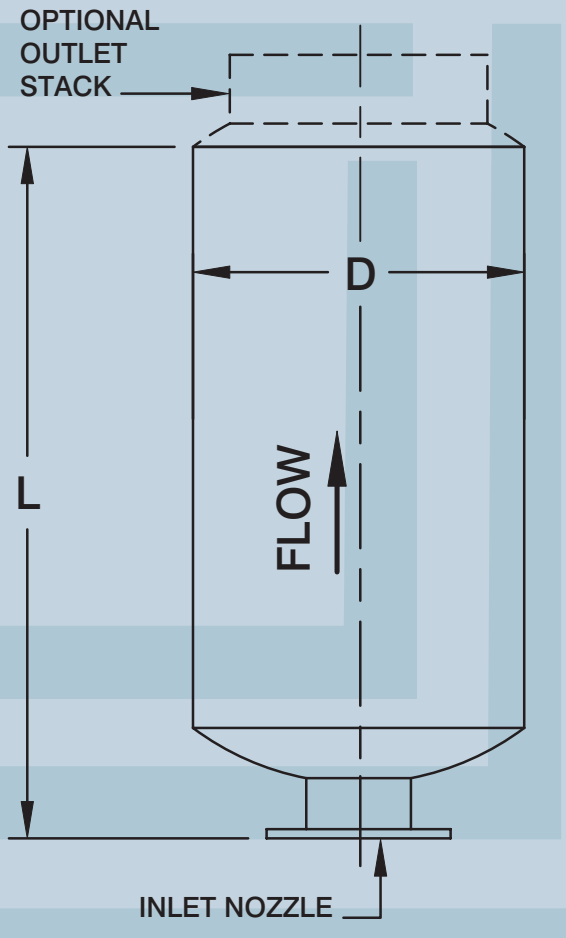
E.I. Williams
STEEL DIVISION
BUILDING SOUND SOLUTIONS

reference catalogue 6

VENT SILENCERS



INFORMATION ON VENT SILENCERS

A vent silencer or a blow off silencer is a device used to reduce unwanted noise created by gas or steam flow in a pipeline discharging directly into the atmosphere. This noise can be generated due to the high velocity flow through the valve and turbulence created around any obstacle in the line that suddenly restricts or changes the direction of flow such as valve or an orifice.

Vent silencers find wide applications in high pressure vents, steam vents, safety relief valve outlets, system blow downs and purge outlets etc.

Vent and blow down noise is a function of upstream pressure and temperature, type of gas being vented, the valve size and type, plus the effect of down stream piping.

Each vent silencer is designed to attenuate the noise level to the required sound pressure level criteria at a given distance from the silencer. This is the reason that vent and blow down silencers are seldom a catalogue selection. The details given here can be considered as a guideline. Contact our experienced engineers to recommend a silencer best suited for your application for vertical or horizontal installations.

In any steam or gas venting / blow off system, the primary release of noise energy occurs at the open stack exit. The blow off silencer is installed either within the stack or at the stack outlet to intercept this noise before it escapes into the environment.

There are two fundamental noise reduction principles used in passive silencer design. Dissipative components (using sound absorbing material) provide balanced noise reduction over a broad frequency range. Reactive components, using resonant reflections within tuned chambers and passages, provide peak noise reduction in a more concentrated frequency band. The SV series vent silencers combines both dissipative and reactive technology in a highly efficient design.

DATA REQUIRED TO SELECT VENT SILENCER

- Application (Vent, Blow down, Relief Valve etc.)
- Fluid Composition (Steam, Gas, Air)
- Molecular Weight or Specific Gravity
- Process conditions upstream of valve i.e. Flow rate (W) and units (lb/hr, SCFM, ACFM), Temperature (T 1), Pressure (P 1)
- Atmospheric pressure (P a) and down stream temperature (T 2) if known.
- Line size between valve and silencer and connection type.
- Line size from silencer discharge
- Unsilenced octave band noise levels, if known
- Attenuation required (silencer performance)
- Allowable pressure drop

SIZING OF A VENT SILENCER

Typical examples of sizing a SV series vent silencer are shown here. The diameter of a silencer is a function of flow rate of the gas it can safely pass without eroding the acoustical packing or regenerating noise. The silencer length is a function of the degree of noise reduction to be achieved.

A. STEAM

Example 1: Service conditions: W max. = 60000 lb / hr. superheated steam, P 1 = 250 psia, T = 500 F, P a = 14.7 psia. Require 40 dB attenuation.

a. From steam tables, using P 1 (250 psia) and T 1 (500 F), find the upstream enthalpy, h 1 = 1264.7 btu / lb.

b. Assuming constant enthalpy expansion h1 = h2, from steam tables determine the down stream specific volume v2 using h2 (1265 btu / lb and P a (14.7 psia), v2 = 36.75 cu. Ft. / lb.

c. Calculate actual down stream flow rate Q d (ACFM), actual cubic feet per minute using equation

$$Q\,d = \frac{W \times V2}{60}$$

$$Q\,d = \frac{60000 \times 36.75}{60}$$

$$= 36750 \text{ ACFM}$$

d. Select silencer using Table 1, having capacity equal to or greater than Q d. Therefore SV-36-2 is selected. Table 1 can be used to select SV type for desired attenuation or contact our engineers for selection.

Example 2: Service Conditions : W max. = 120000 lb / hr. of saturated steam, P 1 = 300 psia. T1 = 417 F, P a = 15 psia. Require minimum of 55 dB attenuation.

Using the same procedure as example 1 above.

a. From steam tables h 1 = 1203.2 btu / lb = h2

b. For h 2 = 1203 btu / lb and P a = 15 psia , V 2 is determined to be 31 cu. Ft. / lb.

c. Using equation:

$$Q\,d = \frac{W \times V\,2}{60}$$

$$Q\,d = \frac{120000 \times 31}{60}$$

$$= 62000 \text{ ACFM}$$

d. From table 1, SV-48-4 is selected.

B. GAS

Service conditions: W max. = 200000 lb / hr. Nitrogen, (or Q = 45022 SCFM), Specific gravity (S.G.) = 0.97, T 2 = 200 F and P a = 14.3 psia. Require 40 to 50 dB attenuation.

a. If flow is given in lb / hr., calculate Q d (ACFM) using equation :

$$Q\,d = \frac{W \times (T\,2 + 460)}{162 \times P\,a \times S.G.}$$

$$Q\,d = \frac{200000 \times (200 + 460)}{162 \times 14.3 \times 0.97}$$

$$= 58742 \text{ ACFM}$$

b. If flow is given in SCFM, calculate Q d (ACFM) using equation :

$$Q\,d = \frac{Q \times (T\,2 + 460)}{35.374 \times P\,a}$$

$$Q\,d = \frac{45022 \times (200 + 460)}{35.374 \times 14.3}$$

$$= 58742 \text{ ACFM}$$

c. From Table 1, SV-48-3 is selected.

SPECIFICATIONS

SV SERIES VENT SILENCERS

TYPICAL PERFORMANCE
(Dynamic Insertion Loss) dB

VENT SIZE & TYPE	Octave Band Center Frequency, Hz							
	63	125	250	500	1000	2000	4000	8000
SV1	10	18	27	33	39	40	35	30
SV2	12	23	34	42	49	50	43	37
SV3	14	29	42	53	60	60	51	44
SV4	16	34	49	63	70	69	60	50

The SV series vent silencers are recommended for reducing excessive noise caused by the discharge of high pressure gas, steam or air into the atmosphere.

The silencers are of reactive / absorptive type design. The gas and noise enters the silencer through the single stage or multi stage diffuser where it is permitted to expand through many small holes into the expansion chamber. The design of diffuser and size of the expansion chamber provides a tuned reactive section. The diffuser also provides a frequency shift to higher frequencies which are best attenuated by the absorptive section. The gas then passes through the absorptive section which consists of multiple perforated flow tubes surrounded by dense acoustical packing providing a broad range of attenuation in the mid to high frequency ranges.

The standard construction is a rigid all welded carbon steel shell assembly, flow tube bundle and inlet / diffuser with acoustical packing of dense long strand fiberglass suitable for service temperatures indicated. Length of flow tubes and number of tube bundles is dependent on degree of silencing required. The silencer thickness includes 1/16" corrosion allowance and finished with rust inhibitive primer. The optional features include multiple inlets, special materials or finishes, mounting brackets and code requirements.

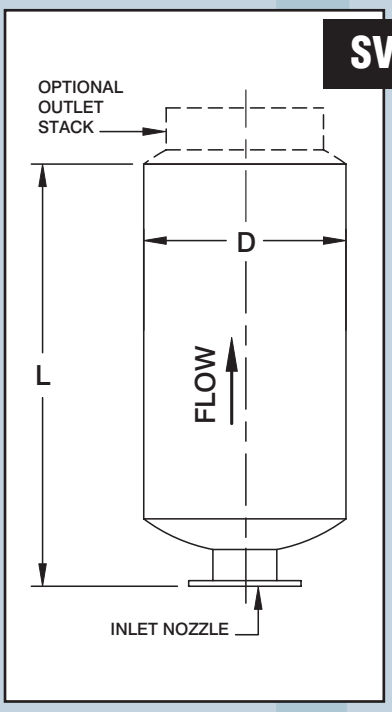


TABLE 1

INLET NOZZLE SIZE	MAX. SILENCER CAPACITY, ACFM	SHELL DIA. SV	OUTLET STACK	TYPE SV1		TYPE SV2		TYPE SV3		TYPE SV4	
				LENGTH	WEIGHT	LENGTH	WEIGHT	LENGTH	WEIGHT	LENGTH	WEIGHT
		D	MIN.	L		L		L		L	
2	2940	10	6	45	90	60	110	70	150	80	210
3	3150	12	6	50	100	60	125	85	170	95	230
4	5235	14	8	60	150	70	180	95	225	105	260
4	7650	16	10	60	180	75	230	100	300	115	330
4	8800	18	10	66	230	80	285	110	375	125	420
6	12500	20	12	75	285	90	350	120	450	140	530
6	15800	22	14	70	350	80	450	105	550	115	630
6	18200	24	16	75	450	85	525	115	680	130	750
8	21500	26	16	75	500	92	625	122	795	135	880
8	28000	28	18	80	580	100	715	130	915	145	1050
8	33300	30	20	86	680	105	830	135	1060	160	1260
10	36500	30	20	90	950	100	1000	130	1250	145	1500
10	41500	36	22	95	1100	115	1350	150	1750	175	2050
12	58500	42	26	85	1270	105	1600	140	2100	150	2300
14	90500	48	34	100	1750	115	2100	150	2700	175	3200
16	112500	54	36	105	2180	125	2600	165	3450	190	4000
18	142000	60	42	115	3200	140	3900	180	5100	205	5800
20	180000	66	48	130	4100	155	4900	200	6350	235	7350
24	225000	72	52	135	4800	165	5900	220	7700	245	8600

- Intermediate and larger sizes available on request, consult factory.
- Dimensions and weights are approximate and may change slightly with production models.
- Dimension in inches.
- Weight in lbs.

We specialize in custom designs and also provide various nozzle orientations to suit your specific requirements.

OTHER PRODUCTS AVAILABLE:

- **ROTARY POSITIVE BLOWER INTAKE AND DISCHARGE SILENCERS**
  reference catalogue 1

- **BASE SILENCERS FOR ROTARY POSITIVE BLOWERS**
  reference catalogue 2

- **COMBINATION SILENCERS FOR ROTARY POSITIVE BLOWERS**
  reference catalogue 3

- **FAN SILENCERS**
  reference catalogue 4

- **CENTRIFUGAL COMPRESSOR SILENCERS**
  reference catalogue 5

- **VENT SILENCERS**
  reference catalogue 6

- **ENGINE SILENCERS**
  reference catalogue 7

- **NOISE ENCLOSURES**
  reference catalogue 8

- **PUCK SILENCERS**
  reference catalogue 9

YOUR ONE STOP CENTER FOR ALL INDUSTRIAL SILENCING NEEDS.

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