



**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

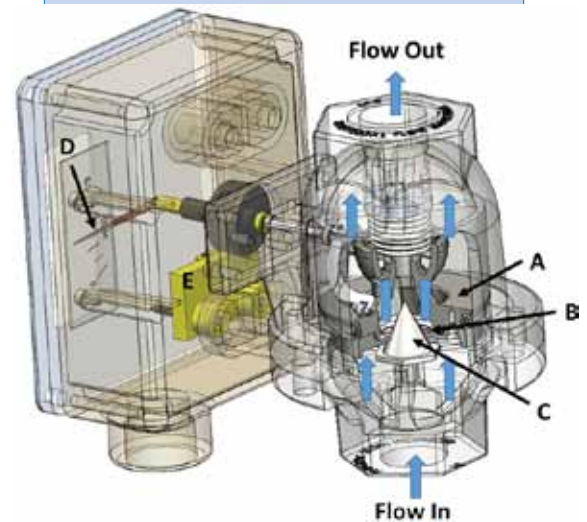
All flow meters are individually calibrated for fluids with the viscosity you specify (up to 3000 SSU/650 Centistokes). We also compensate for your fluid's specific gravity. For NIST Traceability please consult factory.

### 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 = **PI**

**HOUSING MATERIAL 500PSI WHERE USED**

Aluminum Lube oil = **A**  
 Brass Water = **B**

**HOUSING MATERIAL 1500PSI WHERE USED**

Stainless steel (316) Chemicals, corrosives, oil = **Z**

**INTERNAL MOVING PARTS**

Stainless steel (316L series) Water, oil, 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 = **T**

**MAX FLOW RATE LIQUIDS**

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 & 30** = **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, 80, 90, 100** = **LM**  
 CMH: **1, 2, 3, 4, 5, 6** = **CMH**  
 GLM: Dual scale - gallons & liters per minute = **GLM**

**SCALES**

**THREADED ATTACHMENT**

Pipe Size and attachment method	Pipe Size In Inches	NPT	SAE	BSPP	BSPT	Max Flow In GPM
1/4	3/8	<b>2</b>	<b>4T</b>	<b>4BP</b>	<b>4BT</b>	<b>5</b>
		<b>3</b>	<b>6T</b>	<b>6BP</b>	<b>6BT</b>	<b>10</b>
1/2	5/8	<b>4</b>	<b>8T</b>	<b>8BP</b>	<b>8BT</b>	<b>15</b>
		<b>6</b>	<b>12T</b>	<b>12BP</b>	<b>12BT</b>	<b>30</b>
3/4	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: **32V1.0** 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**

	<b>A Box</b>	<b>L Box</b>	<b>Z Box</b>
4-20 mA transmitter (Intrinsically safe with approved barriers)	<b>AX0</b>	<b>LX0</b>	<b>ZX0</b>
HART with programmable switch points	<b>AH0</b>	<b>LH0</b>	<b>ZH0</b>
Display only	<b>A0</b>	<b>L0</b>	<b>Z0</b>
One SPDT (3 wire)	<b>A1</b>	<b>L1</b>	<b>Z1</b>
One high vibration SPDT (3 wire)	<b>A1B</b>	<b>L1B</b>	<b>Z1B</b>
Two SPDT (3 wire)	<b>A2</b>	<b>L2</b>	<b>Z2</b>
Two high vibration SPDT (3 wire)	<b>A2B</b>	<b>L2B</b>	<b>Z2B</b>
One SPDT (4 wire)	<b>A3</b>	<b>L3</b>	<b>Z3</b>
Two SPDT (4 wire)	<b>A4</b>	<b>L4</b>	<b>Z4</b>
One SPDT (3 wire) high temperature	<b>A61</b>	<b>L61</b>	<b>Z61</b>
Two SPDT (3 wire) high temperature	<b>A62</b>	<b>L62</b>	<b>Z62</b>
One SPDT (3 wire) gold contact	<b>A71</b>	<b>L71</b>	<b>Z71</b>
Two SPDT (3 wire) gold contact	<b>A72</b>	<b>L72</b>	<b>Z72</b>
One SPDT (3 wire) hermetically sealed	<b>A53</b>	<b>L53</b>	<b>Z53</b>
Two SPDT (3 wire) hermetically sealed	<b>A54</b>	<b>L54</b>	<b>Z54</b>



**"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	<b>R0</b>
One SPDT (3 wire)	<b>R1</b>
One high vibration SPDT (3 wire)	<b>R1B</b>
Two SPDT (3 wire)	<b>R2</b>
Two high vibration SPDT (3 wire)	<b>R2B</b>
One SPDT (4 wire)	<b>R3</b>
Two SPDT (4 wire)	<b>R4</b>
One SPDT (3 wire) high temperature	<b>R61</b>
Two SPDT (3 wire) high temperature	<b>R62</b>
One SPDT (3 wire) gold contact	<b>R71</b>
Two SPDT (3 wire) gold contact	<b>R72</b>

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

**For > 5 amp circuits**

One SPDT hazardous location	<b>R7</b>
One DPDT hazardous location	<b>R17</b>
Two SPDT hazardous location	<b>R18</b>
Two DPDT hazardous location	<b>R19</b>

**For < 1 amp circuits**

One SPDT hazardous location	<b>R20</b>
One DPDT hazardous location	<b>R21</b>
Two SPDT hazardous location	<b>R22</b>
Two DPDT hazardous location	<b>R23</b>
One SPST hazardous location proximity	<b>R30</b>
Two SPST hazardous location proximity	<b>R31</b>

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

Display and transmitter only	
(Intrinsically safe with approved barriers)	<b>RX0</b>
One SPDT (3 wire)	<b>RX1</b>
Two SPDT (3 wire)	<b>RX2</b>
One SPDT (4 wire)	<b>RX3</b>
Two SPDT (4 wire)	<b>RX4</b>
One SPDT (3 wire) high temperature	<b>RX61</b>

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

HART output only	<b>RH0</b>
One SPDT (3 wire)	<b>RH1</b>
Two SPDT (3 wire)	<b>RH2</b>
One SPDT (4 wire)	<b>RH3</b>
Two SPDT (4 wire)	<b>RH4</b>

**T Box**

**"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.



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

No switches (Intrinsically safe with approved barriers)	<b>TX0</b>
One SPDT (3 wire)	<b>TX1</b>
Two SPDT (3 wire)	<b>TX2</b>
One SPDT (4 wire)	<b>TX3</b>
Two SPDT (4 wire)	<b>TX4</b>
One SPDT (3 wire) high temperature	<b>TX61</b>

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

Two programmable HART switches	<b>TH0</b>
One SPDT (3 wire)	<b>TH1</b>
Two SPDT (3 wire)	<b>TH2</b>
One SPDT (4 wire)	<b>TH3</b>
Two SPDT (4 wire)	<b>TH4</b>
One SPDT (3 wire) high temperature	<b>TH61</b>



**LCD readout, 4-20mA plus option:**

No switches (Intrinsically safe with approved barriers)	<b>TXL0</b>
One SPDT (3 wire)	<b>TXL1</b>
One SPDT (4 wire)	<b>TXL3</b>
One SPDT (3 wire) high temperature	<b>TXL61</b>

## 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**

## SPECIAL OPTIONS

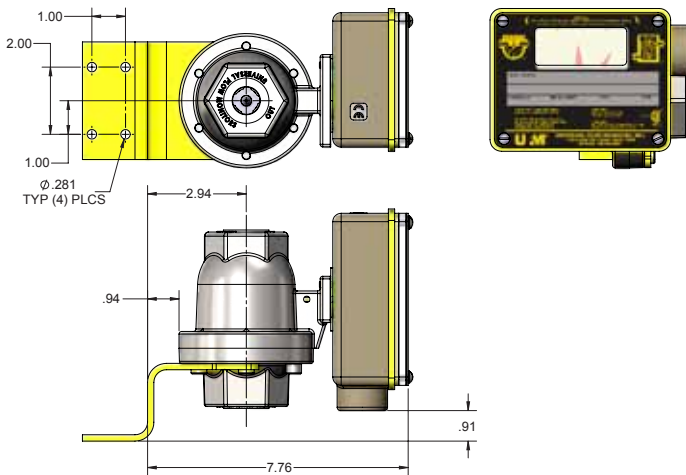
**High temperature:** (option HT) requires all-metal construction with seals of Viton, EPR, Kalrez or Teflon (compatible with fluid). A thermal barrier (heat-resistant cloth) is added between the housing and the control box, which must be used with service option "W" (weatherproof) or "X" (corrosion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

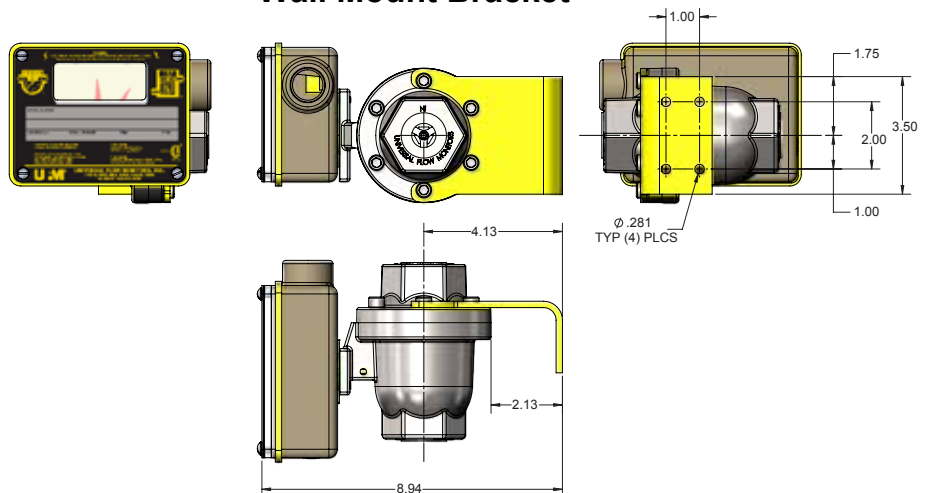
**Identification tag:** (option ST) customer-supplied information is stamped on a stainless steel tag that is attached to the nameplate.

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

### Foot Mount Bracket

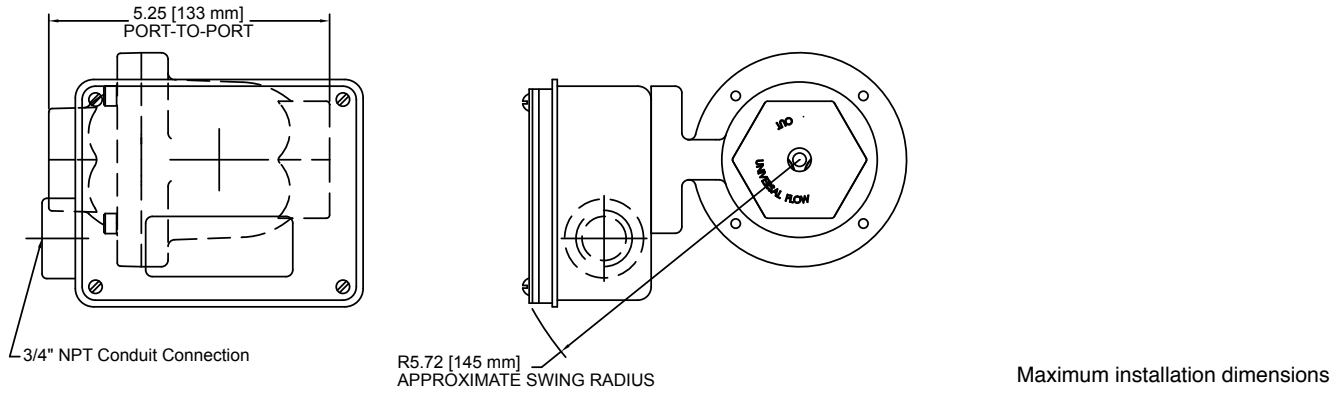


### Wall Mount Bracket

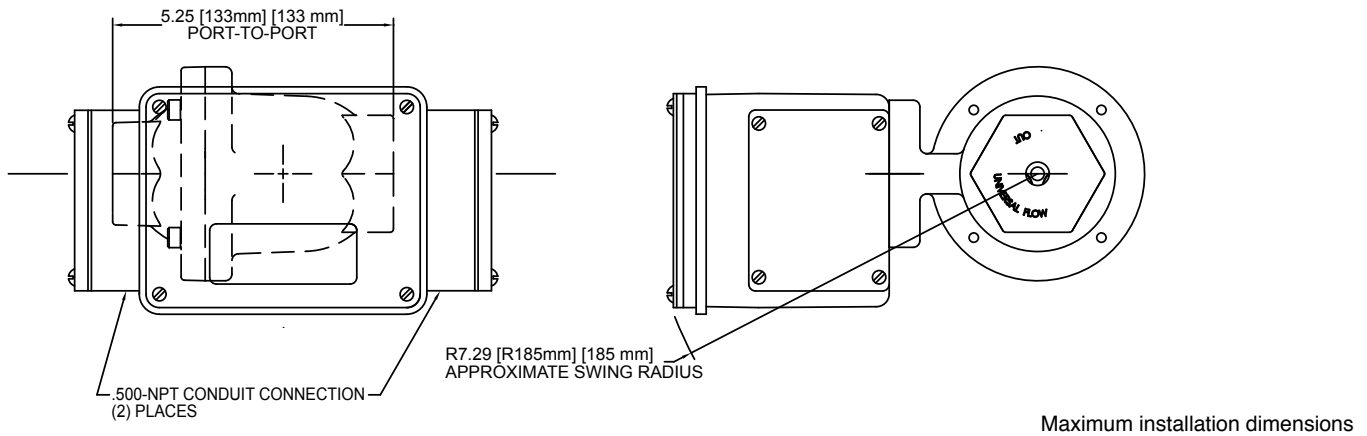


# CONTROL BOX SELECTION GUIDE

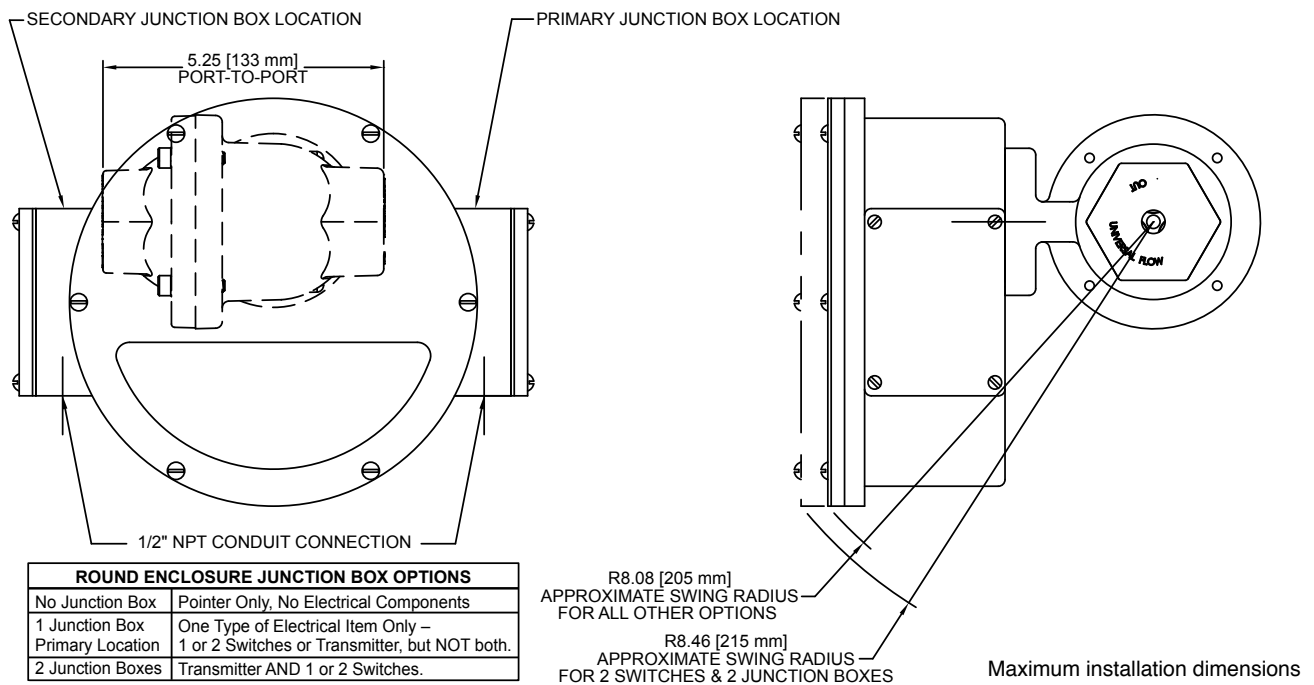
## “A”, “L” and “Z” Boxes



## “T” Box



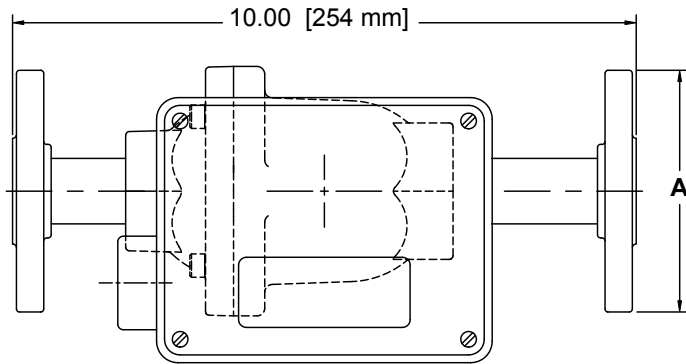
## “R” Box



**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.