Fluid flow causes a spring-loaded piston having a circular opening at its center to move along the axis of a precision-tapered shaft. This creates a variable orifice in direct proportion to the flow rate. The piston is mechanically linked to the readout pointer and actuates switch or a transmitter (not shown).

**Flow meters, Flow switches and Flow transmitters**

A piston design for low flows of liquids

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**DESCRIPTION**

These variable-area meters position an orifice over a tapered shaft to establish flow rate. Mounting is in-line and in any position. Straight pipe runs before or after this monitor are not required. The all-mechanical sensing system directly drives the pointer, 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**

Housings and seals are offered in a variety of materials to suit a wide range of applications, such as: water, oil, coolants, paint, solvents and some corrosive fluids. See selections in the “How to Order” section.

**LINE CONNECTION**

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

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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:** LL - B Z P S B 15GH- 4 U- 32ØV.9 -

### SERIES BY PRESSURE RATING
- Normal pressure (150 or 300 PSI) = LL
- Medium pressure (500 PSI) = LP
- High pressure (1500 PSI) = LH

### HOUSING MATERIAL WHERE USED
- Aluminum = Lube oil = A
- Cast iron, nickel plated = Water, oil with exterior corrosion protection = N
- Brass = Water = B
- Cast iron = Oil = C
- Carbon steel = Oil = M
- Carbon steel, nickel plated = Water, oil with exterior corrosion protection = J
- Stainless steel (316) = Chemicals, corrosives = Z

### PISTON MATERIAL
- Brass = Water, oil = B
- Stainless steel (316) = Corrosives, chemicals = Z

### CAP MATERIAL
- Metal (same as housing) use matches housing (300 PSI) = M
- Polysulfone (150 PSI) (Not available for 10 GPH and below) = P (LL only)

### INTERNAL MOVING PARTS
- Stainless steel (300 series) Standard for oil = S
- Stainless steel (316 series) Water, chemicals and corrosives = Z

### SEAL MATERIAL
- Buna N = Water, oil = B
- EPR = Hot water, caustics = E
- Viton = Acids, some caustics = F
- Kalrez = Corrosives, solvents = J
- Kalrez (dynamic) & Buna N (static) = Specialty = A
- Kalrez (dynamic) and EPR (static) = Specialty = H
- Kalrez (dynamic) and Viton (static) = Specialty = K
- Kalrez (dynamic) and Teflon (static) Corrosives, solvents = Available only in metal “Cap Material” (option M) = T

### MAX FLOW RATE LIQUIDS
- **SCALES**
  - **GPH:** 5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 80, 90, 100, 120, 150, 200, 250 & 300 = GH
  - **GPM:** 0.25, 0.5, 0.75, 1, 1.5, 2, 2.5, 3, 4, 5, 6, 7, 8, 9, 10, 15 & 20 = GM
  - **LPH:** 20, 30, 40, 50, 60, 70, 80, 90, 100, 200, 300, 400, 500, 600, 700, 800, 900 & 1000 = LH
  - **LPM:** 5, 10, 15, 20, 25, 30, 35, 40, 50, 60, 70 & 75 = LM
  - **CMH:** 1, 2, 3 & 4 = CMH
  - **GLM:** Dual scale - gallons & liters per minute = GLM

### FLANGED
- **Ex:** 2FWCS150RF – 1/4": Welded, Carbon steel, Class 150, Raised Face flange
  - **Pipe Size In Inches** | **Attachment** | **Material** | **Class** | **Style**
  - 2 = 1/4" | FW = Welded | CS = Carbon Steel | 15Ø | RF = ANSI raised face
  - 3 = 3/8" | FT = Threaded | S = 316 Stainless Steel | 30Ø | 60Ø
  - 4 = 1/2" | 8T | 8BP | 8BT | 10
  - 5/8 | 10T | 10BP | 10BT | 15
  - 3/4 | 12T | 12BP | 12BT | 20

### THREADED ATTACHMENT
- **Pipe Size and attachment method** | **NPT** | **SAE** | **BSPP** | **BSPT** | **Max Flow In GPM**
  - 1/8 | 2T | 2BP | 2BT | 2
  - 1/4 | 4T | 4BP | 4BT | 5
  - 3/8 | 6T | 6BP | 6BT | 10
  - 1/2 | 8T | 8BP | 8BT | 15
  - 5/8 | 10T | 10BP | 10BT | 15
  - 3/4 | 12T | 12BP | 12BT | 20

### INLET PORT POSITION
- **Upper inline (max. 2 GPM)** = U
- **Lower offset** = L

### FLUID CHARACTERISTICS
- Viscosity number followed by a ‘V’ (for SSU), ‘C’ (for centipoise), or ‘CS’ (for centistokes) followed by the specific gravity. Example: 32øV.9 would indicate a fluid with a viscosity of 320 SSU with a specific gravity of .9.
Weatherproof, corrosion proof (Type 4X) Available on all boxes = X
Weatherproof (Type 4) Available on all boxes = W
Oil and dust tight (Type 12) Available on “A”, “L” and “Z” only = N

SERVICE
Oil and dust tight (Type 12) Available on “A”, “L” and “Z” only = N
Weatherproof (Type 4) Available on all boxes = W
Weatherproof, corrosion proof (Type 4X) Available on all boxes = X

FLOW DIRECTION
Left to right = R
Right to left = L
Up = U
Down = D

SPECIAL OPTIONS (See explanations below)

| High-temp - 400°F (300°F for transmitter options) | = HT |
| High accuracy (+/-3%) ref. page 4 | = HA |
| Stainless steel ID tag | = ST |
| CSA enclosure / PVC window | = C |
| Safety Glass window ref. page 4 | = TG |
| Wall mounting bracket ref. page 4 | = W |
| Foot mounting bracket ref. page 4 | = F |

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).

<table>
<thead>
<tr>
<th>A Box</th>
<th>L Box</th>
<th>Z Box</th>
</tr>
</thead>
<tbody>
<tr>
<td>A, L and Z small control box in the following configurations and materials:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polysulfone</td>
<td>Aluminum</td>
<td>316 SS</td>
</tr>
<tr>
<td>4-20 mA transmitter (intrinsically safe with approved barriers)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Display only</td>
<td>AX0</td>
<td>A0</td>
</tr>
<tr>
<td>HART with programmable switch points</td>
<td>LX0</td>
<td>LH0</td>
</tr>
<tr>
<td>One SPDT (3 wire)</td>
<td>ZL0</td>
<td>ZH0</td>
</tr>
<tr>
<td>One high vibration SPDT (3 wire)</td>
<td>A1</td>
<td>L1</td>
</tr>
<tr>
<td>Two SPDT (3 wire)</td>
<td>A1B</td>
<td>L1B</td>
</tr>
<tr>
<td>Two high vibration SPDT (3 wire)</td>
<td>A2</td>
<td>L2</td>
</tr>
<tr>
<td>Two SPDT (4 wire)</td>
<td>A2B</td>
<td>L2B</td>
</tr>
<tr>
<td>One SPDT (4 wire)</td>
<td>A3</td>
<td>L3</td>
</tr>
<tr>
<td>One SPDT (3 wire) high temperature</td>
<td>A4</td>
<td>L4</td>
</tr>
<tr>
<td>Two SPDT (3 wire) high temperature</td>
<td>A61</td>
<td>L61</td>
</tr>
<tr>
<td>Two SPDT (3 wire) gold contact</td>
<td>A62</td>
<td>L62</td>
</tr>
<tr>
<td>One SPDT (3 wire) gold contact</td>
<td>A71</td>
<td>L71</td>
</tr>
<tr>
<td>Two SPDT (3 wire) gold contact</td>
<td>A72</td>
<td>L72</td>
</tr>
<tr>
<td>One SPDT (3 wire) hermetically sealed</td>
<td>A53</td>
<td>L53</td>
</tr>
<tr>
<td>Two SPDT (3 wire) hermetically sealed</td>
<td>A54</td>
<td>L54</td>
</tr>
</tbody>
</table>

“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.

Flow rate display plus:
Display only R0
One SPDT (3 wire) R1
One high vibration SPDT (3 wire) R1B
Two SPDT (3 wire) R2
Two high vibration SPDT (3 wire) R2B
One SPDT (4 wire) R3
Two SPDT (4 wire) R4
One SPDT (3 wire) high temperature R61
Two SPDT (3 wire) high temperature R62
One SPDT (3 wire) gold contact R71
Two SPDT (3 wire) gold contact R72

Flow rate display, Hazardous location switches as follows:

For > 5 amp circuits:
One SPDT hazardous location R7
One DPDT hazardous location R17
Two SPDT hazardous location R18
Two DPDT hazardous location R19

For < 1 amp circuits:
One SPDT hazardous location R20
One DPDT hazardous location R21
Two SPDT hazardous location R22
Two DPDT hazardous location R23
One SPDT hazardous location proximity R30
Two SPDT hazardous location proximity R31

Flow rate display, 4-20 mA transmitter plus options as follows:
Display and transmitter only R0
(Intrinsically safe with approved barriers) RX0
One SPDT (3 wire) RX1
Two SPDT (3 wire) RX2
One SPDT (4 wire) RX3
Two SPDT (4 wire) RX4
One SPDT (3 wire) high temperature RX61

Flow rate display, HART output plus options as follows:
HART output only RH0
One SPDT (3 wire) RH1
Two SPDT (3 wire) RH2
One SPDT (4 wire) RH3
Two SPDT (4 wire) RH4
ENGINEERING DATA

Maximum fluid temperature: 200°F (93°C)

Optional max. fluid temperatures: 300 & 400°F (148 & 204°C) (option HT)

Maximum ambient temp: 150°F (65°C) CSA listed only to 105°F (41°C)

Series LL max. operating pressures:
With plastic cap: (3:1 safety factor): 150 PSI (10.34 BAR)
With metal cap: (3:1 safety factor): 300 PSI (20.69 BAR)

Series LP max. operating pressures: (2:1 safety factor): 500 PSI (34.48 BAR)

Series LH max. operating pressures: (2:1 safety factor): 1500 PSI (103.45 BAR)

Pressure drop: 5 PSI (.35 BAR) at full scale

Readout accuracy, full scale: ±5%

Switch repeatability is 1% of actual flow

SPECIAL OPTIONS

High temperature: (option HT) requires all-metal construction (M Cap material) 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.

High Accuracy: (option HA)
Modification of full scale to +/-3%. HA not available with transmitter or R7, R17, R18, R19 switch options. Requires flow rates of 1 GPM or greater.

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.

INSTALLATION

Flow monitors mount in-line or offset and are typically supported by rigid pipe. For additional support when using tubing or flexible hose, order special options W (wall) or F (foot) mounting brackets.

Wall Mount Bracket

Foot Mount Bracket
CONTROL BOX SELECTION GUIDE

“A”, “L” and “Z” Boxes

Maximum installation dimensions

“R” Box

Maximum installation dimensions
CONTROL BOX SELECTION GUIDE

“T” Box

Maximum installation dimensions

Flanged Face to Face Dimensions for In-Line and Offset Installation

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>3.88</td>
</tr>
<tr>
<td>1</td>
<td>4.25</td>
</tr>
</tbody>
</table>