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Any operation expressly prohibited in this Guide, any adjustment, or assembly procedures not recommended or authorized in these instructions shall void the warranty.
About this manual

**AUDIENCE**

This manual has been written for people who are already familiar with all aspects of an immersion 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 experience with this kind of equipment.

**IMMERSOJet DOCUMENTS**

*Installation Guide No. 330*
- This document

*Data Sheet No. 330-2, 330-3, 330-4, 330-6, 330-8*
- Available for individual IJ models
- Required to complete installation in this guide

*Design Guide No. 330*
- Used with Data Sheet to design burner system

*Price List No. 330*
- Used to order burners

**RELATED DOCUMENTS**

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

**Purpose**

The purpose of this manual is to make sure that the design of a safe, effective and trouble-free combustion system is carried out.
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.

**Danger:**
Indicates hazards or unsafe practices which WILL result in severe personal injury or even death.

Only qualified and well trained personnel are allowed to carry out these instructions or procedures.

Act with great care and follow the instructions.

---

**Warning:**
Indicates hazards or unsafe practices which could result in severe personal injury or damage.

Act with great care and follow the instructions.

---

**Caution:**
Indicates hazards or unsafe practices which could result in damage to the machine or minor personal injury. Act carefully.

---

**Note:**
Indicates an important part of the text. Read thoroughly.

---

If you need help, you can contact your local Eclipse Combustion representative. You can also contact Eclipse Combustion at any of the addresses listed on the back of this document.
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The ImmersoJet (IJ) is a nozzle-mix tube-firing burner that is designed to fire at high velocities through small diameter immersion tubes.

**Figure 1.1  The ImmersoJet Burner**

The combustion gases from the burner scrub the inner tube surface and produce high heat transfer rates. This, in combination with the high velocity flow through the smaller diameter tubes allows for system efficiencies in excess of 80%.

The smaller IJ tubes also have smaller bends which means less tank space is occupied by the tubes. With a combustion chamber that is integral to the burner body, the new version of the ImmersoJet can sit lower on the tank than previous IJ models.
In this section you will find important notices about safe operation of a burner system.

**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; You can cause fires and explosions.

Never try to light the burner if the burner shows signs of damage or malfunctioning.

**Warning:**

The burner is likely to have HOT surfaces. Always wear protective clothing when approaching the burner.

**Note:**

This manual gives information for the use of these burners for their specific design purpose. Do not deviate from any instructions or application limits in this manual without written advice from Eclipse Combustion.

Read this entire manual before you attempt to start the system. If you do not understand any part of the information in this manual, then contact your local Eclipse representative or Eclipse Combustion before you continue.
| **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 competent operator. Thoroughly instruct operators so they demonstrate an adequate understanding of the equipment and its operation. Regular retraining must be scheduled to maintain a high degree of proficiency. |
| **REPLACEMENT PARTS** | Order replacement parts from Eclipse only. Any customer-supplied valves or switches should carry UL, FM, CSA, CGA and/or CE approval where applicable. |
In this section you will find the information and instructions needed to install the burner and system components.

Handling
1. Make sure the area is clean.
2. Protect the components from weather, damage, dirt and moisture.
3. Protect the components from excessive temperatures and humidity.

Storage
1. Make sure the components are clean and free of damage.
2. Store the components in a cool, clean, dry room.
3. After making sure everything is present and in good condition, keep the components in original packages as long as possible.

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 330, Chapter 3 “System Design.” Use the schematics in that chapter to build your system.

All limit controls and safety equipment must comply with the current following standards:
- NFPA Standard 86
- NFPA Standard 86C

All devices must be listed, certified or approved by the following agencies:
- UL
- FM
- CGA
**Electrical wiring**

All the electrical wiring must comply with one of these standards:
- NFPA Standard 70
- ANSI-CI1981
- EN 746-2

The electrical wiring must also be acceptable to the local authority having jurisdiction.

**Gas piping**

All the Gas piping must comply with one of these standards:
- NFPA Standard 54
- ANSI Z223
- EN 746-2

The gas piping must also be acceptable to the local authority having jurisdiction.

**Where to get the standards**

<table>
<thead>
<tr>
<th>Standard Type</th>
<th>Available From</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical</td>
<td>National Fire Protection Agency&lt;br&gt;Batterymarch Park&lt;br&gt;Quincy, MA 02269</td>
</tr>
<tr>
<td></td>
<td>American National Standard Institute&lt;br&gt;1430 Broadway&lt;br&gt;New York, N Y 10018</td>
</tr>
<tr>
<td></td>
<td>UL Standards&lt;br&gt;333 Pfingsten Road&lt;br&gt;Northbrook, IL 60062</td>
</tr>
<tr>
<td></td>
<td>FM Standards&lt;br&gt;1151 Boston-Providence Turnpike&lt;br&gt;P.O.Box 9102&lt;br&gt;Norwood, MA 02062</td>
</tr>
<tr>
<td></td>
<td>CGA Standards&lt;br&gt;55 Scarsdale Road&lt;br&gt;Toronto, Ontario&lt;br&gt;Canada M3B 2R3</td>
</tr>
</tbody>
</table>

Information on the EN standards, and where to get the standards is available from:

<table>
<thead>
<tr>
<th>Standard Type</th>
<th>Available From</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN Standards</td>
<td>Comité Européen de Normalisation&lt;br&gt;Stassartstraat 36&lt;br&gt;B-1050 Brussels&lt;br&gt;Phone: +32-25196811&lt;br&gt;Fax: +32-25196819</td>
</tr>
<tr>
<td></td>
<td>Comité Européen de Normalisation Electronique&lt;br&gt;Stassartstraat 36&lt;br&gt;B-1050 Brussels&lt;br&gt;Phone: +32-25196871&lt;br&gt;Fax: +32-25196919</td>
</tr>
</tbody>
</table>
**CHECKLIST BEFORE INSTALLATION**

**Intake**
To admit fresh combustion air from outdoors, provide an opening in the room of at least one square inch per 4000 Btu/hr.

If there are corrosive fumes or materials in the air, then supply the burner with clean air from an uncontaminated area.

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

**Access**
Make sure the burner is installed in such a way that it is easily accessed for inspection and maintenance.

**Environment**
Make sure that 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.

**Configuration**
Verify the configuration of the ImmersoJet burner package:

- Make sure piping orientation is correct. See page 3-4 of this manual for guidance on changing the orientation.
- Make sure spark plug is installed.
- Make sure flame sensor is installed. It may be either a flame rod or a U.V. scanner, depending on the type of flame monitoring control system being used.

For detailed information on how to install and connect a flame rod, refer to:
- Bulletin / Info guide 832.

For detailed information on how to install and connect a U.V. scanner, refer to:
- straight U.V. scanner; Bulletin / Info Guide 854
- 90° U.V. scanner; Bulletin / Info Guide 852
ImmersoJet burners are designed to be easily installed under a variety of conditions. Some minor preparation may be required to install the new ImmersoJet into specific systems.

**Component Positions**

It is possible to change the relative position of the gas inlet to the air inlet. This can be convenient for the routing of the piping. The following procedure illustrates how to rotate the rear cover plate assembly:

![Caution](image)

The ratio regulator must be installed with the spring housing in a vertical upright position. The burner system will not operate properly if the ratio regulator is not correctly installed. If the rear cover plate assembly is rotated, make sure the ratio regulator is positioned properly.

To rotate the rear cover plate assembly:

1. Disconnect loading line at ratio regulator
2. Remove outer bolts
3. Rotate rear cover plate assembly to desired position.
4. Reinstall outer bolts
5. Reconnect loading line at ratio regulator if necessary, connect loading line to the burner pressure tap connection on opposite side of air inlet.
6. Position the ratio regulator with the spring housing in a vertical upright position.

**Figure 3.1** Component Locations
**INSTALLATION**

**Burner**

**Dimensions**
Bolt the burner to the immersion tank wall or immersion tube flange. For bolt hole patterns, see the Data Sheet for your ImmersoJet model. If adapters are used, burner flange should not be spaced farther than 4” from tank wall.

**Tank wall**
Make sure that the wall of the tank is strong enough to carry the weight of the burner. If necessary, reinforce the tank wall area where you plan to install the burner.

[Caution]
Burner body surface temperature near the flange can exceed 200 deg. F (100 deg. C) If an adapter flange is used, higher temperatures may occur. Allow a free, convective flow of air around the burner and do not cover with insulation.

**Piping**

**Layout**
Install all the piping as shown in the system schematics found in Chapter 3 of IJ Design Guide 330.

**Support the piping**
Use brackets or hangers to support the piping; don’t let burner support the weight of the piping. If you have questions, consult your local gas company.

**Pipe connections**
1. Install a pipe union in the line to each burner. This simplifies removal of the burner.

---

Avoid piping configurations that could cause high pressure drops. Read the following notes and contact Eclipse Combustion with any questions.

---

[Note]
Flexible pipe nipples may cause higher pressure drops than equivalent standard pipes. Consider that when sizing the lines.

[Note]
The pressure drop of the gas and the air in the piping is a critical parameter. Make sure that the size of all the piping is large enough to prevent excessive pressure losses. Refer to Eclipse Engineering Guide 825, section 1.12 for details.
Valves orientation

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

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 that, somebody may think that the gas cock is in the closed position, while it is actually in the open position.

Ratio regulator

The ratio regulator is installed on the burner at the factory. When mounting the burner, be sure that gas flow through the regulator is horizontal and the spring housing points upward. If the ratio regulator is replaced with a different model, make sure the regulator manufacturer’s orientation instructions are followed.

Flame monitoring control system

For information, refer to the Bulletins of the flame monitoring control system:

- Veriflame; Bulletins I-610, I-620, I-630
- Multi Flame; Bulletin 820
- Bi-Flame; Bulletin 826.
CHECKLIST AFTER INSTALLATION

To verify proper system installation, do the following:

1. Make sure that there are no leaks in the gas lines or the 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, then have a qualified electrician rewire the blower to reverse its rotation.

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

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.
Obey the safety precautions in Chapter 2 "Safety".

Read all of this chapter before starting your system.

ADJUSTMENTS

Preparation

1. Set the air pressure switch so that it drops out at 4” w.c. (10 mbar) below the air inlet pressure listed in the appropriate IJ Data Sheet.

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 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 the burner to be sure that the flame monitoring system indicates a flame failure.

6. Activate 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.
Control Panel Settings
During burner adjustment, you will need to drive the control motor to high and low fire several times. You may do this with the process temperature control, setting it to a higher temperature for high fire or a lower temperature for low fire; or your equipment may be fitted with a manual override attached to the control motor. Before attempting to adjust the burner, determine how you will control the motor position and become familiar with the method.

Regulator Settings
The main gas regulator must be adjusted to supply 14.0” w.c. (35 mbar) minimum fuel pressure at the ratio regulator inlet. Higher gas pressures may be required for operation at firing rates greater than 1,000,000 Btu/hr. See the appropriate Data Sheet 330 for your burner. Maximum fuel pressure at the ratio regulator is dependent on the regulator model. See Bulletin 742 for additional information.

Warning:
Do not operate the burner with insufficient gas inlet pressure. Lower gas inlet pressures may cause the proportionator to remain fully open as the burner turns down from high fire, causing excess fuel operation and the possible accumulation of unburned fuel in the tube. In extreme cases, this may cause explosions or fires.
Gas Valves
Close all manual and automatic gas valves.

Packaged Blower—Low Fire Air

1. Drive the control motor to the low fire position.
2. Loosen the setscrew on the motor side of the flexible coupling.
3. Adjust the air butterfly valve until the slot is perpendicular to the air flow.
4. Hold the shaft firmly in place and tighten the setscrew.

Packaged Blower—High Fire Air

1. Drive the control motor to the high fire position (fully open).
2. Verify that the slot on the end of the butterfly valve shaft is parallel to air flow (fully open). If necessary, adjust the control motor travel for high fire.
3. Cycle the control motor several times, checking high and low fire positions. If they don’t repeat, check for a loose valve shaft coupling or binding of the motor or valve.

Remote Butterfly Valve—Low Fire Air

Low fire air static pressure at tap “A” must be a minimum of 0.2” w.c. (0.5 mbar).

1. Drive the control motor to the low fire position.
2. Adjust the air butterfly valve to obtain the required static pressure.

Remote Butterfly Valve—High Fire Air

Use the “Operating Data” from Data Sheet 330 for the appropriate burner to find the static air pressure required at tap “A”.

1. Drive the control motor to the high fire position (fully open).
2. Adjust the manual butterfly valve for the static air pressure at high fire.
3. Cycle the control motor several times, checking high and low fire pressures. If they don’t repeat, check for binding of the motor or valve.
High Fire Gas Adjustment

High fire gas flow requires no adjustment. The size of the integral gas orifice is selected based on the fuel (natural gas, propane or butane) specified at the time the burner is ordered.

Note:
Ratio regulator is used only to adjust low fire gas. Adjustment will NOT affect high fire gas.

Low Fire Gas Adjustments

Low fire gas adjustment is factory set for most applications. It can be field adjusted if necessary:

1. Drive the air butterfly valve to low fire.
2. Make sure the combustion air blower is running.
4. Start the ignition sequence through the flame monitoring control system.

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

5. If burner does not light, turn the adjusting screw on the ratio regulator 1/2 turn clockwise and repeat step 4.

Note:
Initially it may be necessary to repeat step 4 two or three times to purge all the air out of the gas pipework.

6. After the burner is ignited, drive the air butterfly valve to high fire. Make sure the burner stays lit.
**START PROCEDURE**

1. Open all the manual gas cocks to the burner.

2. Start the control system (steps may be manual or automatic):
   - Start the blower (if controlled separately)
   - Allow time to purge tube
   - Initiate low fire start
   - Start the flame monitoring system and ignition sequence

3. Verify that flame is present at the 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. Stop the control system:
   - Stop the flame monitoring system
   - Stop the blower (if controlled separately)
   - For extended shutdown periods, shut off the main power to the control system

2. Close all the manual gas cocks to the burner.

3. For extended shutdown periods, shut off the manual valves in the burner gas line upstream of the main gas regulator.
INTRODUCTION
This section is divided into two parts:
• The first part describes the maintenance procedures.
• The second part helps identify problems that may occur, and gives advice on how to solve these problems.

MAINTENANCE
Preventive maintenance is the key to a reliable, safe and efficient system. The core of any preventive maintenance program is a list of periodic tasks.

Following are suggestions for a monthly list and a yearly list.

Note:
The monthly list and the yearly list are an average interval. If your environment is dirty, then the intervals may be shorter. Other standards may take precedence for your particular application.

Monthly Checklist
1. Inspect flame-sensing & ignition devices for good condition and cleanliness.
2. Test all the alarm systems for proper signals.
3. Check valve motors and control valves for free, smooth action and adjustment.
4. 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.
5. Test main fuel hand-valves for operation.
6. Clean or replace the combustion air blower filter.

Yearly Checklist
• Perform all monthly checks plus:
1. Leak test shut-off valves for tightness of closure.
2. Inspect loading lines for leaks.
3. Make sure that the following components are not damaged or distorted:
   • the burner nozzle
   • the spark plug
   • the flame sensor
4. Inspect the immersion tube for leaks and excessive corrosion.
**Troubleshooting Guide**

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cannot initiate start sequence</td>
<td>• Main power is off</td>
<td>Make sure power is on to control system</td>
</tr>
<tr>
<td></td>
<td>• No power to control</td>
<td>Call qualified electrician to investigate</td>
</tr>
<tr>
<td></td>
<td>• Air pressure switch has not made contact</td>
<td>Check air-pressure switch adjustment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check air filter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check blower rotation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check outlet pressure from blower</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check tubing and electrical connections to pressure switches</td>
</tr>
<tr>
<td></td>
<td>• High gas pressure switch has tripped</td>
<td>Check incoming gas pressure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Adjust gas pressure if necessary</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check pressure switch setting and operation</td>
</tr>
<tr>
<td></td>
<td>• Low gas pressure switch has activated</td>
<td>Check incoming gas pressure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Adjust gas pressure if necessary</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check pressure switch setting and operation</td>
</tr>
<tr>
<td></td>
<td>• Malfunction of flame monitoring control system such as shorted out flame</td>
<td>Have a qualified electrician investigate and rectify</td>
</tr>
<tr>
<td></td>
<td>sensor or electrical noise in the sensor line</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Purge cycle not completed</td>
<td>Check flame monitoring control system, purge timer, interlocks and limit</td>
</tr>
<tr>
<td></td>
<td></td>
<td>switches</td>
</tr>
</tbody>
</table>

**PROBLEM**

**POSSIBLE CAUSE**

**SOLUTION**

5-2

Eclipse ImmersoJet v2.00 Installation Guide 330, 12/97
<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Cause</th>
<th>Solution</th>
</tr>
</thead>
</table>
| Start-up sequence runs but burner does not light | No ignition:  
- There is no power to the ignition transformer  
- Open circuit between the ignition transformer and the spark plug  
- The spark plug needs cleaning  
- The spark plug is not correctly grounded to the burner  | Restore power to the ignition transformer  
Check flame monitor control  
Repair or replace the wiring and connectors to the spark plug  
Check ground connection to the transformer  
Clean the spark plug  
Clean the threads of the spark plug and the burner  
Do not apply grease to the thread of the spark plug |
| | Too much gas:  
- Wrong orifice or no orifice installed  
- Damaged ratio regulator  
- Gas pressure out of the main gas pressure regulator is too high  | Check orifice size for fuel type  
Replace ratio regulator  
Adjust main gas regulator  
If necessary, remove regulator and investigate |
| | Not enough gas:  
- Gas valve not open  
- Start gas solenoid valve does not open  
- Air in the gas line  
- Damaged or missing ratio regulator loading line  | Check all manual valves  
Check wiring to automatic gas shut-off valve  
Check solenoid valve coil for proper operation. Replace if necessary  
Open gas cock  
Purge gas line  
Inspect and replace as required  
Inspect and replace as required |
| | Not enough gas:  
- Damaged ratio regulator  
- Improper orifice  
- The gas pressure out of the main gas pressure regulator is too low  | Check orifice size for fuel type  
Adjust main gas regulator  
If necessary, remove regulator and investigate |
<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>The low fire flame is weak or unstable</td>
<td>• Low fire adjusted too low</td>
<td>Increase low fire gas setting</td>
</tr>
<tr>
<td></td>
<td>• Not enough gas</td>
<td>Check gas adjustment and modify to increase gas flow</td>
</tr>
<tr>
<td></td>
<td>• Not enough air</td>
<td>Check air adjustment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Investigate any change, i.e. blocked filter, loose connections</td>
</tr>
<tr>
<td>The burner goes off when it cycles to high fire</td>
<td>• Insufficient air (flame too rich)</td>
<td>Check air adjustment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check air filter, clean or replace if required</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check ratio regulator and loading line</td>
</tr>
<tr>
<td></td>
<td>• Insufficient gas</td>
<td>Check ratio regulator and loading line</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check main gas regulator</td>
</tr>
<tr>
<td>The burner is erratic and does not respond to adjustment</td>
<td>• Flame signal weak</td>
<td>Check condition of flame monitoring device</td>
</tr>
<tr>
<td></td>
<td>• Internal damage to the burner. Some parts inside the burner may be loose or dirty</td>
<td>Contact your Eclipse Combustion representative or the Eclipse factory</td>
</tr>
<tr>
<td>The burner is unstable or produces soot or smoke</td>
<td>• The air/gas ratio is out of adjustment</td>
<td>Check adjustments, ratio regulator and loading lines</td>
</tr>
<tr>
<td>Cannot achieve full capacity</td>
<td>• Air filter is blocked</td>
<td>Clean or replace the air filter</td>
</tr>
<tr>
<td></td>
<td>• Gas pressure is too low into the main gas pressure regulator</td>
<td>Adjust gas pressure</td>
</tr>
<tr>
<td></td>
<td>• Increased tube pressures</td>
<td>Check for blockage</td>
</tr>
<tr>
<td></td>
<td>• Poor piping practices</td>
<td>Contact factory</td>
</tr>
</tbody>
</table>
## Appendix

### Conversion Factors

#### Metric to Metric.

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>Multiply by</th>
</tr>
</thead>
<tbody>
<tr>
<td>cubic meter (m³)</td>
<td>cubic foot (ft³)</td>
<td>35.31</td>
</tr>
<tr>
<td>cubic meter/hour (m³/h)</td>
<td>cubic foot/hour (cfh)</td>
<td>35.31</td>
</tr>
<tr>
<td>degrees Celsius (°C)</td>
<td>degrees Fahrenheit (°F)</td>
<td>(°C × 1.8) + 32</td>
</tr>
<tr>
<td>kilogram (kg)</td>
<td>pound (lb)</td>
<td>2.205</td>
</tr>
<tr>
<td>kilowatt (kW)</td>
<td>Btu/hr</td>
<td>3.414</td>
</tr>
<tr>
<td>meter (m)</td>
<td>foot (ft)</td>
<td>3.28</td>
</tr>
<tr>
<td>millibar (mbar)</td>
<td>inches water column (&quot;wc)</td>
<td>0.401</td>
</tr>
<tr>
<td>millibar (mbar)</td>
<td>pounds/sq in (psi)</td>
<td>14.5 × 10⁻³</td>
</tr>
<tr>
<td>millimeter (mm)</td>
<td>inch (in)</td>
<td>0.001</td>
</tr>
</tbody>
</table>

#### Metric to English.

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>Multiply by</th>
</tr>
</thead>
<tbody>
<tr>
<td>cubic meter (m³)</td>
<td>cubic foot (ft³)</td>
<td>2.832 × 10⁻²</td>
</tr>
<tr>
<td>cubic meter/hour (m³/h)</td>
<td>cubic foot/hour (cfh)</td>
<td>2.832 × 10⁻²</td>
</tr>
<tr>
<td>degrees Celsius (°C)</td>
<td>degrees Fahrenheit (°F)</td>
<td>(°F – 32) ÷ 1.8</td>
</tr>
<tr>
<td>kilogram (kg)</td>
<td>pound (lb)</td>
<td>0.454</td>
</tr>
<tr>
<td>kilowatt (kW)</td>
<td>Btu/hr</td>
<td>6.895</td>
</tr>
<tr>
<td>meter (m)</td>
<td>foot (ft)</td>
<td>3.28</td>
</tr>
<tr>
<td>millibar (mbar)</td>
<td>inches water column (&quot;wc)</td>
<td>0.401</td>
</tr>
<tr>
<td>millimeter (mm)</td>
<td>inch (in)</td>
<td>0.001</td>
</tr>
</tbody>
</table>

#### English to Metric.

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>Multiply by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Btu/hr</td>
<td>kilowatt (kW)</td>
<td>0.293 × 10⁻³</td>
</tr>
<tr>
<td>cubic foot (ft³)</td>
<td>cubic meter (m³)</td>
<td>0.833</td>
</tr>
<tr>
<td>cubic foot/hour (cfh)</td>
<td>cubic meter/hour (m³/h)</td>
<td>0.833</td>
</tr>
<tr>
<td>degrees Fahrenheit (°F)</td>
<td>degrees Celsius (°C)</td>
<td>(°F – 32) ÷ 1.8</td>
</tr>
<tr>
<td>foot (ft)</td>
<td>meter (m)</td>
<td>0.3048</td>
</tr>
<tr>
<td>inches (in)</td>
<td>millimeter (mm)</td>
<td>25.4</td>
</tr>
<tr>
<td>inches water column (&quot;wc)</td>
<td>millibar (mbar)</td>
<td>2.49</td>
</tr>
<tr>
<td>pound (lb)</td>
<td>kilogram (kg)</td>
<td>0.454</td>
</tr>
<tr>
<td>pounds/sq in (psi)</td>
<td>millibar (mbar)</td>
<td>68.95</td>
</tr>
<tr>
<td>Pos.</td>
<td>Qty.</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>Gasket, mounting</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>PF plug test, 1/8” NPT</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>Body</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>Chamber, combustion</td>
</tr>
<tr>
<td>5</td>
<td>*</td>
<td>Screw, M4 x 16</td>
</tr>
<tr>
<td>6</td>
<td>*</td>
<td>Washer, lock, M4</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>Plate, adapter, RC</td>
</tr>
<tr>
<td>8</td>
<td>*</td>
<td>Screw, MB x 22</td>
</tr>
<tr>
<td>9</td>
<td>*</td>
<td>Washer, lock, MB</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>Cover, rear</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>Spark rod, 1/2” NPT</td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td>Peep sight</td>
</tr>
<tr>
<td>13</td>
<td>1</td>
<td>Body</td>
</tr>
<tr>
<td>14</td>
<td>1</td>
<td>Chamber, combustion</td>
</tr>
<tr>
<td>15</td>
<td>*</td>
<td>Screw, hex head, M8 x 45, gas inlet block</td>
</tr>
<tr>
<td>16</td>
<td>*</td>
<td>Screw, socket head, M8 x 50 (BV Only)</td>
</tr>
<tr>
<td>17</td>
<td>1</td>
<td>Fitting, tube, Prestolok</td>
</tr>
<tr>
<td>18</td>
<td>*</td>
<td>Screw, M8 x 25, rear cover to plate</td>
</tr>
<tr>
<td>19</td>
<td>1</td>
<td>Tube, nylon</td>
</tr>
<tr>
<td>20</td>
<td>**</td>
<td>Nameplate, ImmersoJet burner</td>
</tr>
<tr>
<td>21</td>
<td>4</td>
<td>Screw, drive, nameplate</td>
</tr>
<tr>
<td>22</td>
<td>1</td>
<td>Plug, 3/4” NPT</td>
</tr>
<tr>
<td>23</td>
<td>1</td>
<td>Nozzle, machined, Natural Gas</td>
</tr>
<tr>
<td>24</td>
<td>1</td>
<td>Nozzle, machined, Propane/Butane</td>
</tr>
<tr>
<td>25</td>
<td>1</td>
<td>Actuator, EMP-423-4</td>
</tr>
<tr>
<td>26</td>
<td>1</td>
<td>Actuator, EMP-424-4</td>
</tr>
<tr>
<td>27</td>
<td>1</td>
<td>Honeywell M9174-C-1025</td>
</tr>
<tr>
<td>28</td>
<td>1</td>
<td>Bracket, mounting, actuator</td>
</tr>
<tr>
<td>29</td>
<td>1</td>
<td>Actuator mounting kit - Honeywell</td>
</tr>
<tr>
<td>30</td>
<td>1</td>
<td>Actuator mounting kit - Eclipse</td>
</tr>
<tr>
<td>31</td>
<td>1</td>
<td>Switch, air</td>
</tr>
<tr>
<td>32</td>
<td>2</td>
<td>Screw, M6 x 12</td>
</tr>
<tr>
<td>33</td>
<td>1</td>
<td>Plug</td>
</tr>
</tbody>
</table>

* Quantity varies with product configuration
** Not Illustrated

Part Numbers  ImmersoJet Series version 2.00

Varies with configuration of burner system
Optional Honeywell actuator adapter is included with "Honeywell actuator mounting kit" — Eclipse p/n 101037, and is used with supplied coupling. p/n 18519
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Eclipse Combustion, Inc.
1665 Elmwood Road
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Phone: 815-877-3031
Fax: 815-877-3336
E-mail: eclipse@eclipsenet.com
www.eclipsenet.com

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