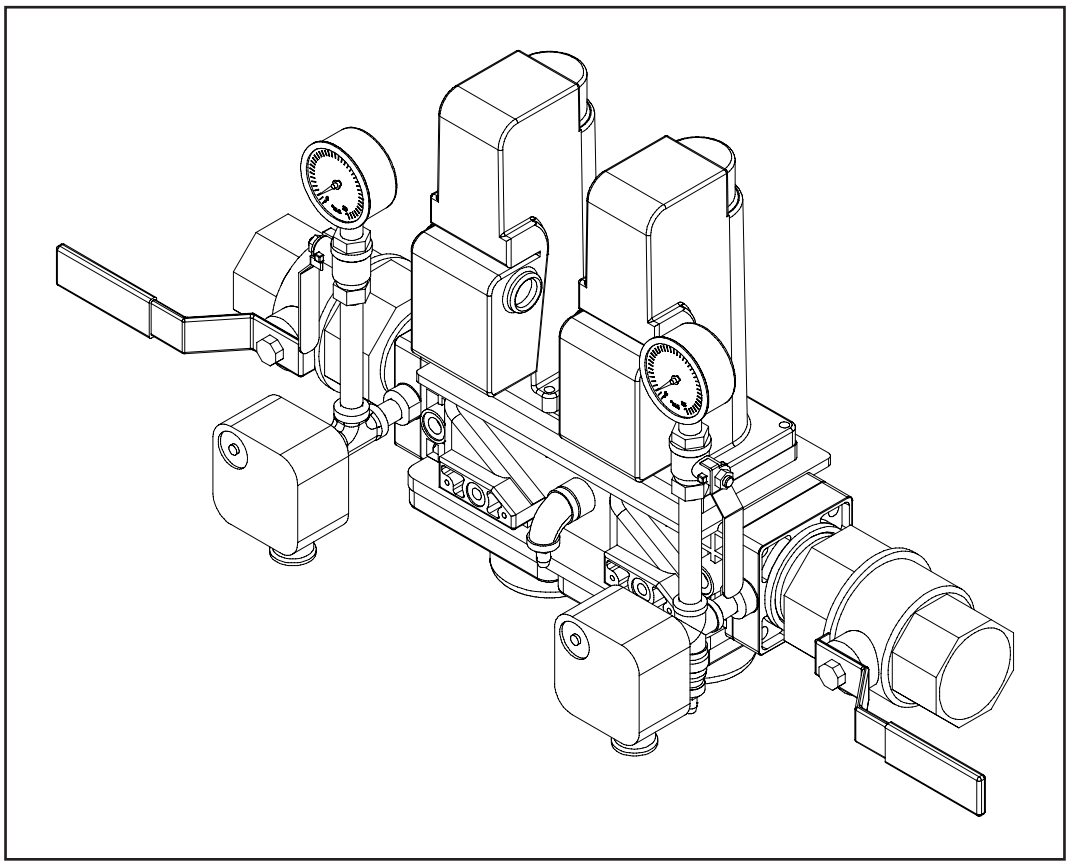
Installation Guide 791
10/5/07

Eclipse Standardized Valve Train Segments

NFPA and CE Models
Version 1



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Innovative Thermal Solutions

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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 gas valves, safety devices and piping components, also referred to as "the valve train."

These aspects are:

- Design/selection
- Use
- Maintenance.

The audience is expected to have had experience with this kind of equipment.

Valve Train Documents

Design Guide No. 791

- Used for design & selection

Data Sheet No. 791-1 and 791-2

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

Installation Guide No. 791

- This document

Price List No. 791

- Used to order valve trains

Related Documents

- EFE 825 (Combustion Engineering Guide)
- Eclipse bulletins and Info Guides

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.

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.

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.

How to Get Help

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Introduction

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Product Description

The Eclipse Standard Valve Train Segments are sub-assemblies that may be used for many different global applications. 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:

- Double safety shut off valves
- High and low gas pressure switches
- Permanent and ready means for leak testing
- Inlet and outlet manual isolation valves
- Connection ports with isolation valves for pressure measurements

To fully meet the requirements of local codes, these sub-assemblies will require additional components, such as a drip leg, strainer, filter, dryer, regulator 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.

Safety

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SAFETY

Important notices about safe operation will be found in this section. 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 before you continue.

Danger:

The valve trains covered in this manual are designed to deliver fuel gas to a 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. You can cause fires and explosions.

Never try to light the burner if any devices show signs of damage or malfunctioning.

Note:
This manual gives 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

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 new 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.

Installation

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Introduction

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

Handling and Storage

Handling

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

Storage

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

Approval of Components

Limit controls and 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 (NEC)
- IEC60364
- CSA C22.2
- BS 7671

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

Approval of Components (Continued)

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 with jurisdiction.

Where To Get the Standards

The NFPA Standards are available from:

National Fire Protection Agency
Batterymarch Park
Quincy, MA 02269

The ANSI Standards are available from:

American National Standard Institute
1430 Broadway
New York, N Y 10018

The UL Standards are available from:

333 Pfingsten Road
Northbrook, IL 60062

The FM Standards are available from:

1151 Boston-Providence Turnpike
P.O.Box 9102
Norwood, MA 02062

The CSA Standards are available from:

5060 Spectrum Way
Mississauqa, Ontario
Canada L4W5N6

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

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

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 Data 791-1 or 791-2. Check the following items:

- Voltage, frequency, and stability of 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.

Note:
Make sure all devices are properly oriented with respect to flow direction and vertical (gravity) orientations.

Note:
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.

Piping Connections
For threaded connections, insure 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.

Installation (Continued)

For flange connections, insure that the faces of flanges and 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 gasket 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.

Installing Pressure Gauges

Ports are provided for installing inlet and outlet pressure gauges. Close the port valve before removing the pipe plug from the port. Use a second backing wrench to prevent loosening the piping assembly when removing the pipe plugs from the ports.

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 data sheets for specific ratings.

Checklist After Installation

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

- The valve train is securely mounted
- Check and make provisions to guard against accidental damage
- Insure 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 and Stop

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Before Applying Gas

Applying Gas Supply

Before applying the site gas supply, be sure the actual pressure does not exceed the inlet rating of the system. Close the inlet and outlet manual valves on the valve train 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 the pressure gauges or any components with ratings less than the test pressure should first be isolated. Check the individual product data sheets for specific ratings.

Shut Off Valves Functional Test

1. Slowly open the inlet manual valve to allow gas to flow to the safety shut off valve.
2. Measure and confirm the correct pressure is present at the inlet gauge port and that there is no pressure rise at the outlet gauge port. If there is a pressure rise, stop and investigate if the valve seat may be leaking.
3. Apply power to the upstream shut off valve and check again that there is no pressure rise at the outlet port.
4. Finally apply power to both shut off valves and verify that there is a pressure rise in the outlet port.

Pressure Switch Functional Test

1. With pressure applied, adjust the high gas switch set point below the pressure.

TESTS (CONTINUED)

2. Look for the proper shut-down response from the control system.
3. Adjust the set point back to the required value.
4. Test the low gas switch by adjusting the inlet gas pressure below the switch set point or shutting the supply off. It may be necessary to bleed off trapped pressure.
5. Look for the proper shut-down response from the control system.
6. Adjust the set point back to the required value.

Safety Shut Off Valve Seat Leak Test

The safety shut off 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 6 mm. With the burner shut off and gas supplied to the upstream valve, perform the following test:

1. Close the downstream manual valve
2. Bleed trapped gas by opening the leak test port between the valves
3. Connect the free end of the tubing to the open test port between the valve seats
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
7. Open the downstream test port 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 port

Leakage Rate Limits

NPT (in.)	DN (mm)	UL 429, ANSI Z21.21, CSA6.5 Bubbles/min.	FM 7400 Bubbles/min.	EN 161 Bubbles/min.
.50	15	26	44	4
.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 and Troubleshooting 5

Introduction

This section is divided into two parts. The first part describes the maintenance procedures, and the second part helps you to identify problems that may occur and gives advice on how to solve these problems.

Preventative maintenance is the key to a reliable, safe and efficient system. The following are suggested guidelines for periodic maintenance. Burners in severe environments or operational conditions should be checked more frequently.

Note:
The monthly and yearly lists are an average interval. If your environment is dirty, then the intervals may be shorter. Check with local authorities having jurisdiction on their recommended maintenance schedules.

Caution:
Turn off power to burner and controls before proceeding with burner inspection.

Monthly Checklist

1. Inspect and tighten loose mechanical components
2. Look for signs of damage and repair as needed
3. Clean the external surfaces
4. Check pressure switch settings

Yearly Checklist

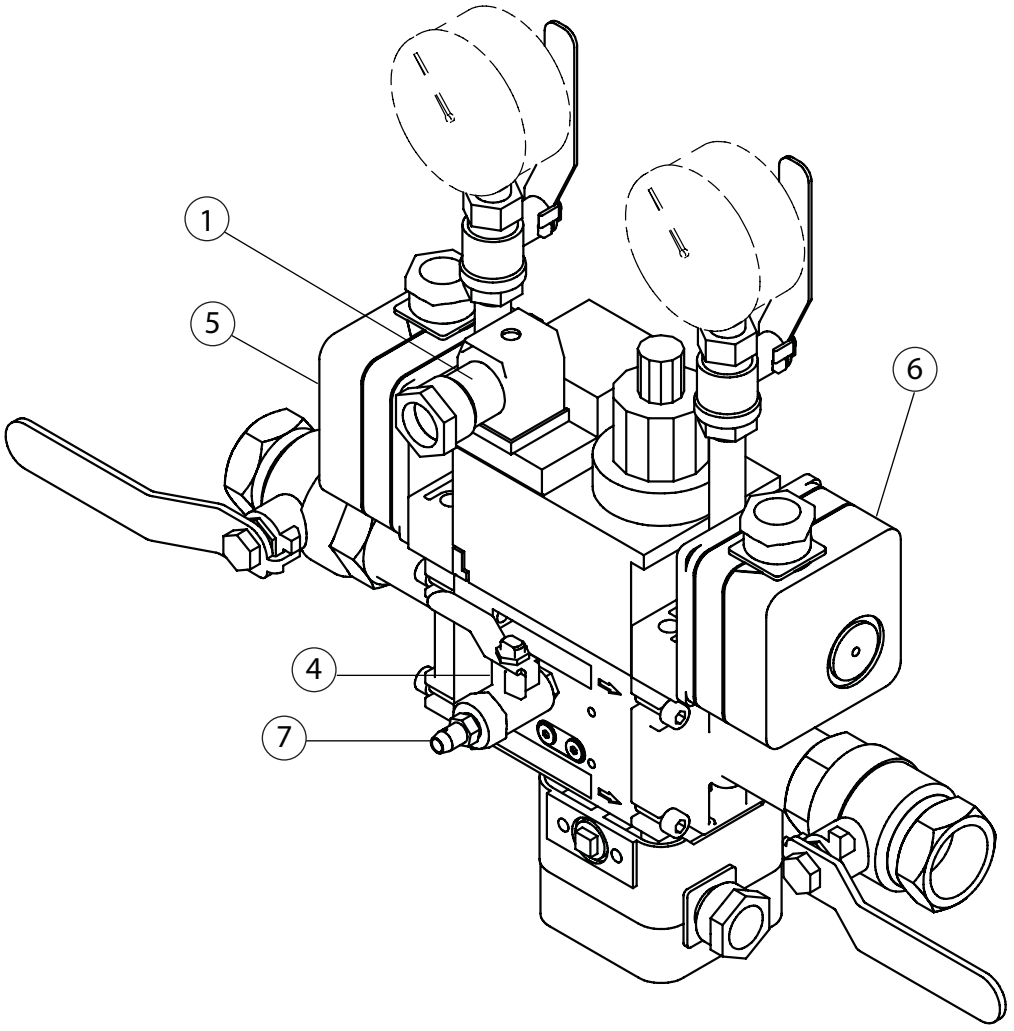
1. Perform all monthly checklist items
2. Check tightness of wiring connections
3. Check for gas pipe leaks
4. Perform safety shut off valve seat leak test

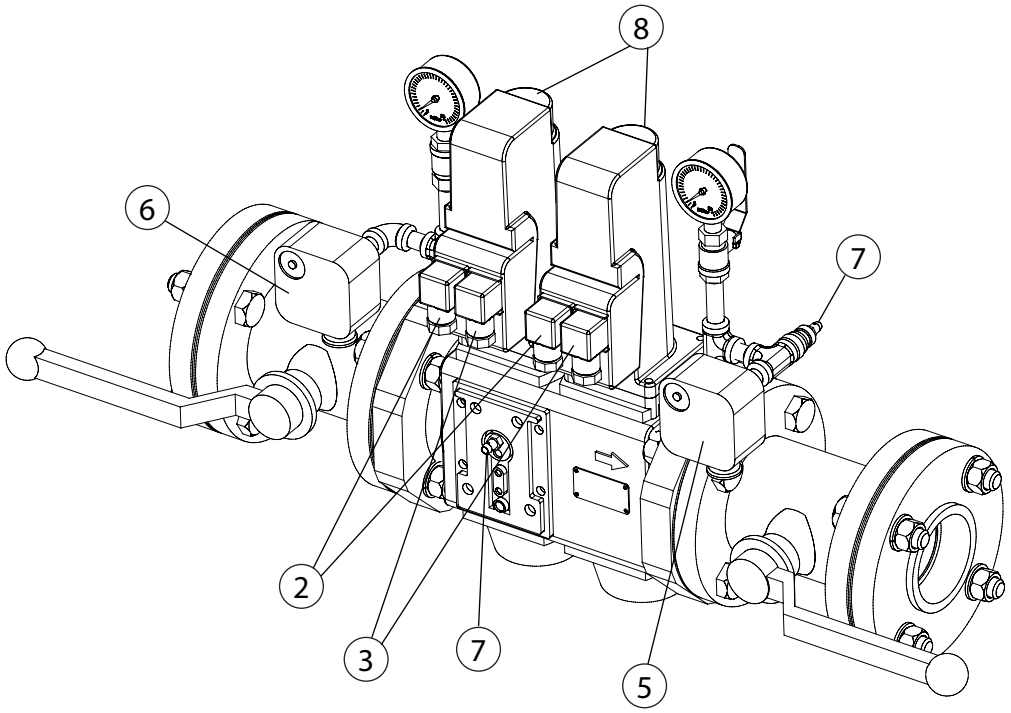
Troubleshooting Procedures

Problem	Possible Cause	Solution
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 data sheet
Gas valves not closing	Leaking seat	Perform seat leak test, service valve
	Control wiring short	Remove wiring to valve terminals and service control system

Recommended Spare Parts

Item	Part No.	Description
1	10005168	DIN connector for power on 0.5-1.5 inch
2	10022063	DIN connector for power on 2 inch and above CE versions, AGA64
3	10022068	DIN connector for switch on 2 inch and above CE versions, AGA65
4	10004480	Manual 1/8 inch valve for leak test on NFPA versions
5	21196	Pressure switch 12-60 inch wc for 0.5-1.5 inch NFPA versions
5	14599	Pressure switch 12-60 inch wc for 2 inch and above NFPA versions
5	10031361	Pressure switch 30-150 mbar for 0.5-1.5 inch CE versions
5	10029741	Pressure switch 30-150 mbar for 2 inch and above CE versions
6	10031363	Pressure switch 2.5-50 mbar for 0.5-1.5 inch CE versions
6	10029740	Pressure switch 2.5-50 mbar for 2 inch and above CE versions
6	21196-1	Pressure switch 2-20 inch wc for 0.5-1.5 inch NFPA versions
6	14598	Pressure switch 2-20 inch wc for 2 inch and above NFPA versions
7	13445	Pressure test tap
8	10018245	Valve actuator on 2 inch and above NFPA versions
8	10033684	Valve actuator, 120V, on 2 inch and above CE versions
8	10022060	Valve actuator, 230V, on 2 inch and above CE versions





Pressure gauges supplied separately..

Appendix

Conversion Factors

Metric to English.

From	To	Multiply by
cubic meter (m^3)	cubic foot (ft^3)	35.31
cubic meter/hour (m^3/h)	cubic foot/hour (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 (“wc)	0.401
millibar (mbar)	pounds/sq in (psi)	14.5×10^{-3}
millimeter (mm)	inch (in)	3.94×10^{-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) ÷ 1.8
foot (ft)	meter (m)	0.3048
inches (in)	millimeter (mm)	25.4
inches water column (“wc)	millibar (mbar)	2.49
pound (lb)	kilogram (kg)	0.454
pounds/sq in (psi)	millibar (mbar)	68.95

Offered By:
Power Equipment Company
2011 Williamsburg Road
Richmond, Virginia 23231
Phone (804) 236-3800
Fax (804) 236-3882

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