

LINE SILENCER

PRODUCT GUIDE

PULSCO LINE SILENCER

TABLE OF CONTENTS

<u>DESCRIPTION</u>	<u>PAGE</u>
PULSCO LINE SILENCERS	
GENERAL INFORMATION	4
LINE SILENCER COMPONENTS.....	5
PULSCO LINE SILENCER MODEL DESCRIPTIONS	7
ALTERNATE MATERIALS OF CONSTRUCTION	9
HIGH TEMPERATURE DESIGN.....	10
FLANGES.....	10
SILENCER SUPPORTS.....	10
DESIGN PROCESS	11

GENERAL INFORMATION

Mailing Address: PULSCO, Inc.
17945 Sky Park Circle, Suite G
Irvine, CA 92614

Main Voice: Ph: 949.261.1717
TF: 877.785.7262
Fx: 949.975.0532

Email: sales@pulSCO.com

Web Page: www.pulSCO.com

Office Hours: 07:00-17:00 PST
(Voice Mail after Hours)

PULSCO

LINE SILENCER PRODUCT GUIDE

GENERAL INFORMATION

PULSCO has been designing and manufacturing industrial grade acoustic silencers to meet customers' specific requirements for over 50 years. The PULSCO line silencer is an ASME Section VIII Pressure Vessel that prevents high intensity noise generated by gas or steam turbulence from Flow Control Valves or Pressure Reducing Valves from propagating into the downstream piping and radiating into the surrounding space.

The overall size of a line silencer is directly proportional to the desired noise reduction and the flow rate of the particular gas. Noise reduction depends on the silencer's length while the diameter of the silencer depends on the gas flow rate. These silencers can range in size from 12 inches to over 10 feet in diameter. There are no moving parts in the operation of the line silencer.

In addition to providing the required backpressure on the valve, each line silencer is designed to attenuate the noise level by 25dB. Its design incorporates the acoustical benefits of both reactive and absorptive principles in a highly efficient design to provide a high degree of attenuation in a short length. The reactive components provide peak noise reduction in low frequency bands. The absorbing materials provide noise reduction over a broad frequency range. Each PULSCO line silencer is fitted with an inlet and outlet nozzle sized to be compatible with the customer's existing or planned piping. All PULSCO line silencers are quoted on a case by case basis incorporating customer unique specifications and operating conditions to fully meet each customer's form, fit and function requirements. Each silencer is designed and constructed to withstand the thermal and shock stresses produced by gas flows in high-pressure, high-temperature, continuous or periodic operations.

LINE SILENCER COMPONENTS

The three principal components of the PULSCO line silencer that actively reduce noise are the **Pressurized Inlet Diffuser**, **Plenum Section** and **Acoustic Tube Module** as shown in Figure 1. Each component contributes towards the diffusion and smoothing of the flow and an overall reduction of noise.

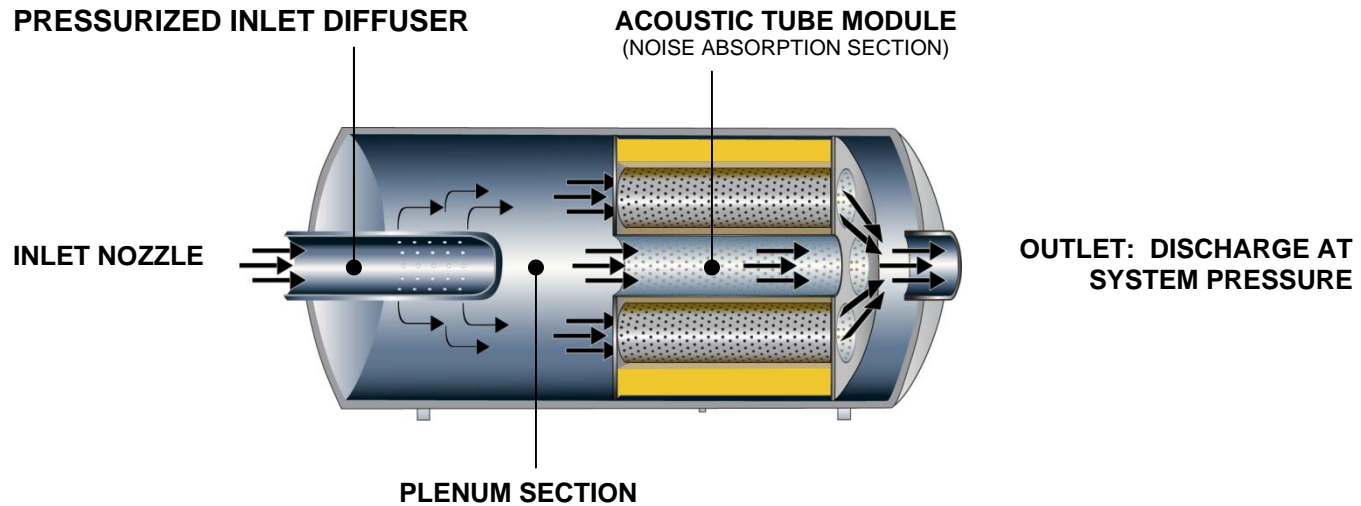


FIGURE 1. LINE SILENCER CROSS-SECTION

The **Pressurized Inlet Diffuser** provides energy dissipation and modification of the noise spectrum for easier attenuation. It does this by breaking up the large jet stream of gas into many small jets. The diffuser also provides the backpressure on the valve for optimum performance of the valve. This backpressure reduces the pressure drop across the valve which reduces the noise generated by the valve and reduces the velocity downstream of the valve. While increasing the pressure at the Inlet Diffuser will not affect the required diameter of the line silencer, ***it may reduce the size and noise trim requirements of the valve.*** Valve performance and life can be significantly improved by appropriate allocation of the pressure drop between the valve and line silencer. ***Providing appropriate backpressure on the valve has very little, if any, impact on the silencer cost but can significantly reduce the cost of the valve and piping.***

The **Plenum Section** is an expansion chamber and is constructed to smooth and uniformly distribute the flow while reducing sound energy before it enters the Acoustic Tube Module. It also slows the flow velocity prior to the gas or steam entering the Acoustic Tube Module

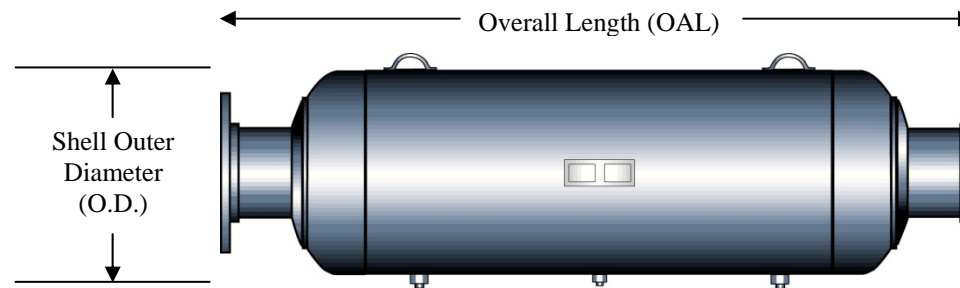
The **Acoustic Tube Module** consists of multiple parallel, circular flow tubes, surrounded by acoustic packing, that absorb and attenuate the acoustic energy entering from the Plenum section. In addition, this module is designed and constructed to accommodate the differential thermal expansions that occur in cyclical operations.

- The **SHELL, HEAD AND NOZZLES** are welded, heavy-duty fabrications designed to meet the ASME Section VIII Pressure Vessel requirements and constructed of plate steel or seamless pipe to give long lasting service and minimize noise radiation.
- **DRAIN COUPLINGS** are included as a means of draining liquid in the silencer when the silencer is out of service.
- A **COMPACT DESIGN** is utilized to minimize the required support structures. A variety of supports can be provided to meet specific field application requirements; the most common type being two support saddles.
- An **ACOUSTIC DESIGN** is utilized to achieve maximum attenuation of the noise level entering the silencer.
 - PULSCO offers **GUARANTEED PERFORMANCE of the silencer** when it is selected with the **PULSCO Line Silencer Sizing Program**. This program assures that the silencer will meet the specified application conditions for **both flow capacity and noise reduction**. The effects of the type of valve, the individual pressure drops across the valve and line silencer diffuser, and the specific design conditions are all included in the program.

PULSCO LINE SILENCER MODEL DESCRIPTIONS

The PULSCO line silencers are available to provide capacities for a wide range of flows. Each line silencer is specific to each application.

As shown in Figure 2, silencers are available in diameters ranging from 12 to 120 inches.



Model	LS 12-2	LS 18-2	LS 24-2	LS 30-2	LS 36-2	LS 42-2	LS 48-2	LS 54-2
Shell OD (inches)	12.75	18	24	30	36	42	48	54
O.A.L. (inches)	76	80	88	80	118	136	144	162
Shell OD (inches)	60	66	72	78	84	96	108	120
O.A.L. (inches)	142	160	164	180	184	185	203	215

FIGURE 2. LINE SILENCER MODEL DIMENSIONS

The basic components of each line silencer model are shown in Figure 3 and are described below.

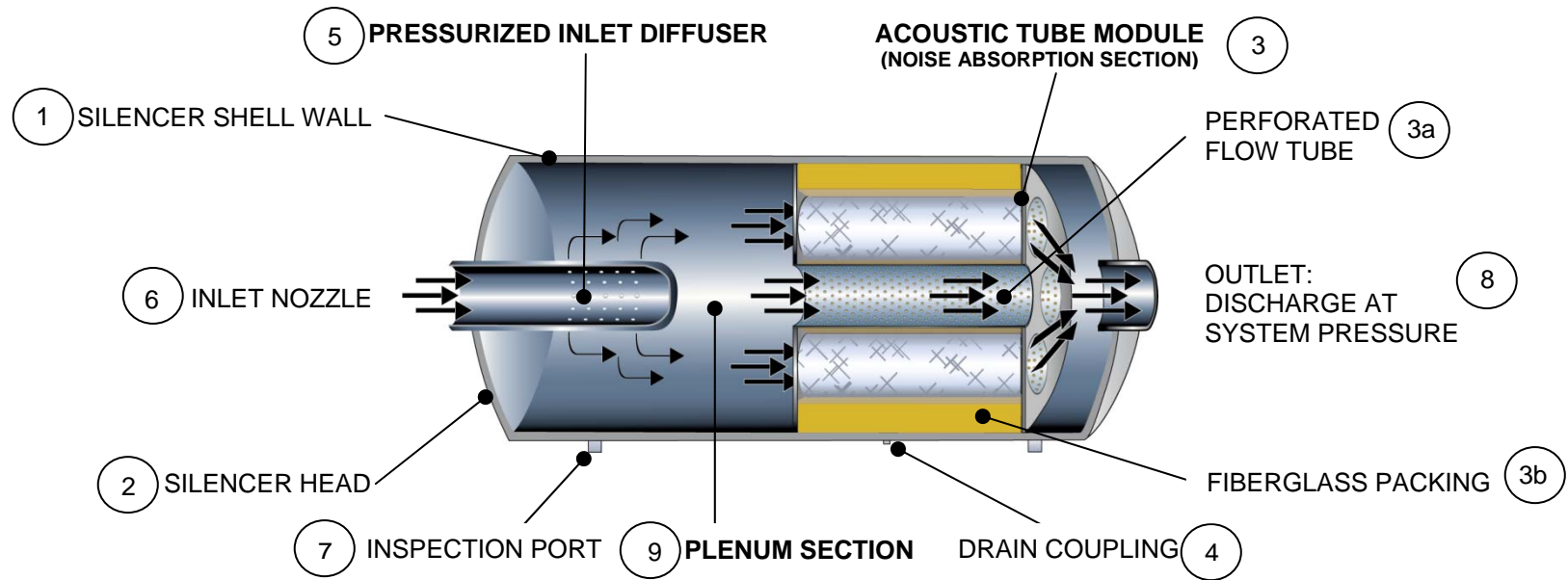


FIGURE 3. LINE SILENCER CROSS SECTION

- (1) Silencer Shell Wall: Heavy pressure containing vessel shell, rolled plate or seamless pipe, normally designed for maximum valve upstream pressure, plus 10%, as recommended by ASME Section VIII, Div. 1. However, depending on system configuration, a lower design pressure may be considered to lower the cost.
- (2) Silencer Heads: 2:1 Elliptical heads with nozzle designed to meet ASME Section VIII, Div. 1 requirements.
- (3) Acoustic Tube Module: The acoustically absorptive section; consists of **(3a)** perforated 14 gage steel flow tubes, **(3b)** fiberglass cloth wrapped around each tube provides erosion protection and **(3c)** acoustical packing consists of inert, non-combustible, moisture resistant fiberglass which has a high acoustic absorption coefficient.
- (4) Drain Coupling: 3/4" (minimum) National Pipe Thread (NPT) coupling installed in the vessel shell.
- (5) Pressurized Inlet Diffuser: Integral with the inlet nozzle; sized and configured to produce the required valve backpressure specified in the application data.
- (6) Inlet Nozzle: Beveled-for-weld pipe fitted through and attached to the head. (Flanges can be added).
- (7) Inspection Ports: ASME Code requirement to allow access for internal inspection of vessel.
- (8) Outlet Nozzle: Beveled-for-weld pipe fitted through and attached to the head. (Flanges can be added).
- Standard Finish: High temperature black on external surfaces of the shell and heads (Alternative finishes are available, if required by the customer).
- (9) Plenum Section: Expansion chamber to minimize noise transmission through the shell wall.

MATERIALS OF CONSTRUCTION

Silencer components are generally constructed from carbon steel. However, they may be constructed from other materials to meet specific design or application requirements such as high temperature, corrosive environment, or oxygen service. Material recommendations are dependent on the specified operating conditions.

For a corrosive environment, components or complete silencers can be constructed from a 300 Series Stainless Steel (usually 304 or 316). For oxygen service, Monel or a Monel/300 series steel combination is usually used together with special cleaning and degreasing procedures.

HIGH TEMPERATURE DESIGN

Construction materials and finishes used in Line Silencers designed for temperatures in excess of 1,000 °F are determined by the specified operating conditions. At these elevated temperatures, PULSCO establishes the silencer design as a “Special Design”. This requires particular attention to the design of the diffuser and may require all stainless-steel construction, special packing and extraordinary erosion protection.

- a) Economic high temperature black paint is available for temperatures up to 1,000 °F.
- b) Other paints such as zinc rich primer can be provided if required by the customer.

FLANGES

ANSI B16.5 flanges are normally quoted. Other type flanges can be can be quoted on an individual basis.

SILENCER SUPPORTS

Line silencers can be provided with external supports. PULSCO has a standard design for saddles. Other supports can be provided to meet specific customer requirements. We will design supports to meet specified loads and mounting requirements. We will also fabricate and install other designs per the customer drawings; the integrity of such designs is the responsibility of the customer. PULSCO can review the supporting requirements based on service and local environmental loads.

DESIGN PROCESS

The PULSCO Line Silencer Sizing Program incorporates the customer's operating conditions, specifications and system description to select the most cost effective line silencer configuration.

In order to properly size a line silencer, all operating conditions need to be considered. This includes start-up, steady state and any condition that may cause a high volumetric flow rate.

The following information is required to size a line silencer (please use the **QF 7.2 – 920 Line Silencer Application Sheet** and fax or e-mail the information to PULSCO):

1. The Fisher Sizing Report showing the Valve and Diffuser calculations
2. Type of Gas and Specific Gravity and Molecular Weight, if it is not steam
3. Pressure Downstream of the Silencer
Note: The line silencer should be sized for maximum steady state operating conditions, i.e., maximum flow at the specified pressure and temperature. However, off design transient points, such as start-up, must be considered to determine the maximum volumetric flow through the silencer. There is a direct relationship between the silencer system pressure (downstream of the silencer) and the actual volumetric flow rate. If the downstream system pressure decreases, the volumetric flow rate (all other parameters remaining the same) will increase and a larger silencer may be required. ***It is essential to identify the worst case or greatest volumetric flow rate for the application.***
4. Flow Rate
5. Ratio of Specific Heats (C_P/C_V)
6. Pressure Upstream of the Valve
7. Temperature Upstream of the Valve
8. Silencer Diffuser Inlet Pressure
9. Inlet and Outlet Nozzle Size
10. Connection Types
 - Flanged (size and rating for both Inlet and Outlet connections)
 - Butt Weld End (size and schedule or wall thickness)

11. Specific code requirements, if not ASME, and maximum design working pressure
12. Corrosion allowance, if any
13. Other requirements, such as orientation (most commonly horizontal), material of construction, paint, support requirements (if any, none or saddles for horizontal orientation), etc.

IMPORTANT: If the customer requires special construction and/or application standards, PULSCO must have their written requirements before a quotation is finalized. Unless PULSCO is provided copies of all relevant customer specifications, the silencers are manufactured to our standards.

The customer is provided with a drawing that is specific to the application. This drawing specifies:

- Silencer Dimensions
- Application Data and Conditions
- Materials of Construction
- Type of Finish
- Silencer Accessories, if any
- Special customer requirements and designations, if any

FREIGHT & SHIPPING

All orders shipped are F.O.B. factory unless other arrangements have been made. Unit sizes 12” through 36” are shipped on a skid to allow for pick up by fork or sling. Openings are covered and protected. The shipping packet contains a packing list, outline drawing and installation instructions.

Manufacturing lead-time is 8 to 16 weeks.

PULSCO warrants equipment for workmanship and materials for one year from date of initial operation or eighteen months from date of shipment, whichever is earlier.