	18933	18933	18933	18933
8	Nameplate	1	20729	20729	20729	20729	20729	20729	20729
9	Lock Washer M8	13	15222	15222 (12)	15222 (16)	15222 (20)	15222 (20)	15222 (32)	15222 (32)
10	Screw M8	4	15886	15886	15886 (8)	15892 (8)	15892 (8)	15892 (16)	15892 (16)
11	Spark Plug	1	10019728	23045	23045	23045	23045	23045	23045
12	Peepsight	1	10509	13225	13225	10509	10509	10509	10509
13	Pressure Tap	4	13445	13445	13445	13445	13445	13445	13445
14	Flamerod	1	10002242-2	N/A	N/A	N/A	N/A	N/A	N/A
15	O-ring	2	14778	14778	14778	14781	14781	14781	14781
16	Orifice Plate, NG	1	14188-1	14188-3	14188-5	14802-14	14802-15	14802-4	14802-7
16	Orifice Plate, PR	1	14188-4	14188-19	14188-3	14802-17	14802-19	14802-20	14802-13
16	Orifice Plate, BU	1	14188-4	14188-19	14188-3	14802-16	14802-18	14802-19	14802-20
17	Inlet Block, Gas NPT	1	3973-3	3973-2	3973-2	3996-3	3996-3	3996-3	3996-3
17	Inlet Block, Gas Rc	1	3973-1	3973-10	3973-10	3996-4	3996-4	3996-4	3996-4
18	Screw M8	4	15893	15893	15893	15888	15888	15888	15888
19	Screw M8	4	15888	15892	15892	15892 (8)	15892 (8)	20579 (12)	20579 (12)
19	Thread Insert	8	N/A	N/A	20304 (6)	20304	20304	N/A	N/A
20	Inlet Block, Air NPT	1	3996-1	100041	N/A	N/A	N/A	N/A	N/A
20	Inlet Block, Air Rc	1	3996-2	100041-1	N/A	N/A	N/A	N/A	N/A
20	Inlet, Welded Air	1	N/A	100040	100044	101111	101111	N/A	N/A
20	Inlet, Flanged Air	1	N/A	N/A	N/A	N/A	N/A	10005018	10005018
21	Orifice Plate, Air	1	14802-8	10039-1	20152-1	10002627-3	10002627-2	10005107-1	10005107-4
22	Block & Holder Asy, HV	1	187317-68	187315-68	100015-68	10004465-68	10004466-68	10007035-68	10007036-68
22	Block & Holder Asy, MV	1	187316-68	187314-68	100016-68	10004466-68	10004467-68	10007632-68	10007632-68
22	Down Fired Block & Holder HV	1	10025720	10025718	10025716	10025715	10025712	10025711	10025708
22	Down Fired Block & Holder MV	1	10025721	10025719	10025717	10025712	10025713	10025710	10025710
23	Combustor, Alloy HV	1	15260	108721	100042	10003218-1	10003218-2	10005394-1	10005394-2
23	Combustor Alloy MV	1	15259	108721-1	100043	10003218-2	10003218-3	10007168	10007168
24	Silicon Carbide Gasket	1	10005	N/A	N/A	N/A	N/A	N/A	N/A
25	Retaining Ring, SiC	1	10003	N/A	N/A	N/A	N/A	N/A	N/A
26	Combustor, SiC HV	1	15262	N/A	N/A	N/A	N/A	N/A	N/A
26	Combustor, SiC MV	1	15261	N/A	N/A	N/A	N/A	N/A	N/A
27	UV Scanner Adapter	1	18720	18720	18720	18743	18743	18743	18743
28	Screw FH	4	10001	10001	10001	10001	10001	21587 (2)	21587 (2)
29	Gasket, Air Inlet	2	N/A	N/A	N/A	N/A	N/A	10006989	10006989
30	Gasket, Alloy Tube, Body	1	N/A	N/A	N/A	N/A	N/A	10006940	10006940
31	Gasket Body, Adapter Plate	1	N/A	N/A	N/A	N/A	N/A	10007000	10007000
32	Gasket Rear Cover	1	N/A	N/A	N/A	N/A	N/A	10007002	10007002
33	1/8" Plug	1	15398	15398	15398	15398	15398	15398	15398
34	Flat Washer	12	N/A	N/A	N/A	N/A	N/A	15643	15643
35	Nut M8	12	N/A	N/A	N/A	N/A	N/A	90804	90804
36	Rear Cover Adapter Plate	1	N/A	N/A	20150	N/A	N/A	10004488	10004488

Appendix

Conversion Factors

Metric to English

From	To	Multiply By
cubic meter (m^3)	cubic foot (ft^3)	35.31
cubic meter/hr (m^3/h)	cubic foot/hr (cfh)	35.31
degrees Celsius (°C)	degrees Fahrenheit (°F)	(°C x 1.8) + 32
kilogram (kg)	pound (lb)	2.205
kilowatt (kW)	BTU/hr	3414
meter (m)	foot (ft)	3.28
millibar (mbar)	inches water column ("w.c.)	0.401
millibar (mbar)	pounds/sq in (psi)	14.5×10^{-3}
millimeter (mm)	inch (in)	3.94×10^{-2}
MJ/m^3 (normal)	BTU/ft^3 (standard)	2.491×10^{-2}

Metric to Metric

From	To	Multiply By
kiloPascals (kPa)	millibar (mbar)	10
meter (m)	millimeter (mm)	1000
millibar (mbar)	kiloPascals (kPa)	0.1
millimeter (mm)	meter (m)	0.001

English to Metric

From	To	Multiply By
BTU/hr	kilowatt (kW)	0.293×10^{-3}
cubic foot (ft^3)	cubic meter (m^3)	2.832×10^{-2}
cubic foot/hour (cfh)	cubic meter/hour (m^3/h)	2.832×10^{-2}
degrees Fahrenheit (°F)	degrees Celsius (°C)	(°F - 32) ÷ 18
foot (ft)	meter (m)	0.3048
inch (in)	millimeter (mm)	25.4
inches water column ("w.c.)	millibar (mbar)	2.49
pound (lb)	kilogram (kg)	0.454
pounds/sq in (psi)	millibar (mbar)	68.95
BTU/ft^3 (standard)	MJ/m^3 (normal)	40.14

Notes

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