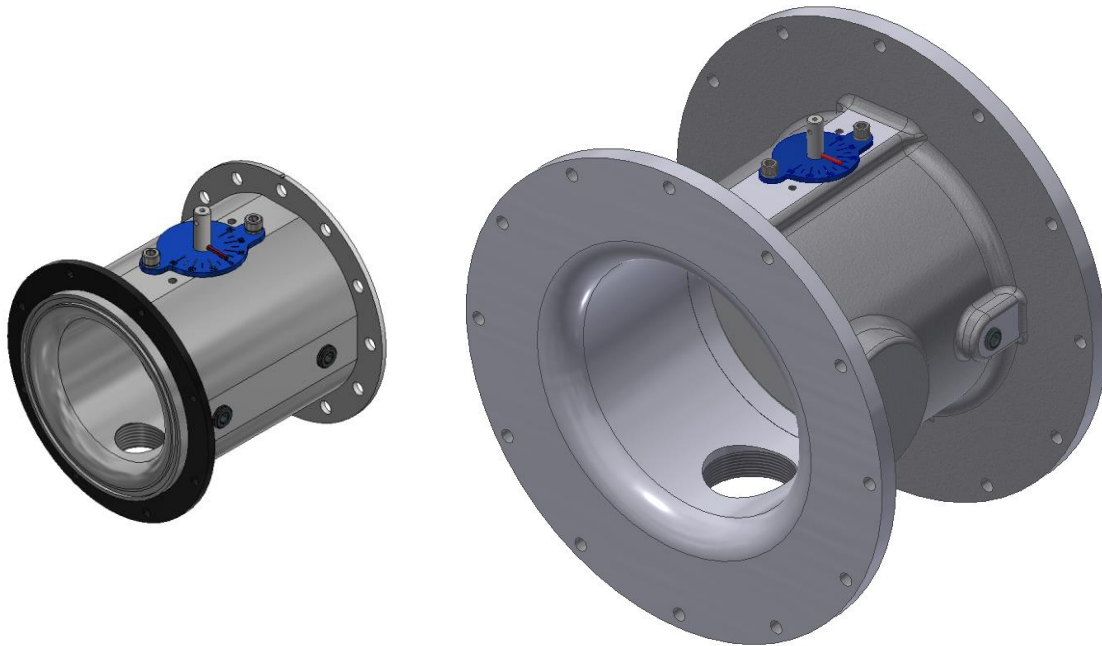


PBA... Series

PBA... Valve Manifolds



Description

PBA... series valve manifolds precisely control the flow of air and introduce fuel gas before a premix blower.

Features

- Supports high burner turndown such as 40 to 1
 - Multiple sizes for optimal pressure drop and flow control
 - Shaft supported by precision bearings for repeatable performance
 - Swing through design with low leakage rate at full closed position
 - Low pressure drop at the full open position
 - Corrosion-resistant housing and internals
 - Clear position indication on a 2" laser-etched anodized dial
 - Valve actuator assemblies available (Document No. VA-9000)
 - Gas inlet available upstream or downstream of the valve disc
-

Application

PBA... series valve manifolds precisely control the flow of air and provide a means to introduce fuel gas upstream of a premix – rated blower. The PBA... series valve disc is positioned with a high accuracy rotary actuator.

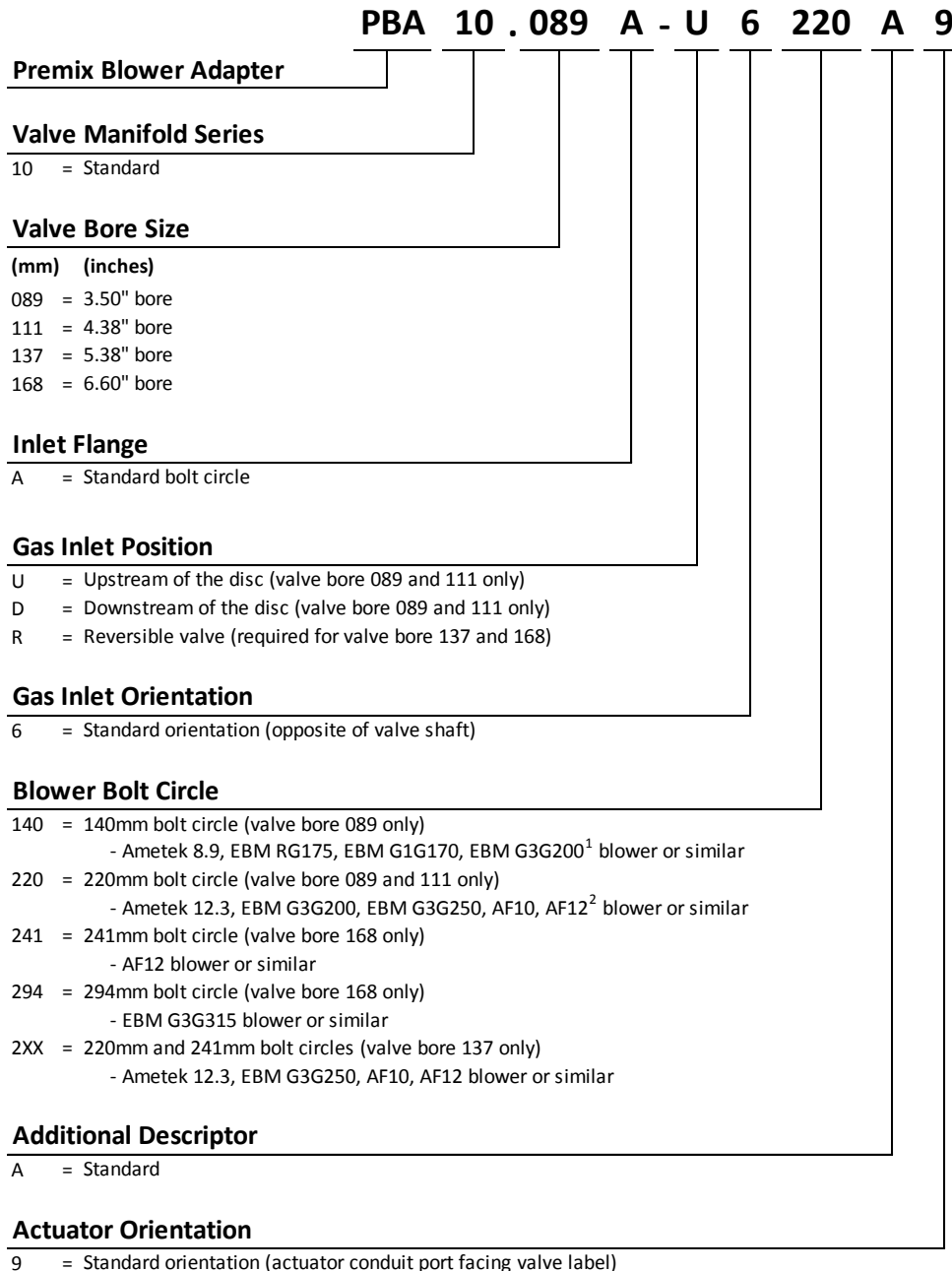
When the PBA... series valve manifolds are applied in combination with precise fuel gas flow control, high burner turndowns such as 40 to 1 may be accomplished. This high burner turndown can also be achieved “on ratio” which means that the burner is not run excessively rich or lean at any point in the operating range.

Installation

- Use suitable pipe thread sealant on all piping connections.
- Valve can be mounted in any orientation.
- Do not interfere with or modify the valve.
- All activities (mounting, installation, service work, etc.) must be performed by qualified staff.
- Fall or shock can adversely affect the function of these valves. Such valves must not be put into operation, even if they do not exhibit any damage.
- No special tools are required.
- Ensure the installation complies with relevant local and national codes.
- PBA... valve manifolds do not require any maintenance.
- From the full closed position, disc may turn in either direction to increase flow.

Product Part Numbers

The following chart provides PBA... valve manifold part number identification only. Not all possible part number combinations are available. See Table 1 on the following page for available part number combinations.



¹The EBM G3G200 has the 8.66" (220mm) bolt circle on every model, one model has the 5.51"(140mm) bolt circle

²The American Fans AF-12 has the 9.50" (241mm) bolt circle on every model, one model has the 8.66" (220mm)

Product Part Numbers (continued)

Available PBA... valve manifold part numbers are listed in Table 1.

Table 1: Summary of Available PBA... Valve Manifolds

PBA Part Number	Maximum Burner Size ²		Bore Size		Gas Inlet		Inlet Flange				Blower Flange Bolt Circle ⁴	
	MBH	kW	inch	mm	NPT inch	Entry Point ³	Bolt Circle		Fastener	Sealing	inch	mm
							inch	mm				
PBA10.089A-U6140A9	1845	540	3.50	89	1	Upstream	5.75	146	#10 or M5 (x8)	O-ring (-157)	5.51	140
PBA10.089A-D6140A9						Downstream						
PBA10.089A-U6220A9						Upstream					8.66	220
PBA10.089A-D6220A9						Downstream						
PBA10.111A-U6220A9	2995	877	4.38	111	1.25	Upstream	6.72	171	1/4" or M6 (x8)	O-ring (-161)	8.66	220
PBA10.111A-D6220A9						Downstream					8.66	220
PBA10.137A-R62XXA9 ¹	4364	1278	5.38	137	1.50	Reversible	8.66	220	M8 (x8)	Gasket	8.66	220
							9.50	241	7/16" (x8)		9.50	241
PBA10.168A-R6241A9	6431	1883	6.60	168	2	Reversible	9.50	241	7/16" (x8)	Gasket	9.50	241
PBA10.168A-R6294A9							11.6	294	M8 (x8)		11.6	294

Specific Notes:

1. The PBA10.137 has two bolt circles on the inlet flange and two bolt circles on the blower flange.
2. Maximum burner size assumes the following: 3" WC pressure drop across the PBA, 14.35 air / fuel ratio, and natural gas that is 1000 BTU / SCF.
3. The gas inlet entry point can be upstream of the disc, downstream of the disc, or reversible.
4. See compatibility section for specific information concerning PBA to blower compatibility.

General Notes:

Additional dimensional information is available in the Dimensions section of this literature.

Additional flow data is available in the Flow Data section of this literature.

When firing natural gas, an air / fuel ratio of 14.35 to 1 results in approximately 6% O₂ (dry) in the boiler exhaust.

When firing natural gas, 6% O₂ (dry) in the boiler exhaust is approximately equal to 8.6% CO₂ (dry).

PBA assemblies are not supplied with gaskets, O-rings, or fasteners needed for connection to the inlet side of the PBA.

Thread locking hardware (locknuts, lockwashers, loctite, etc) is recommended for inlet flange connection.

A lower air / fuel ratio (more rich) will increase the maximum burner size, reduce the % O₂, and increase the % CO₂

Compatibility

The PBA... series valve manifolds have a flange on either end. Valve manifolds with a bore size of 89mm and 111mm will have a different flange for the inlet and outlet. Valve manifolds with a bore size of 137mm and 168mm have identical flanges on the inlet and outlet.

The outlet of a PBA... series valve manifold mates directly to a blower. Sealing between the PBA... valve manifold and the blower is accomplished with either an o-ring or gasket depending on the blower model. Table 2 outlines common blower compatibility and the recommended sealing method.

Table 2: Blower Compatibility

LEGEND:

- G = Gasket Sealing
- O = O-ring Sealing

PBA Part Number	Blower Flange				Blowers								
	Bolt Circle		Fastener		Ametek 8.9 EBM RG175 Ametek 12.3 EBM G3G170 EBM G3G200 ¹ EBM G3G250 American Fan AF-10 American Fan AF-12 ²								
	in	mm	Thread Size	Qty.									
PBA10.089A-U6140A9	5.51	140	M8 x 1.25mm	6	O	O		O	O				
PBA10.089A-D6140A9													
PBA10.089A-U6220A9	8.66	220	M8 x 1.25mm	6			O		O	O		G	G
PBA10.089A-D6220A9													
PBA10.111A-U6220A9	8.66	220	M8 x 1.25mm	6					O	O		G	G
PBA10.111A-D6220A9	8.66	220											
PBA10.137A-R62XXA9	8.66	220	M8 x 1.25mm	6			O		O	O			
	9.50	241	7/16"	8								G	G
PBA10.168A-R6241A9	9.50	241	7/16"	8									G
PBA10.168A-R6294A9	11.58	294	M8 x 1.25mm	6						O			

Specific Notes:

¹The EBM G3G200 has the 8.66" (220mm) bolt circle on every model, one model has the 5.51" (140mm) bolt circle

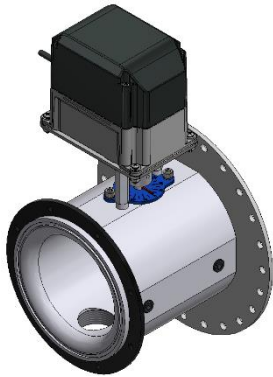
²The American Fans AF-12 has the 9.50" (241mm) bolt circle on every model, one model has the 8.66" (220mm)

General Notes:

PBA assemblies are not supplied with gaskets, O-rings, and fasteners needed to install the PBA assembly to the blower. Thread locking hardware (locknuts, lockwashers, loctite, etc) is recommended for blower flange connection. The chart above only covers mechanical compatibility of the PBA to a blower.

Accessories

VA... Valve Actuator Assemblies



A PBA... valve manifold, SQM33 actuator, coupling, and bracket are built, tested, and shipped as a VA... assembly. Valve actuator assemblies ensure proper shaft alignment and engagement. For additional information see Document No. VA-9000.

Materials

Below is a typical valve manifold cross-section that identifies the materials used in a PBA valve manifolds with a bore size of 89mm or 111mm.

Table 3: PBA Valve Manifold Materials for Bore Sizes 89mm and 111mm

Item	Description	Material
A	Socket Head Screw	Stainless Steel
B	Lock Washer	Stainless Steel
C	Valve Body	Aluminum-6061
D	O-rings	Buna-N
E	Blower Flange	Aluminum-5052
F	1/4" Pipe Plug	Steel (Black Oxide)
G	Dial	Aluminum-5052 (Anodized)
H	Ball Bearing	Steel
I	Shims	Stainless Steel
J	Shaft	Steel (Electroless Nickel Plated)
K	Button Head Screws	Stainless Steel
L	Disc	Aluminum-5052
M	Bearing (Sleeve)	Acetal
N	Cover	Aluminum-5052
O	Inlet Flange	Steel (Powder Coated)
P	Button Head Screws	Steel (Zinc Plated)

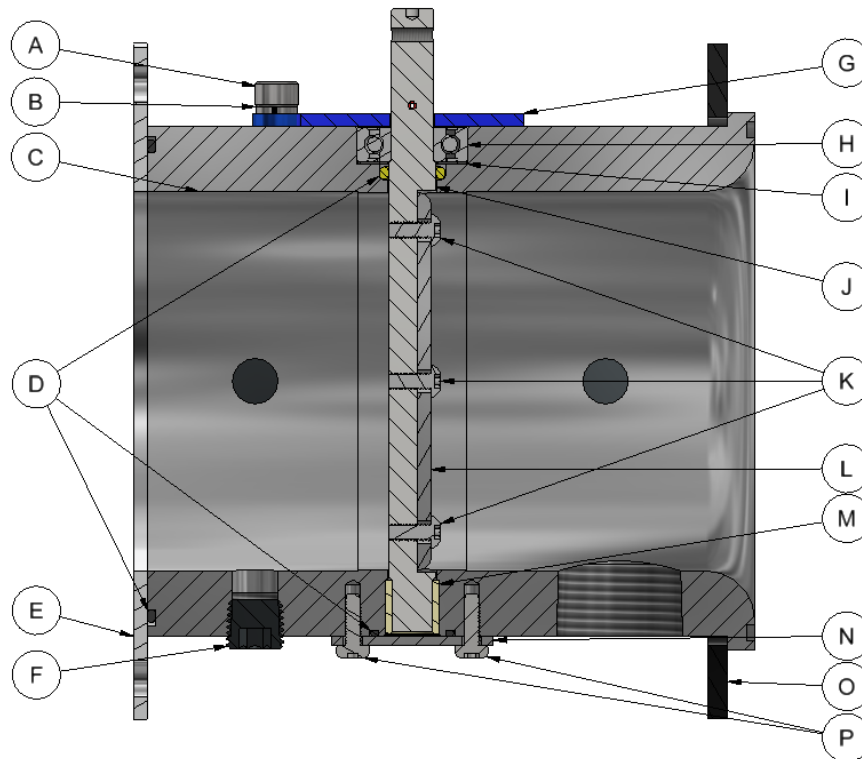


Figure 1: Cross-section of a PBA10.089A-Uxxxxxx

Materials (continued)

Below is a typical valve manifold cross-section that identifies the materials used in a PBA valve manifolds with a bore size of 137mm or 168mm.

Table 4: PBA Valve Manifold Materials for Bore Sizes 137mm and 168mm

Item	Description	Material
A	Socket Head Screw	Stainless Steel
B	Lock Washer	Stainless Steel
C	Valve Body	Aluminum-356
D	O-rings	Buna-N
E	1/4" Pipe Plug	Steel (Black Oxide)
F	Dial	Aluminum-5052 (Anodized)
G	Ball Bearing	Steel
H	Shims	Stainless Steel
I	Shaft	Steel (Electroless Nickel Plated)
J	Button Head Screws	Stainless Steel
K	Disc	Aluminum-5052
L	Bearing (Sleeve)	Acetal
M	Cover	Aluminum-5052
N	Button Head Screws	Steel (Zinc Plated)

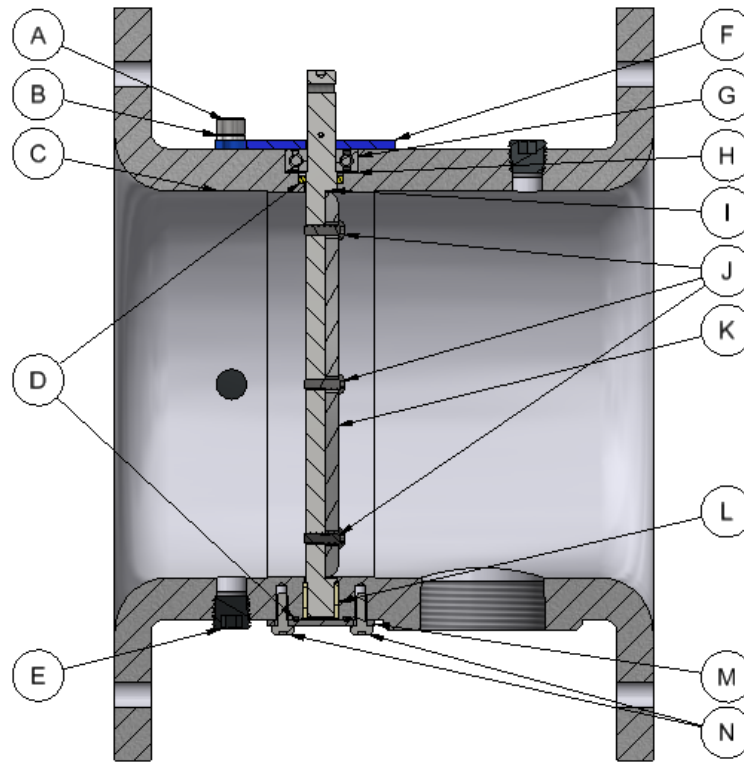


Figure 2: Cross-section of a PBA10.137A-Rxxxxxx

Flow Data

Air flow and Cv values are listed for common differential pressures in table 5. Cv values can be utilized to calculate flow at any operating conditions.

Flow is calculated with atmospheric inlet pressure at a media temperature of 70°F.

Table 5: Approximate Flow Rates of Air [SCFH] and Maximum Burner Size at Full Open Position (1" - 3" wc Differential Pressure)

Part Number	Bore Size		Gas Inlet		Cv	CAPACITY - AIR					
	in	mm	NPT in	Entry Point		1" WC		2" WC		3" WC	
						SCFH ¹	MBH ²	SCFH ¹	MBH ²	SCFH ¹	MBH ²
PBA10.089A-U6140A9	3.50	89	1	Upstream	356	15300	1066	21630	1507	26470	1845
PBA10.089A-D6140A9				Downstream							
PBA10.089A-U6220A9				Upstream							
PBA10.089A-D6220A9				Downstream							
PBA10.111A-U6220A9	4.38	111	1.25	Upstream	578	24850	1732	35120	2447	42980	2995
PBA10.111A-D6220A9				Downstream							
PBA10.137A-R62XXA9	5.38	137	1.50	Reversible	842	36200	2523	51160	3565	62620	4364
PBA10.168A-R6241A9	6.60	168	2	Reversible	1241	53350	3718	75400	5254	92290	6431
PBA10.168A-R6294A9											

Specific Notes:

1. Standard cubic feet per hour air flow. Gas flow through PBA body is not taken into account.
2. Burner output in thousands of BTU / HR calculated using a 14.35 to 1 Air / Fuel ratio and Natural Gas that is 1000 BTU/ SCF.
3. The gas inlet entry point can be upstream of the disc, downstream of the disc, or reversible.

General Notes:

When firing natural gas, an air / fuel ratio of 14.35 to 1 results in approximately 6% O₂ (dry) in the boiler exhaust.

When firing natural gas, 6% O₂ (dry) in the boiler exhaust is approximately equal to 8.6% CO₂ (dry).

A lower air / fuel ratio (more rich) will increase the burner output, reduce the % O₂, and increase the % CO₂.

Upstream and reversible PBA models may have fuel gas traveling past the valve disc. In this configuration, high fire air flow can be reduced by approximately 5%. If gas is introduced downstream of the disc, the fuel gas flow has minimal impact on the air flow (less than 2%).

Flow Data (continued)

Flow rate through the valve body at the full open position can be estimated using the equation below and the C_v values from Table 6.

$$Q = 1360 \times C_v \times \left(\sqrt{\frac{P_1 + P_2}{GT_f}} \right) \times \left(\sqrt{\frac{P_1 - P_2}{2}} \right)$$

...where...

C_v = Flow coefficient (see Table 6)

G = Specific gravity of air (1.0)

P_1 = Absolute inlet pressure in PSIA (PSIG + 14.7)

P_2 = Absolute outlet pressure in PSIA (PSIG + 14.7)

Q = Flow rate in SCFH

T_f = Media temperature in degrees Rankine ($^{\circ}\text{F} + 460$)

Example:

Burner with 2000 SCFH gas flow

Air at 70 degrees Fahrenheit

PBA will have 3" wc (0.1 PSI) pressure drop with the inlet side at atmospheric pressure

14.35 air/fuel ratio

G = 1.0

P_1 = 14.7 PSIA

P_2 = (14.7 - 0.1) = 14.6 PSIA

Q = 14.35 (A/F Ratio) \times 2000 (Gas Flow) = 28,700 SCFH of air flow

T_f = (70 $^{\circ}\text{F} + 460$) = 530 $^{\circ}\text{R}$

Re-arrange equation and solve for C_v

$$C_v = \frac{28700}{1360 \times \left(\sqrt{\frac{14.7 + 14.6}{1.0 \times 530}} \right) \times \left(\sqrt{\frac{14.7 - 14.6}{2}} \right)}$$

$$C_v = 401.4$$

Using Table 6 and a required C_v of 401.4, choose the smallest valve bore size that has a higher C_v value than the one calculated. In this example the correctly sized valve would be the PBA10.111x.xxxxxxx.

Note: Upstream and Reversible PBA models may have fuel gas traveling past the valve disc. The required C_v value can be approximately 5% higher in this configuration. If gas is introduced downstream of the disc, the effect of the gas is minimal (less than 2%).

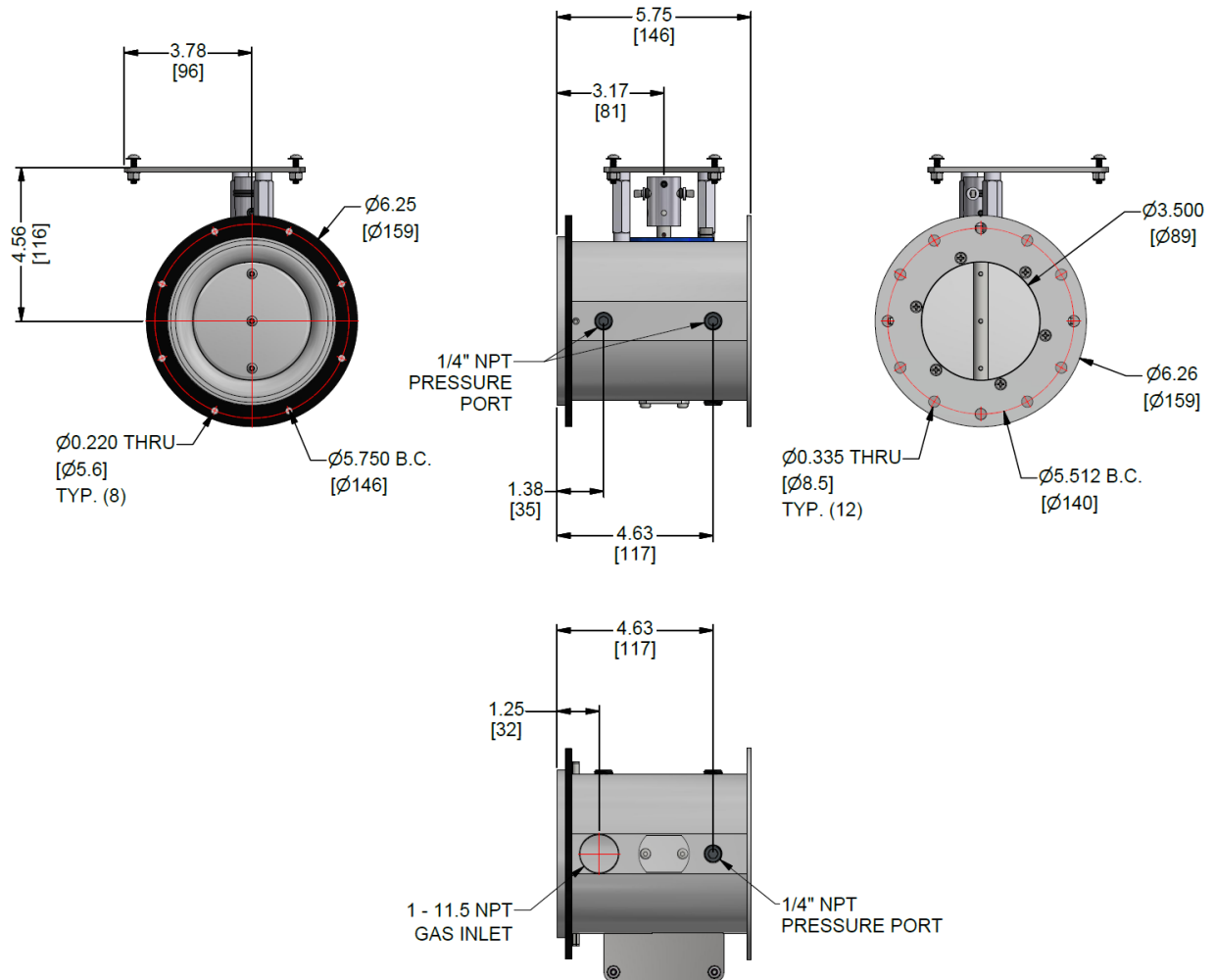
Dimensions

PBA10.089-U6140A9

Valve manifold with a 3.50" (89mm) bore, 1" NPT gas inlet upstream of the disc, and a blower flange mating to a 5.51" (140mm) bolt circle.

Compatible blowers include: Ametek 8.9, EBM RG175, EBM G3G170

Dimensions in inches; millimeters in brackets



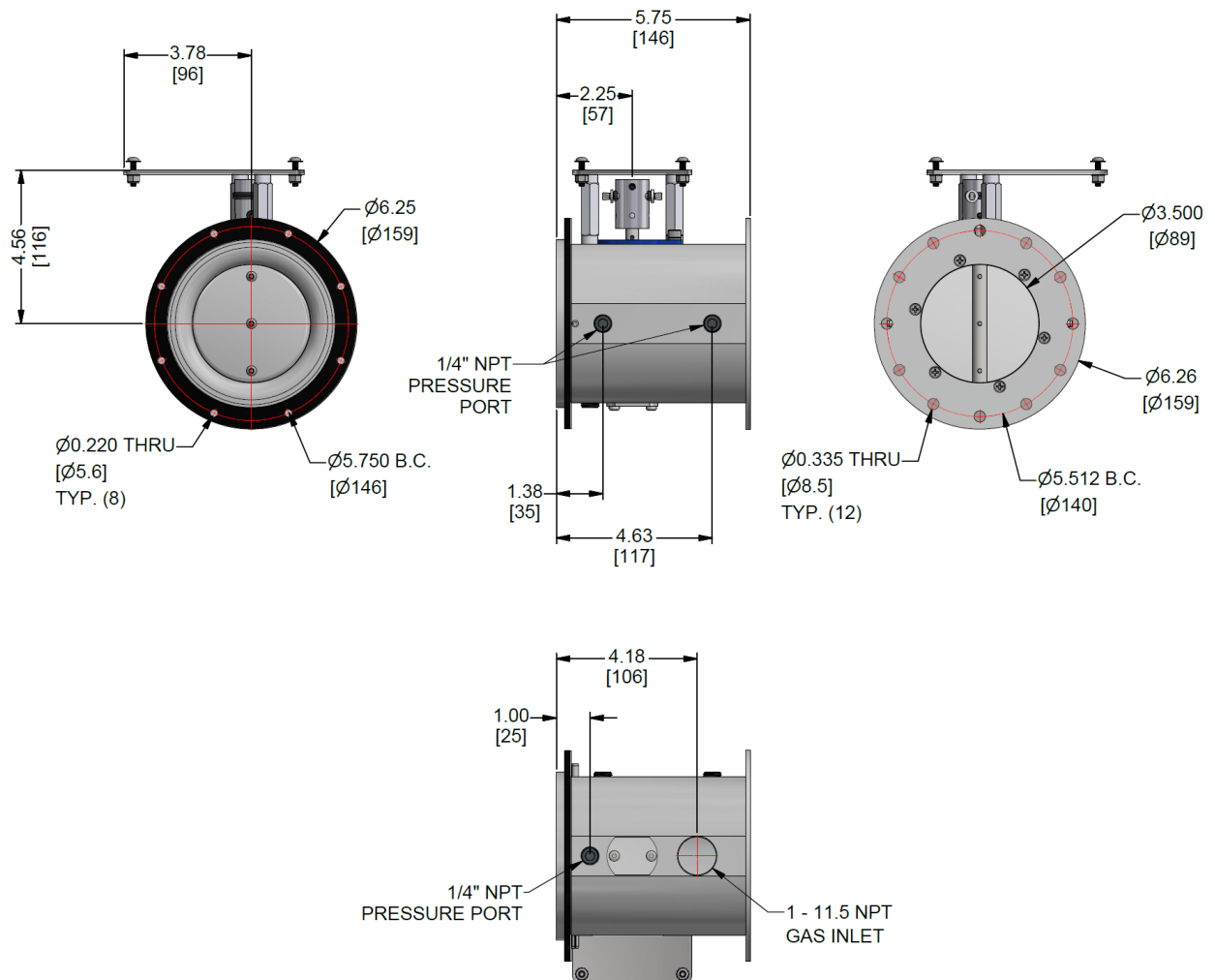
Dimensions (continued)

PBA10.089-D6140A9

Valve manifold with a 3.50" (89mm) bore, 1" NPT gas inlet downstream of the disc, and a blower flange mating to a 5.51" (140mm) bolt circle.

Compatible blowers include: Ametek 8.9, EBM RG175, EBM G3G170

Dimensions in inches; millimeters in brackets



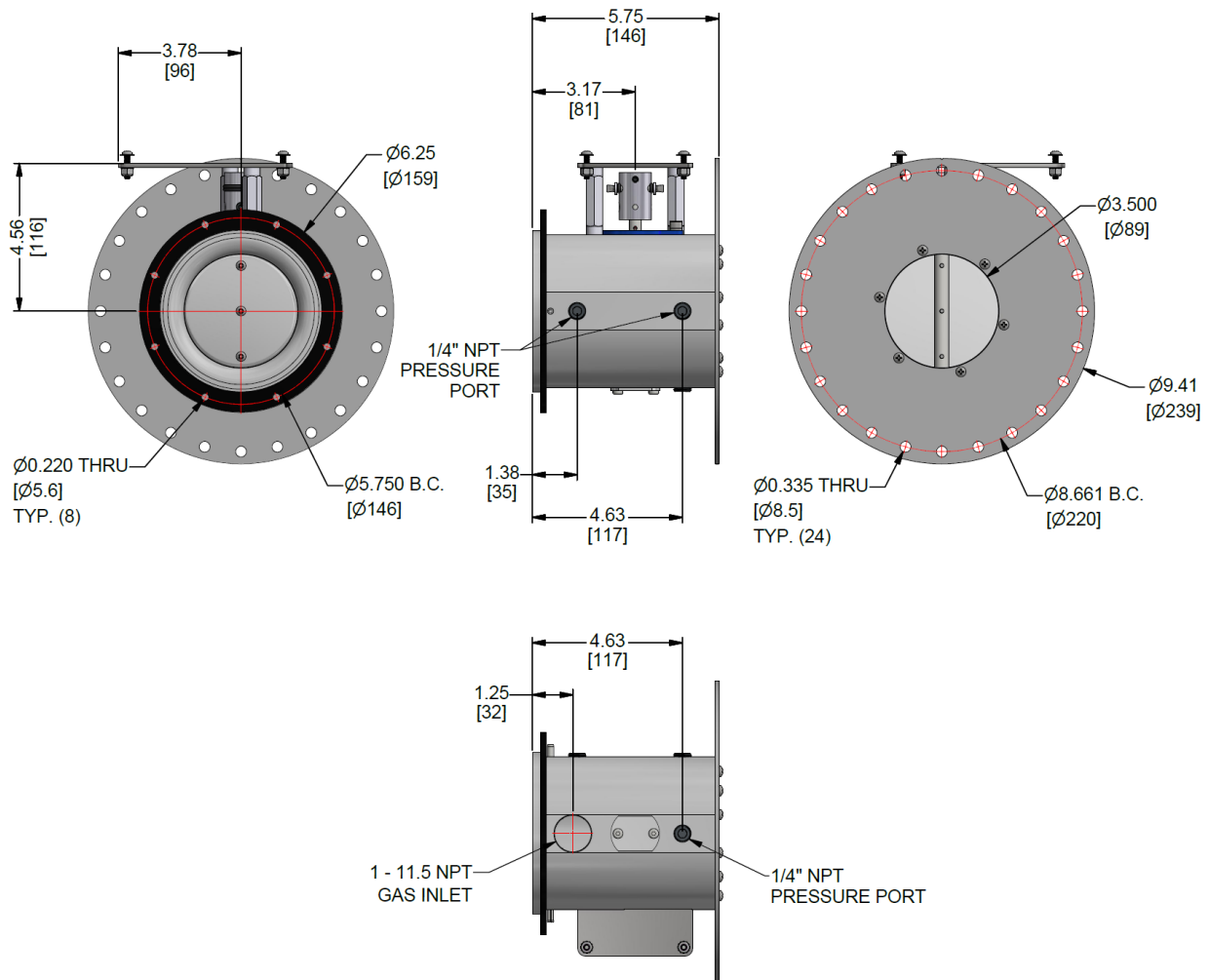
Dimensions (continued)

PBA10.089-U6220A9

Valve manifold with a 3.50" (89mm) bore, 1" NPT gas inlet upstream of the disc, and a blower flange mating to a 8.66" (220mm) bolt circle.

Compatible blowers include: Ametek 12.3, EBM G3G200, EBM G3G250, and AF-10

Dimensions in inches; millimeters in brackets



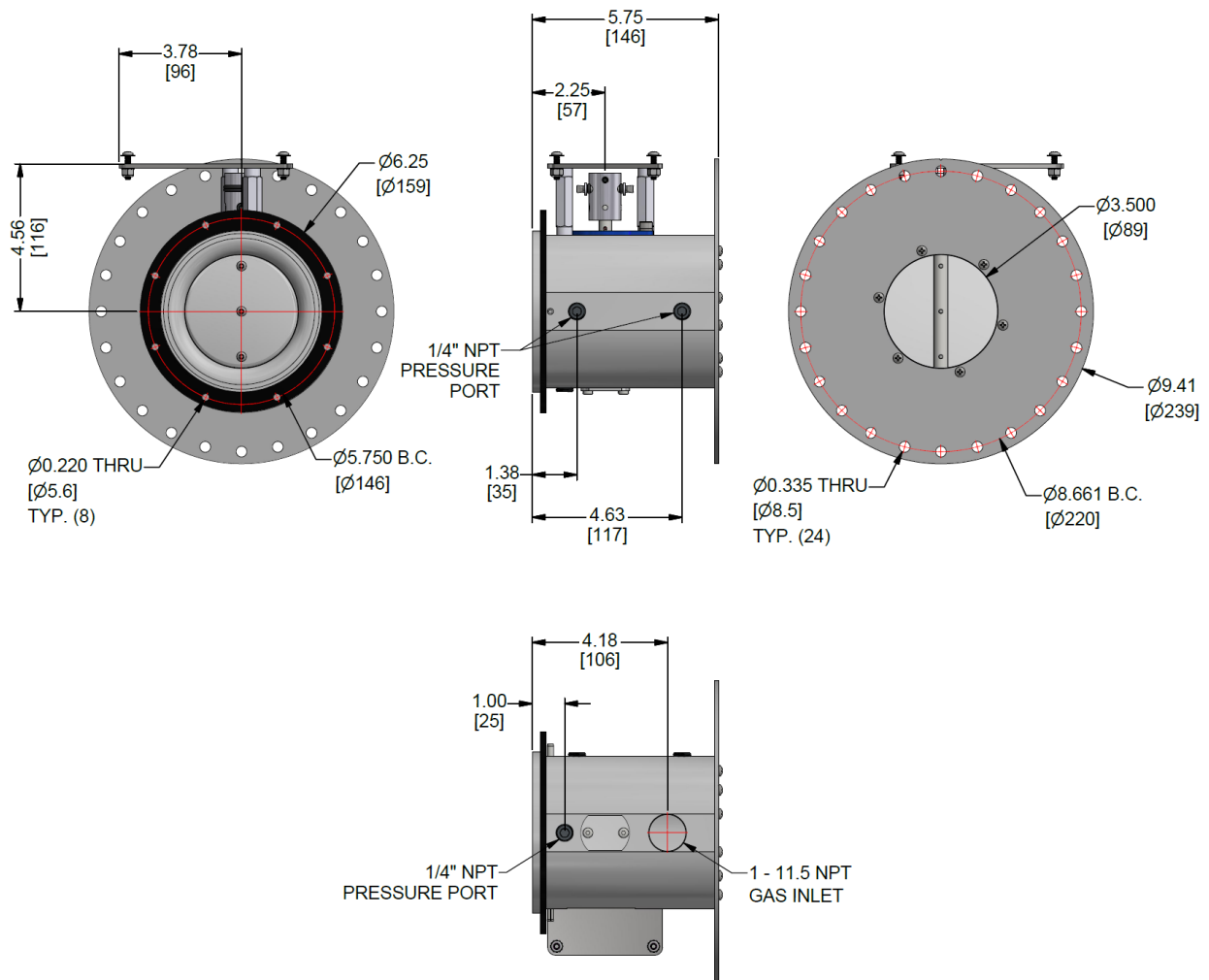
Dimensions (continued)

PBA10.089-D6220A9

Valve manifold with a 3.50" (89mm) bore, 1" NPT gas inlet downstream of the disc, and a blower flange mating to a 8.66" (220mm) bolt circle.

Compatible blowers include: Ametek 12.3, EBM G3G200, EBM G3G250, and AF-10

Dimensions in inches; millimeters in brackets



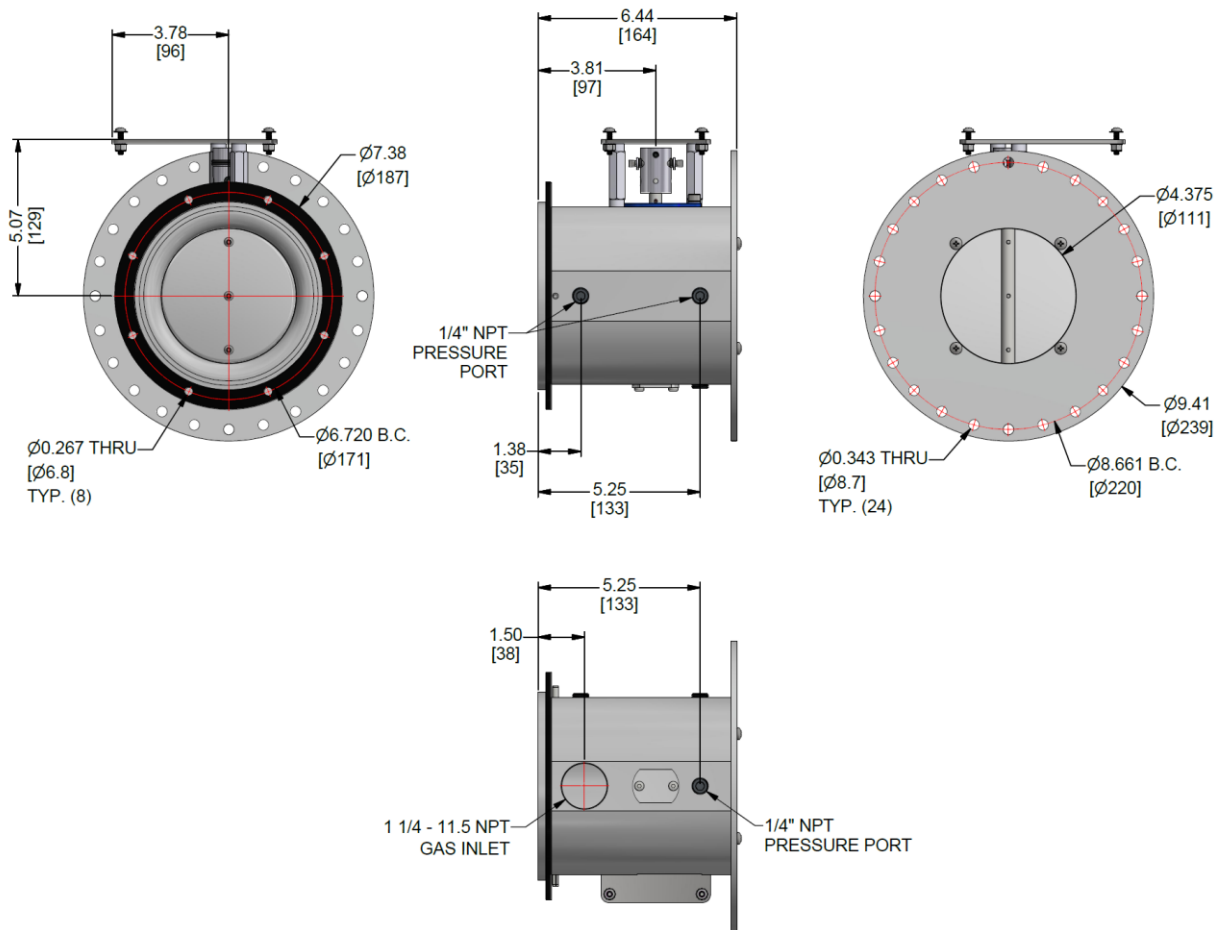
Dimensions (continued)

PBA10.111-U6220A9

Valve manifold with a 4.38" (111mm) bore, 1-1/4" NPT gas inlet upstream of the disc, and a blower flange mating to a 8.66" (220mm) bolt circle.

Compatible blowers include: Ametek 12.3, EBM G3G200, EBM G3G250, and AF-10

Dimensions in inches; millimeters in brackets



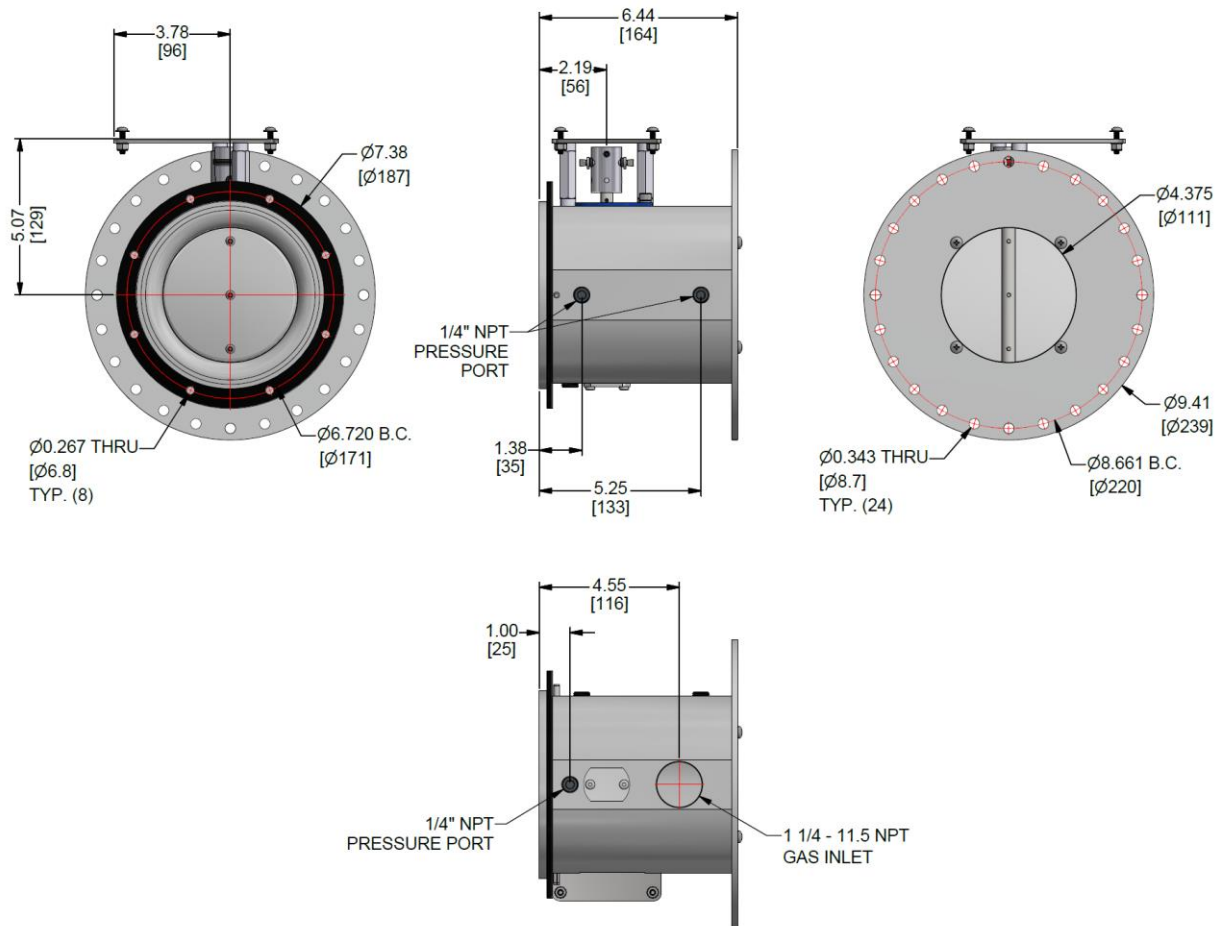
Dimensions (continued)

PBA10.111-D6220A9

Valve manifold with a 4.38" (111mm) bore, 1-1/4" NPT gas inlet downstream of the disc, and a blower flange mating to a 8.66" (220mm) bolt circle.

Compatible blowers include: Ametek 12.3, EBM G3G200, EBM G3G250, and AF-10

Dimensions in inches; millimeters in brackets



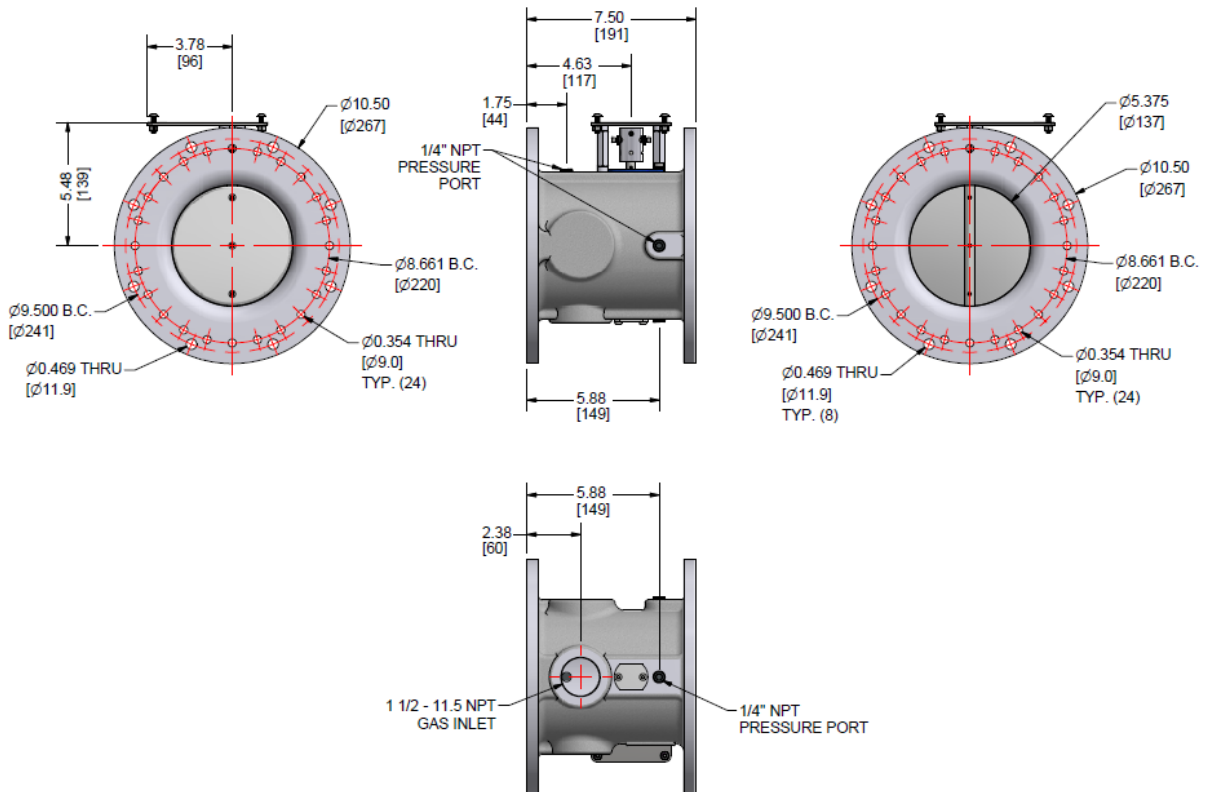
Dimensions (continued)

PBA10.137-R62XXA9

Reversible valve manifold with a 5.38" (137mm) bore, 1-1/2" NPT gas inlet, and flanges with two bolt circles: 8.66" (220mm) and 9.50" (241mm).

Compatible blowers include: Ametek 12.3, EBM G3G200, EBM G3G250, AF-10, and AF-12

Dimensions in inches; millimeters in brackets



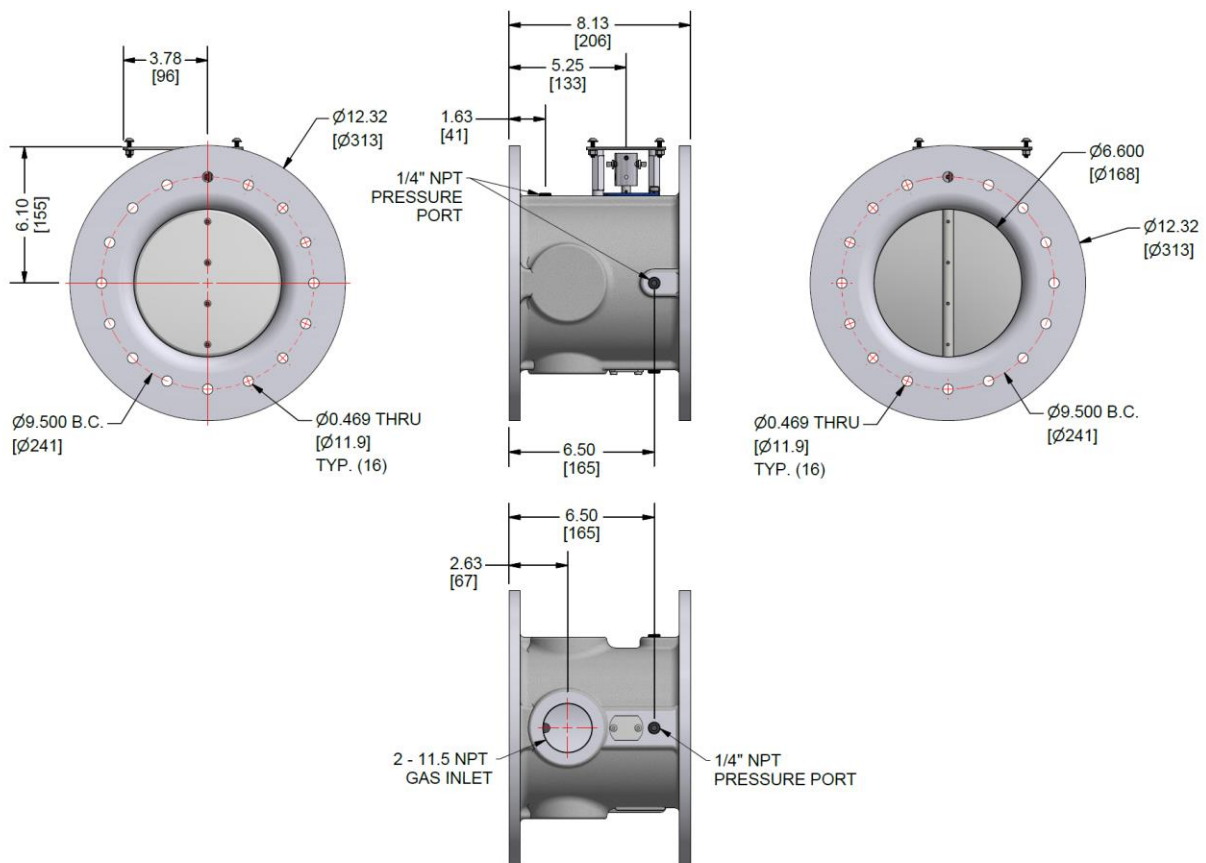
Dimensions (continued)

PBA10.168A-R6241A9

Reversible valve manifold with a 6.60" (168mm) bore, 2" NPT gas inlet, and flanges with a bolt circle of 9.5" (241mm).

Compatible blowers include: AF-12

Dimensions in inches; millimeters in brackets



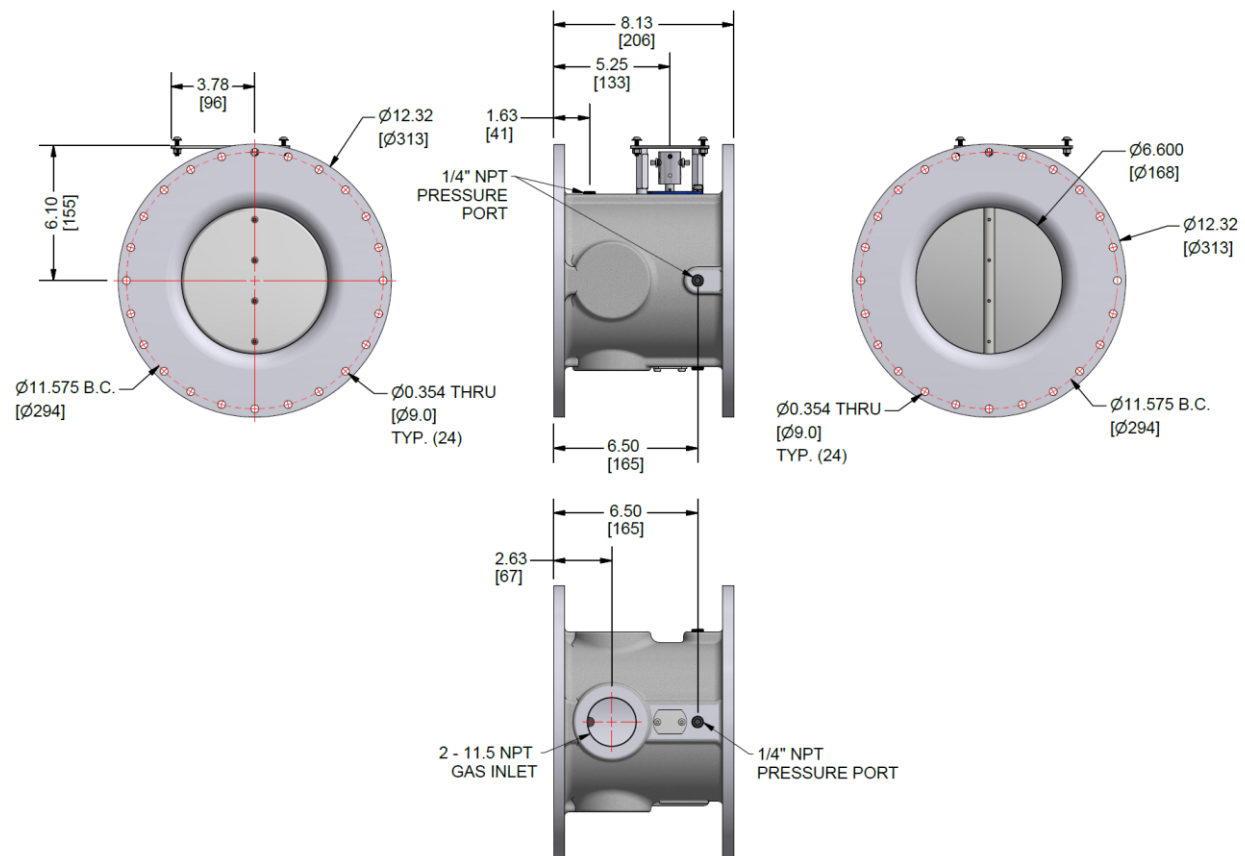
Dimensions (continued)

PBA10.168A-R6294A9

Reversible valve manifold with a 6.60" (168mm) bore, 2" NPT gas inlet, and flanges with a bolt circle of 11.58" (294mm).

Compatible blower: EBM G3G315

Dimensions in inches; millimeters in brackets



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