MAX FLOW SIZES FROM
0.5 TO 20 GPM (2 TO 75 LPM)

MAX LIQUID PRESSURE 300 PSI (20.69 BAR) **SN SERIES**
MAX LIQUID PRESSURE 500 PSI (34.48 BAR) **SM SERIES**
MAX LIQUID PRESSURE 2000 PSI (137.93 BAR) **SH SERIES**

# Flow meters, Flow switches and Flow transmitters

## A Small Vane Style For Liquids




*SN Series shown with "A" style control box*

**NIST Traceable Calibration Certificate Available**

## 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

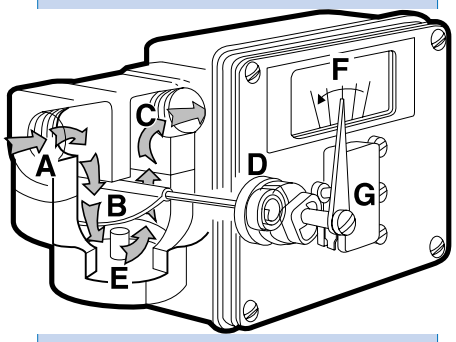
All flow meters are individually calibrated for fluids with the viscosity you specify (up to 3000 SSU/650 Centistokes). We also compensate for your fluid's specific gravity. For NIST Traceability please consult factory.

## 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.

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## HOW TO ORDER Select appropriate symbols and build a model code number, as in example shown:

**EXAMPLE: SN - B I B 7GM V - 4 - 32ØV.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 1500psi. Exterior bolts are not 316 SS. | = | SH |

### HOUSING MATERIAL

| HOUSING MATERIAL | WHERE USED | | | |
|---|---|---|---|---|
| Aluminum with nylon flow chamber | Lube oil | = | A | SN only |
| Brass with nylon flow chamber | Water | = | B | |
| Aluminum | Lube oil | = | D | SN or SM |
| Brass | Water | = | F | |
| Stainless steel (316) | Chemicals, corrosives | = | I | SH, SM or SN |
| Carbon steel | Oil | = | M | |

*NOTE: SH-I units only good to 1500 PSI. External screws not 316 SS.*

### INTERNAL MOVING PARTS

| | | | |
|---|---|---|---|
| Stainless steel (316 series) | Water, chemicals and corrosives | = | I |
| Titanium | Sea water | = | T |

### SEAL MATERIAL

| | | | |
|---|---|---|---|
| Buna N | Water, oil | = | B |
| Viton | Acids, some caustics | = | F |
| Kalrez (dynamic) and Viton (static) | Specialty | = | K |

### MAX FLOW RATE LIQUIDS

Viscosity minimum (SSU/Centistokes)

| | 500/110 | 250/55 | 100/20 | None | | |
|---|---|---|---|---|---|---|
| GPH: | 3Ø | 6Ø | 9Ø, 12Ø | 18Ø, 24Ø, 3ØØ, 2ØØ, 3ØØ, 4ØØ, 5ØØ, 6ØØ, 7ØØ, 8ØØ, 9ØØ, 1ØØØ, 12ØØ | = | GH |
| GPM: | .5 | 1 | 1.5, 2 | 3, 4, 5, 6, 7, 8, 9, 1Ø, 15 & 2Ø | = | GM |
| LPM: | 2 | 4 | 6, 8 | 1Ø, 15, 2Ø, 25, 3Ø, 35, 4Ø, 45, 5Ø, 6Ø, 75 | = | LM |
| LPH: | 1ØØ | 2ØØ | 35Ø, 5ØØ | 6ØØ, 7ØØ, 8ØØ, 9ØØ, 1ØØØ, 15ØØ, 2ØØØ, 25ØØ, 3ØØØ, 35ØØ, 4ØØØ | = | LH |
| CMH: | .1 | .25 | .35, .5 | .75, 1, 1.25, 1.5, 2, 2.5, 3, 3.5, 4, 4.5 | = | CMH |
| GLM: Gallons & liters per minute -dual scale | | | | | = | GLM |
| DGM: Dual viscosity scale | | | | | = | DGM |

*NOTE: Dual Scales not available with LCD displays*

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

| | | |
|---|---|---|
| No Valve | = | No Symbol |
| Valve (brass) | = | V |

Not available on carbon steel or stainless steel housings.

### THREADED ATTACHMENT

Pipe size and attachment method

| Pipe Size In Inches | NPT Female | SAE | BSPP | BSPT | Max Flow In GPM |
|---|---|---|---|---|---|
| 1/4 | 2 | 4T | 4BP | 4BT | 8 |
| 3/8 | 3 | 6T | 6BP | 6BT | 8 |
| 1/2 | 4 | 8T | 8BP | 8BT | 12 |
| 5/8 | | 1ØT | 1ØBP | 1ØBT | 15 |
| 3/4 | 6 | 12T | 12BP | 12BT | 2Ø |

### FLANGED

Ex: 2FWCS15ØRF = 1/4", Welded, Class 15Ø, 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 | 3ØØ | |
| 4 = 1/2" | | | | |
| 6 = 3/4" | | | | |
| 8 = 1" | | | | |

### 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. 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: 32Ø/15ØV.9.

| A1 | W | L - | | | ST - | 2D |
|---|---|---|---|---|---|---|

| SERVICE | | |
|---|---|---|
| Oil and dust tight (Type 12) | = | N |
| Weatherproof (Type 4) | = | W |
| Weatherproof, corrosion proof (Type 4X) | = | X |

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

| SPECIAL OPTIONS | | |
|---|---|---|
| High-temp- 400°F, 300°F for transmitter options | = | HT |
| High accuracy (+/-3%) ref. page 4 | = | HA |
| Stainless steel ID tag for customer supplied information | = | ST |
| Safety Glass window ref. page 4 | = | TG |
| Clearance vane for ≥ 5 GPM | = | Z86 |
| Foot mount bracket | = | F |
| Wall mount bracket | = | W |

**SWITCH SETTING**

No symbol = Lowest possible setting

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. Consult factory for settings out of flow range. **2D**

## 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: | A Box Polysulfone | L Box Aluminum | Z Box 316 SS |
|---|---|---|---|
| 4-20 mA transmitter (Intrinsically safe with approved barriers) | AXØ | LXØ | ZXØ |
| HART with programmable switch points | AHØ | LHØ | ZHØ |
| Display only | AØ | LØ | ZØ |
| 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 | A61 | L61 | Z61 |
| Two SPDT (3 wire) high temperature | A62 | L62 | Z62 |
| One SPDT (3 wire) gold contact | A71 | L71 | Z71 |
| Two SPDT (3 wire) gold contact | A72 | L72 | Z72 |
| One SPDT (3 wire) hermetically sealed | A53 | L53 | Z53 |
| Two SPDT (3 wire) hermetically sealed | A54 | L54 | Z54 |

**T Box**

### "T" Box

"T" box always has a transmitter (4-20 mA) 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.
NOTE: The 4-20mA transmitter with or without the LCD and with NO switches is Intrinsically safe with approved barriers.



**LCD readout, 4-20mA with 2 open collectors:**

| | |
|---|---|
| No switches | TXLØ |
| One SPDT (3 wire) | TXL1 |
| One SPDT (4 wire) | TXL3 |
| One SPDT (3 wire) high temperature | TXL61 |




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

| | |
|---|---|
| No switches | TXØ |
| One SPDT (3 wire) | TX1 |
| Two SPDT (3 wire) | TX2 |
| One SPDT (4 wire) | TX3 |
| Two SPDT (4 wire) | TX4 |
| One SPDT (3 wire) high temperature | TX61 |

**Flow rate display, HART & 4-20mA output:**

| | |
|---|---|
| HART protocol is not intrinsically safe | |
| HART & 4-20mA output only | THØ |
| One SPDT (3 wire) | TH1 |
| Two SPDT (3 wire) | TH2 |
| One SPDT (4 wire) | TH3 |
| Two SPDT (4 wire) | TH4 |



### "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.

**R Box**

**Flow rate display plus:**

| | |
|---|---|
| Display only | RØ |
| 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:**

| | |
|---|---|
| One SPDT hazardous location | R7* |
| One DPDT hazardous location | R17* |

NOTE: Flows 5GPM or greater*

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

| | |
|---|---|
| Display and transmitter only (Intrinsically safe with no switch options with approved barriers) | RXØ |
| 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 & 4-20mA output:**

| | |
|---|---|
| Hart protocol is not intrinsically safe | |
| HART & 4-20mA output only | RHØ |
| 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 (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**

## INSTALLATION

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

## 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 16 GPM/60 LPM = pressure drop from 1.9 to 5.5 PSID (3.7 PSID average).

Maximum flow ranges to 20 GPM/75 LPM = pressure drop from 1.9 to 6 PSID (4.0 PSID average).

## 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.

**High Accuracy:** (option **HA**) Modification of full scale to +/-3%. HA not available with transmitter or R7, R17 switch options. Water viscosities require a flow rate of 3 GPM or greater. On viscosities (200 SSU and greater) requires flow rates of 1 GPM or greater.

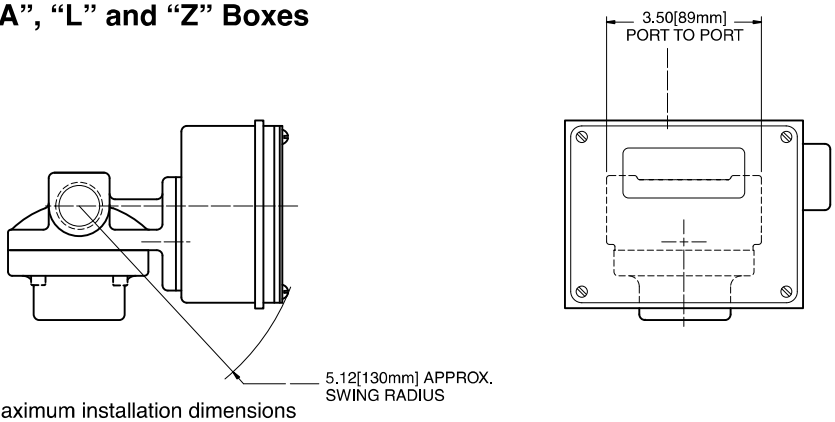
**Identification tag:** (option **ST**) customer-supplied information is stamped on a stainless steel tag that is attached to the nameplate.

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

**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.

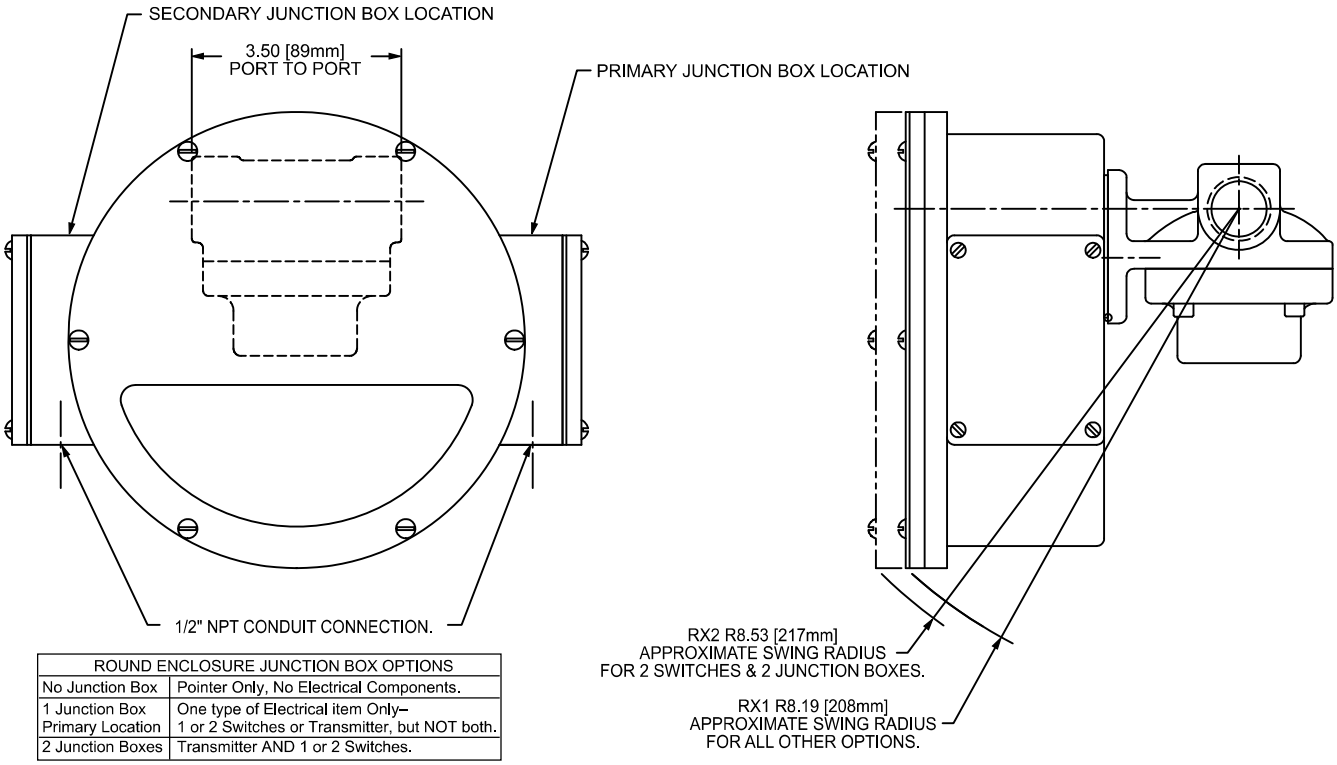
## CONTROL BOX SELECTION GUIDE

### “A”, “L” and “Z” Boxes




Maximum installation dimensions

### “R” Box

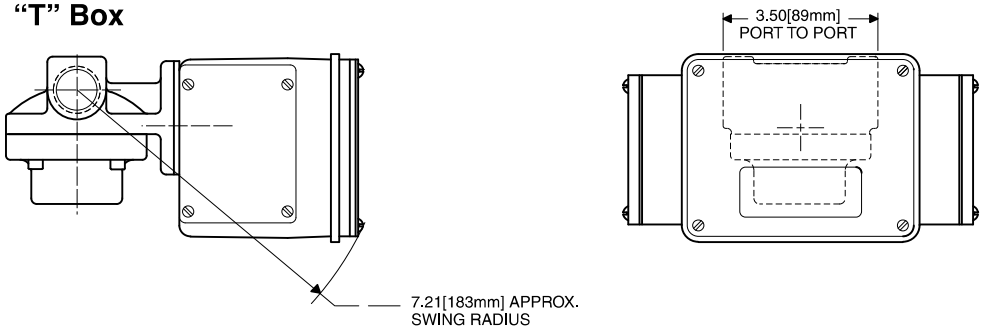



| ROUND ENCLOSURE JUNCTION BOX OPTIONS | |
|---|---|
| No Junction Box | Pointer Only, No Electrical Components. |
| 1 Junction Box Primary Location | One type of Electrical item Only– 1 or 2 Switches or Transmitter, but NOT both. |
| 2 Junction Boxes | Transmitter AND 1 or 2 Switches. |

Maximum installation dimensions

## CONTROL BOX SELECTION GUIDE

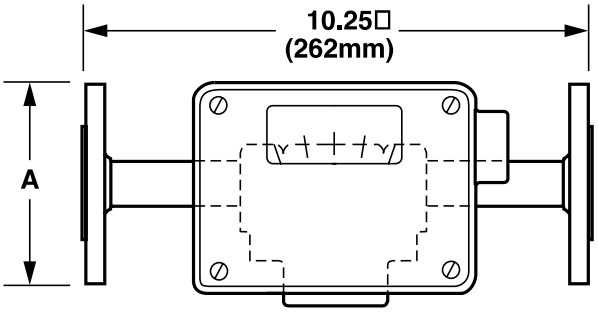
### "T" Box




Maximum installation dimensions

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

| Port Size (inches) | A (inches) |
|---|---|
| 1/2 | 3.50 |
| 3/4 | 3.87 |
| 1 | 4.25 |




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

**Universal Flow Monitors, Inc.**
1755 E. Nine Mile Road ▪ P.O. Box 249 ▪ Hazel Park, MI 48030
Tel: 248-542-9635 ▪ Fax: 248-398-4274
www.flowmeters.com ▪ E-mail: ufm@flowmeters.com