Soft Seated HUSH™ Trim
**General**
The long-standing and high cost problem of leaking control valves in severe duty power and process applications has been solved through the development of a unique soft seat trim design. It is not unusual for generating plants to lose up to 10% of capacity through leakage, often costing from USD $500,000 to $1,000,000 per year. Trim leakage often occurs in severe duty applications such as boiler feed pump recirculation valves. These valves typically are required to remain closed approximately 95% of the time, against shutoff pressures of up to 5000 psig (34450 kPa).

Copes-Vulcan's Soft Seated HUSH® Trim can save money by preventing lost capacity, plus a substantial reduction in maintenance costs.

Copes-Vulcan's Engineering Center has developed and tested a patented soft seated trim which maintains zero (bubble tight) leakage throughout the service life of the trim.

The trim is designed for new as well as existing valve installations. Known as the Soft Seated HUSH Trim, the design is unique in that it uses a dual plug, with a primary plug engaging the soft seat and an inner plug engaging the secondary metal seat, thereby preventing throttling at the soft seat. The soft seated trim, when used in conjunction with Copes-Vulcan's HUSH Trim, reduces all likelihood of damaging cavitation.

**Field Documentation**
Soft Seated HUSH Trims have been operating in boiler feed pump recirculation valves at numerous generating stations since May of 1985. Test apparatus designed at Copes-Vulcan's Engineering Center verifies seat tightness, and hence zero leakage.

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1 Patent Numbers 598859 & 599252
2 Leakage rate equals 0 cc/minute at maximum service differential pressure with water at 60°F (16°C).

**Applications**
Soft Seated HUSH Trim is designed for new or replacement trims in Copes-Vulcan valves as well as valves of other manufacturers. Any liquid control valve taking a pressure drop up to 5000 psi (34,450 kPa) which spends more than 90% of the trim in the closed position must use Soft Seated HUSH Trim to maintain zero leakage.

Typical applications include:
- Boiler feed pump recirculation valves
- Start-up feedwater control valves
- Attemperator spray block valves
- Attemperator spray control valves which do not have a block valve
- Heater drain valves
- Process block, vent and anti-surge valves

Note: In the event that maximum continuous operating temperature (not design temperature) exceeds 500°F (260°C), consult Copes-Vulcan.

**Features**
- Designed for differential pressures to 5000 psi (34,000 kPa)
- Double plug design protects the soft seat assuring a long lasting tight seal
- Soft seat is further protected by use of a strainer which entraps entertained solids 1/16” (.065mm) and larger
- Flow under the seat directs discharge flow into the valve body outlet and away from the seat area
- Quick change design for ease of maintenance
- Constructed of 420 stainless steel for corrosion/erosion resistance
- Balanced design minimizes actuator sizing
- Surface hardened main plug eliminates galling
**Seat Wire Drawing—The Major Problem**

Zero leakage is imperative, since even the smallest amount of leakage will cause trim failure. Once a leak occurs, seat wire drawing will follow. Subsequent to the initial stages of wire drawing, damage due to cavitation occurs.

The primary reason conventional soft seat designs have been unable to maintain zero leakage is that the soft seat is the primary throttle surface at the valve opening, thus the soft seat trim rapidly deteriorates. Conventional soft seats last through only one or two cycles.

Copes-Vulcan’s design provides a means of opening the valve without throttling at the soft seat, protecting the seat from premature damage and maintaining tight shutoff. The damaging effects of wire drawing from metal-seated trims being unable to maintain zero leakage will be eliminated by the use of the Soft Seated Trim. Shown is a typical conventional metal-seated trim which was unable to maintain seat tightness throughout the service life of the valve.

**Soft Seated Hush Trim Operation**

Copes-Vulcan’s patented Soft Seated HUSH Trim design provides a means for opening and closing the valve without throttling at the soft seat itself. This is achieved by opening or closing the valve in two stages.

The first stage of opening moves the main plug clear of the soft seat with no flow through the valve and thus no throttling across the soft seat. During this stage, the main plug moves independently of the inner throttle plug and the inner plug remains seated due to a small amount of unbalanced force.

During the second stage of opening, the inner plug will open at the same time as the main plug. Flow will then be established through the valve. When the inner plug opens there will be throttling for a brief second at the inner plug metal seat, followed by the throttling in the HUSH Trim cage for the remainder of the plug travel. By opening and closing the valve in this sequence the damaging effects of high velocity flow will be taken across the hardened stainless steel surfaces within the trim.

Any foreign particles lodged between the valve seats and plug can cause premature wire drawing by preventing full valve closure. Therefore, Copes-Vulcan’s soft seat design is provided with an integral strainer element installed below the seat retainer.

**Sizing Requirements**

**On/Off or Modulating Service**

Indicate whether the valve is for on/off or modulating service.

**Inlet Pressures**

When considering the valve inlet pressure be certain to account for line losses and head pressure from the inlet piping. The inlet pressure given must be the valve inlet and not the pump discharge pressure or the source pressure.

**Outlet Pressures**

When considering the valve outlet pressure be certain to account for downstream piping losses and head pressure, as well as effects from downstream orifice plates, diffusers, spargers or capillary tubes. If any such devices are used, the sizing information must be present on the valve specification sheet.

**Flows**

The full range of inlet flows must be given and, in the case of a modulating valve, the minimum flow must be given.

**Actuator Air Supply Pressures**

The minimum available air supply must be known prior to sizing the actuator.

**Maximum Differential Pressure Condition**

The maximum differential pressure condition must be given with the range of inlet temperatures in order to provide adequate cavitation protection within the trim.

**Additional Cv Requirements**

Any requirements for full flow at a reduced travel or additional flow capacity beyond the normal conditions must be known.
Model 1000 diaphragm actuators are designed for severe duty applications where vibration and stress are factors. The unique frame/yoke design provides maximum strength and rigidity for heavy duty performance. Direct-acting actuators normally are required with this trim.

### Valve Body/Subassemblies
- STD Sizes: 3, 4, 6, 8" and others available
- ANSI Rating: 900, 1500, and 2500
- Materials: Carbon Steel, Stainless Steel, Chrome-Moly, Other Castable Materials
- End Connections: Butt Weld, Integral Flanges per Application

### Bonnet
- Types: Standard
- Material: Same as Body
- Construction: Bolted

### Actuators
<table>
<thead>
<tr>
<th>Valve Size</th>
<th>Actuator Model Required</th>
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<tbody>
<tr>
<td>3&quot; (80mm)</td>
<td>1000-160</td>
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<tr>
<td>4&quot; (100mm)</td>
<td>1000-160</td>
</tr>
<tr>
<td>6&quot; (150mm)</td>
<td>1000-160</td>
</tr>
<tr>
<td>8&quot; (200mm)</td>
<td>1000-260</td>
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### Hush Cylinders
Usually the soft seated design will be used with HUSH Trim, thus further protecting the valve’s integrity and resistance to cavitation. All trims will use a HUSH cylinder or a drilled hole cage as determined in sizing sections.

For other conditions or more information, please contact Copes-Vulcan.

Your local contact:

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For more information about our worldwide locations, approvals, certifications, and local representatives, please visit www.spxfc.com.

SPX reserves the right to incorporate our latest design and material changes without notice or obligation. Design features, materials of construction and dimensional data, as described in this bulletin, are provided for your information only and should not be relied upon unless confirmed in writing. Certified drawings are available upon request.

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