Flow meters, Flow switches and Flow transmitters
A Small Vane Style
For Liquids

DESCRIPTION
These are variable area meters with a spring biased semi-circular vane that opens wider with more flow. They are installed in-line in any position. Straight pipe runs before or after the meter are not required. The simple mechanical connection directly drives pointers, switches and transmitters.

READOUTS
The flowmeter has outputs both visual and electronic. Visual displays are either pointer (with inscribed scale) or numeric (digital LCD). Electronic outputs can be mechanical switch closure, 4-20 mA analog, HART or some combination of switches with electronic outputs (for signal redundancy). The switches can be general purpose or rated for hazardous locations (all classes, groups and divisions).

CALIBRATION
All flow meters are individually calibrated for fluids with the viscosity you specify (up to 3000 SSU/650 Centistokes). We also compensate for your fluid’s specific gravity. For NIST Traceability please consult factory.

CONSTRUCTION MATERIALS
The meter body, internal moving parts, and seals are offered in a variety of materials to suit a wide range of applications: water, synthetic and petroleum based oils, paint, corrosives and solvents. See selections in the “How to Order” section.

LINE CONNECTION
Ports can be threaded or flanged. See selections in the “How to Order” section.

Fluid enters at A, passes around the semi-circular vane B. exits at outlet C. The vane resists the flow because of the spring D. The further the vane is pushed the larger the passageway E becomes. This minimizes the pressure drop. The vane shaft turns to operate the pointer F and remote signal devices such as the switch G.

Viton® and Kalrez™ are registered trademarks for DuPont Performance Elastomers.
HOW TO ORDER

Select appropriate symbols and build a model code number, as in example shown:

EXAMPLE:  SN - B S B 7GM V - 4 - 320V.9 -

SERIES BY PRESSURE RATING

| Normal pressure (300 PSI) | = SN |
| Medium pressure (500 PSI) | = SM |
| High pressure (2000 PSI) *Note: Max pressure for 316 SS body reduced to 1500 psi. Exterior bolts are not 316 SS. | = SH |

HOUSING MATERIAL WHERE USED

<table>
<thead>
<tr>
<th>Material</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum with nylon flow chamber</td>
<td>Lube oil</td>
</tr>
<tr>
<td>Brass with nylon flow chamber</td>
<td>Water</td>
</tr>
<tr>
<td>Naval bronze with nylon flow chamber</td>
<td>Specialty</td>
</tr>
<tr>
<td>Aluminum</td>
<td>Lube oil</td>
</tr>
<tr>
<td>Aluminum (hard coated)</td>
<td>Lube oil with exterior corrosion protection</td>
</tr>
<tr>
<td>Brass</td>
<td>Water</td>
</tr>
<tr>
<td>Naval bronze</td>
<td>Sea water</td>
</tr>
<tr>
<td>Stainless steel (316)</td>
<td>Chemicals, corrosives</td>
</tr>
<tr>
<td>Cast iron</td>
<td>Oil</td>
</tr>
<tr>
<td>Cast iron, nickel plated</td>
<td>Water, oil with exterior corrosion protection</td>
</tr>
<tr>
<td>Carbon steel</td>
<td>Oil</td>
</tr>
<tr>
<td>Carbon steel, nickel plated</td>
<td>Water, oil with exterior corrosion protection</td>
</tr>
</tbody>
</table>

Note: SH-I units only good to 1500 PSI. Exterior screws not 316 SS.

INTERNAL MOVING PARTS

<table>
<thead>
<tr>
<th>Material</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard for oil</td>
<td>S</td>
</tr>
<tr>
<td>Water, chemicals and corrosives</td>
<td>I</td>
</tr>
<tr>
<td>Sea water</td>
<td>T</td>
</tr>
<tr>
<td>Corrosives</td>
<td>L</td>
</tr>
</tbody>
</table>

SEAL MATERIAL

<table>
<thead>
<tr>
<th>Material</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buna N</td>
<td>Water, oil</td>
</tr>
<tr>
<td>EPR</td>
<td>Hot water, caustics</td>
</tr>
<tr>
<td>Viton</td>
<td>Acids, some caustics</td>
</tr>
<tr>
<td>Kalrez</td>
<td>Corrosives, solvents</td>
</tr>
<tr>
<td>Kalrez (dynamic) &amp; Buna (static)</td>
<td>Specialty</td>
</tr>
<tr>
<td>Kalrez (dynamic) and EPR (static)</td>
<td>Specialty</td>
</tr>
<tr>
<td>Kalrez (dynamic) and Viton (static)</td>
<td>Specialty</td>
</tr>
<tr>
<td>Kalrez (dynamic) and Teflon (static)</td>
<td>Corrosives, solvents</td>
</tr>
</tbody>
</table>

Note: Not available with A, B or W "Housing Materials" = T

MAX FLOW RATE LIQUIDS

<table>
<thead>
<tr>
<th>Viscosity minimum (SSU/Centistokes)</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPH: 30</td>
<td>60</td>
</tr>
<tr>
<td>GPM: .5</td>
<td>1</td>
</tr>
<tr>
<td>LPM: 2</td>
<td>6, 8</td>
</tr>
<tr>
<td>LPH: 100</td>
<td>200</td>
</tr>
<tr>
<td>CMH: .1</td>
<td>25</td>
</tr>
<tr>
<td>GLM: Gallons &amp; liters per minute - dual scale</td>
<td></td>
</tr>
<tr>
<td>DGM: Dual viscosity scale</td>
<td></td>
</tr>
</tbody>
</table>

Hand operated globe valve integral to flowmeter body (SN series only)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Valve</td>
<td>No Symbol</td>
</tr>
<tr>
<td>Valve (brass)</td>
<td>V</td>
</tr>
</tbody>
</table>

Not available on carbon steel or stainless steel housings.

THREADED ATTACHMENT

<table>
<thead>
<tr>
<th>Pipe Size and attachment method</th>
<th>Pipe Size in Inches</th>
<th>Pipe Size in Inches</th>
<th>NPT</th>
<th>SAE</th>
<th>BSPP</th>
<th>BSPT</th>
<th>Max Flow in GPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4</td>
<td>4</td>
<td>4T</td>
<td>48B</td>
<td>48T</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/8</td>
<td>3T</td>
<td>3T</td>
<td>68B</td>
<td>68T</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/2</td>
<td>2T</td>
<td>2T</td>
<td>88B</td>
<td>88T</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5/8</td>
<td>10T</td>
<td>10B</td>
<td>10B</td>
<td>10T</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/4</td>
<td>12T</td>
<td>12B</td>
<td>12B</td>
<td>12T</td>
<td>20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

FLANGED

<table>
<thead>
<tr>
<th>Example</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ex: 2FWCS15RF = 1/4&quot;</td>
<td>Welded, Class 150, Raised Face flange</td>
</tr>
</tbody>
</table>

PLANNED

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Attachment</th>
<th>Material</th>
<th>Class</th>
<th>Style</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>= 1/4&quot;</td>
<td>FW=Welded</td>
<td>CS=Carbon Steel</td>
<td>150</td>
</tr>
<tr>
<td>3</td>
<td>= 3/8&quot;</td>
<td>FT=Threaded</td>
<td>S=316 Stainless</td>
<td>300</td>
</tr>
<tr>
<td>4</td>
<td>= 1/2&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>= 3/4&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>= 1&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

FLUID CHARACTERISTICS

Viscosity number followed by a ‘V’ (for SSU), ‘C’ (for centipoise), or ‘CS’ (for centistokes) followed by the specific gravity. Example: 320V.9 would indicate a fluid with a viscosity of 320 SSU with a specific gravity of .9. For dual viscosities (where there is a start up viscosity or where there may be a range) put in both values with a slash. Example: 320/150V.9.
**SN Series**

**One SPDT (3 wire) high temperature**

**One SPDT (4 wire)**

**Two SPDT (3 wire)**

**One SPDT (3 wire) approved barriers**

**No switches (Intrinsically safe with approved barriers)**

**High accuracy (+/-3%) ref. page 4**

**Stainless steel ID tag for customer supplied information**

**Safety Glass window ref. page 4**

**Clearance vane for ≥ 5 GPM**

**Foot mount bracket**

**Wall mount bracket**

**CONTROL BOX & READOUT**

**“A”, “L” and “Z” Boxes**

“A”, “L” and “Z” boxes are small, simple and cost effective. Available with analog display, mechanical switches or transmitters (HART or 4-20mA).

**A, L and Z small control box in the following configurations and materials:**

- Polyetheretherketone (PEEK)
- Polysulfone
- Aluminum 316 SS
- Brass

**4-20 mA transmitter (Intrinsically safe with approved barriers)**

- AX0
- LX0
- ZX0

**HART with programmable switch points**

- AX0
- LX0
- Z0

**Display only**

- A0
- L0
- Z0

**One SPDT (3 wire)**

- A1
- L1
- Z1

**One high vibration SPDT (3 wire)**

- A1B
- L1B
- Z1B

**Two SPDT (3 wire)**

- A2
- L2
- Z2

**Two high vibration SPDT (3 wire)**

- A2B
- L2B
- Z2B

**One SPDT (4 wire)**

- A3
- L3
- Z3

**Two SPDT (4 wire)**

- A4
- L4
- Z4

**One SPDT (3 wire) high temperature**

- A5
- L5
- Z5

**One high vibration SPDT (3 wire)**

- A5B
- L5B
- Z5B

**Two SPDT (3 wire) gold contact**

- A6
- L6
- Z6

**One SPDT (3 wire) gold contact**

- A7
- L7
- Z7

**Two SPDT (3 wire) high temperature**

- A8
- L8
- Z8

**One SPDT (3 wire) hermetically sealed**

- A9
- L9
- Z9

**Two SPDT (3 wire) hermetically sealed**

- A10
- L10
- Z10

**“T” Box**

“T” box always has a transmitter (4-20 mA or HART) and can be in combination with a mechanical switch for redundancy. It has two junction boxes to separate wiring for switches and transmitters. The display can be analog or digital LCD.

** (“R” Box**

“R” box is selected for greater visual resolution. It holds switches (general purpose and hazardous location all classes, groups and divisions) and transmitters (HART or 4-20 mA). Switch (standard service) and transmitter are offered in this control box together when signal redundancy is desired.

**Display only**

- R0
- R1
- R2
- R3
- R4
- R5
- R6
- R7
- R10

**Flow rate display plus:**

- TX0
- TX1
- TX2
- TX3
- TX4

**HART, pointer, scale plus option:**

- C1
- C2
- C3
- C4

**Pointer, scale and 4-20 mA plus option:**

- TX0
- TX1
- TX2
- TX3
- TX4

**Flow rate display, Hazardous location switches as follows:**

- RX0
- RX1
- RX2
- RX3
- RX4
- RX5

**Flow rate display, 4-20 mA transmitter plus options as follows:**

- TX0
- TX1
- TX2
- TX3
- TX4

**Flow rate display, HART output plus options as follows:**

- RX0
- RX1
- RX2
- RX3
- RX4

**Switch Setting**

No symbol = Lowest possible setting (usually 10% of maximum flow)

Desired set point is assumed to be in flow units already selected (GPM). Give flow rate followed by a “D” for flow going down (flow failure) or a “U” for flow going up.

Example, 2D indicates a setting of 2 GPM in declining flow.

**Switch Setting**

- No symbol = Lowest possible setting (usually 10% of maximum flow)
- Desired set point is assumed to be in flow units already selected (GPM). Give flow rate followed by a “D” for flow going down (flow failure) or a “U” for flow going up.
- Example, 2D indicates a setting of 2 GPM in declining flow.

**Switch Setting**

- No symbol = Lowest possible setting (usually 10% of maximum flow)
- Desired set point is assumed to be in flow units already selected (GPM). Give flow rate followed by a “D” for flow going down (flow failure) or a “U” for flow going up.
- Example, 2D indicates a setting of 2 GPM in declining flow.
ENGINEERING DATA

Maximum fluid temperature: 200°F (95°C)
Optional max. fluid temperatures:
300 & 400°F (150 & 205°C) (option HT)
Maximum ambient temp: 150°F (65°C)
CSA listed only to 105°F (40°C)
Series SN max. operating pressure:
(3:1 safety factor): 300 PSI (20.69 BAR)
Series SM max. operating pressure:
(2:1 safety factor): 500 PSI (34.48 BAR)
Series SH max. operating pressure:
(3:1 safety factor) 2000 PSI (137.93 BAR)
Stainless Steel with special option Z67SH, 1500 PSI (103.42 BAR)
Readout accuracy, full scale: ±5%
Repeatability of switches 1% of actual flow rate

FLOW & PRESSURE DROP

Maximum flow ranges to 8 GPM/32 LPM = pressure drop from 1.9 to 2.5 PSID (2.2 PSID average).
Maximum flow ranges to 9 to 12 GPM/45 LPM = pressure drop from 1.9 to 4 PSID (2.95 PSID average).
Maximum flow ranges to 15 GPM/56 LPM = pressure drop from 1.9 to 5 PSID (3.5 PSID average).
Maximum flow ranges to 20 GPM/75 LPM = pressure drop from 1.9 to 6 PSID (4.0 PSID average).

INSTALLATION

Flow monitors mount in-line and are typically supported by rigid pipe.

SPECIAL OPTIONS

High temperature: (option HT) requires all-metal construction of housing/orifice cover with seals of Viton, EPR, Kalrez or Teflon (compatible with fluid). A thermal barrier (heat-resistant cloth) is added between the housing and the control box, which must be used with service option “W” (weatherproof) or “X” (corrosion resistant). A metal scale is provided.

Identification tag: (option ST) customer-supplied information is stamped on a stainless steel tag that is attached to the nameplate.

Safety Glass window: (option TG) replaces the standard window with "Laminated Safety Glass" ANSI Z97.1 and CPSC 1601 CFR 1201.

Clearance vane: (option Z86) the swing vane is modified to provide extra clearance for liquids that contain particulate. Available for maximum flow range of 5 TO 9 GPM. This reduces the turndown. The minimum flow is 1.5 GPM. Z86 is standard for maximum flows 10 to 20 GPM.
CONTROL BOX SELECTION GUIDE

“A”, “L” and “Z” Boxes

Maximum installation dimensions

“R” Box

SECONDARY JUNCTION BOX LOCATION

PRIMARY JUNCTION BOX LOCATION

ROUND ENCLOSURE JUNCTION BOX OPTIONS

<table>
<thead>
<tr>
<th>No Junction Box</th>
<th>Pointer Only, No Electrical Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Junction Box</td>
<td>One type of Electrical Item Only—1 or 2 Switches or Transmitter, but NOT both</td>
</tr>
<tr>
<td>Primary Location</td>
<td>1 or 2 Switches or Transmitter, but NOT both</td>
</tr>
<tr>
<td>2 Junction Boxes</td>
<td>Transmitter AND 1 or 2 Switches</td>
</tr>
</tbody>
</table>

Maximum installation dimensions
CONTROL BOX SELECTION GUIDE

“T” Box

Maximum installation dimensions

With 150 lb R.F. flanges
(for other flanges consult factory)

<table>
<thead>
<tr>
<th>Port Size (inches)</th>
<th>A (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2</td>
<td>3.50</td>
</tr>
<tr>
<td>3/4</td>
<td>3.87</td>
</tr>
<tr>
<td>1</td>
<td>4.25</td>
</tr>
</tbody>
</table>

*Flow up* or *flow down* dimensions are the same.
Scale numbers are turned 90° to read correctly.