

Hoffman Specialty[®]

Series 2000 Pressure and/or Temperature Steam Regulator

NOISE CONTROL GUIDELINES

HS-907

Understanding Sound

Sound results from pressure fluctuations in the air. Sound pressure levels cover an enormous range. In order to compress the range, sound levels are usually expressed in decibels. A decibel is simply the logarithm of the ratio of two quantities, the sound pressure level being measured and a reference level. The reference level is by definition 0 dB.

The human ear does not respond equally to all frequencies. It tends to be insensitive to very low and very high frequencies. Standard sound level meters are equipped with a scale that

approximates the human ear's response. Sounds measured on this scale are expressed as A-weighted decibels (dBA). The dBA is commonly used in engineering work.

Decibels are expressed in a logarithmic ratio. Therefore they cannot simply be added or subtracted. A reduction of 6 dB in measured sound level will result in a decrease of the sound pressure level by 50%. The relationship between measured decibel level and absolute sound is summarized in the following table.

Relative reduction (dB)	1	2	3	4	5	6	10	20	40
Absolute reduction (%)	11	21	29	37	44	50	68	90	99

Noise

We are all surrounded by noise of varying degree. The Occupational Safety and Health Administration (OSHA) has established acceptable noise levels. Hearing protection must be worn in environments with a noise level exceeding an 85 dB weighted average, over an eight hour period. Many manufacturers *prefer* to keep noise level below this limit in order to protect their employees and visitors, and eliminate the need to provide hearing protection. Commercial and institutional facilities such as offices, hospitals, and schools *require* noise level to be below the 85-dB limit.

Comparison of Noise Levels

0 dB	Threshold of audibility
20 dB	Very faint whisper
40 dB	Quiet office
60 dB	Normal conversation or Air Conditioner
80 dB	Garbage disposal or loud singing
100 dB	Police siren at 100 feet, Snowmobile, or Air Hammer
120 dB	Thunderclap, Rock Music, or Turbine Generator
140 dB	Jet at 10 feet or .22 Caliber Rifle
158 dB	Shotgun
188 dB	Apollo lift-off at close range

Pressure Regulator Valve Noise

A pressure regulator main valve controls outlet pressure and changes steam flow. In the process, a portion of the potential energy from the inlet pressure is converted into turbulence. Some of this turbulent energy is converted into heat. A small portion of the energy creates sound, which results in noise in the main valve.

In a typical installation the main valve will emit only minimal noise. However, the noise inside the pipe, downstream of the main valve, can be excessive. The sound level decreases as the distance from the pipe increases. Use the actual distance between the work area and the piping for your **Steam Specialty Component Selector (ESP- PLUS)** calculation when selecting the main valve. To determine the noise level of an existing installation take the measurement 3 feet downstream of the main valve and 3 feet (or more) away from the outlet's pipe surface.

At further distances from the pipe surface, the radiated sound drops off in intensity. Some typical noise level reductions compared to distances are shown below. The sound level reductions shown assume the valve is acoustically isolated from the surrounding structure. Sound can be transmitted throughout the structure with little attenuation if the piping system is not properly isolated, or if surroundings are acoustically "hard". The piping system itself can also act as a conduit for sound.

Noise Level Reduction/Distance

Distance from Pipe	3 Ft.	6 Ft.	12 Ft.	25 Ft.	50 Ft.
Noise Level Reduction	0 dB	3 dB	6 dB	9 dB	12 dB

Steam Component and ESP-PLUS Selection

The Hoffman Specialty website **Steam Specialty Component Selector** and the **ESP-PLUS** selection program for the Series 2000 Regulators incorporates the Instrument Society of America (ISA) standard to calculate noise level generated at the main valve outlet. If the ESP-PLUS calculated noise level with a full port main valve exceeds your requirements, try using a larger size main valve with a normal port or a reduced

port. Since velocity generates sound, using a larger valve can reduce the noise level. Also, use a valve that will be operating at *50% or more* of its rated capacity, as oversized valves can wire draw the seat when operating at higher pressures. The following chart shows some comparisons of noise level using full port, normal port, and reduced port valves.

Examples

Decible (dB) calculations

(Based on 125 psi inlet pressure reducing to 15 psi outlet pressure)

lbs/hr	2100	4200	5600	7500	11400	16800	27720	62600
Full port	88.2	92.9	94.3	94.9	95.7	97.3	99.6	103.5
Normal	86.2	91.4	92.2	91.5	93.6	95.1	96.3	-----
Reduced	86.2	89.7	89.1	90.1	91.9	92.3	-----	-----

Two Stage Reduction

Two stage	80.3	83.6	84.3	83.7	87.2	-----	-----	-----
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How to Reduce Pressure Regulator Noise Level

- Use the **Steam Specialty Component Selector** on the website or **ESP-PLUS** to make an initial main valve selection. The Component Selector calculates noise level 3 feet downstream of the main valve and 3 feet away from the pipe, and is based on schedule 40 pipe. Also, it will allow you to specify the noise level for a greater distance in the event that someone actually works 3 feet away from the pipe.
 - Base selection on the actual flow rate of steam required. Do not allow any safety factors to be figured in.
 - Use the "Results" screen to determine the noise level of main valves that meet the required flow rates. Whenever possible, use the full port main valve, as this will provide the smallest, least expensive valve to meet the required capacity.
- If the noise level slightly exceeds your specification limit, determine if the steam pipe will be insulated. Insulation helps block noise transmission and reduces the noise level. Fiberglass insulation provides the greatest noise level reduction (6 to 8 dB per inch of insulation). Check with insulation manufacturers for specific information.
- Use schedule 80 pipe rather than the standard schedule 40 to achieve the following reductions.
- Use the **Steam Specialty Component Selector** to make a two-stage reduction that will reduce noise levels 5 to 10 dB. If the noise level of the program's selection exceeds your requirements on one of the main valves, change the intermediate pressure selection by increasing the pressure drop across the valve with the lower noise level. The noise level of the two main valves will then be closer or equal.
- Purchase and install a noise attenuation device for the valve or in the downstream piping.

Noise Attenuation Device	Noise Level Reduction
Acoustic insulating blankets	5 to 7 dB
Acoustic orifice plates	5 to 10 dB
Acoustic diffusers	10 to 15 dB
Acoustic silencers	20 to 30 dB

While Hoffman Specialty does not offer noise attenuation devices, arrangements have been made with selected manufacturers to provide their products to Hoffman Specialty Representatives. (Refer to the information beginning on page 5.)

A noise-attenuating device may be appealing with a lower initial cost. But remember that a two-stage reduction will reduce the noise level **and** increase the seat life.

- Follow proper noise reduction piping practices below.

NPT Pipe Size	Noise Level Reduction
1/2" to 2"	6 dB
4"	7 dB
6" or 8"	8 dB
10"	9 dB
12"	10 dB

Noise Reduction Piping Practices

1. Install the Series 2000 regulator in an accessible location and at least three feet away from any solid walls or structures that could transmit and reflect sound.
2. Use sound isolating piping supports.
3. Use the Saturated Steam Capacity Tables below to properly size the inlet and outlet piping for a velocity appropriate with the application. The velocity of most industrial applications should be less than 10,000 feet per minute. Offices, hospitals, schools or others that require low noise levels should be sized for less than 6,000 feet per minute.
4. Use pipe reducers and expanders that have gradual tapers (maximum 20°) on both the inlet and outlet sides of the main valve. Do not increase or decrease the pipe more than two pipe sizes per stage. Do not use eccentric reducers.
5. Do not make directional changes in the outlet pipe before the piping has been increased to the required size. A minimum straight run of 10 pipe diameters upstream and 20 pipe diameters downstream should be used.
6. Install a drip trap ahead of the regulator to prevent the accumulation of condensate, which causes water hammer. A drip trap may also be required downstream of the valve if condensate cannot drain away from the valve by gravity.
7. All strainers, gate valves and piping components must be sized identical to the enlarged pipe. Use long radius elbows to make directional changes. Do not use bullhead tees.
8. Use high-density insulation to cover regulator body, piping and system components to reduce heat loss and noise level. A properly fitted insulation blanket not only reduces heat loss significantly, but also can provide moderate (3-6 dB) local noise attenuation. Adding an acoustic barrier as part of the insulation can provide even greater noise reduction (5-7 dB).

Flow Rates

Saturated Steam (lbs./hr) at 6000 ft/min (velocity) in Schedule 40 iron or steel pipe

Pipe Size (inches)	PRESSURE PSI (GAUGE)									
	5	10	15	30	50	75	100	125	200	250
1/2	30	40	45	60	90	120	150	180	270	330
3/4	55	70	80	110	160	220	280	340	510	620
1	90	110	125	180	270	390	460	560	840	1020
1-1/4	160	200	225	325	480	650	820	990	1490	1830
1-1/2	220	270	300	450	650	900	1100	1300	2060	2550
2	370	455	520	750	1100	1500	1900	2300	3450	4200
2-1/2	525	650	750	1050	1600	2175	2750	3300	4950	6050
3	800	950	1350	1600	2500	3350	4250	5150	7700	9450
3-1/2	1100	1350	1550	2200	3300	4550	5700	6900	10200	12700
4	1450	1800	2000	2900	4300	5850	7400	8900	13450	16400
5	2300	2800	3200	4600	6900	9300	11700	14100	21200	26000
6	3200	3900	4500	6400	9800	13200	16800	20300	30800	36900
8	5700	7000	8000	11400	17200	23300	29300	35400	53100	65200
10	9300	11400	13000	18900	28200	38000	48100	58100	87100	106500
12	13500	16600	18900	27000	40800	55300	69700	84200	126500	154700

Saturated Steam (lbs./hr) at 10,000 ft/min (velocity) in Schedule 40 iron or steel pipe

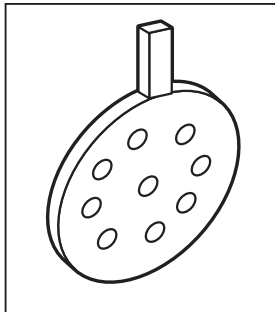
Pipe Size (inches)	PRESSURE PSI (GAUGE)									
	5	10	15	30	50	75	100	125	200	250
1/2	50	65	75	100	150	200	250	300	450	550
3/4	90	115	130	180	265	365	460	560	850	1030
1	150	180	200	300	450	650	760	930	1400	1700
1-1/4	260	330	375	540	800	1080	1360	1650	2480	3050
1-1/2	360	450	500	750	1080	1500	1830	2160	3430	4250
2	610	750	860	1250	1830	2500	3160	3830	5750	7000
2-1/2	875	1080	1250	1750	2660	3620	4580	5500	8250	10050
3	1330	1580	2250	2650	4150	5550	7050	8550	12800	15700
3-1/2	1800	2250	2550	3650	5500	7550	9500	11500	17000	21100
4	2400	3000	3300	4800	7150	9750	12300	14800	22400	27300
5	3800	4650	5300	7650	11500	15500	19500	23500	35300	43300
6	5300	6500	7500	10600	16300	22000	28000	33800	51300	61500
8	9500	11600	13300	19000	28600	38800	48800	59000	88500	108600
10	15500	19000	21600	31500	47000	63300	80100	96800	145000	-----
12	22500	27655	31500	45000	68000	92000	116000	140000	-----	-----

Noise Attenuating Devices

Several noise attenuating devices can be used with pressure regulator valves. Some are mounted to the main valve in the downstream piping. These include:

- Acoustic Orifice Plates (commonly called orifice plates)
- Acoustic Diffusers
- Acoustic Silencers
- Acoustic Insulating Blankets

Acoustic Orifice Plates



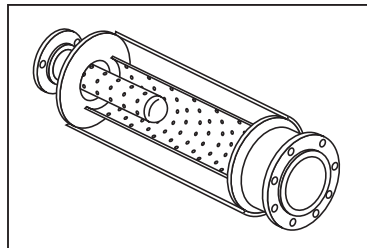
Acoustic orifice plates use a multiple orifice hole pattern in the plate to reduce noise levels of the pressure reducing valve by 5 to 10 dB (measured 3 feet from the main valve) by:

- Graduating the expansion across the valve.
- Absorbing the vent pressure at the downstream side of the valve.
- Reorienting the normal exit turbulence of the steam flow.
- Providing a noise frequency shift.

An Acoustic orifice plate:

- Is installed between standard ANSI flanges downstream of the pressure reducing valve.
- Can be used in conjunction with acoustic diffusers for additional noise reduction.
- Creates a maximum pressure drop across the plate of 5 psig (add 5 psi to the desired outlet pressure to assure the valve and plate combination will meet the specified application requirements).
- Has a pattern of orifice holes specifically designed for each individual application to attain maximum noise reduction.

Acoustic Silencers



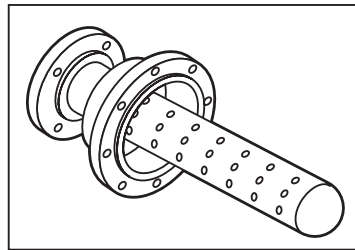
Acoustical silencers use a diffuser pipe nozzle inserted in a perforated tube that in turn is surrounded by layers of sound absorbing material to reduce noise levels of the pressure reducing valve by 20 to 30 dB (measured 3 feet from the main valve) by:

- Graduating the expansion across the valve.
- Breaking up the normal exit turbulence of the steam flow.
- Attenuating the high-frequency noise ranges by use of sound absorbing material.

An acoustic silencer:

- Can be mounted to either the NPT screwed outlet or to the standard ANSI flanges downstream of the pressure reducing valve.
- Can be used in conjunction with acoustical orifice plates for additional noise reduction.
- Creates a maximum pressure drop across the plate of 6 psig (add 6 psi to the desired outlet pressure to assure the valve and silencer combination will meet the specified application requirements).
- Has a size and hole pattern specifically designed for each individual application to attain maximum noise reduction.

Acoustic Diffusers



Acoustical diffusers use a multiple hole pattern in a pipe nozzle to reduce noise levels of the pressure reducing valve by 10 to 15 dB (measured 3 feet from the main valve) by:

- Graduating the expansion across the valve.

- Breaking up the normal exit turbulence of the steam flow.

An acoustic diffuser:

- Can be mounted to either the NPT screwed outlet or to the standard ANSI flanges downstream of the pressure reducing valve.
- Can be used in conjunction with acoustical orifice plates for additional noise reduction.
- Creates a maximum pressure drop across the plate of 5 psig (add 5 psi to the desired outlet pressure to assure the valve and diffuser combination will meet the specified application requirements).
- Has a hole pattern specifically designed for each individual application to attain maximum noise reduction.

Acoustic Insulating Blankets

Acoustic insulating blankets (mufflers) use a combination of a high-density insulated fiberglass mat and a sound absorbing material mat to reduce noise levels of the pressure reducing valve by 5 to 7 dB (measured 3 feet from the main valve) by:

- Reducing reflected noise and absorbing noise energy with the fiberglass mat.
- Blocking transmitted noise with the sound absorbing material mat.

The insulating blanket:

- Covers the main valve with a one piece insulating cover.
- Has Velcro® hook and loop fasteners to secure the blanket to the main valve.
- Allows easy removal for testing and maintenance of main valve.
- Can be installed without disturbing piping around the valve.
- Is custom fit to each particular valve.

Installation of Noise Attenuation Devices

1. Before installing the Series 2000 Pressure Reducing Valve, ensure the piping is free from foreign materials, scale, etc.
2. Install the Series 2000 Pressure Reducing Valve in accordance with the instructions included with the valve (HS-601).
3. Connect the acoustic orifice plate, acoustic diffuser or acoustic silencer directly to the outlet connection of the Series 2000 Pressure Reducing Valve to avoid the generation of flanking noise.
4. Provide a straight-run length of, at least, ten (10) pipe diameters equal to the nominal size of the acoustic diffuser/acoustic silencer outlet. If desired, outlet piping may be reduced to a smaller size, as long as flow velocity will not exceed 6,000 feet per minute. Use only concentric reducers to make pipe size changes.
5. Ensure that the piping and pressure reducing valve are adequately supported to avoid imposing stress on the valve body or the acoustic diffuser / acoustic silencer.

Sources of Noise Attenuation Devices

The following manufacturers can be used as sources for the listed noise attenuating devices. In both cases, the following applies:

- Prices can be obtained through the listed manufacturer.
- Requirements for items not listed should be addressed directly with the listed manufacturer.
- Place orders directly with the listed manufacturer
- Shipping and billing will be handled by the listed manufacturer

Acoustic orifice plates, acoustic diffusers and acoustic silencers are available from:

Burgess-Manning, Inc.
227 Thorn Avenue
Orchard Park, NY 14127-2862
Attention: Jim McGrath
Phone: 716/662-6540
Fax: 716/662-6548
Email: jmcgrath@nitran.com
www.burgess-manning.com

Acoustic insulating blankets are available from:

Shannon Enterprises of W.N.Y., Inc.
75 Main Street, P.O. Box 199
North Tonawanda, NY 14120-0199
Attention: Frank Kovacs
Phone: 716/693-7954
Fax: 716/693-1647
Email: fkovacs@shannonent.com
www.blanket-insulation.com

Selecting Noise Attenuation Devices

Burgess-Manning Acoustic Orifice Plates

To determine the acoustic orifice plate required:

1. Enter the chart in Table 1 (page 7) at the row for the upstream pressure and
2. Match the valve size and steam capacity as close to the actual conditions as possible.

The following notes are applicable to the acoustic orifice plates from Burgess-Manning:

- The Burgess-Manning acoustic plates (BAP series) are designed to be installed within the bolting of two (2) 125#/150# or 250#/300# flanged connections.
- Material of construction is carbon steel.
- Shipment is three to four weeks after receipt of order.
- Prices are NET, F.O.B., Burgess-Manning's Cisco, Texas plant and are subject to change without notice.
- Typical acoustical performance:

Frequency (Hz)	63	125	250	500	1K	2K	4K	8K
DIL of BAP (dB)*	-1	-2	-2	-3	-4	-5	-5	-3

* DIL - Dynamic Insertion Loss

Overall Dimensions are as follows:

Nominal Pipe Size		125 # ANSI Flange		250 # ANSI Flange	
in.	(mm)	in.	(mm)	in.	(mm)
2"	(50)	4 3/16"	106	6"	(152)
2 1/2"	(65)	4 15/16"	(125)	7"	(178)
3"	(80)	5 11/16"	(144)	7 1/2"	(190)
4"	(100)	6 15/16"	(176)	9"	(229)
6"	(150)	9 11/16"	(246)	11"	(279)

Plate thickness is 3/4" (19mm) for all plates

Burgess-Manning Acoustic Orifice Plate Model Numbers

Table 1

Upstream Pressure (Psig)		VALVE SIZE									
		1/2" *	3/4" *	1" *	1-1/4" *	1-1/2" *	2" *	2-1/2"	3"	4"	6"
5	Flow Rate	75	125	210	285	390	700	1,040	1,345	2,140	4,560
	Model #	BAP-1/2A-1-I	BAP-3/4A-2-I	BAP-1A-4-I	BAP-1-1/4A-5-I	BAP-1-1/2A-7-I	BAP-2A-12-I	BAP-2-1/2A-17-I	BAP-3A-22-I	BAP-4A-23-J	BAP-6A-22-K
7	Flow Rate	95	165	270	360	500	900	1,340	1,730	2,750	5,870
	Model #	BAP-1/2A-1-I	BAP-3/4A-2-I	BAP-1A-4-I	BAP-1-1/4A-5-I	BAP-1-1/2A-7-I	BAP-2A-13-I	BAP-2-1/2A-19-I	BAP-3A-25-I	BAP-4A-25-J	BAP-6A-24-K
10	Flow Rate	120	210	350	475	650	1,160	1,740	2,245	3,580	7,600
	Model #	BAP-1/2A-1-I	BAP-3/4A-3-I	BAP-1A-4-I	BAP-1-1/4A-6-I	BAP-1-1/2A-7-I	BAP-2A-14-I	BAP-2-1/2A-22-I	BAP-3A-17-J	BAP-4A-12-K	BAP-6A-26-K
12	Flow Rate	140	250	400	540	750	1,325	1,990	2,560	4,100	8,750
	Model #	BAP-1/2A-1-I	BAP-3/4A-3-I	BAP-1A-4-I	BAP-1-1/4A-6-I	BAP-1-1/2A-8-I	BAP-2A-15-I	BAP-2-1/2A-22-I	BAP-3A-17-J	BAP-4A-12-K	BAP-6A-15-L
15	Flow Rate	150	270	445	610	835	1,475	2,140	2,865	4,570	9,750
	Model #	BAP-1/2A-1-I	BAP-3/4A-3-I	BAP-1A-4-I	BAP-1-1/4A-6-I	BAP-1-1/2A-8-I	BAP-2A-15-I	BAP-2-1/2A-22-I	BAP-3A-18-J	BAP-4A-13-K	BAP-6A-15-L
20	Flow Rate	180	320	520	705	970	1,720	2,595	3,350	5,330	11,300
	Model #	BAP-1/2A-2-I	BAP-3/4A-3-I	BAP-1A-4-I	BAP-1-1/4A-6-I	BAP-1-1/2A-8-I	BAP-2A-15-I	BAP-2-1/2A-22-I	BAP-3A-18-J	BAP-4A-13-K	BAP-6A-15-L
25	Flow Rate	220	380	630	860	1,180	2,100	3,140	4,070	6,460	13,800
	Model #	BAP-1/2A-2-I	BAP-3/4A-3-I	BAP-1A-4-I	BAP-1-1/4A-6-I	BAP-1-1/2A-9-I	BAP-2A-16-I	BAP-2-1/2A-23-I	BAP-3A-18-J	BAP-4A-13-K	BAP-6A-15-L
30	Flow Rate	230	410	670	910	1,250	2,220	3,350	4,330	6,850	14,620
	Model #	BAP-1/2A-2-I	BAP-3/4A-3-I	BAP-1A-4-I	BAP-1-1/4A-6-I	BAP-1-1/2A-9-I	BAP-2A-16-I	BAP-2-1/2A-23-I	BAP-3A-18-J	BAP-4A-13-K	BAP-6A-15-L
40	Flow Rate	300	530	870	1,180	1,620	2,880	4,330	5,600	9,000	19,000
	Model #	BAP-1/2A-2-I	BAP-3/4A-3-I	BAP-1A-5-I	BAP-1-1/4A-6-I	BAP-1-1/2A-9-I	BAP-2A-16-I	BAP-2-1/2A-23-I	BAP-3A-19-J	BAP-4A-14-K	BAP-6A-16-L
50	Flow Rate	375	660	1,080	1,470	2,035	3,590	5,410	6,980	11,700	23,800
	Model #	BAP-1/2A-2-I	BAP-3/4A-3-I	BAP-1A-5-I	BAP-1-1/4A-7-I	BAP-1-1/2A-9-I	BAP-2A-16-I	BAP-2-1/2A-25-I	BAP-3A-20-J	BAP-4A-15-K	BAP-6A-18-L
60	Flow Rate	445	785	1,290	1,755	2,410	4,300	6,440	8,300	13,200	28,200
	Model #	BAP-1/2A-2-I	BAP-3/4A-3-I	BAP-1A-5-I	BAP-1-1/4A-7-I	BAP-1-1/2A-10-I	BAP-2A-17-I	BAP-2-1/2A-25-I	BAP-3A-21-J	BAP-4A-15-K	BAP-6A-18-L
75	Flow Rate	545	960	1,560	2,150	2,960	5,240	7,900	10,200	16,200	34,600
	Model #	BAP-1/2A-2-I	BAP-3/4A-3-I	BAP-1A-5-I	BAP-1-1/4A-7-I	BAP-1-1/2A-10-I	BAP-2A-17-I	BAP-2-1/2A-26-I	BAP-3A-21-J	BAP-4A-15-K	BAP-6A-18-L
90	Flow Rate	630	1,110	1,830	2,500	3,420	6,060	9,140	11,800	18,750	40,000
	Model #	BAP-1/2A-2-I	BAP-3/4A-3-I	BAP-1A-5-I	BAP-1-1/4A-7-I	BAP-1-1/2A-10-I	BAP-2A-17-I	BAP-2-1/2A-26-I	BAP-3A-21-J	BAP-4A-15-K	BAP-6A-18-L
100	Flow Rate	700	1,220	2,000	2,730	3,750	6,640	10,000	12,910	20,300	43,800
	Model #	BAP-1/2A-2-I	BAP-3/4A-3-I	BAP-1A-5-I	BAP-1-1/4A-7-I	BAP-1-1/2A-10-I	BAP-2A-17-I	BAP-2-1/2A-26-I	BAP-3A-21-J	BAP-4A-15-K	BAP-6A-18-L
125	Flow Rate	850	1,490	2,450	3,350	4,600	8,250	12,300	15,880	25,200	53,800
	Model #	BAP-1/2A-2-I	BAP-3/4A-3-I	BAP-1A-5-I	BAP-1-1/4A-7-I	BAP-1-1/2A-10-I	BAP-2A-17-I	BAP-2-1/2A-26-I	BAP-3A-21-J	BAP-4A-15-K	BAP-6A-18-L
150	Flow Rate	1,000	1,765	2,900	3,940	5,420	9,600	14,450	18,650	29,700	63,400
	Model #	BAP-1/2A-2-I	BAP-3/4A-3-I	BAP-1A-5-I	BAP-1-1/4A-7-I	BAP-1-1/2A-10-I	BAP-2A-17-I	BAP-2-1/2A-26-I	BAP-3A-21-J	BAP-4A-15-K	BAP-6A-18-L
175	Flow Rate	1,150	2,030	3,350	4,550	6,250	11,180	16,650	21,500	34,200	73,000
	Model #	BAP-1/2A-2-I	BAP-3/4A-3-I	BAP-1A-5-I	BAP-1-1/4A-7-I	BAP-1-1/2A-10-I	BAP-2A-17-I	BAP-2-1/2A-26-I	BAP-3A-21-J	BAP-4A-15-K	BAP-6A-18-L
200	Flow Rate	1,300	2,300	3,760	5,130	7,040	12,500	18,800	24,250	38,600	82,400
	Model #	BAP-1/2A-2-I	BAP-3/4A-3-I	BAP-1A-5-I	BAP-1-1/4A-7-I	BAP-1-1/2A-10-I	BAP-2A-17-I	BAP-2-1/2A-26-I	BAP-3A-21-J	BAP-4A-15-K	BAP-6A-18-L
225	Flow Rate	1,455	2,560	4,200	5,740	7,880	13,920	21,000	27,100	43,200	92,000
	Model #	BAP-1/2A-2-I	BAP-3/4A-3-I	BAP-1A-5-I	BAP-1-1/4A-7-I	BAP-1-1/2A-10-I	BAP-2A-17-I	BAP-2-1/2A-26-I	BAP-3A-21-J	BAP-4A-15-K	BAP-6A-18-L
250	Flow Rate	1,600	2,825	4,640	6,320	8,700	15,400	28,200	29,950	47,600	102,800
	Model #	BAP-1/2A-2-I	BAP-3/4A-3-I	BAP-1A-5-I	BAP-1-1/4A-7-I	BAP-1-1/2A-10-I	BAP-2A-17-I	BAP-2-1/2A-26-I	BAP-3A-21-J	BAP-4A-15-K	BAP-6A-18-L

* Valves with screwed NPT outlets require an adaptor to convert to flanged outlet for installation of an Acoustic Orifice Plate.

Burgess-Manning Acoustic Diffusers

To determine the acoustic diffuser series required:

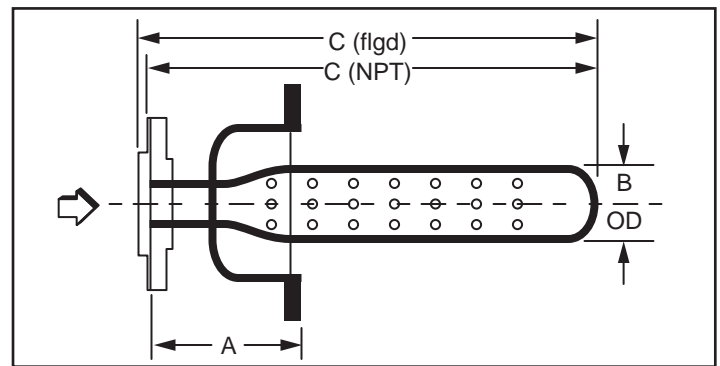
1. Enter the chart in Table 2 (below) at the row for the steam capacity
2. Match the pressure upstream (inlet pressure) of the valve.
3. With knowledge of the series of acoustic diffuser required, locate the specific model in Table 3 (page 9) based on the characteristics of the specific main valve.

The following notes are applicable to the acoustic diffusers from Burgess-Manning:

- The Burgess-Manning diffusers are installed directly to the PRV outlet.
- Material of construction is carbon steel.
- Shipment is four to six weeks after receipt of order.
- Prices are **NET**, F.O.B., Burgess-Manning's Cisco, Texas plant and are subject to change without notice.
- Typical acoustical performance:

Frequency (Hz)	63	125	250	500	1K	2K	4K	8K
DIL of Series D (dB)*	-2	-3	-6	-10	-13	-15	-12	-8

* DIL - Dynamic Insertion Loss



Dimensions are as Follows:

SERIES	INLET SIZE*	OUTLET SIZE**	A	B	C
D1	1/2 to 1"	2"	5-1/2	1-5/16	10-1/2
D3	1/2 to 1"	2"	5-1/2	1-5/16	13-1/2
D4	3/4" to 2"	4"	6-1/2	2-3/8	13-1/2
D5	3/4" to 2-1/2"	4"	6-1/2	2-7/8	16-1/2
D6	1-1/4" to 3"	6"	8	3-1/2	17
D8	1-1/2" to 4"	8"	10	4-1/2	17
D10	2" to 6"	12"	12	6-5/8	21
D12	2-1/2" to 6"	12"	12	6-5/8	21
D14	3" to 6"	12"	12	6-5/8	28
D16	4" & 6"	16"	12	8-5/8	24
D18	4" & 6"	16"	12	8-5/8	31
D20	6"	20"	12	10-3/4	26
D24	6"	20"	12	10-3/4	32

*Available inlet sizes: NPT Male 1/2", 3/4" 1", 1-1/4", 1-1/2", 2"; ANSI 125 or 250 Flanged **All outlets are ANSI 125/150 or 250/300 Flanged

Burgess-Manning Acoustic Diffuser Series Numbers

Table 2

Steam Capacity (thousands of lbs/hr)	VALVE INLET PRESSURE (psig)												
	10	20	30	40	50	60	75	100	125	150	175	200	250
<1													
1								D-1					
1.5								D-3					
2								D-4					
3								D-5					
4								D-6					
6								D-8					
8								D-8					
10								D-8					
12								D-8					
15								D-8					
18								D-10					
20								D-10					
25								D-12					
30								D-12					
35								D-12					
40								D-14					
50								D-14					
75								D-16					
100								D-16					
								D-18					
								D-20					
								D-24					

Burgess-Manning Acoustic Diffuser Model/Part Numbers

Table 3

Diffuser Model Outlet Size Part #		MAIN VALVE OUTLET SIZE					
		1/2" NPT	3/4" NPT	1" NPT	1 1/4" NPT	1 1/2" NPT	2" NPT
D-1	Outlet Size Part #	2"-150# 10-1196-000	2"-150# 10-1150-000	2"-150# 10-1176-000	----- -----	----- -----	----- -----
	Outlet Size Part #	2"-300# 10-1818-000	2"-300# 10-1897-000	2"-300# 10-1912-000	----- -----	----- -----	----- -----
D-3	Outlet Size Part #	2"-150# 10-2053-000	2"-150# 10-1241-000	2"-150# 10-1212-000	----- -----	----- -----	----- -----
	Outlet Size Part #	2"-300# 10-1812-000	2"-300# 10-1811-000	2"-300# N/A	----- -----	----- -----	----- -----
D-4	Outlet Size Part #	----- -----	4"-150# 10-1195-000	4"-150# 10-1249-000	4"-150# 10-1272-000	4"-150# 10-1164-000	4"-150# 10-1389-000
	Outlet Size Part #	----- -----	4"-300# N/A	4"-300# N/A	4"-300# 10-1635-000	4"-300# N/A	4"-300# 10-1313-000
D-5	Outlet Size Part #	----- -----	4"-150# N/A	4"-150# 10-1163-000	4"-150# 10-1211-000	4"-150# 10-1147-000	4"-150# 10-1271-000
	Outlet Size Part #	----- -----	4"-300# N/A	4"-300# 10-1391-000	4"-300# 10-1224-000	4"-300# 10-1253-000	4"-300# 10-1312-000
D-6	Outlet Size Part #	----- -----	----- -----	----- -----	6"-150# 10-1194-000	6"-150# 10-1208-000	6"-150# 10-1144-000
	Outlet Size Part #	----- -----	----- -----	----- -----	6"-300# 10-1255-000	6"-300# N/A	6"-300# 10-1614-000
D-8	Outlet Size Part #	----- -----	----- -----	----- -----	----- -----	8"-150# N/A	8"-150# 10-1258-000
	Outlet Size Part #	----- -----	----- -----	----- -----	----- -----	8"-300# 10-1230-000	8"-300# 10-1326-000
D-10	Outlet Size Part #	----- -----	----- -----	----- -----	----- -----	----- -----	12"-150# N/A
	Outlet Size Part #	----- -----	----- -----	----- -----	----- -----	----- -----	12"-300# N/A

- NOTES: 1. Diffuser inlets for use on main valves with a NPT threaded outlet have NPT threads of the same size as the main valve (see figure 1).
 2. All diffuser outlet sizes are either ANSI 150# or 300# flanges as noted.
 3. ANSI 125# and 150# flanges have identical outside diameters and bolt hole patterns.
 4. ANSI 250# and 300# flanges have identical outside diameters and bolt hole patterns.

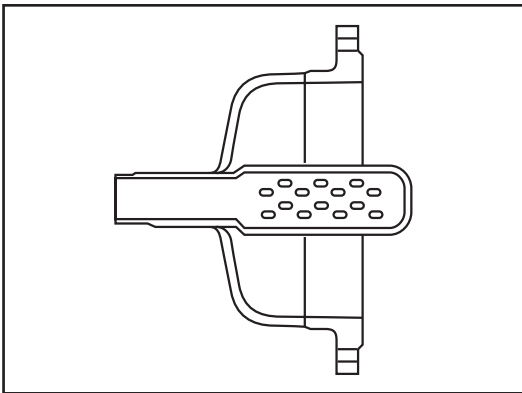


Figure 1
Diffuser with NPT inlet X ANSI flanged outlet

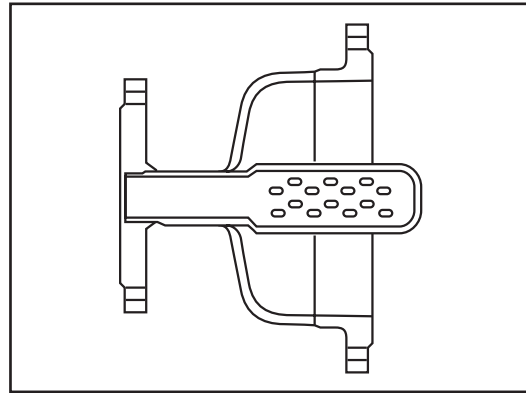


Figure 2
Diffuser with ANSI flanged inlet X ANSI flanged outlet

Burgess-Manning Acoustic Diffuser Model/Part Numbers

Table 3 (continued)

Diffuser Model Outlet Size Part #		MAIN VALVE OUTLET SIZE									
		2" 125#	2" 250#	2 1/2" 125#	2 1/2" 250#	3" 125#	3" 250#	4" 125#	4" 250#	6" 125#	6" 250#
D-4	Outlet Size Part #	4"-150# N/A	----	----	----	----	----	----	----	----	----
	Outlet Size Part #	----	4"-300# N/A	----	4"-300# 10-1593-000	----	----	----	----	----	----
D-5	Outlet Size Part #	4"-150# N/A	----	----	----	----	----	----	----	----	----
	Outlet Size Part #	----	4"-300# N/A	----	4"-300# 10-1593-000	----	----	----	----	----	----
D-6	Outlet Size Part #	6"-150# N/A	----	----	----	6"-150# 10-1209-000	----	----	----	----	----
	Outlet Size Part #	----	6"-300# N/A	----	6"-300# 10-1178-000	----	6"-300# 10-1228-000	----	----	----	----
D-8	Outlet Size Part #	8"-150# N/A	----	----	----	8"-150# 10-1221-000	----	8"-150# 10-1291-000	----	----	----
	Outlet Size Part #	----	8"-300# N/A	----	8"-300# 10-1316-000	----	8"-300# 10-1177-000	----	8"-300# 10-1260-000	----	----
D-10	Outlet Size Part #	12"-150# N/A	----	----	----	12"-150# 10-1252-000	----	12"-150# 10-1182-000	----	12"-150# 10-1207-000	----
	Outlet Size Part #	----	12"-300# N/A	----	12"-300# 10-1205-000	----	12"-300# 10-1148-000	----	12"-300# 10-1239-000	----	12"-300# 10-1323-000
D-12	Outlet Size Part #	----	----	----	----	12"-150# 10-1373-000	----	12"-150# 10-1297-000	----	12"-150# 10-1183-000	----
	Outlet Size Part #	----	----	----	12"-300# 10-1553-000	----	12"-300# 10-1350-000	----	12"-300# 10-1342-000	----	12"-300# 10-1341-000
D-14	Outlet Size Part #	----	----	----	----	12"-150# N/A	----	12"-150# N/A	----	12"-150# 10-1277-000	----
	Outlet Size Part #	----	----	----	----	----	12"-300# 10-1781-000	----	12"-300# 10-1565-000	----	12"-300# 10-1242-000
D-16	Outlet Size Part #	----	----	----	----	----	----	16"-150# N/A	----	16"-150# 10-1906-000	----
	Outlet Size Part #	----	----	----	----	----	----	----	16"-300# 10-1379-000	----	16"-300# 10-1536-000
D-18	Outlet Size Part #	----	----	----	----	----	----	16"-150# N/A	----	16"-150# 10-1301-000	----
	Outlet Size Part #	----	----	----	----	----	----	----	16"-300# N/A	----	16"-300# N/A
D-20	Outlet Size Part #	----	----	----	----	----	----	----	----	20"-150# N/A	----
	Outlet Size Part #	----	----	----	----	----	----	----	----	----	20"-300# N/A
D-24	Outlet Size Part #	----	----	----	----	----	----	----	----	20"-150# N/A	----
	Outlet Size Part #	----	----	----	----	----	----	----	----	----	20"-300# 10-2042-000

- NOTES: 1. Diffuser inlets for use on main valves with a flanged outlet have flanges of the same size as the main valve (see figure 2 on page 9).
 2. All diffuser outlet sizes are either ANSI 150# or 300# flanges as noted.
 3. ANSI 125# and 150# flanges have identical outside diameters and bolt hole patterns.
 4. ANSI 250# and 300# flanges have identical outside diameters and bolt hole patterns.

Burgess-Manning Acoustic Silencers

Selecting an acoustic silencer should be done on a consultative basis working with Burgess-Manning. Burgess-Manning requires the following information:

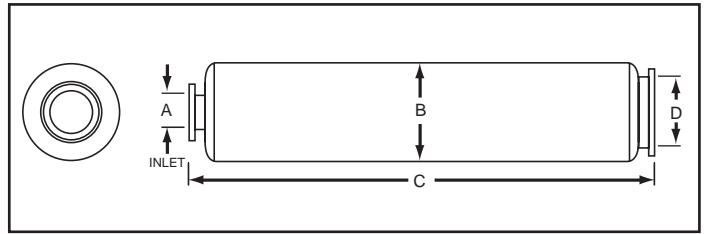
- Steam flow rate (lbs./hr)
- Inlet and outlet pressures
- Size of the Series 2000 Main Valve
- Steam temperature.

The following notes are applicable to the acoustic silencers from Burgess-Manning:

- The Burgess-Manning silencers are installed directly to the PRV outlet.
- All welded steel construction. Exterior surfaces are prime coated. Acoustic absorptive material is fiberglass.
- Shipment is four to six weeks after receipt of order.
- Prices are NET, F.O.B., Burgess-Manning's Cisco, Texas plant and are subject to change without notice.
- Typical acoustical performance:

Frequency (Hz)	63	125	250	500	1K	2K	4K	8K
DIL of LCV (dB)* @ 5,000 fpm	-7	-15	-23	-30	-32	-30	-27	-24
@ 10,000 fpm	-9	-17	-23	-29	-30	-28	-25	-23

* DIL - Dynamic Insertion Loss



Dimensions are as Follows:

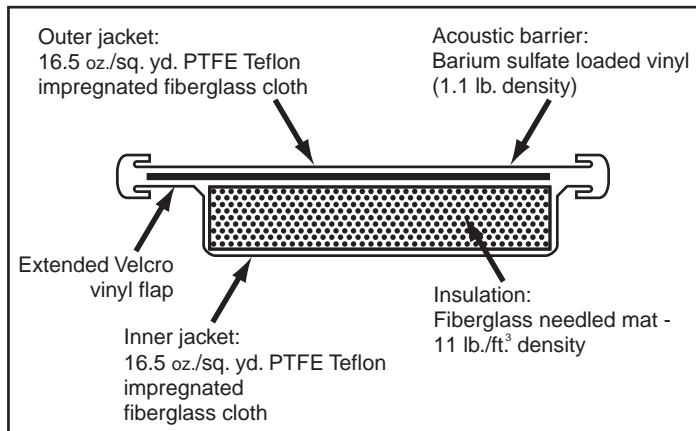
Silencer Number	Dimensions in Inches			
	A (Inlet)	B	C	D (Outlet)
LCV-2	1/2" to 2" NPT	5	35	2" flanged
LCV-3	1/2" to 2" NPT; 2" & 3" flanged	6 1/2	46	3" flanged
LCV-4	1/2" to 2" NPT; 2" & 4" flanged	10	52	4" flanged
LCV-5	3/4" to 2" NPT; 2" & 4" flanged	12	60	5" flanged
LCV-6	2" to 6" flanged	12	66	6" flanged
LCV-8	2" to 6" flanged	14	72	8" flanged
LCV-10	1/2" to 2" NPT; 2" to 6" flanged	16	78	10" flanged
LCV-12	2" to 6" flanged	18	90	12" flanged
LCV-14	2 1/2" to 6" flanged	20	104	14" flanged
LCV-16	2 1/2" to 6" flanged	22	116	16" flanged
LCV-18	3" to 6" flanged	24	132	18" flanged
LCV-20	4" & 6" flanged	26	146	20" flanged
LCV-22	6" flanged	30	158	22" flanged
LCV-24	6" flanged	30	174	24" flanged
LCV-26	6" flanged	32	186	26" flanged
LCV-28	6" flanged	36	202	28" flanged
LCV-30	6" flanged	36"	216	30" flanged

Shannon Enterprises Acoustic Insulating Blankets

Acoustic insulating blankets have both thermal and acoustic performance benefits for Series 2000 Pressure Reducing Valves. Recognized "Energy Savings" as well as significant reductions in "Radiant Sound Energy" are achieved. The blanket absorbs sound and reduces sound reflection, producing a reduction in ambient mechanical room noise levels. The following notes are applicable to the acoustic insulating blankets from Shannon Enterprises:

- Terms: Net 30 Days
- FOB: North Tonawanda, NY
- Delivery: 3-4 Weeks
- Shannon custom manufacturers each individual acoustic insulating blanket.
- Each acoustic insulating blanket is boxed separately.
- Plain I.D. Tags are used on every blanket.

Design Components:



Typical Acoustic Performance

Estimated dBA Reduction*	Finished Surface Mass
5-7 dBA	2.4 lbs./sq. ft. Surface Mass

* Based on a typical flow rate with an open free field environment. Performance may vary depending on actual field conditions.

Thermal Performance:

Operating Temperature		Blanket Thickness		Blanket Outside Surface Temp.*	
°F	(°C)	in.	(mm)	°F	(°C)
250	(121)	1.5	(38)	92	(38)
300	(149)	1.5	(38)	98	(41)
350	(177)	1.5	(38)	104	(45)
400	(204)	1.5	(38)	111	(50)
450	(232)	1.5	(38)	118	(54)

* Surface temperature of the blanket will achieve ambient temperature conditions. Heat loss calculations are based on a 70°F ambient using a flat surface condition.

Fabrication Details:

- A. **Blanket construction** is a double-sewn lock stitch with a minimum of 7 stitches per inch. All raw jacket edges have a tri fold PTFE Teflon Fiberglass cloth binding. No raw cut jacket edges are exposed. Stitching is Teflon coated fiberglass thread. Hogrings and staples are not used.
- B. **Overlap flaps:** Blanket pieces include an extended 2" wide fabric vinyl flap to avoid penetrating noise at mating seams. This flap covers the exposed "Hot Spot" seam and minimizes any potential noise leaks.
- C. **Nameplate:** An aluminum nameplate tag is riveted to each blanket piece for ease of identification and location. 1/8" embossed lettering is used to include manufacturer description, size, pressure rating, part number and model number.
- D. **Quilting pins:** To enhance blanket quality and maintain uniform thickness, stainless steel quilting pins are placed at random locations to prevent shifting of the insulation filler.
- E. **Fasteners:**
- Wiretwist fasteners utilize stainless steel type 304 wire and stainless steel type 304 lacing pins. The wire is 20-gauge stainless steel wire, doubled up and twisted in a spiral fashion with a minimum of 4 twists per inch. Wiretwist length is 16" or greater. Wiretwists are secured to the 14-gauge lacing pin at the pin stem.
 - Velcro® Hook & Loop Fasteners are sewn to the outer jacketing. A 2" wide hook fastener is stitched to the blanket and a 2" wide loop fastener is stitched to an extended outer jacketing flap. Velcro is rated for temperatures up to 350°F.
- F. **One-piece design:** Design incorporates a 1-piece valve design with the "Bonnet" and "Body".
- G. **Pull-down strap:** Extended 3" wide fabric flaps include a Teflon coated fiberglass draw cord.
- H. **Warranty:** All blankets carry an 18-month warranty. The warranty covers the replacement cost of the blanket for blanket failures due to premature degradation from either blanket components used in the blanket, the blanket design, construction or workmanship.
- I. **Design guidelines:** To assess the limitations of this blanket design, refer to the technical data sheets on each product component. The blanket design follows these guidelines and produces the highest achievable service life possible. Blanket design quality can be reduced or enhanced by changing any one component. If a question arises regarding deviations from the stated guidelines, contact Shannon Enterprises directly.

Shannon Enterprises Acoustic Insulating Blankets Part Numbers

Size	Part Number
Series 2100 & 2150 Screwed NPT Ends	
1/2"	IBA-ITT-2100-PRV-1/2"
3/4"	IBA-ITT-2100-PRV-3/4"
1"	IBA-ITT-2100-PRV-1"
1-1/4"	IBA-ITT-2100-PRV-1-1/4"
1-1/2"	IBA-ITT-2100-PRV-1-1/2"
2"	IBA-ITT-2100-PRV-2"
Series 2200 & 2250 Flanged Ends ANSI 125 Flanged	
2"	IBA-ITT-2200-PRV-2"
2-1/2"	IBA-ITT-2200-PRV-2-1/2"
3"	IBA-ITT-2200-PRV-3"
4"	IBA-ITT-2200-PRV-4"
6"	IBA-ITT-2200-PRV-6"
Series 2300 Flanged Ends ANSI 250 Flanged	
2"	IBA-ITT-2300-PRV-2"
2-1/2"	IBA-ITT-2300-PRV-2-1/2"
3"	IBA-ITT-2300-PRV-3"
4"	IBA-ITT-2300-PRV-4"
6"	IBA-ITT-2300-PRV-6"



Xylem, Inc.
 8200 N. Austin Avenue
 Morton Grove, Illinois 60053
 Phone: (847) 966-3700
 Fax: (847) 965-8379
www.xylem.com/brands/bellgossett

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