Fisher™ Multi-Stage Micro-Flat Trim

Fisher Multi-Stage Micro-Flat is a multi-stage, anti-cavitation control valve trim concept for use in services where high pressure drop, staged cavitation control is needed along with low-flow capability. The trim concept uses an axial, expanding area flow path and features a protected seat design where the shutoff function of the valve is separate from the throttling areas of the trim. The plug and cage are a matched pair and must be replaced as a set if either one is damaged in service.

Features

- **Versatility**—Retrofits into existing angle and globe valve designs. Flows up or down. Can provide up to 50-1 turndown.
- **Cavitation Control**—3-8 stage used properly can help eliminate cavitation damage.
- **Trim Materials**—S44004 plug and S17400 seat ring or NACE option of R30016 plug and seat ring.
- **Resistance to Erosion Damage**—Standard hardened trim materials provide excellent wear resistance, resulting in long trim life. The contoured valve plug seat reduces fluid separation, helps direct fluid away from trim, and protect against erosion damage.

Principle of Operation

Multi-Stage Micro-Flat trim is a plug-characterized design with a series of flats on a common stem to provide staged cavitation control. Flow direction is typically flow down, but flow up use is possible in special cases. Consult your Emerson sales office for additional information.

This trim is used to control cavitation. Features include a protected seat design and pressure drops as high as 6500 psi. To maximize seat life in cavitating environments, staged flow control as low as $C_v = 0.01$ is possible. This trim must be used with hardened materials, such as R30016 and S44004/S17400.

- **Cavitation Control Trim**—Trim design eliminates the effects of cavitation.
- **Multi-Stage Micro-Flat**—Multi-Stage Micro-Flat trim is a cage-guided unbalanced characterized plug design with a series of flats on a common stem. High $\Delta P$'s and $C_v$’s down to approximately 0.01. This is a cavitation control trim for use on liquids. Not intended for gas service. See figure 1.
## Specifications

### Available Valves
- easy-e, EH, EHA, HP, and HPA

### End Connection Styles
- Refer to appropriate valve bulletin

### Valve Body Dimensions and Weights
- Valve type, pressure class, and number of stages will result in changes to these values. Please consult your Emerson sales office for more information on finished dimensions and weights.

### Shutoff Classifications
- Class V per ANSI/FCS 70-2 and IEC 60534-4

### Maximum Inlet Pressures and Temperatures\(^{(1)}\)
- Consistent with applicable CL900, CL1500, and CL2500 pressure/temperature ratings according to ASME B16.34 ratings unless limited by individual temperature and pressure limits.

### Maximum Pressure Drop\(^{(1)}\)
- See table 2

### Construction Materials
- Typical materials are 440C or Solid Alloy 6. Consult your Emerson sales office for your specific application.

### Flow Characteristic
- Typically equal percent.

### Flow Direction
- Flow down (typical) or Flow up (available).

### Valve Cavitation Coefficient
- \(K_c = 1.0\) for all valves when trim is used within applicable pressure drop limits.

### Maximum Valve Plug Travel
- Plug travels is 0.75 inch through 2 inch. Contact your Emerson sales office for your specific application.

### Minimum Seating Force
- Use Class V seat load requirements.

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\(^{(1)}\) The pressure/temperature limits in this bulletin and any applicable standard or code limitation for valve should not be exceeded.
# Trim Applications and Limits

## Table 1. Applications

<table>
<thead>
<tr>
<th>VALVE</th>
<th>PRESSURE CLASS</th>
<th>VALVE SIZE</th>
<th>SHUTOFF PORT SIZE</th>
<th>FLOWING PORT SIZE(1)</th>
<th>UNBALANCED AREA</th>
<th>TRAVEL</th>
<th>PERFORMANCE LEVEL</th>
<th>AVAILABLE CAPACITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>NPS mm Inch</td>
<td>mm Inch cm² Inch²</td>
<td>mm Inch</td>
<td>Number of Stages</td>
<td>Min Cv</td>
<td>Max Cv</td>
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<tr>
<td>ES</td>
<td>600</td>
<td>1 12.7 0.5</td>
<td>9.525 0.375 1.503 0.233</td>
<td>19.05 0.75</td>
<td>3</td>
<td>0.01</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 15.875 0.625</td>
<td>9.525 0.375 1.503 0.233</td>
<td>19.05 0.75</td>
<td>3</td>
<td>0.1</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>EAS</td>
<td>1500</td>
<td>1 15.875 0.625</td>
<td>12.7 0.5 2.316 0.359</td>
<td>19.05 0.75</td>
<td>3</td>
<td>0.1</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 15.875 0.625</td>
<td>12.7 0.5 2.316 0.359</td>
<td>19.05 0.75</td>
<td>3</td>
<td>0.01</td>
<td>0.6</td>
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</tr>
<tr>
<td>HPS/HPAS</td>
<td>EHS/EHAS</td>
<td>2500</td>
<td>1 15.875 0.625</td>
<td>12.7 0.5 2.316 0.359</td>
<td>19.05 0.75</td>
<td>4</td>
<td>0.1</td>
<td>0.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 15.875 0.625</td>
<td>12.7 0.5 2.316 0.359</td>
<td>19.05 0.75</td>
<td>4</td>
<td>0.1</td>
<td>0.7</td>
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</table>

1. Other port sizes and higher Cv are available upon request. Consult your Emerson sales office for additional information.

## Table 2. Pressure Drop Limits

<table>
<thead>
<tr>
<th>Number of Stages</th>
<th>ΔP (psi)</th>
<th>ΔP (bar)</th>
<th>Kc</th>
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<tbody>
<tr>
<td>3</td>
<td>1500</td>
<td>103.4</td>
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<td>5</td>
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<td>241.3</td>
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<td>6</td>
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<td>310.3</td>
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<tr>
<td>7</td>
<td>5500</td>
<td>379.2</td>
<td>1.0</td>
</tr>
<tr>
<td>8</td>
<td>6500</td>
<td>448.2</td>
<td>1.0</td>
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</table>
Figure 1. Fisher EHA Valve Assembly with 8-Stage Micro-Flat Flow Down Trim Design

- **PLUG/STEM/CAGE ASSEMBLY**
- **PLUG/STEM ASSEMBLY**
- **BONNET**
- **STUDS (QTY 8)**
- **HEX NUTS (QTY 8)**
- **GASKET**
- **SPIRAL WOUND GASKET (QTY 2)**
- **UPPER CAGE**
- **O-RING**
- **VALVE BODY**
Figure 2. Fisher HPA Valve Assembly with 4-Stage Micro-Flat Flow Up Trim Design
Figure 3. Fisher Globe Body Valve Assembly