**TVA Flowmeter for Saturated Steam Service**

**Description**

The Spirax Sarco TVA flowmeter is designed for use on saturated steam only and operates on the target principle, by measuring the force produced on a moving cone by the fluid flow. This strain is then converted into density compensated mass flowrate and is transmitted via a single loop powered 4–20 mA and pulsed output. TVA flowmeters also incorporate a totalised flow function and RS 232 Modbus communications.

**Sizes and pipe connections**

2", 3" and 4"

The TVA flowmeter is of wafer design, suitable for fitting between the following flanges: ASME (ANSI) B 16.5 Class 150 and Class 300

**Note:**

The Spirax Sarco TVA flowmeter should be installed in pipework manufactured to BS 1600 or ASME (ANSI) / ASME B 36.10 Schedule 40. For systems with different standards/schedules, spool pieces manufactured from BS 1600 or ASME (ANSI) / ASME B 36.10 Schedule 40 pipe should be used. If this is not possible, please contact Spirax Sarco.

**Pressure/temperature limits**

- **Max design pressure:** 464 psig @ 462°F
- **Max design temperature:** 462°F
- **Min design temperature:** 32°F
- **Max operating pressure (horizontal)**: 464 psig @ 462°F
- **Max operating temperature (horizontal)**: 462°F
- **Min operating temperature**: 9 psig
- **Max operating temperature (saturation)**: 462°F
- **Note**: For lower operating temperatures consult Spirax Sarco
- **Max electronics ambient temperature**: 131°F
- **Max electronics humidity level**: 90% RH (non-condensing)
- **Designed for a maximum cold hydraulic test pressure of 754 psig**

**Technical data**

- **IP rating**: IP65 with correct cable glands
- **Power supply**: Loop powered nominal 24 Vdc
- **Outputs**: 4 - 20 mA (proportional to mass flow)
  - Pulsed output ($V_{max}$ 28 Vdc $R_{min}$ 10 kΩ)
- **Communication port**: Modbus EIA 232C (RS 232)

**Performance**

The TVA flowmeter has inbuilt electronics which give a density compensated output. An LCD display is incorporated within the electronics head. The M750 display unit can be used to provide a remote display function if required, utilising the 4 - 20 mA output.

**System uncertainty, to 95% confidence (2 STD):**

- ±2% of measured value from 10% to 100% of maximum rated flow.
- ±0.2% FSD, from 2% to 10% of maximum rated flow.
- Turndown: up to 50:1

As the TVA flowmeter is a self contained unit, the uncertainty quoted is for the complete system. Many flowmeters claim a pipeline unit uncertainty and for a true system uncertainty, the individual uncertainty values of any associated equipment, such as DP cells, need to be added to the pipeline value.

**Pressure drop**

The pressure drop across the TVA is nominally 300 ins water gauge at maximum rated flow for the 2", and 200 inches water gauge for the 3" and 4".

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*Local regulation may restrict the use of this product below the conditions quoted. Limiting conditions refer to standard connections only.*

*In the interests of development and improvement of the product, we reserve the right to change the specification.*
TVA
Flowmeter for Saturated Steam Service

Dimensions/weights (approximate) in inches and pounds

<table>
<thead>
<tr>
<th>Size</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>2&quot;</td>
<td>1.4</td>
<td>4.1</td>
<td>12.7</td>
<td>6.3</td>
<td>2.6</td>
<td>5.9</td>
</tr>
<tr>
<td>3&quot;</td>
<td>1.8</td>
<td>5.4</td>
<td>13.1</td>
<td>6.3</td>
<td>2.6</td>
<td>9.7</td>
</tr>
<tr>
<td>4&quot;</td>
<td>2.4</td>
<td>6.4</td>
<td>13.5</td>
<td>8.5</td>
<td>2.6</td>
<td>16.0</td>
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</tbody>
</table>

TVA flowmeter flow capacities and pressure drops

<table>
<thead>
<tr>
<th>Flowmeter Type</th>
<th>Maximum QE US gal/min</th>
<th>Maximum DP Wg</th>
</tr>
</thead>
<tbody>
<tr>
<td>2&quot;</td>
<td>80</td>
<td>300</td>
</tr>
<tr>
<td>3&quot;</td>
<td>203</td>
<td>200</td>
</tr>
<tr>
<td>4&quot;</td>
<td>317</td>
<td>200</td>
</tr>
</tbody>
</table>

Sizing the TVA flowmeter for saturated steam (lb/hr)
(Horizontal orientation)
Maximum flowrates in lb/hr at different pressures (psig).

Notes:
1. Maximum steam flowrates are calculated at maximum differential pressure.
2. For vertical capacities please contact Spirax Sarco.
3. The table below is a guide only.

| Size | Steam pressure psig | 15 | 44 | 73 | 102 | 145 | 174 | 218 | 290 | 363 | 435 | 464 | psig |
|------|---------------------|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 2"   | Maximum flow        | 1,365 | 1,894 | 2,297 | 2,637 | 3,075 | 3,336 | 3,695 | 4,228 | 4,707 | 5,148 | 5,311 | lb/hr |
|      | Minimum flow        | 26 | 37 | 46 | 53 | 62 | 66 | 73 | 84 | 95 | 104 | 132 | lb/hr |
| 3"   | Maximum flow        | 3,501 | 4,859 | 5,895 | 6,768 | 7,895 | 8,565 | 9,482 | 10,851 | 12,081 | 13,215 | 13,633 | lb/hr |
|      | Minimum flow        | 71 | 97 | 117 | 134 | 159 | 172 | 190 | 216 | 243 | 265 | 284 | lb/hr |
| 4"   | Maximum flow        | 5,456 | 7,573 | 9,187 | 10,547 | 12,304 | 13,347 | 14,778 | 16,912 | 18,827 | 20,593 | 21,246 | lb/hr |
|      | Minimum flow        | 108 | 152 | 183 | 212 | 247 | 267 | 295 | 337 | 377 | 412 | 425 | lb/hr |

Safety information, installation and maintenance
For full details see the Installation and Maintenance Instructions (IM-P337-51 and IM-P337-52) supplied with the product.

The following main points are given for guidance only:
1. The TVA flowmeter should be mounted with a minimum of 6 straight pipe diameters upstream and 3 downstream. No valves, fittings or cross sectional changes are permitted within these pipe lengths. Where an increase in nominal pipe diameter is required, upstream of the flowmeter, the length of straight pipe should be increased to 12 diameters. Similarly, where a Spirax Sarco TVA is installed downstream of two 90 degree bends in two planes, a pressure reducing valve or a partly open valve, 12 upstream pipe diameters should be allowed.
2. It is important that the internal upstream and downstream diameters of pipe are smooth. Ideally seamless pipes should be used and there should be no intrusive weld beads on the internal diameter. It is also recommended that slip-on flanges are used to avoid this.
3. Care should be taken to install the TVA flowmeter concentrically in the line. If this is not done, flow measurement errors may occur.
4. The TVA flowmeter can be installed in any orientation up to a line pressure of 101 psig.
5. As for all steam flowmetering installations, good basic steam engineering practices should be followed:
   - Correct line drainage through adequate trapping.
   - Good alignment and support of associated pipework.
   - Line size changes achieved by the use of eccentric reducers.
   - Do not lag (insulate) the TVA body or the mating flanges.

How to order
Example: 1 off Spirax Sarco 4" TVA flowmeter for installation between ASME (ANSI) B 16.5 Class 150 flanges for use on saturated steam at 145 psig - Maximum flow 12,304 lb/hr.

Note: For details of the optional remote display see the relevant Spirax Sarco M750 literature.