Richter Bellows-sealed
Globe Control Valves

Corrosion-resistant PFA lining
ANSI/ISA and ISO/DIN
Heavy-duty bellows
Special designs for chlorine and high-purity media
Cv 0.012 to 180 USgpm
Richter bellows-sealed globe control valves

**Fields of application**
Flow control of corrosive, hazardous, pure and/or slightly solids-laden liquids, vapours and gases in the chemical, pharmaceutical and other industries.

The Richter RSS series is especially suitable
- for media where stainless steel is not sufficiently corrosion-resistant.
- as an alternative to valves made of special metals (Hastelloy®, Monel®, titanium etc.).
- for environmentally critical media (German Clean Air Act – „TA-Luft“).
- for metal-reactive media, e.g. H₂O₂.
- for biotechnology and high-purity media where good cleaning and anti-adhesive surfaces are important (see page 6).
- for highly permeating media (see page 6).

**Operating range**
- -75 to 400 °F (-60 to +200 °C) operating temperature
- 0.1 mbar vacuum up to 235 psi (16 bar) operating pressure

**Design**
Bellows-sealed globe control valve. Lined with fluoroplastic. Safety stuffing box as standard. Pneumatic or electric actuation. Also available as manually actuated control or shut-off valve (HVR, HV series).

**Control characteristics to DIN EN 60534**
Equal percentage, linear, on-off. Rangeability 1:25. Rangeability 1:100 with V-control plug.
Cv 0.012-180 (k, 0.01-155), see page 5.

**Product features**
- Face-to-face to ANSI/ISA 75.08.01 Cl. 150, flanges ASME (ANSI) B16.5 Cl. 150 RF
- Face-to-face to ANSI/ISA 75.08.01 Cl. 300 for DN 1” to 2”, flanges ASME (ANSI) B16.5 Cl. 300 RF
- Face-to-face to ISO 5752-R.1 (DIN EN 558-1 R.1), flanges ISO 7005-2/PN 16, on request drilled to ASME (ANSI) Cl. 150
- Comprehensive options package, see pages 5+6

**Type codes, wetted materials**
- Bellows-sealed globe control valve, remote actuation RSS/...

**Lining**
- PFA …/F
- Antistatic PFA-L …/F-L
- Ultrapure (e.g. pharma applications) PFA-HP …/PFA-HP
- Highly permeationresistant PFA-P …/F-P

**Option:**
Heavy-duty PTFE bellows with stainless steel or PTFE/carbon support rings.

1. **Thick-walled virgin PFA lining**
   - Optional PFA-L antistatic, PFA-HP high purity and PFA-P highly permeation-resistant linings.
   - Identification to ANSI B16.34, DIN EN 19
   - Lining thickness: 0.2"-0.3" (5 - 6 mm), 1½"-3½" (DN 15+20): 0.14"-0.16" (3.5 - 4 mm).
   - Vacuum-proof

2. **One-piece valve body**
as well as all other pressure-bearing components made of ductile cast iron ASTMA395 (EN-1549).
   - Absorbs system pressure and pipe forces.
   - Top entry = simple maintenance of bellows, plug and seat.
   - Body heating on request.
   - Tantalum-coated

3. **PTFE bellows**
hermetically seals the product chamber from the atmosphere and protect the valve stem against corrosion. Standard PTFE bellows up to 145 psi (10 bar) operating pressure.

**Options** (see page 5):
- **Heavy-duty PTFE bellows**
  for highly permeating media, high temperatures and pressures up to 235 psi (16 bar).
- **Hastelloy bellows**
  for special cases, e.g. extreme permeation and pressure/temperature conditions.

4. **Safety stuffing box**
Adjustable from outside as a standard feature. Valve design complies with the German Clean Air Act (“TA-Luft”).

5. **Monitor connection**
as an option, especially in case of critical media.
**Exchangeable valve plug**
- Modified pure pressure-resistant TFM-PTFE, no fillers.
- Screwed to bellows without play and secured by means of PTFE cord.
- Change in Cv value simply by replacing seat/plug.
- Special V-control plug made of TFM-PTFE for minimum Cv values from 0.012 (0.01 m³/h), see page 5.
- Special U-plug if there is a risk of cavitation.

**Exchangeable seat**
- Made of modified pure pressure-resistant TFM-PTFE, no fillers.

**Stainless steel sliding stem**
- Optionally made of Hastelloy® or titanium coated in case of extremely permeating fluids like e.g. chlorine.

**Easy top entry maintenance**
- Of the wetted internals: removable valve bonnet

**High-quality external corrosion protection:**
- Epoxy coating of the valves
- Valve stem and screws made of stainless steel, other materials like steel, B7M etc. optional.

**Actuators and accessories**
- Pneumatic or electric actuators
- Positioners, limit switches etc.
- All common makes.

**Travel stop**
- Protects plug and seat against excessively high actuator closing forces, installation as per table on page 4 depending on Δp and seat Ø. With protective rubber bellows.
### Flow rates Cv (US gpm), k\textsubscript{v100} (m³/h)

<table>
<thead>
<tr>
<th>DN (inch)</th>
<th>ANSI/DIN/ISO (mm)</th>
<th>Seat-Ø inch (mm)</th>
<th>Seating materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4&quot;</td>
<td>38 (95)</td>
<td>5.10</td>
<td>Stainless steel, PTFE, TFM-PTFE, PTFE/carbon support rings</td>
</tr>
<tr>
<td>1&quot;</td>
<td>50 (125)</td>
<td>5.10</td>
<td>Stainless steel, PTFE, TFM-PTFE, PTFE/carbon support rings</td>
</tr>
<tr>
<td>1 1/4&quot;</td>
<td>65 (160)</td>
<td>5.10</td>
<td>Stainless steel, PTFE, TFM-PTFE, PTFE/carbon support rings</td>
</tr>
<tr>
<td>2&quot;</td>
<td>80 (200)</td>
<td>10.15</td>
<td>Stainless steel, PTFE, TFM-PTFE, PTFE/carbon support rings</td>
</tr>
<tr>
<td>2 1/2&quot;</td>
<td>100 (250)</td>
<td>10.15</td>
<td>Stainless steel, PTFE, TFM-PTFE, PTFE/carbon support rings</td>
</tr>
</tbody>
</table>

* If a U-plug is used, the Cv \( (k_{v100}) \) values reduce from 180 USgpm (155 m³/h) to 157 USgpm (135 m³/h) and from 117 USgpm (100 m³/h) to 90 USgpm (75 m³/h).

** Remarks:**
1. V-control plugs are used for Cv 0.012 to 1.4 \( (k_{v100}) \) values 0.1 to 1.2, see page 5.
2. The next lower Cv \( (k_{v100}) \) value can also be attained by using a different plug without changing the seat diameter.
3. Conversion Cv (USgpm) to \( k_{v100} \) is 
   \[ \text{Cv} = \frac{1.165 \times k_{v100}}{v100} \]

### Pressure/temperature range

<table>
<thead>
<tr>
<th>Temperature (°F)</th>
<th>Vacuum (mbar)</th>
<th>157</th>
<th>245</th>
<th>345</th>
<th>490</th>
<th>722</th>
</tr>
</thead>
<tbody>
<tr>
<td>150</td>
<td>0.02</td>
<td>0.07</td>
<td>0.20</td>
<td>0.41</td>
<td>0.93</td>
<td>1.37</td>
</tr>
<tr>
<td>200</td>
<td>0.03</td>
<td>0.08</td>
<td>0.21</td>
<td>0.43</td>
<td>0.96</td>
<td>1.40</td>
</tr>
<tr>
<td>250</td>
<td>0.04</td>
<td>0.10</td>
<td>0.27</td>
<td>0.52</td>
<td>1.07</td>
<td>1.62</td>
</tr>
</tbody>
</table>

### Components and materials

<table>
<thead>
<tr>
<th>Item</th>
<th>Designation</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>106</td>
<td>Cover</td>
<td>D.C. ASTM A395/EN-JS 1049</td>
</tr>
<tr>
<td>204</td>
<td>Plug</td>
<td>TFM-PTFE</td>
</tr>
<tr>
<td>206</td>
<td>Bellows</td>
<td>TFM-PTFE, TFM-PTFE, PTFE/carbon antistatic, Hastelloy, Heavy-duty version with stainless steel or PTFE/carbon support rings</td>
</tr>
</tbody>
</table>

### Required shut-off valves lbf (N) with seat and plug made of modified TFM-PTFE*

<table>
<thead>
<tr>
<th>Max. Δp psi (bar), valve in closed position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard PTFE bellows (max. oper. pressure 145 psi/10 bar)</td>
</tr>
<tr>
<td>Heavy-duty PTFE bellows (max. oper. press. 232 psi/16 bar)**</td>
</tr>
<tr>
<td>Hastelloy C-bellows (max. oper. pressure 232 psi/16 bar)</td>
</tr>
</tbody>
</table>

### Mechanical travel stop (see framed cells)

- \( \Delta p > 145 \text{ psi} (10 \text{ bar}) \) and seat Ø 0.55"-2" (14-50 mm)
- \( \Delta p > 87 \text{ psi} (6 \text{ bar}) \) and seat Ø 2.6° (65 mm)

**Attention:** If \( \Delta p < \rho_p \), instead insert \( p_0 \) instead of \( \rho_p \).

### Dimensions and weights

<table>
<thead>
<tr>
<th>Face-to-face lengths ANSI/ISA 75.08.01 Cl. 150+300, flanges ASME (ANS) B16.5 Cl. 150+300 RF</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN (inch)</td>
</tr>
<tr>
<td>3/4&quot;</td>
</tr>
<tr>
<td>1&quot;</td>
</tr>
<tr>
<td>1 1/4&quot;</td>
</tr>
<tr>
<td>1 1/2&quot;</td>
</tr>
<tr>
<td>2&quot;</td>
</tr>
<tr>
<td>2 1/2&quot;</td>
</tr>
<tr>
<td>3&quot;</td>
</tr>
<tr>
<td>4&quot;</td>
</tr>
</tbody>
</table>

**Face-to-face lengths ISO 5752 series 1 (DN EN 588-1 series 1)*, flanges ISO 7005-2/PNIEN (DN 1092-2)**

<table>
<thead>
<tr>
<th>DN (inch)</th>
<th>DN (mm)</th>
<th>H (inch)</th>
<th>Weight approx. lbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 1/4&quot;</td>
<td>15</td>
<td>4.93</td>
<td>13</td>
</tr>
<tr>
<td>1 1/2&quot;</td>
<td>20</td>
<td>5.12</td>
<td>13</td>
</tr>
<tr>
<td>1&quot;</td>
<td>25</td>
<td>5.12</td>
<td>13</td>
</tr>
<tr>
<td>2&quot;</td>
<td>50</td>
<td>9.06</td>
<td>42</td>
</tr>
<tr>
<td>2 1/2&quot;</td>
<td>65</td>
<td>11.42</td>
<td>44</td>
</tr>
<tr>
<td>3&quot;</td>
<td>80</td>
<td>13.39</td>
<td>86</td>
</tr>
<tr>
<td>4&quot;</td>
<td>100</td>
<td>13.78</td>
<td>97</td>
</tr>
</tbody>
</table>

* DN 1/2": flanges with tapped bore ** without actuator *** not to ANSI/ISA

** Formerly DN 3202/F1, 2532/33 ** without actuator
Heavy-duty bellows for 1“-4“ (DN 25-100)

These bellows were developed for particularly difficult operating conditions:

- **Highly permeating media:**
  The wall thickness of 0.1“ (2.5 mm) ensures considerably higher resistance to permeation. Also available in modified TFM-PTFE for particularly strong permeation.

- **Higher pressures and temperatures:**
  The convolutions of the bellows retain their function even at a pressure of 235 psi (16 bar) and at elevated temperatures. They are individually supported on the stainless steel support rings (and not on the valve stem!) and thus remain flexible. On request, support rings are also available in PTFE/carbon for an operating pressure of 145 psi (10 bar).

- **For high-purity media:**
  Large convolution distances facilitate flushing/sterilisation of the inner valve chamber (see also page 6 „Version for biotechnology/high-purity media“).

RSS V-plug for small Cv 0.012-1.4 (k_v 0.01-1.20)

The V-plug made of compression-proof and dimensionally stable TFM-PTFE has 1 to 4 grooves, depending on the Cv (k_v) value. When the valve opens, the V-grooves offer an expanding opening cross section whilst the plug is always guided in the seat. This ensures high-quality control even at elevated temperatures and differential pressures.

A dynamic sealing lip integrated into the seat limits the flow precisely to the V-grooves, thus preventing undesired leakage. A PTFE cord prevents the plug from unscrewing. Hastelloy or tantalum plug inserts, which were previously used for stability and accuracy reasons, can now be dispensed with.

**Customer benefits:**
Lower cost than special metals, shorter delivery times, metal-free, maximum chemical resistance.

The V-plugs are the preferred version for RSS valves 1/2“-1“ (DN 15-25) with low Cv (k_v)-values.

**Operating range**
- Up to 235 psi at 360°F (16 bar at 180 °C)
- Pressure/temperature diagram: see page 4
- Not for highly viscous or solids-containing media

**Cv-values (USgpm), k_v 100-values (m³/h)**

<table>
<thead>
<tr>
<th>CV</th>
<th>1/2”</th>
<th>3/4” (DN 15 + 20):</th>
<th>1” (DN 25):</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2”</td>
<td>0.012</td>
<td>0.023</td>
<td>0.06</td>
</tr>
<tr>
<td>3/4”</td>
<td>0.012</td>
<td>0.023</td>
<td>0.06</td>
</tr>
<tr>
<td>1”</td>
<td>0.012</td>
<td>0.023</td>
<td>0.06</td>
</tr>
</tbody>
</table>

Other sizes and Cv/k_v-values on request.
* only 1” (DN 25)

**Control characteristics**

- Quadratic curve, rangeability 1:100
- Travel (%) 5 10 20 30 40 50 60 70 80 90 100
- Flow rate (%) 1.25 2 5 10 17 26 37 50 64 81 100

**Components and material**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>204</td>
<td>Plug</td>
<td>TFM-PTFE</td>
</tr>
<tr>
<td>205</td>
<td>Seat</td>
<td>TFM-PTFE</td>
</tr>
<tr>
<td>522</td>
<td>Cord</td>
<td>PTFE</td>
</tr>
</tbody>
</table>

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Other options

Version for highly permeating media (e.g. chlorine)
The special bush ① - material e.g. Hastelloy C - protects the cover flange in the valve stem area against corrosive attack by permeating media. The valve stem - also e.g. Hastelloy C - remains moveable.
Bellows: TFM-PTFE heavy-duty bellows with PTFE/carbon or Hastelloy support rings or bellows made of Hastelloy C ②.
The thick-walled seamless PFA body lining provides outstanding protection against permeation.
Further options: special highly permeation-resistant Richter PFA-P lining, tantalum-coated stem.

Version for „biotech/high purity media”
Pharmaceutical, fine and semiconductor chemicals, fermentation etc., suitable for CIP and SIP!
In the segment of PFA lined globe control valves this time-tested version is unique:
• Free from cavities.
• Anti-adhesive PFA body lining without fillers with seamlessly integrated seat.
• One-piece PTFE bellows/plug design ① with large convolution distances, easy to clean ②, ½”+⅜” (DN 15+20) with standard bellows.
• On request, special „high-purity media production process” and FDA conformity certificate.

Operation close to cavitation
This special U-plug (U = circumferential guiding) is recommended, when cavitation might occur with 3”+4” (DN 80+100) valve size. It reliably overcomes the higher loads by dividing the medium flow and through the permanent guide in the valve seat. Universal for all RSS bellows versions.

Control ball valve KNAR/KNR
Compact valve with special control ball for
Cv 0.12-465 USgpm (k=0.1-400 m³/h), ½”-8” (DN 15-200), face-to-face lengths and flanges to ASME/ANSI and ISO/DIN.
See separate publication.