Masoneilan™
Lo-dB™ Cartridges &
Expansion Plates
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Introduction

In the fluid process industry, to protect both the environment and the safety of plant personnel, users and industry regulators are more frequently demanding a sound pressure level (SL) of 85–90 dbA as measured one meter from the noise source. To meet this condition, particularly when the operating pressure drop exceeds the critical limit, many valve manufacturers recommend adding a downstream device to create back pressure on the valve and add an additional stage of pressure reduction.

There are two types of industry devices that are used to accomplish this condition. One option is a silencer, which provides a minimal pressure drop while adding shielding features to dampen noise. Due to their required expanded outlet to limit velocity, silencers can be quite heavy and cumbersome, and thus costly to purchase and install.

A second and more cost effective option is an expansion plate. Expansion plates are line–size devices that are matched to the expanded pipe downstream of the valve. The Masoneilan Lo-dB Cartridges and Lo-dB Plates by Baker Hughes have evolved the traditional drilled hole expansion plate into an engineered device that optimizes acoustical efficiency relative to flow capacity.

Industry testing has been documented on other devices to create pressure drops in series with valves such as multi-turn piping, perforated plates, and metal sponges to name a few. For most of these devices, the noise reduction was generally insufficient and many of these devices were easily clogged by common pipeline debris. Masoneilan Lo-dB Cartridge and Lo-dB Plates solve these problems by providing an optimized flow passage to balance flow capacity with noise reduction. In addition, the normal foreign material that is encountered in process piping easily passes through these cartridges and plates.

It is recommended that Lo-dB Cartridges and Plates be installed with Lo-dB valves such as the Series 21000, 41005, or 77000, when the pressure ratio is higher than 4, or with standard valves when their sound pressure level requires a reduction of 20 dbA or more.

Application

Masoneilan Lo-dB Cartridges and Plates are sized to sufficiently decrease the pressure drop across the valve until it becomes subcritical. Since this has little effect on the capacity of the valve, while greatly affecting the valve noise, it is normally unnecessary to increase the valve size. In general, proper application of a Lo-dB Cartridge or Plate requires a pressure ratio of at least 4 to 1. Lo-dB Cartridges and Plates are normally close coupled to the valve outlet in a closed system. Depending on the degree of noise reduction required, either single or multiple Lo-dB Cartridges and Plates are used with either standard or low noise valves. Sizing techniques for Lo-dB Cartridges and Plates are similar to valve sizing in regards to the use of C values.

Many open vent applications require large valve outlets and large downstream piping to eliminate the noise generated by high velocity fluid flow. These large systems can be expensive and may be unnecessary. By employing a Lo-dB Cartridge or Plate at the vent outlet, or at some downstream location, both the valve size and pipe size between the valve and Cartridges or Plates can be reduced, which can lead to significant savings in pipe costs. Lo-dB Cartridges and Plates used in combination with a vent silencer can lead to a significant cost reduction of the overall system.
Lo-dB Cartridges

Principle of Operation
Masonelian Lo-dB Cartridge is a static device that produces a pressure drop in gas or vapor applications where a high pressure reduction is required. The Cartridge employs a progressive pressure reduction through a tortuous path comprised of 16-stages. Through this staging process, the flow is also divided into a number of interconnected flow passages resulting in a microturbulent flow. Via these flow paths, both the mean velocity as well as all discrete point velocities are controlled below a target threshold. As a result, the Lo-dB Cartridge acts as a high volume flow restriction while providing excellent core strength. Because this unique flow matrix is created with uniform components that are oriented into a composite assembly, the $C_v$ is well-defined and reproducible.

Control valve with three Lo-dB Cartridges provides a cost effective method of noise control with gradual pipe expansion when dumping gas or steam into a low pressure system.

Installation
Lo-dB Cartridges are always mounted downstream of the control valve. For optimum noise reduction, Lo-dB Cartridges should be mounted as close as possible to, and preferably, directly adjacent to the valve outlet. Installation further downstream can result in piping cost savings, but can be less effective with regards to noise reduction.

The flow direction of the Lo-dB Cartridge is indicated by an external flow arrow. Make certain that the Lo-dB Cartridge is installed in the proper direction.

For flange mounted Lo-dB Cartridges, the outside diameter of the Cartridge housing matches the raised face diameter of the pipe flange.

When mounting between flanges, loosely connect the lower bolts to act as a cradle for the Cartridge. After the Cartridge is aligned, add the remaining bolts and tighten per normal torquing procedures.

Butt welded Lo-dB Cartridges are installed by normal welding techniques according to the housing material and the mating piping.

Large Lo-dB Cartridges are supplied with an eye bolt for maneuvering into position.

As in any high performance low noise device with small flow passages, the cleanliness of the system should be ensured before start-up.
Lo-dB Cartridges

Construction

Housing
The exterior housing of the Lo-dB Cartridge is constructed of carbon or stainless steel and machined to accept the internal components. At assembly, the internal components are compressed and held in place by welding the retainer ring to the housing. This construction applies to both flanged and butt weld constructions.

Reducer Ring
Reduced capacity Lo-dB Cartridges are designed with an additional 304 SST reducer ring inserted between the multi-stage element and the retainer ring.

Retainer Ring
Both the multi-stage element and the support grate are held in place by the 304 SST welded retainer ring.

Support Grate
The support grate is constructed of interlocked 304 SST bars and forms a trellis network whose diameter is equal to that of the multi-stage element. The support grate is shouldered against the housing to support the multi-stage element. Double support grates are available for increased pressure drops.

Multi-Stage Element
The multi-stage element is constructed of a stack of resistance welded 304 SST grilles. Adjacent grilles are oriented in a controlled manner to maintain flow characteristics. The positioning of adjacent grilles with respect to each other provides the required noise reduction.
Lo-dB Cartridges

General Data

Flow Direction
Uni-directional – per flow arrow

Cv Range
15 to 5900

Minimum Fluid Temperature
−20°F (−29°C)

Maximum Fluid Temperature
750°F (399°C)

Connections
2" to 36" (DN50 to DN900) – mount between line flanges up to ASME Class 2500
16" to 36" (DN400 to DN900) – butt weld to schedule 40

1. Refer to ΔP versus Temperature graph page 7 for maximum static ratings. Other standard pipe schedules can be accommodated. See page 8.

Materials

Multi-Stage Element
304 stainless steel

Grate
304 stainless steel

Retainer Ring
304 stainless steel

Reducer Ring (for reduced capacity only)
304 stainless steel

Housing (flange mounted)
ASTM A515 Grade 70 carbon steel to 650°F (343°C)
ASTM A240 Type 304 stainless steel to 750°F (399°C)

Housing (butt welded)
ASTM A106 Grade B carbon steel to 650°F (343°C)
ASTM A312 Type 304 stainless steel to 750°F (399°C)

Flow Coefficient – Rated Cv² for Standard Lo-dB Cartridges

<table>
<thead>
<tr>
<th>Cartridge Nominal Size</th>
<th>Capacity</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>10</th>
<th>12</th>
<th>16</th>
<th>20</th>
<th>24</th>
<th>30</th>
<th>36</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN 50</td>
<td>Full</td>
<td>21</td>
<td>45</td>
<td>82</td>
<td>195</td>
<td>330</td>
<td>535</td>
<td>780</td>
<td>1200</td>
<td>1900</td>
<td>2700</td>
<td>4200</td>
<td>5900</td>
</tr>
<tr>
<td></td>
<td>0.9</td>
<td>19</td>
<td>40</td>
<td>74</td>
<td>175</td>
<td>300</td>
<td>480</td>
<td>700</td>
<td>1080</td>
<td>1710</td>
<td>2430</td>
<td>3750</td>
<td>5300</td>
</tr>
<tr>
<td></td>
<td>0.8</td>
<td>17</td>
<td>36</td>
<td>65</td>
<td>155</td>
<td>265</td>
<td>430</td>
<td>625</td>
<td>950</td>
<td>1500</td>
<td>2200</td>
<td>3350</td>
<td>4700</td>
</tr>
<tr>
<td></td>
<td>0.7</td>
<td>15</td>
<td>31</td>
<td>55</td>
<td>135</td>
<td>230</td>
<td>375</td>
<td>545</td>
<td>840</td>
<td>1330</td>
<td>1890</td>
<td>2900</td>
<td>4150</td>
</tr>
</tbody>
</table>

2. Full flow coefficients are based on mating to Schedule 40 pipe. For capacity limitations imposed by use with heavier pipe schedules, see table on page 8.

Dimensions for Standard Lo-dB Cartridges

<table>
<thead>
<tr>
<th>Nominal Size</th>
<th>Flange Mounted ASME Class 150 to 2500</th>
<th>Butt Welded Schedule 40 Pipe</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Inches</td>
<td>DN</td>
<td>A</td>
</tr>
<tr>
<td>2</td>
<td>50</td>
<td>3.6</td>
</tr>
<tr>
<td>3</td>
<td>75</td>
<td>5.0</td>
</tr>
<tr>
<td>4</td>
<td>100</td>
<td>6.2</td>
</tr>
<tr>
<td>6</td>
<td>150</td>
<td>8.5</td>
</tr>
<tr>
<td>8</td>
<td>200</td>
<td>10.7</td>
</tr>
<tr>
<td>10</td>
<td>250</td>
<td>12.8</td>
</tr>
<tr>
<td>12</td>
<td>300</td>
<td>15.0</td>
</tr>
<tr>
<td>16</td>
<td>400</td>
<td>18.5</td>
</tr>
<tr>
<td>20</td>
<td>500</td>
<td>23.0</td>
</tr>
<tr>
<td>24</td>
<td>600</td>
<td>27.2</td>
</tr>
<tr>
<td>30</td>
<td>750</td>
<td>33.7</td>
</tr>
<tr>
<td>36</td>
<td>900</td>
<td>40.2</td>
</tr>
</tbody>
</table>
Lo-dB Cartridges

Specifications

Pressure Drop vs. Temperature

<table>
<thead>
<tr>
<th>Temperature (°F)</th>
<th>0°</th>
<th>200°</th>
<th>400°</th>
<th>600°</th>
<th>800°</th>
</tr>
</thead>
<tbody>
<tr>
<td>°C</td>
<td>-18°</td>
<td>93°</td>
<td>204°</td>
<td>316°</td>
<td>427°</td>
</tr>
</tbody>
</table>

1. Consult Baker Hughes for other temperatures and materials.
2. Custom constructions are available to satisfy larger pressure drops. Consult Baker Hughes for application assistance.
3. For cyclic applications with temperatures exceeding 650°F (343°C) contact Baker Hughes.
## Lo-dB Cartridges

### Capacity Limitations for Standard Lo-dB Cartridges

<table>
<thead>
<tr>
<th>Cartridge Nominal Size</th>
<th>Mating Pipe Size</th>
<th>Schedule</th>
<th>Maximum Capacity Factor</th>
<th>Maximum $C_v$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inches</td>
<td>DN</td>
<td>40/ST 80/XS 160 XXS</td>
<td>Full</td>
<td>0.9</td>
</tr>
<tr>
<td>2</td>
<td>50</td>
<td>Full</td>
<td>0.9</td>
<td>0.7</td>
</tr>
<tr>
<td>3</td>
<td>75</td>
<td>Full</td>
<td>0.9</td>
<td>0.7</td>
</tr>
<tr>
<td>4</td>
<td>100</td>
<td>Full</td>
<td>0.9</td>
<td>0.7</td>
</tr>
<tr>
<td>6</td>
<td>150</td>
<td>Full</td>
<td>0.9</td>
<td>0.7</td>
</tr>
<tr>
<td>8</td>
<td>200</td>
<td>Full</td>
<td>0.9</td>
<td>0.7</td>
</tr>
<tr>
<td>10</td>
<td>250</td>
<td>Full</td>
<td>0.9</td>
<td>0.7</td>
</tr>
<tr>
<td>12</td>
<td>300</td>
<td>Full</td>
<td>0.9</td>
<td>0.7</td>
</tr>
</tbody>
</table>

The above table lists capacity limits for 2" to 12" (DN50 to DN300) cartridges when installed in common heavy wall piping. For other cartridge sizes and pipe schedules, contact Baker Hughes. Refer to page 7 for maximum pressure and temperature limits. See below for typical examples.
Lo-dB Expansion Plates

Principle of Operation

Masoneilan Lo-dB Expansion Plates are two-stage multi-port devices specifically designed to absorb a large percentage of the pressure drop that would otherwise be handled by the control valve. This can reduce the amount of noise generated by the system by up to 20 db. Lo-dB Expansion Plates are mounted downstream of a control valve to raise the valve outlet pressure while maintaining a choked flow condition across the valve. This serves to reduce the downstream velocity and ensures that the noise generated in the downstream pipe does not exceed the valve noise. As with Lo-dB Cartridges, Lo-dB Plates do not necessitate use of larger control valves. These devices reduce noise and related vibration instead of muffling noise like conventional silencers.

In general, Lo-dB Plates are more restrictive than Lo-dB Cartridges within the same nominal size. Thus, Lo-dB Plates provide more back pressure to the adjacent valve and are more effective at reducing noise.

Installation

Lo-dB Expansion Plates are always mounted downstream of the control valve. The distance between the valve and the Plate, or between adjacent Plates in series, is not critical. A Plate can be mounted in any convenient location in the downstream piping. In most cases, valves and reducers having heavier walls than the adjoining piping provide additional noise attenuation. The Plate itself acts as a barrier to the sound waves produced upstream. If the Lo-dB Plate is mounted directly against the valve outlet flange, or if the valve and Plate are only separated by a reducer, an additional net reduction of 6 dB in valve sound pressure level is obtained.

The flow direction of the Lo-dB Plate is indicated by an external flow arrow. Make certain that the Plate is installed in the proper direction.

Lo-dB Plates from size 3” to 12” (DN75 to DN300) are bolted between conventional ASME Class pipe flanges on the downstream side of the control valve, normally in conjunction with pipe expanders. The outside diameter of the Lo-dB Plate housing matches the raised face diameter of the pipe flange. When mounting between flanges, loosely connect the lower bolts to act as a cradle for the Plate. After the Plate is aligned, add the remaining bolts and tighten per normal torquing procedures.

Larger Lo-dB Plates, from size 16” to 36”, (DN400 to DN900) are designed with butt weld connections. Butt welded Lo-dB Plates are installed by normal welding techniques according to the housing material and the mating piping. Large Lo-dB Plates are supplied with an eye bolt for maneuvering into position.

As in any high performance low noise device with small flow passages, the cleanliness of the system should be ensured before start-up.

Flow Coefficient-Rated $C_v$ for Standard and Reduced Lo-dB Plates

<table>
<thead>
<tr>
<th>Nominal Plate Size</th>
<th>Rated $C_v$ 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inches DN Full Reduction 1 Reduction 2 Reduction 3</td>
<td></td>
</tr>
<tr>
<td>3 75</td>
<td>20</td>
</tr>
<tr>
<td>4 100</td>
<td>40</td>
</tr>
<tr>
<td>6 150</td>
<td>80</td>
</tr>
<tr>
<td>8 200</td>
<td>155</td>
</tr>
<tr>
<td>10 250</td>
<td>230</td>
</tr>
<tr>
<td>12 300</td>
<td>310</td>
</tr>
<tr>
<td>16 400</td>
<td>450</td>
</tr>
<tr>
<td>18 450</td>
<td>620</td>
</tr>
<tr>
<td>20 500</td>
<td>700</td>
</tr>
<tr>
<td>24 600</td>
<td>920</td>
</tr>
<tr>
<td>26 650</td>
<td>1240</td>
</tr>
<tr>
<td>30 750</td>
<td>1840</td>
</tr>
<tr>
<td>36 900</td>
<td>2480</td>
</tr>
</tbody>
</table>

1 Use $C_v$ in conjunction with the sizing equations. See Baker Hughes Noise Control Manual.
Lo-dB Expansion Plates

Masoneilan Lo-dB Plates employ a two-stage pressure reduction flow path which limits velocity variation from stage to stage and creates thorough mixing of the fluid. These features contribute to the high noise reduction capabilities of the Lo-dB Plates.

The Lo-dB Plates are constructed of 304 SST welded to a carbon steel housing for use up to 650°F (343°C). For higher temperatures, a housing constructed of 304 SST is used. Consult the Baker Hughes Engineering Department if the ΔP versus temperature ratings on page 11 will be exceeded.

**Housing**
The exterior housing of the Lo-dB Plate is constructed of carbon or stainless steel and machined to accept the plates. At assembly, the plates are compressed and held in place during full circumferential welding.

**Drilled Hole Plates**
The first and second stage plates are constructed of 304 stainless steel. The arrangement of the drilled hole configuration is designed to provide optimum 2-stage pressure reduction.

**Plate Spacer**
The plate spacer is employed to provide alignment during fabrication and structural support in service.

**General Data**
- **Flow Direction**: Uni-directional – per flow arrow
- **Cv Range**: 12 to 2480
- **Minimum Fluid Temperature**: −20°F (−29°C)
- **Maximum Fluid Temperature**: 750°F (399°C)

**Connections**
- 3” to 12” (DN75 to DN300) – mount between line flanges up to ASME Class 2500
- 16” to 36” (DN400 to DN900) – butt weld to schedule 40

**Materials**
- **Drill Hole Plates**: 304 stainless steel
- **Housing (flange mounted)**
  - ASTM A515 Gr 70 carbon steel to 650°F (343°C)
  - ASTM A240 Type 304 stainless steel to 750°F (399°C)
- **Housing (butt welded)**
  - ASTM A106 Gr B carbon steel to 650°F (343°C)
  - ASTM A312 Type 304 stainless steel to 750°F (399°C)

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1. Refer to ΔP versus Temperature graph page 11 for maximum static ratings. Other standard pipe schedules can be accommodated. Consult Baker Hughes.
## Lo-dB Expansion Plates

### Specifications

#### Pressure Drop vs. Temperature

<table>
<thead>
<tr>
<th>Service Temperature</th>
<th>°F</th>
<th>°C</th>
<th>0°</th>
<th>200°</th>
<th>400°</th>
<th>600°</th>
<th>800°</th>
<th>1000°</th>
</tr>
</thead>
<tbody>
<tr>
<td>-18°</td>
<td>93°</td>
<td>204°</td>
<td>316°</td>
<td>427°</td>
<td>538°</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Consult Baker Hughes for other temperatures and materials.
2. Custom constructions are available to satisfy larger pressure drops. Consult Baker Hughes for application assistance.

### Lo-dB Expansion Plates Specifications

<table>
<thead>
<tr>
<th>Plate Nominal Size</th>
<th>Flange Mounted ASME 150 to 2500</th>
<th>Butt Welded Schedule 40 Pipe</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td><strong>Inches</strong></td>
<td><strong>DN</strong></td>
<td><strong>mm</strong></td>
</tr>
<tr>
<td>3</td>
<td>75</td>
<td>1.2</td>
</tr>
<tr>
<td>4</td>
<td>100</td>
<td>1.2</td>
</tr>
<tr>
<td>6</td>
<td>150</td>
<td>1.5</td>
</tr>
<tr>
<td>8</td>
<td>200</td>
<td>1.5</td>
</tr>
<tr>
<td>10</td>
<td>250</td>
<td>2.0</td>
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<tr>
<td>12</td>
<td>300</td>
<td>2.0</td>
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<tr>
<td>16</td>
<td>400</td>
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<tr>
<td>18</td>
<td>450</td>
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<tr>
<td>20</td>
<td>500</td>
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<tr>
<td>24</td>
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<td>26</td>
<td>650</td>
<td>-</td>
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<tr>
<td>30</td>
<td>750</td>
<td>-</td>
</tr>
<tr>
<td>36</td>
<td>450</td>
<td>-</td>
</tr>
</tbody>
</table>

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