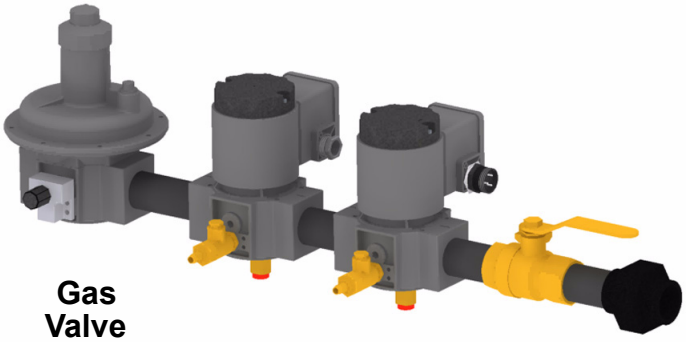
791-2 Installation Guide
8/10/2010

Eclipse PulsePak

Valve Train Segments

NFPA and CE Models

Version 1



Gas Valve Train

2-1/2" - 3" Air Valve Train

ECLIPSE®

Innovative Thermal Solutions

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In accordance with the manufacture's policy of continual product improvement, the product presented in this brochure is subject to change without notice or obligation.

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

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. You can also contact Eclipse at:

1665 Elmwood Rd.
Rockford, Illinois 61103 U.S.A.
Phone: 815-877-3031
Fax: 815-877-3336
http://www.eclipsenet.com

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

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 Pulsepak Valve Train Segments are sub-assemblies used for pulse firing applications globally. Standardization results in quicker throughput and a reduction of errors from the beginning stages of quotations through the stages of commissioning, operation and maintenance. These segments include:

Gas:

- Two safety shut off valves with flow adjustment

  NOTE: Maximum number of cycles for the safety shutoff valves is 1,000,000. It is recommended to replace the valves at 90% of that cycle capacity. A cycle counter can be found in the zone panel or through the T400 Flame Safety Unit.
- Ratio regulator with low fire bypass

⚠ CAUTION

- **Ratio regulator may be adjustable for gas rich situation. Verify that the bias adjustment on the ratio regulator is set for a safe setting.**
  - Permanent and ready means for leak testing
  - Outlet manual isolation valve
  - Visual position indicators
  - Quick electrical disconnects

Air:

- Control valve with flow adjustment

  NOTE: Maximum number of cycles for the control valve is 1,000,000. It is recommended to replace the valves at 90% of that cycle capacity. A cycle counter can be found in the zone panel or through the T400 Flame Safety Unit.
- Low fire bypass with flow adjustment
- Quick electrical disconnect

To fully meet the requirements of local codes, these sub-assemblies will require additional components, such as a drip leg, strainer, filter, dryer, regulator, high and low gas pressure switches, air flow switch, and overpressure protection depending on the end-use application.

Where this document refers to NFPA 86, it is for the 2007 edition. For EN 746-2, it is for the 1997 edition with foresight of the 2006 draft document.

Audience

This manual has been written for personnel already familiar with all aspects of gas valves, safety devices and piping components, also referred to as “the valve train”.

These aspects are:

- Design / Selection
- Use
- Maintenance
- Safety

The audience is expected to be qualified and have experience of this type of equipment and its working environment.

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.

PulsePak Documents

Installation Guide No. 791-2

- This document

Datasheets No. 791-3 and 791-4

- Available for NFPA and CE models
- Required to complete design calculations in this guide

Design Guide No. 862

- Used with datasheets to design your valve train

Related Documents

- EFE 825 (Combustion Engineering Guide)
- Eclipse Bulletins and Information Guides: 791, 862

Safety

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Important notices for safe operation of the burner system will be found in this section. To avoid personal injury, damage to property or the facility, the following warnings must be observed. 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 Warnings

DANGER

- **The valve trains covered in this manual may be designed to deliver fuel gas to the burner. 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; fire or explosion could result.**
- **Never try to light a burner if it shows signs of damage or malfunction.**

NOTICE

- **This manual provides information for the use of these valve trains for their specific design purpose. Do not deviate from any instructions or application limits in this manual without written advice from Eclipse.**

Capabilities

Only qualified personnel, with good mechanical aptitude and experience with combustion equipment, should adjust, maintain, or troubleshoot any mechanical or electrical part of this system.

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. Any customer supplied valves or switches should carry UL, FM, CSA, CGA and/or CE approvals where applicable.

Installation 3

Introduction

In this section you will find the information and instructions needed to install the valve train.

Handling & Storage

Handling

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

Storage

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

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

Placement

The valve train should be installed in an accessible ventilated location, level to a horizontal or vertical position, and supported to solid structural elements. Locate the valve train to avoid excessive numbers of bends and fittings in the interconnecting piping.

Access

Provide ready access to the manual valves and test ports for maintenance and testing.

Environment

The components should be mounted in an area that will be within the environmental conditions specified in Datasheets 791-3 or 791-4. Check the following items:

- Voltage, frequency and stability of the electrical power
- Ambient temperature and humidity
- Area classification is non-hazardous
- Exposure to sunlight, water, ice, wind, and vibration

Preparation for Installation

Protect and prevent contamination of the piping during installation. Remove any packing and shipping materials and inspect for foreign objects in the piping.

NOTICE

- **Make sure all devices are properly oriented with respect to flow direction and vertical (gravity) orientations.**
- **Avoid severe size reductions in pipe connections, unnecessary fittings, and excessive numerous bends that may cause additional flow restriction and pressure loss.**

Installation

Mechanical Support

The installation must comply with local gas piping codes. Brackets or hangers must support the gas piping at intervals short enough to support the weight and to damp out excessive vibration. Provisions shall be made for expansion and contraction and for structural settlement that may affect the piping.

Flow

The valve train segments and components are manufactured to allow flow in only one direction. Verify that the flow direction is correct. See Figure 3.1 through Figure 3.3 for proper flow direction.

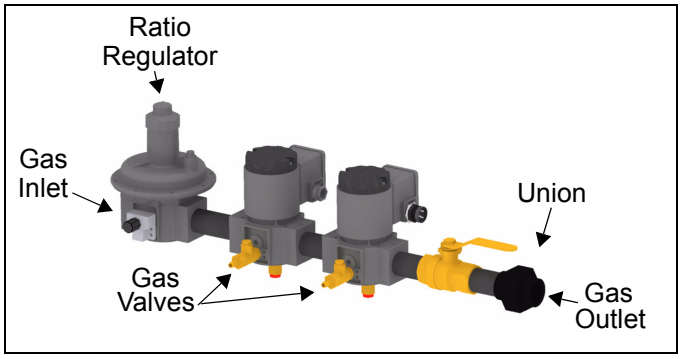

Figure 3.1 Gas Valve Train

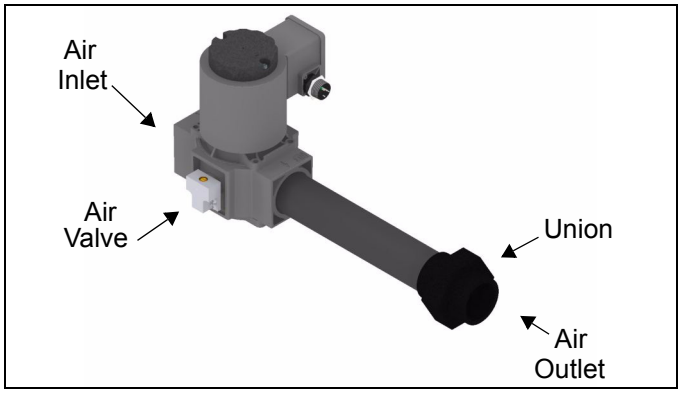

Figure 3.2 Air Valve Train with Modular Bypass

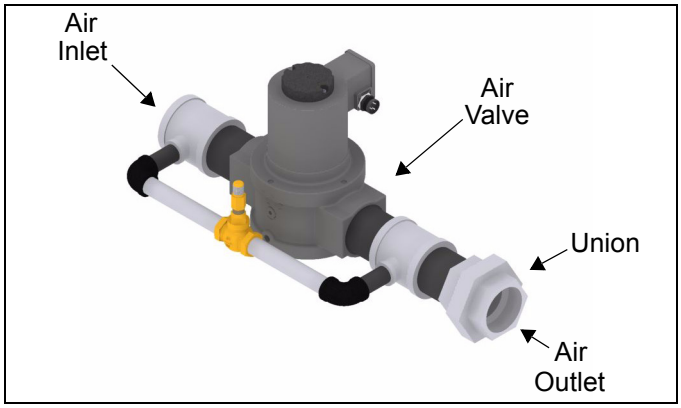

Figure 3.3 Air Valve Train with Piped Bypass

Piping Connections

For threaded connections, ensure that pipe sealing tape or compounds do not enter inside the pipe. It is good practice to leave the first 2 threads bare to prevent the tape or compound from entering inside the pipe. Use sealing methods that are compatible with the gas and piping materials and that are accepted by the local authority.

For flange connections, ensure that the faces of flanges, bolt, and nut bearing areas are clean and smooth. Adjoining flange faces must be parallel to prevent overstraining the flange to achieve a gas-tight joint. Do not use a joint compound on the faces and gaskets without checking its compatibility with the gasket material.

First loosely install and align the gasket and bolts. Then tighten the bolts in a diagonal pattern while keeping the pressure evenly distributed. Take care to avoid undue strain on valves, fittings, and other accessories. Do not install undersized bolts to make up for misalignment of bolt holes.

Electrical Wiring

All electrical wiring must be done in accordance with the national electrical code, the local utility company and municipal agency requirements. Before making any electrical connections, compare the electrical supply circuit ratings at the installation site to those on the nameplates of the devices being wired. Check the individual component datasheets for specific ratings.

Checklist After Installation

To verify the system was properly installed, perform the following checks:

- The valve train is securely mounted
- Flow is in the proper direction
- Check and make provisions to guard against accidental damage
- Ensure there are no loose components or conduits
- All wiring connections are tight
- Access covers are in place and tightened
- Verify all device orientations are correct with respect to flow direction
- Ensure that it is in accordance with the equipment system design

Adjustment, Start & Stop

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Before Applying Gas

Before applying the site gas supply, be sure the actual pressure does not exceed the inlet rating of the system. Close the zone inlet valve and outlet manual valve on the PulsePak valve train segment and then slowly open the site gas supply valve.

⚠ WARNING

- **Check for any abnormal conditions and immediately shut off the site gas supply to the system if you sense any danger such as gas leaks or mechanical stress.**

Tests

Leak Testing

The valve train segment is tested and leak tight at the factory, however, shipping and installation may cause joints to loosen. Check and test all piping for leaks.

⚠ WARNING

- **Test pressure must not exceed 7 PSIG or 500 mbar and any components with ratings less than the test pressure should first be isolated. Check the individual product datasheets for specific ratings.**

Shutoff Valve Functional Test

1. Slowly open the zone manual valve to allow gas to flow to the PulsePak valve train segment safety shutoff valve.
2. Verify the pressure to the inlet of the ratio regulator does not exceed the maximum allowable pressure to the PulsePak valve train segment.
3. Initiate air source and set air control valve to high fire setting.
4. Verify there is enough loading line pressure to the ratio regulator for gas flow.
5. Verify there is no pressure rise at the test port on either safety shutoff valve. If there is a pressure rise, stop, and investigate if the valve seats may be leaking.
6. Apply power to the upstream shutoff valve. Verify there is a pressure rise on the upstream shutoff valve test port and there is not a pressure rise at the down stream shutoff valve test port. If there is a pressure rise at the down stream shutoff valve, stop, and investigate if the valve seat may be leaking.
7. Finally apply power to both shut off valves and verify there is a pressure rise at the down stream shutoff valve as well.

Safety Shutoff Valve Seat Leak Test

The safety shutoff valve seats should be tested whenever there is an event that raises the possibility of contamination entering into the valve. Because valve seats can deteriorate over time, the test should be performed at least annually.

⚠ WARNING

- **Take care when performing the test since small amounts of flammable gas will be released into the local area. Ensure adequate ventilation.**

Prepare a glass with water and insert one end of flexible tubing to a depth of 1/8 to 1/4 inch or 3 to 6mm. With the burner shut off and gas supplied to the ratio regulator perform the following test:

1. Close the downstream manual valve.
2. Bleed trapped gas by opening the leak test ports on both shutoff valves.
3. Connect the free end of the tubing to the port on the upstream shutoff valve.
4. If bubbles appear immediately and continue, the upstream valve seat is leaking and must be serviced; otherwise wait 30 seconds to charge the volume between the valve seats.
5. Count the bubbles for the next minute; if the number is greater than that allowed by local standards then the valve must be serviced; see the following chart for guidelines.

6. Remove the tubing and close the test port on the upstream shutoff valve.
7. Open the test port on the down stream shutoff valve and connect the tubing.
8. Apply power to the upstream valve only.
9. If bubbles appear immediately and continue, the downstream valve seat is leaking and must be serviced; otherwise wait 30 seconds to charge the volume between the valve seat and manual outlet valve.
10. Count the bubbles for the next minute; if the number is greater than that allowed by local standards then the valve must be serviced; see the following chart for guidelines.
11. Remove power, remove the tubing, and close the test ports.

Leakage Rate Limits

NPT (in)	DN (mm)	UL 429, ANSI Z21.21, CSA6.5 Bubbles/min	FM7400 Bubbles/min	EN161 Bubbles/min
0.50	15	26	44	4
0.75	20	26	44	4
1.00	25	26	44	4
1.50	40	39	44	7
2.00	50	52	44	7
2.50	65	65	44	7
3.00	80	78	44	11
4.00	100	104	44	11
6.00	150	157	44	17
8.00	200	209	44	17

Maintenance & Troubleshooting

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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.

⚠ CAUTION

- **Turn off power to the burner and controls before proceeding with burner inspection.**

Monthly Checklist

- Inspect and tighten loose mechanical components
- Look for signs of damage and repair as needed
- Clean the external surfaces

Yearly Checklist

Perform all monthly checklists plus:

- Check tightness of wiring connections
- Check for gas pipe leaks
- Perform safety shut off valve seat leak test

Troubleshooting Guide

Problem	Possible Cause	Solution
Gas valves not opening	Loss of power	Check power connections and fuses or breakers in the system control panel
	Limit switch open	Check operating parameters and limit set points
	Flame safeguard trip	Reset and check burner operation
	Loose connection	Check wiring to terminals
Flow reduced from normal	Obstruction	Check and clean out contamination
Pressure reduced from normal	Inlet pressure reduced	Check regulator, valves, and possible obstruction
	Excessive flow	Check burner firing rates, compare to datasheets
Gas valves not closing	Leaking seat	Perform seat leak test, service valve
	Control wiring short	Remove wiring to valve terminals and service control system

NOTES

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 9/5) + 32
kilogram (kg)	pound (lb)	2.205
kilowatt (kW)	BTU/hr	3415
meter (m)	foot (ft)	3.281
millibar (mbar)	inches water column ("w.c.)	0.402
millibar (mbar)	pounds/sq in (psi)	14.5×10^{-3}
millimeter (mm)	inch (in)	3.94×10^{-2}
MJ/Nm^3	BTU/ft^3 (standard)	26.86

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
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) x 5/9
pound (lb)	kilogram (kg)	0.454
BTU/hr	kilowatt (kW)	0.293×10^{-3}
foot (ft)	meter (m)	0.3048
inches water column ("w.c.)	millibar (mbar)	2.489
pounds/sq in (psi)	millibar (mbar)	68.95
inch (in)	millimeter (mm)	25.4
BTU/ft^3 (standard)	MJ/Nm^3	37.2×10^{-3}

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