



**MAX FLOW SIZES**  
**MAX LIQUID PRESSURE**  
**MAX LIQUID PRESSURE**

From 5 GPH to 30 GPM (20 LPH to 110 LPM)  
 500 PSI (34.48 Bar) or  
 1500 PSI (103.42 BAR)  
 1% FS accuracy available (1 GPM and higher)

PI 1/4 to 1 inch

# UNIVERSAL® Flow Monitors

# Piston Inline PI

Flow meters,  
Flow switches and  
Flow transmitters

## Piston - In Line



NIST Traceable Calibration  
Certificate Available



PI Series, with standard scale and pointer (control box A).

### 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

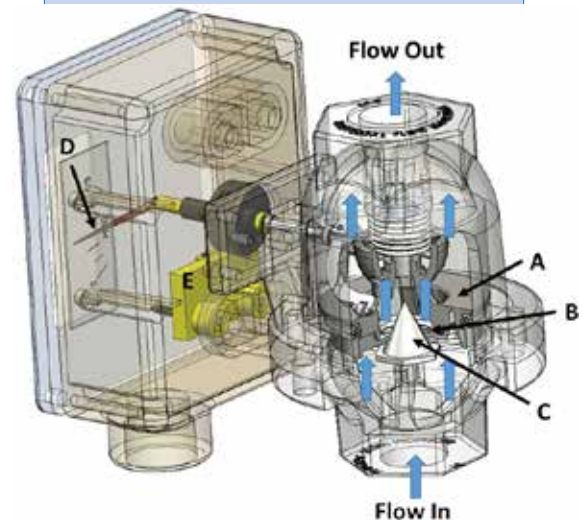
All flow meters are individually calibrated for fluids with the viscosity you specify (up to 3000 SSU/650 Centistokes). We also compensate for your fluid's specific gravity. For NIST Traceability please consult factory.

### 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.



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

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

**EXAMPLE: PI -**

**B**

**Z**

**F**

**10GM-4**

**32V1.0 -**

SERIES BY PRESSURE RATING	
Piston Inline	= <b>PI</b>

HOUSING MATERIAL 500PSI	WHERE USED		
Aluminum	Lube oil	=	<b>A</b>
Brass	Water	=	<b>B</b>

HOUSING MATERIAL 1500PSI	WHERE USED		
Stainless steel (316)	Chemicals, corrosives, oil	=	<b>Z</b>

INTERNAL MOVING PARTS			
Stainless steel (316L series)	Water, oil, chemicals and corrosives	=	<b>Z</b>

SEAL MATERIAL			
Buna N	Water, oil	=	<b>B</b>
EPR	Hot water, caustics	=	<b>E</b>
Viton	Acids, some caustics	=	<b>F</b>
Kalrez	Corrosives, solvents	=	<b>J</b>
Kalrez (dynamic) & Buna N (static)	Specialty	=	<b>A</b>
Kalrez (dynamic) and EPR (static)	Specialty	=	<b>H</b>
Kalrez (dynamic) and Viton (static)	Specialty	=	<b>K</b>
Kalrez (dynamic) and Teflon (static)	Corrosives, solvents	=	<b>T</b>

MAX FLOW RATE LIQUIDS	SCALES
GPH: <b>5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 80, 90, 100, 120, 150, 200, 250 &amp; 300</b>	= <b>GH</b>
GPM: <b>0.25, 0.5, 0.75, 1, 1.5, 2, 2.5, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20 &amp; 30</b>	= <b>GM</b>
LPH: <b>20, 30, 40, 50, 60, 70, 80, 90, 100, 200, 300, 400, 500, 600, 700, 800, 900 &amp; 1000</b>	= <b>LH</b>
LPM: <b>5, 10, 15, 20, 25, 30, 35, 40, 50, 60, 70, 75, 80, 90, 100</b>	= <b>LM</b>
CMH: <b>1, 2, 3, 4, 5, 6</b>	= <b>CMH</b>
GLM: Dual scale - gallons & liters per minute	= <b>GLM</b>
NOTE: Dual Scales not available with LCD displays.	

THREADED ATTACHMENT						
Pipe size and attachment method	Pipe Size In Inches	NPT	SAE	BSPP	BSPT	Max Flow In GPM
	1/4	<b>2</b>	<b>4T</b>	<b>4BP</b>	<b>4BT</b>	<b>5</b>
	3/8	<b>3</b>	<b>6T</b>	<b>6BP</b>	<b>6BT</b>	<b>10</b>
	1/2	<b>4</b>	<b>8T</b>	<b>8BP</b>	<b>8BT</b>	<b>15</b>
	5/8					
	3/4	<b>6</b>	<b>12T</b>	<b>12BP</b>	<b>12BT</b>	<b>30</b>
	1	<b>8</b>	<b>16T</b>	<b>16BP</b>	<b>16BT</b>	<b>30</b>

FLANGED				
Ex: 2FWCS150RF = 1/4", Welded, Carbon steel, Class 150, Raised Face flange				
Pipe Size In Inches	Attachment	Material	Class	Style
<b>2</b> = 1/4"	<b>FW</b> =Welded	<b>CS</b> =Carbon Steel	<b>150</b>	<b>RF</b> =ANSI raised face
<b>3</b> = 3/8"	<b>FT</b> =Threaded	<b>S</b> =316 Stainless	<b>300</b>	
<b>4</b> = 1/2"			<b>600</b>	
<b>6</b> = 3/4"				
<b>8</b> = 1"				

FLUID CHARACTERISTICS
Viscosity number followed by a 'V' (for SSU), 'C' (for centipoise), or 'CS' (for centistokes) followed by the specific gravity. Example: <b>32V1.0</b> would indicate a fluid with a viscosity of 32 SSU and specific gravity of 1.0

A61

W L -

HT - 5D

**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 (+/-1%) ref. page 4 = HA  
 Stainless steel ID tag = ST  
 Safety Glass window ref. page 4 = TG  
 Wall mounting bracket = W  
 Foot mounting bracket = F

**SWITCH SETTING**

No symbol = Lowest possible setting (usually 10% of maximum flow)  
 Desired set point is assumed to be in flow units already selected (GM). Give flow rate followed by a "D" for flow going down (flow failure) or a "U" for flow going up.  
 Example, 5D indicates a setting of 5 GPM in declining flow.

5D

**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 Box L Box Z Box

**A, L and Z small control box in the following configurations and materials: Polysulfone Aluminum 316 SS**

	A Box	L Box	Z Box
4-20 mA transmitter (Intrinsically safe with approved barriers)	AX0	LX0	ZX0
HART with programmable switch points	AH0	LH0	ZH0
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	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



**"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	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:**

One SPDT hazardous location	R7
One DPDT hazardous location	R17
Two SPDT hazardous location	R18
Two DPDT hazardous location	R19

**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)	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 & 4-20mA output:**

Hart protocol is not intrinsically safe	RH0
HART & 4-20mA output only	RH0
One SPDT (3 wire)	RH1
Two SPDT (3 wire)	RH2
One SPDT (4 wire)	RH3
Two SPDT (4 wire)	RH4

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.



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

No switches	TX0
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	TH0
HART & 4-20mA output only	TH0
One SPDT (3 wire)	TH1
Two SPDT (3 wire)	TH2
One SPDT (4 wire)	TH3
Two SPDT (4 wire)	TH4



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

collectors:	
No switches	TXL0
One SPDT (3 wire)	TXL1
One SPDT (4 wire)	TXL3
One SPDT (3 wire) high temperature	TXL61

## ENGINEERING DATA

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

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

**Series PI max. operating pressures:** (3:1 safety factor): 500 PSI (34.48 BAR) or 1500 PSI (103.42 BAR)

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

**Readout accuracy, full scale:** ±2%  
1% HA (high accuracy) available on 1 GPM and above.  
Reference Special Options below

**Switch repeatability is 1% of actual flow**

## INSTALLATION

Piston In-line (PI) meters mount in-line 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.

## SPECIAL OPTIONS

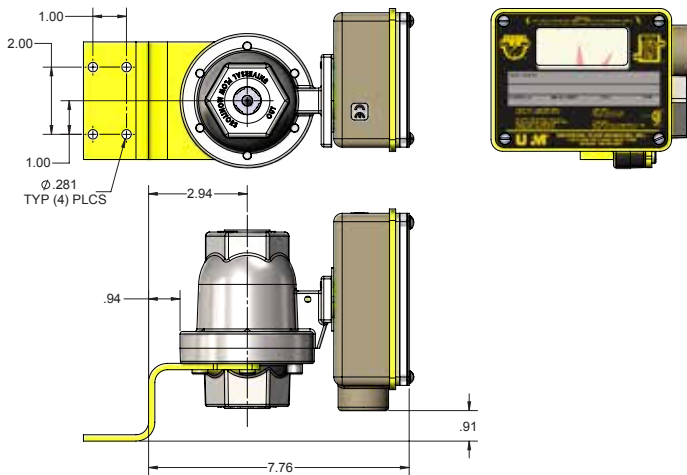
**High temperature:** (option HT) requires all-metal construction with seals of Viton, EPR, Kalrez or Teflon (compatible with fluid). A thermal barrier (heat-resistant cloth) is added between the housing and the control box, which must be used with service option "W" (weatherproof) or "X" (corrosion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

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

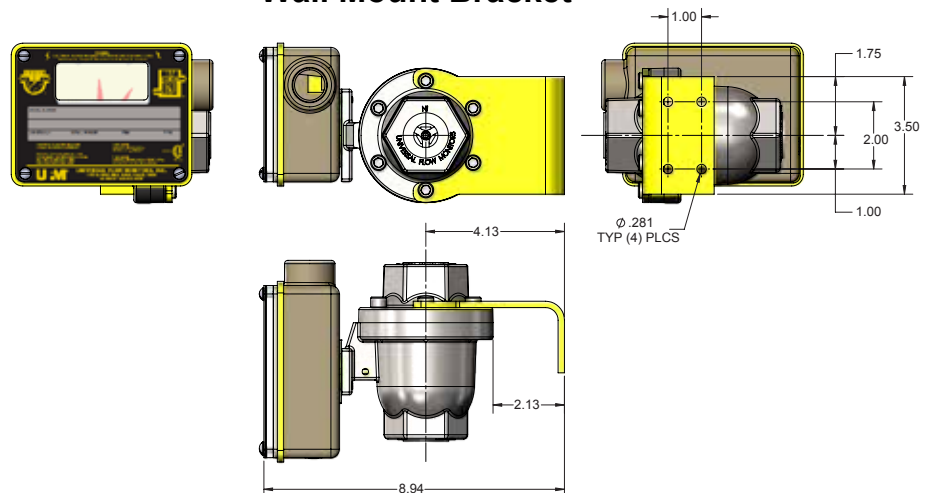
**Identification tag:** (option ST) customer-supplied information is stamped on a stainless steel tag that is attached to the nameplate.

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

### Foot Mount Bracket

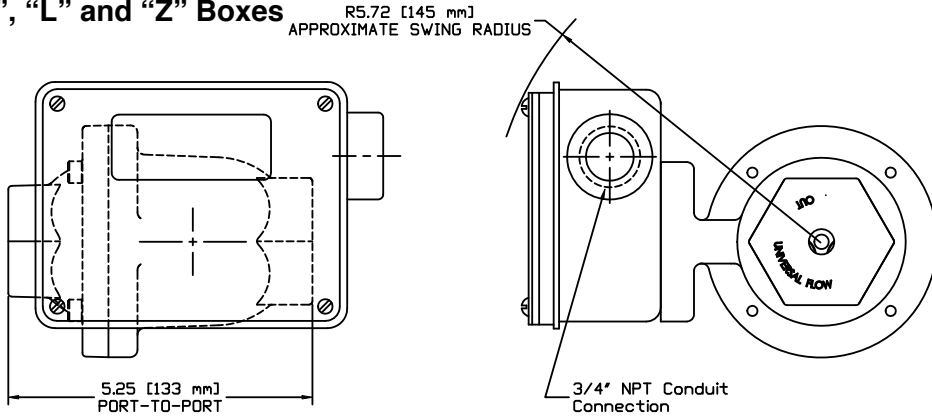


### Wall Mount Bracket



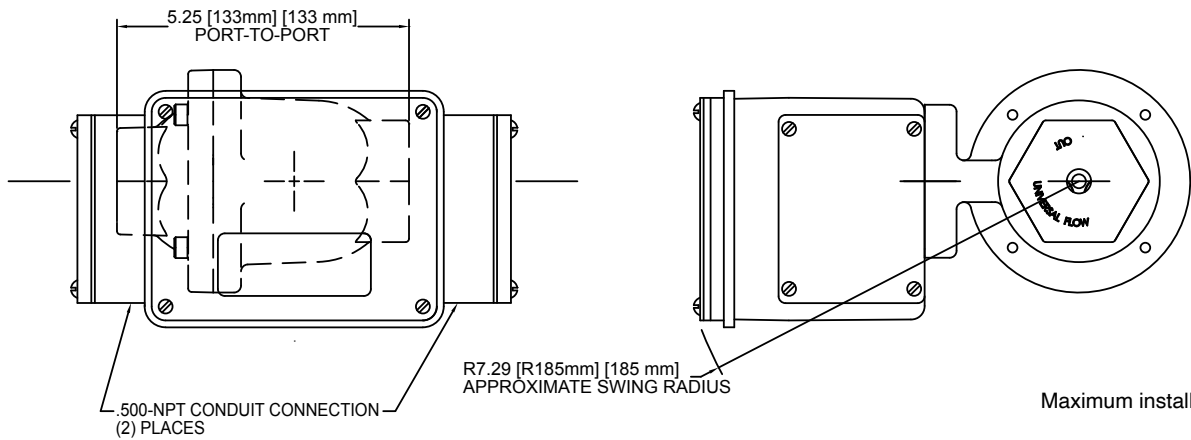
# CONTROL BOX SELECTION GUIDE

## “A”, “L” and “Z” Boxes



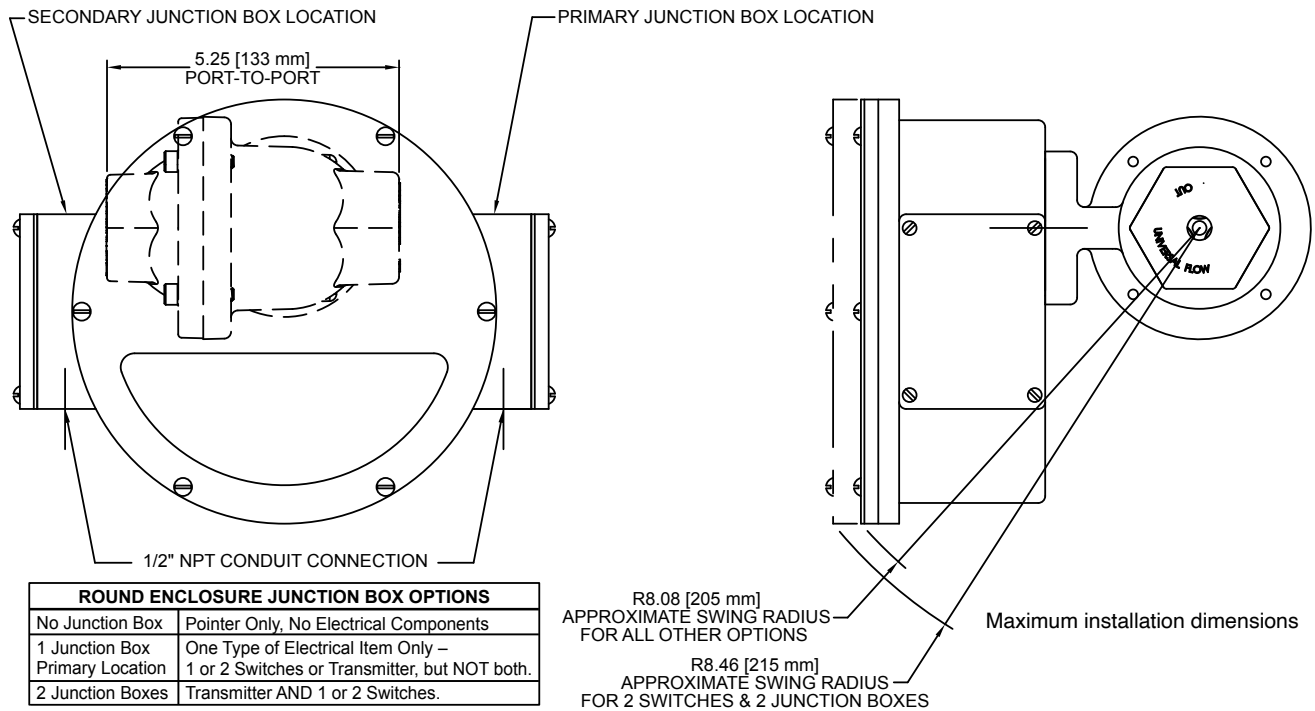
Maximum installation dimensions

## “T” Box



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.

R8.08 [205 mm]  
APPROXIMATE SWING RADIUS  
FOR ALL OTHER OPTIONS

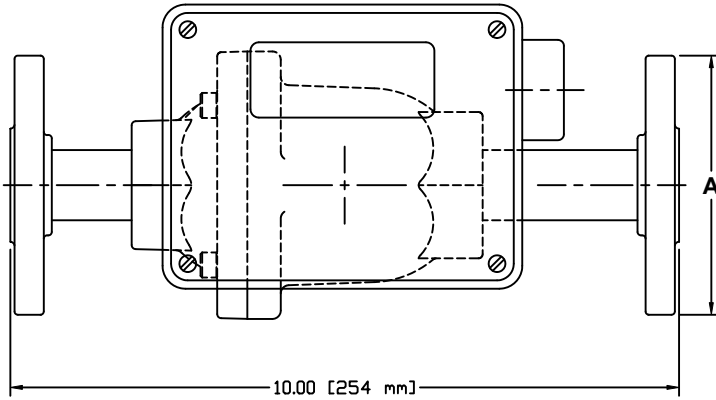
R8.46 [215 mm]  
APPROXIMATE SWING RADIUS  
FOR 2 SWITCHES & 2 JUNCTION BOXES

Maximum installation dimensions

**A-Box for PI Series w Flanges**

**Face-to-Face Dimensions With 150# R.F. Flanges**

(for other flanges consult factory)



Port Size (Inches)	Dia. A
1/2	3 1/2
3/4	3 7/8
1	4 1/4

"Flow Up" or "Flow Down" dimensions are the same.  
Scale numbers are rotated 90° to read correctly.