**FlowGuard® Pulsation Dampeners**

Pulsation Dampeners are hydro-pneumatic devices designed to remove pulsations, vibrations and noise caused by positive displacement pumps in fluid systems.

Using pulsation dampeners on positive displacement pumped systems will result in improved instrument readings, increased pump life, lower maintenance costs, and lower running costs. They eliminate the possibility of pipe fracture caused by vibration and safeguard personnel from the risk of leaks.

**Principles of Operation**
FlowGuard Pulsation Dampeners operate by employing a small volume of gas, usually Nitrogen, contained within a flexible membrane fitted inside a non-corrosive shell. Each time a pulse comes from the pump, part of the pulse goes into the dampener and the gas is compressed slightly. As the flow decreases the pulse stored in the damper will be pushed back into the line, the result is a smooth flow which will keep pressure fluctuations within the required limits (level of damping).

**Designed Efficiency**
Superior, uncomplicated, and efficient designs ensure levels of performance unmatched by traditional adapted hydraulic accumulators. Their basic, yet rugged, construction makes them economically priced and easy to maintain.

**Exceptionally Durable**
Our standard housings are made of non-corrosive 316 stainless steel, polypropylene, or of special alloys like titanium, Hastelloy®, Monel®, etc. The membrane is available in 10 different types of rubber or PTFE (Teflon®) bellows or diaphragm.

**FlowGuard Pulsation Dampeners** are fitted to metering pumps, multi-plunger pumps, air-operated-diaphragm pumps, and peristaltic pumps in the following industries:

- **Oil & Gas**
  - Used widely in the industry for:
    - Corrosion/scale inhibitors
    - Oxygen scavengers
    - Biocides
    - Foam point depressants
    - Polyelectrolyte pumps
    - Chemical injection pumps
    - Methanol injection pumps
    - Multi-plunger pumps for glycol regeneration and condensate recovery

- **Chemical & Petrochemical**
  - For effectively handling slurries, solvents, acids, alkalies, olefins, amines, several other difficult materials as well as water and non-aggressive fluids — pump applications include:
    - Metering pumps
    - Air-driven diaphragm pumps
    - Multipurpose pumps
    - Peristaltic pumps
    - Boiler feed
    - Low/high pressure metering and transfer duties

- **Confectionary & Chocolate**
  - Used on blending and spraying applications and on filling machines

- **Water and Effluent Treatment**
  - Used on dosing pumps, peristaltic pumps, and air-operated-diaphragm pumps for the metering of treatment chemicals and for the transfer of industrial and domestic effluent

- **Water Jetting**
  - Our in-line pulsation dampeners are fitted to high-speed, multi-plunger pumps on mobile sewer cleaning rigs, rodding pumps, jet cutting, and cleaning applications to stop hose wear due to snaking and pipe vibration — and to reduce damage to valves

- **Reverse Osmosis**
  - Used in plants for desalination, dewatering of foodstuffs, and concentration of pharmaceutical products — they reduce the noise and vibration from high-speed multi-plunger pumps and protect the reverse osmosis membranes

- **Common Applications**
  - Used on metering pumps, multi-plunger pumps, air-operated-diaphragm pumps, and peristaltic pumps in the following industries:
    - Multi-plunger pumps for glycol regeneration and condensate recovery
    - Paper & Textiles
      - Found on peristaltic pumps, filling machines, air-operated-diaphragm, and blending pumps for a variety of applications
    - Detergents and Toiletries
      - Fitted to blending pumps for perfumes, colourings, and other additives. Also used for air-operated-diaphragm pumps for bulk transport of base products and inlets of filling machines
    - Food Dairy and Beverage
      - Used on metering pumps for blending, spray drying, mixing applications, and to remove high-frequency-pressure pulsations from homogenisers
    - Paints & Varnishes
      - Used for spraying applications with both air-operated-diaphragm pumps and proportioning pumps — also useful on blending and bulk transfer duties
    - Chemicals
      - Found on peristaltic pumps, filling machines, air-operated-diaphragm, and blending pumps for a variety of applications
    - Metalworking
      - Used on metering pumps for blending, spray drying, mixing applications, and to remove high-frequency-pressure pulsations from homogenisers
    - Chemical Injection
      - Used on dosing pumps, peristaltic pumps, and air-operated-diaphragm pumps for the metering of treatment chemicals and for the transfer of industrial and domestic effluent
    - Reverse Osmosis
      - Used in plants for desalination, dewatering of foodstuffs, and concentration of pharmaceutical products — they reduce the noise and vibration from high-speed multi-plunger pumps and protect the reverse osmosis membranes

- **Other Features of FlowGuard Pulsation Dampeners**
  - Unrestricted inlet port (no poppet valve) for improved dampening efficiency
  - Welded flange connections as well as BSP & NPT threaded
  - Very simple gas charging system
  - One-piece, moulded membranes (no glued joints) on all standard sizes
  - In-line (2-port) available as an option with a choice of port orientation
  - Easy-to-service membrane can be changed without removing dampener from the line
  - Fully coded and approved welding with 100% x-ray if required

**Certified High Quality**
Designed and manufactured to the highest standards, FlowGuard pulsation dampeners conform to internationally recognized pressure vessel codes and may be supplied with full material certification (ASME Coded) if required.

**Broad Range to Fit Your Needs**
Our wide range of FlowGuard pulsation dampeners fulfill most pressure requirements from 10 bar/150 psi to 1034 bar/15,000 psi and may be custom made to meet any specification or a particular duty requirement.
### FD Series

**PTFE Diaphragm Dampeners**

- Lifting Eye for heavier models
- Designed for ease of servicing

**FD - Type A**
- Shell Material: 316 Stainless Steel, Polypropylene & PVC, Titanium, Hastelloy C, Monel 400

### Features:
- 316 stainless, polypropylene & PVC construction
- Ex-stock delivery
- Easy to fit
- Proven performance
- Threaded or flanged connections
- Simple maintenance
- Full technical assistance
- Swift response

### Pressures are calculated in accordance with PD5500 and are based on 316 stainless steel at a design temperature of 100°C (212°F).

### DP & DV Series

**Polypropylene and PVC Pulsation Dampeners**

- Simple maintenance and installation
- Resistant to a wide range of chemicals
- ISO 9001:2008 Certified Company

### DS Series

**316 Stainless Steel Dampeners**

- Simple maintenance & installation
- Suitable for most processes
- ISO 9001:2008 Certified Company

### Bladder-Type Pulsation Dampener

**TYPE A**
- DP & DV Series Shell Material: Polypropylene (DP Series) or PVC (DV Series)
- Documentation: Hydrostatic Test Certificate; Installation Operation & Maintenance Instruction

### Features:
- Ex-stock availability; economical
- Proven performance; reliable
- Full technical back-up
- ISO 9001:2008 Certified Company

### Bladder-Type Pulsation Dampener

**TYPE E**
- DS Series Shell Material: 316 Stainless Steel
- Documentation: Hydrostatic Test Certificate; Installation Operation & Maintenance Instruction

### CHOICE OF SHELL MATERIAL TO SUIT PROCESS CONDITIONS

- Stainless, Double Seated
- Gas Charging Valve
- PTFE Diaphragm for Arduous Chemicals
- Threaded Connections Standard (Flange option available)
- Unrestricted Entry for Fluids

---

### Model Volume

<table>
<thead>
<tr>
<th>Type</th>
<th>Model</th>
<th>Volume (litres)</th>
<th>Pressure (bar)</th>
<th>Connection</th>
<th>Diameter (mm)</th>
<th>Length (mm)</th>
<th>Weight (Kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FD 15</td>
<td>0.05 (0.02)</td>
<td>95 (127)</td>
<td>1/2&quot;</td>
<td>109</td>
<td>75</td>
<td>10 (2.2)</td>
<td></td>
</tr>
<tr>
<td>FD 20</td>
<td>0.10 (0.03)</td>
<td>95 (127)</td>
<td>1/2&quot;</td>
<td>109</td>
<td>75</td>
<td>15 (34.1)</td>
<td></td>
</tr>
<tr>
<td>FD 30</td>
<td>0.15 (0.05)</td>
<td>95 (127)</td>
<td>1/2&quot;</td>
<td>109</td>
<td>75</td>
<td>15 (34.1)</td>
<td></td>
</tr>
<tr>
<td>FD 40</td>
<td>0.20 (0.06)</td>
<td>95 (127)</td>
<td>1/2&quot;</td>
<td>109</td>
<td>75</td>
<td>15 (34.1)</td>
<td></td>
</tr>
<tr>
<td>FD 50</td>
<td>0.25 (0.06)</td>
<td>95 (127)</td>
<td>1/2&quot;</td>
<td>109</td>
<td>75</td>
<td>15 (34.1)</td>
<td></td>
</tr>
</tbody>
</table>

---

### Pneumatic Diaphragm Dampeners

- Designed for ease of servicing
- Lifting eye for heavier models

### Model Volume

<table>
<thead>
<tr>
<th>Type A</th>
<th>Model</th>
<th>Volume (litres)</th>
<th>Pressure (bar)</th>
<th>Connection</th>
<th>Diameter (mm)</th>
<th>Length (mm)</th>
<th>Weight (Kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DP 01</td>
<td>0.00 (0.00)</td>
<td>53 (774)</td>
<td>1/2&quot;</td>
<td>109</td>
<td>75</td>
<td>10 (2.2)</td>
<td></td>
</tr>
<tr>
<td>DP 02</td>
<td>0.02 (0.01)</td>
<td>53 (774)</td>
<td>1/2&quot;</td>
<td>109</td>
<td>75</td>
<td>15 (34.1)</td>
<td></td>
</tr>
<tr>
<td>DP 40</td>
<td>0.40 (0.06)</td>
<td>53 (774)</td>
<td>1/2&quot;</td>
<td>109</td>
<td>75</td>
<td>15 (34.1)</td>
<td></td>
</tr>
</tbody>
</table>

---

### Other Models

- PD - Type A
- Documentation: Standard Certification to DIN 50049 3 lb
- Features:
  - 316 stainless, polypropylene & PVC construction
  - Ex-stock delivery
  - Easy to fit
  - Proven performance
  - Threaded or flanged connections
  - Simple maintenance
  - Full technical assistance
  - Swift response

---

### Choice of Shell Material

- Stainless, double seated
- Gas charging valve
- PTFE diaphragm for arduous chemicals
- Threaded connections standard (flange option available)
- Unrestricted entry for fluids

---

### Table for Other Models

<table>
<thead>
<tr>
<th>Type A</th>
<th>Model</th>
<th>Volume (litres)</th>
<th>Pressure (bar)</th>
<th>Connection</th>
<th>Diameter (mm)</th>
<th>Length (mm)</th>
<th>Weight (Kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 00</td>
<td>0.00 (0.00)</td>
<td>53 (774)</td>
<td>1/2&quot;</td>
<td>109</td>
<td>75</td>
<td>10 (2.2)</td>
<td></td>
</tr>
<tr>
<td>CS 01</td>
<td>0.01 (0.01)</td>
<td>53 (774)</td>
<td>1/2&quot;</td>
<td>109</td>
<td>75</td>
<td>15 (34.1)</td>
<td></td>
</tr>
<tr>
<td>CS 10</td>
<td>0.10 (0.01)</td>
<td>53 (774)</td>
<td>1/2&quot;</td>
<td>109</td>
<td>75</td>
<td>15 (34.1)</td>
<td></td>
</tr>
<tr>
<td>CS 20</td>
<td>0.20 (0.02)</td>
<td>53 (774)</td>
<td>1/2&quot;</td>
<td>109</td>
<td>75</td>
<td>15 (34.1)</td>
<td></td>
</tr>
</tbody>
</table>

---

### Table for Other Models

<table>
<thead>
<tr>
<th>Type A</th>
<th>Model</th>
<th>Volume (litres)</th>
<th>Pressure (bar)</th>
<th>Connection</th>
<th>Diameter (mm)</th>
<th>Length (mm)</th>
<th>Weight (Kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 00</td>
<td>0.00 (0.00)</td>
<td>53 (774)</td>
<td>1/2&quot;</td>
<td>109</td>
<td>75</td>
<td>10 (2.2)</td>
<td></td>
</tr>
<tr>
<td>CS 01</td>
<td>0.01 (0.01)</td>
<td>53 (774)</td>
<td>1/2&quot;</td>
<td>109</td>
<td>75</td>
<td>15 (34.1)</td>
<td></td>
</tr>
<tr>
<td>CS 10</td>
<td>0.10 (0.01)</td>
<td>53 (774)</td>
<td>1/2&quot;</td>
<td>109</td>
<td>75</td>
<td>15 (34.1)</td>
<td></td>
</tr>
<tr>
<td>CS 20</td>
<td>0.20 (0.02)</td>
<td>53 (774)</td>
<td>1/2&quot;</td>
<td>109</td>
<td>75</td>
<td>15 (34.1)</td>
<td></td>
</tr>
</tbody>
</table>

---

### Table for Other Models

<table>
<thead>
<tr>
<th>Type A</th>
<th>Model</th>
<th>Volume (litres)</th>
<th>Pressure (bar)</th>
<th>Connection</th>
<th>Diameter (mm)</th>
<th>Length (mm)</th>
<th>Weight (Kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 00</td>
<td>0.00 (0.00)</td>
<td>53 (774)</td>
<td>1/2&quot;</td>
<td>109</td>
<td>75</td>
<td>10 (2.2)</td>
<td></td>
</tr>
<tr>
<td>CS 01</td>
<td>0.01 (0.01)</td>
<td>53 (774)</td>
<td>1/2&quot;</td>
<td>109</td>
<td>75</td>
<td>15 (34.1)</td>
<td></td>
</tr>
<tr>
<td>CS 10</td>
<td>0.10 (0.01)</td>
<td>53 (774)</td>
<td>1/2&quot;</td>
<td>109</td>
<td>75</td>
<td>15 (34.1)</td>
<td></td>
</tr>
<tr>
<td>CS 20</td>
<td>0.20 (0.02)</td>
<td>53 (774)</td>
<td>1/2&quot;</td>
<td>109</td>
<td>75</td>
<td>15 (34.1)</td>
<td></td>
</tr>
</tbody>
</table>
Thermal Expansion Compensators
Internal flexible membrane reacts instantly to liquid expansion

Problems
- Temperature increases
- Unwanted spillages
- Broken pipelines
- Leaks
- Contamination from relief valves
- Excess pressures
- Liquid expansion

Static liquid, subject to even a modest temperature rise, will expand. This can result in extremely high pressures being generated by the expanding liquid. Unless compensated for, the excessive pressure build up will rupture pipework causing damage to instrumentation, pipework, vessels and equipment – therefore, expensive downtimes. Costly leakage of product from flanges and fittings can result in a serious risk to the safety of personnel and possible contravention of environmental regulations.

Solution
The installation of a FlowGuard Thermal Expansion Compensator, correctly sized, will allow expanding liquid to collect into the chamber of a pressure vessel. The gas-filled membrane automatically contracts to allow more fluid into the chamber. As the temperature falls, the compensator allows the contracting fluid to return to the pipeline – thus preventing pipeline ruptures and consequential leakage.

Pipeline Surge Absorbers
Internal flexible bladder reacts instantly to pressure surge

Problems
- Frequent breakages
- Water hammer
- Cracked casings
- Pipe vibrations
- Ruptured flanges
- Leaks

A rapid valve closure or a sudden pump stoppage will cause a pipeline of fluid flow to rebound back along the pipe. This rebound is a shock wave traveling at the speed of sound and contains all the energy of the preceding flow. The pressures reached can be many times more than the normal operating pressure of the pipeline and, indeed, can often greatly exceed the design pressure of pipework and pipeline equipment. This results in catastrophic failure at the weakest points.

Solution
The FlowGuard Surge Absorber, correctly sized, is located near the source of the problem. The internal gas-filled membrane will contract instantaneously to cushion the shock waves. FlowGuard Surge Absorbers are computer designed to alleviate energy spikes and assists with difficult pump start-ups.
FlowGuard Pulsation Dampeners Are Used In The Following Processes and Conditions:

**Blending and Proportioning** — to ensure continuous, steady flow, thus achieving uniformity of product

**Dosing** — for continuous, steady flow of chemical additives

**Filling** — to ensure accuracy and repeatability at high filling rates

**Metering** — to increase pump metering accuracy and repeatability

**Mixing** — to ensure continuous flow of product to enhance performance of static and dynamic in line mixers

**Prevention** — to prevent relief valves lifting and premature rupture of bursting discs

**Protection** — to protect pipework, heat exchangers, vessels & reactors from the damaging effects of pressure peaks

**Safety** — to prevent leaks from flanges and pipejoints due to overpressurisation which can contravene health & safety and environmental regulations

**Spraying** — to obtain uniform thickness of spray coatings

**Membranes:** Nitrile, Butyl, EPDM, Viton®, PTFE, and many more.

Designed for strength; PD5500, ASME 8.

Catering for temperatures to suit.

Whatever and wherever the problem, our experienced engineering staff will determine the optimal combination of materials and designs for process liquid and pressure compatibility.

**Shell Materials:** Stainless, Carbon, Titanium, Duplex, Super Duplex, Hasteloy, Incoloy.

Charts intended to illustrate typical properties. Property values vary with method of manufacture, size, and shape of part. Data contained herein is not to be construed as absolute and does not constitute a representation or warranty for which CoorsTek assumes legal responsibility. Hastelloy is a registered trademark of Haynes International, Inc. Monel is a trademark of Special Metals Corporation. Teflon is a registered trademark of E. I. du Pont de Nemours and Company. Incoloy is a registered trademark of Inco Alloys International, Inc. CoorsTek, Amazing Solutions, and FlowGuard are registered trademarks of CoorsTek, Inc.

FlowGuard Ltd. has over 30 years of proven applications experience in various industries.