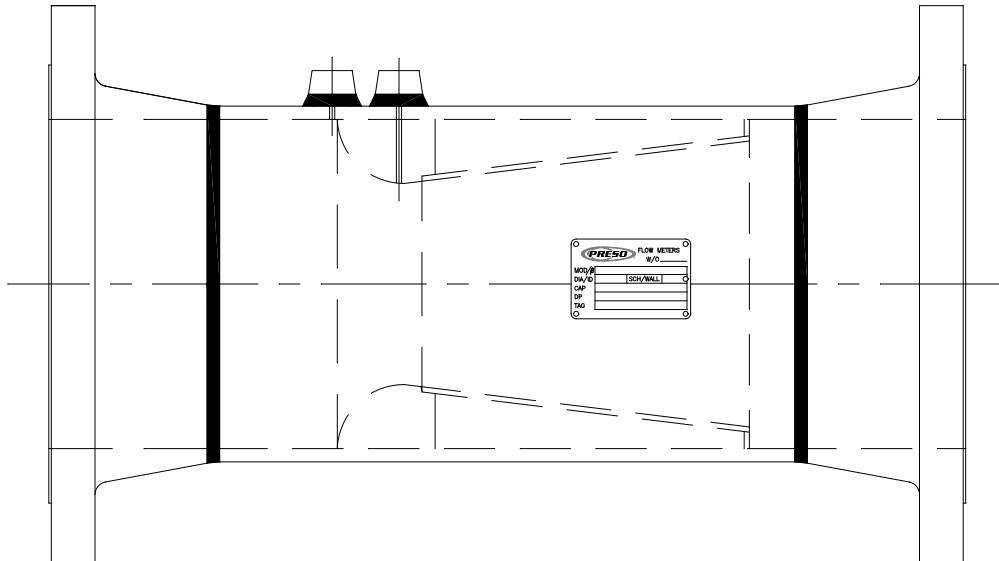




F L O W M E T E R I N G E Q U I P M E N T

# Installation and Instruction Manual



## Venturi Flow Meters

**Models:** SSL, SSM, LPL, VISSL VISSM, VILPL, CV, VBR



## I. Introduction

Preso Venturi flow meters are differential pressure flow devices providing highly accurate and repeatable measurements of liquids, gases, and steam. The Venturi restricts the flow at its throat and measures the pressure difference of the unrestricted flow and restricted flow. The Venturi's throat can be designed to meet the flow measurement application optimizing the Venturi's accuracy and permanent pressure loss.

The Preso Venturi's design provides longer lasting accuracy and lower permanent pressure loss than orifice type meters, reducing maintenance and operating costs. The Preso Venturi can be built to meet the highest pressure and temperature specifications often limited in other flow meter technologies. All models can also be supplied with RTDs and transmitters to provide an economical mass flow measurement solution.

## II. Specifications

<b>Applications:</b>	Liquids, gases and steam
<b>SSL - Classical (Herschel) Design / VISSL - Insert Version</b>	
<b>Pipe Sizes:</b>	½ to 60 inches and larger (13 to 1524 mm)
<b>Pressure &amp; Temperature:</b>	Varies, dependent upon materials of construction
<b>Pressure Loss:</b>	6% of DP maximum
<b>Turndown Ratio:</b>	10:1
<b>Process Connections:</b>	SSL; NPT, flanged, butt weld, socket weld, grooved VISSL; Insert fits between pair of flanges
<b>Instrument Connections:</b>	NPT, socket weld, flanged
<b>Accuracy:</b>	±1% of reading uncalibrated; ±0.5% of reading calibrated
<b>Standard Beta Ratios:</b>	0.35, 0.49, 0.63 and 0.75; exact sizing available to provide custom beta ratios
<b>SSM - Hydraulic Shape Design (Nozzle Type) / VISSM - Insert Version</b>	
<b>Pipe Sizes</b>	½ to 60 inches and larger (13 to 1524 mm)
<b>Pressure &amp; Temperature:</b>	Varies, dependent upon materials of construction
<b>Pressure Loss:</b>	6% of DP maximum
<b>Turndown Ratio:</b>	10:1
<b>Process Connections:</b>	SSM; NPT, flanged, butt weld, socket weld, grooved VISSM; Insert fits between pair of flanges
<b>Instrument Connections:</b>	NPT, socket weld, flanged
<b>Accuracy:</b>	±1% of reading uncalibrated; ±0.5% of reading calibrated
<b>Standard Beta Ratios:</b>	0.35, 0.49, 0.63 and 0.75; exact sizing available to provide custom beta ratios

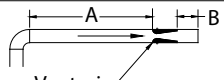
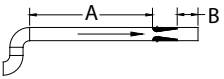
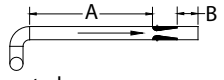
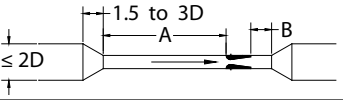
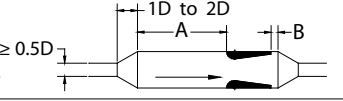
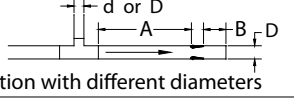
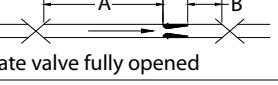
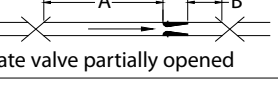
## Specifications (continued)

<b>LPL - Low-Loss Design (Short Form) / VILPL - Insert Version</b>	
<b>Pipe Sizes:</b>	½ to 60 inches and larger (13 to 1524 mm)
<b>Pressure &amp; Temperature:</b>	Varies, dependent upon materials of construction
<b>Pressure Loss:</b>	3% of DP maximum
<b>Turndown Ratio:</b>	10:1
<b>Process Connections:</b>	LPL; NPT, flanged, butt weld, socket weld, grooved VILPL; Insert fits between pair of flanges
<b>Instrument Connections:</b>	NPT, socket weld
<b>Accuracy:</b>	±3-5% of reading uncalibrated; ±0.5% of reading calibrated
<b>Standard Beta Ratios:</b>	-10, -20, -38, -65; exact sizing available to provide custom beta ratios
<b>CV Series</b>	
<b>Pipe Sizes:</b>	2 to 16 inches and larger (51 to 406 mm)
<b>Pressure:</b>	300 PSIG (2070 kPa) maximum
<b>Temperature:</b>	250 °F (120 °C) maximum
<b>Process Connections:</b>	NPT, butt weld, flanged, grooved
<b>Instrument Connections:</b>	NPT
<b>Standard Beta Ratios:</b>	-38, -65
<b>VBR Series</b>	
<b>Pipe Sizes:</b>	½ to 2 inches (13 to 51 mm)
<b>Pressure:</b>	400 PSIG (2756 kPa) maximum
<b>Temperature:</b>	250 °F (120 °C) maximum
<b>Process Connections:</b>	FNPT, socket/sweat
<b>Instrument Connections:</b>	NPT
<b>Standard Beta Ratios:</b>	-10, -20, -38, -65

### III. Installation

#### Straight Pipe Run Requirements - SSL, SSM, LPL, VISSL, VISSM, VILPL

As with most flow elements, proper operation and performance is dependent on the required lengths of unrestricted upstream and downstream piping. The recommended minimum length of the upstream side of the Venturi flow element depends on the type of fitting at the start of the straight run and the pipe configuration. A fully developed symmetrical flow profile is achieved with the minimum upstream and downstream lengths as shown in **Figure 1**.

		MODEL	THROAT SIZE	BETA RATIO		
		SSL / VISSL – Classical SSM / VISSM – Nozzle	-1	0.35		
			-2	0.49		
			-3	0.63		
			-4	0.75		
		LPL / VILPL – Low-Loss	-10	0.35		
			-20	0.49		
			-38	0.62		
			-65	0.81		
		Minimum Recommended Pipe Diameters				
INSTALLATION DISTURBANCE			-1 -10	-2 -20	-3 -38	-4 -65
Single elbow		A	4	4	4	5
		B	2	2	2	2
Two elbows in the same plane		A	8	8	9	10
		B	3	3	3	3
Two elbows in different planes		A	15	15	15	20
		B	4	4	4	4
Reducer		A	6	6	6	7
		B	2	2	2	2
Expander		A	8	8	8	10
		B	3	3	3	3
Tee connection with different diameters		A	8	8	8	10
		B	3	3	3	3
Globe / Gate valve fully opened		A	6	6	6	3
		B	3	3	3	3
Globe / Gate valve partially opened		A	12	12	14	18
		B	3	3	3	3

**FIGURE 1**

*Venturi Pipe Diameter Recommendations  
SSL, SSM, LPL, VISSL, VISSM and VILPL Models*

**NOTES:**

1. For upstream and downstream lengths equal to one half the values shown, add 2 percent to the accuracy value.
2. Any flow conditioner shall be installed in the straight length between the primary element and the upstream distance, or the fitting closest to the element. The straight lengths between fitting and conditioner shall be at least 5D and the length between conditioner and Venturi meter shall be at least 8D.
3. For other fittings, configurations, consult Preso.
4. Reference - ISO-5167, "Flow Measurement Engineering Handbook", R.W. Miller.

## Straight Pipe Run Requirements - CV, VBR

Preso CV and VBR Model Venturi elements can be installed in any position with minimal straight pipe run requirements. The recommended minimum lengths for these models are 5 pipe diameters upstream and 2 pipe diameters downstream.

### Selecting a Mounting Location

The primary Venturi station can be installed in any position on vertical or horizontal lines. However, on horizontal liquid lines where the risk of gas/gas entrapment in the meter tubing is prevalent, it is recommended to install the element with the connections below the horizontal center line. For horizontal air or gas lines, it is recommended to install the element with the connection above the horizontal centerline. For steam lines, to protect the transmitter, it is recommended to install the element so that the connections are in the horizontal centerline on meters with the instrument taps in the same plane. See **Figure 5** for meters with instrument taps that are not in the same plane. Make sure that the flow arrow or the indicated inlet is correctly oriented. Other positions are acceptable provided proper venting of the secondary element is accomplished and differences in tap line elevations are considered.

Vertical installations may introduce a slight hydrostatic head effect, which must be considered when zeroing a transmitter. The use of a 3-valve manifold is recommended particularly for zeroing a transmitter.

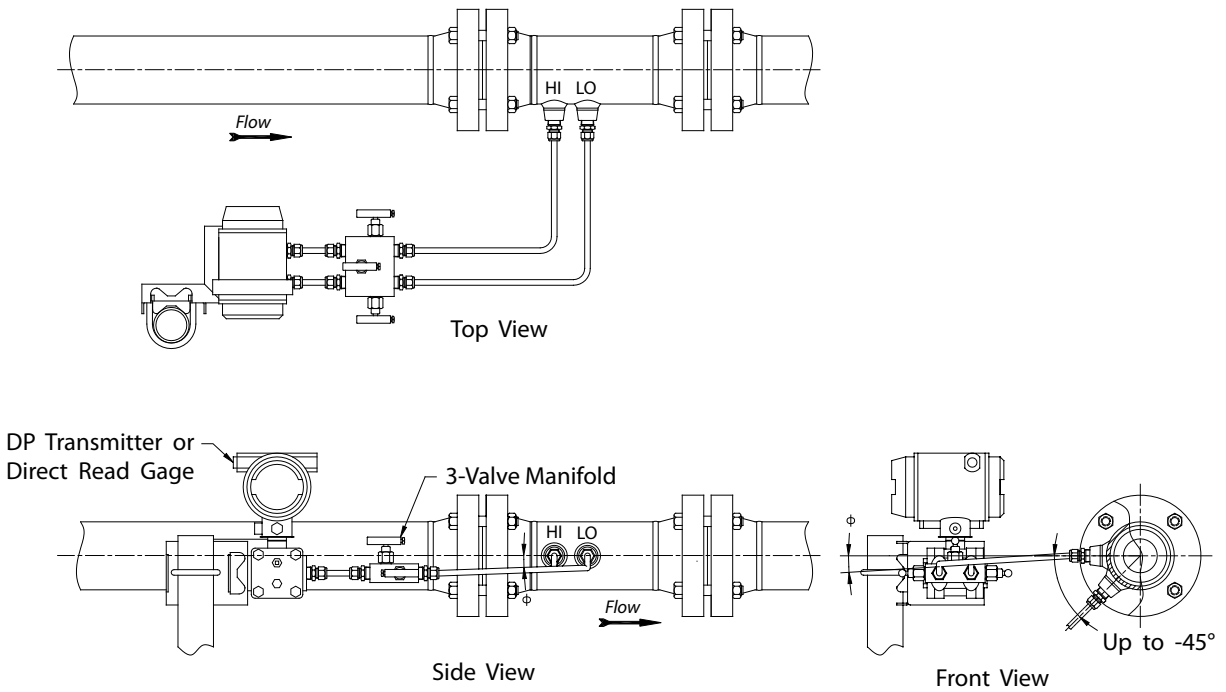
Before installation of any Venturi element, inspect for damage, particularly at the sealing surfaces. Any damage should be reported to Preso as soon as possible. Each flow element has an arrow indicating the required direction of flow. Failure to properly orient the Venturi element according to the direction of flow will cause improper results.

For Venturi elements supplied with lifting rings, the installer should take care to ensure the connections are in the desired position for their application. Thus, supplied lugs location may not be appropriate for all applications and may require other means of lifting.



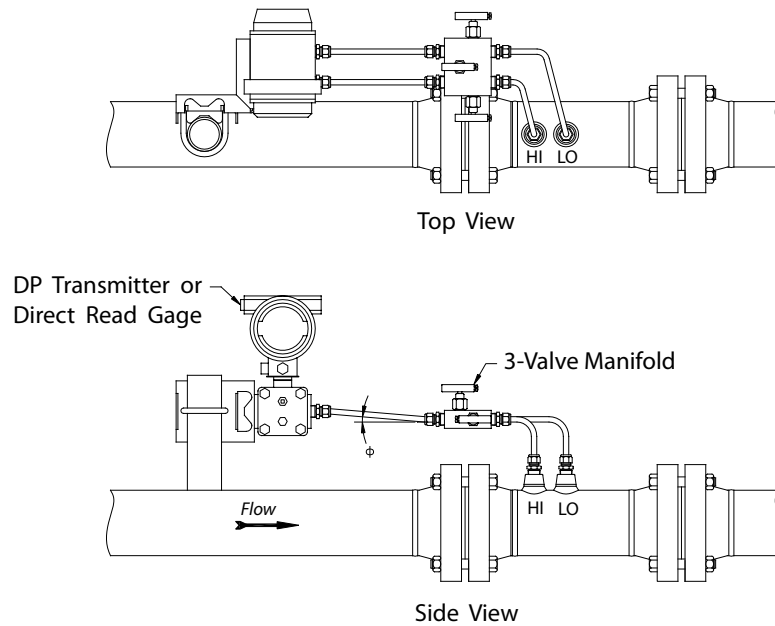
**WARNING:**

Never exceed the maximum pressure or temperature recommended for the measured process. Exceeding proper pressure or temperature ratings can lead to personal injury or equipment damage. The process piping flanges should be identical to those on the Venturi. The process temperature and pressure should never exceed those for which the element has been designed.



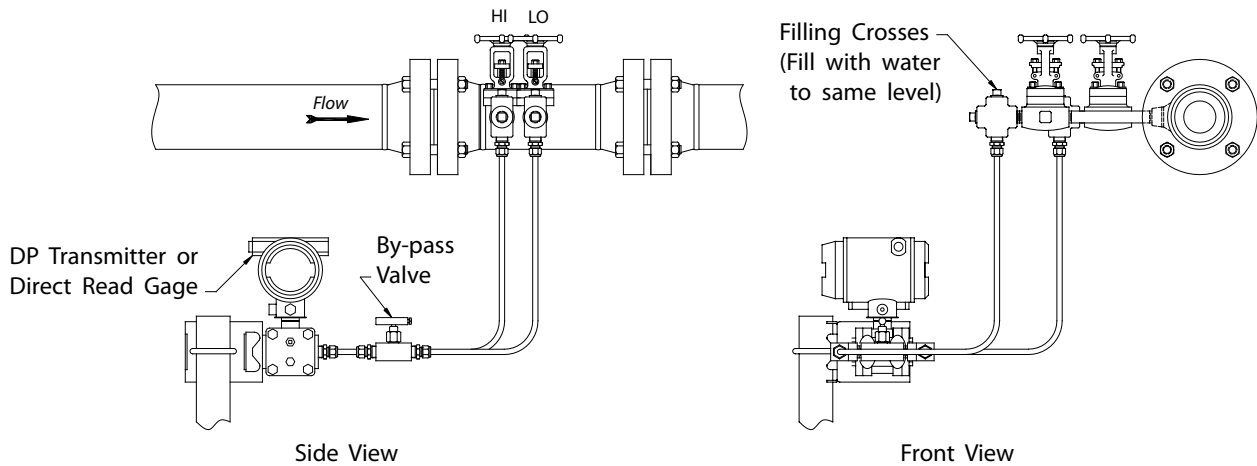
- Notes:
1.  $\phi = 1$  in / ft (80 mm/m) for water;  
2 to 4 in / ft (160 to 320 mm/m) for more viscous fluids
  2. Minimize all lead line lengths

**FIGURE 2**  
*Typical Horizontal Installation for Liquid*

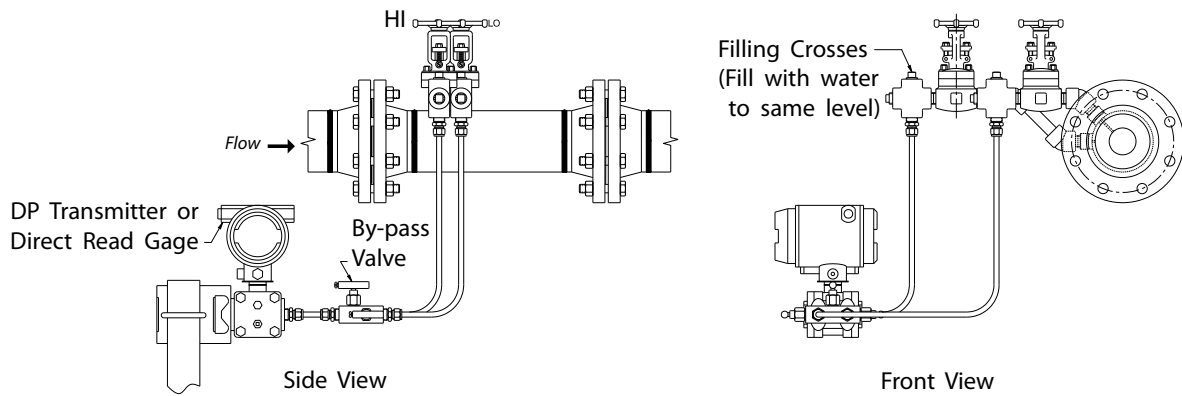


- Notes:
1.  $\phi = 1$  in / ft (80 mm/m)
  2. Minimize all lead line lengths

**FIGURE 3**  
*Typical Horizontal Installation for Gas*

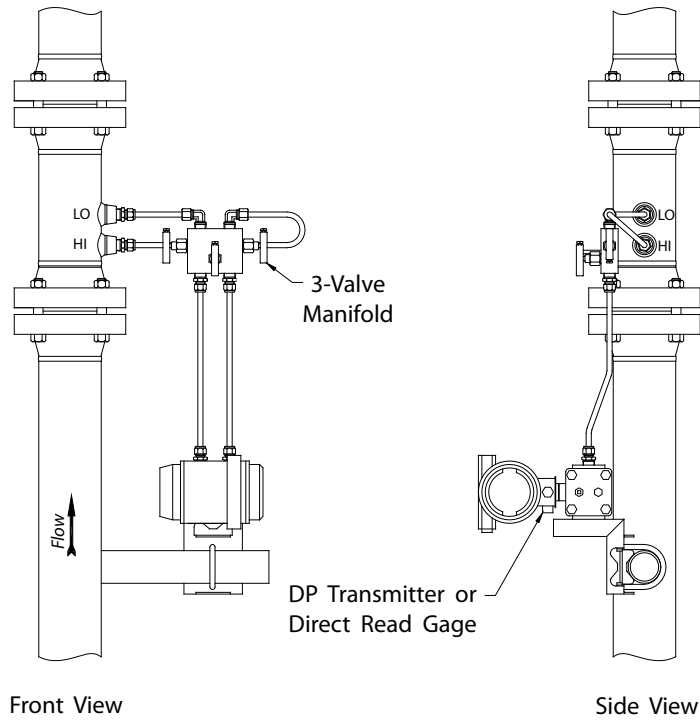


**FIGURE 4**  
*Typical Horizontal Installation for Steam*

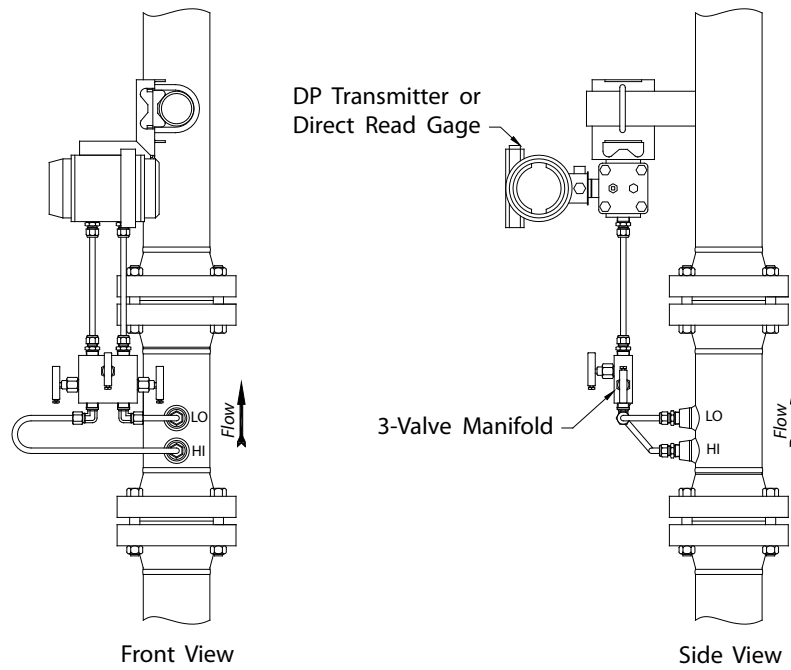


**FIGURE 5**  
*Optional Horizontal Installation for Steam  
 (Instrument Taps Not in the Same Plane)*

**NOTE:** Please see instructions in *Selecting a Mounting Location* section on page 4 for additional information.

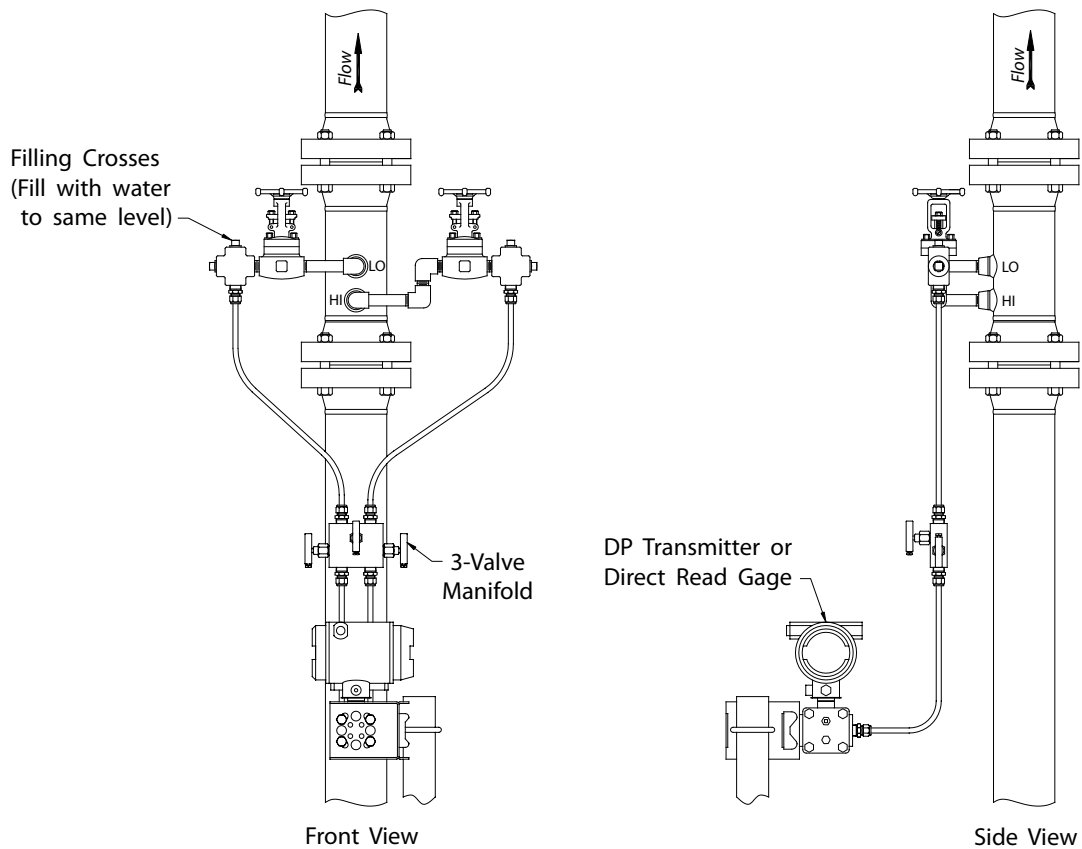


**FIGURE 6**  
*Typical Vertical Installation for Liquid*



**FIGURE 7**  
*Typical Vertical Installation for Gas*





**FIGURE 8**  
*Typical Vertical Installation for Steam*

## Line Installation

All flanged Venturi flow elements require a gasket between the process line connection and the mating flange. Select gaskets that match the pressure rating of the Venturi flanges and resist corrosive attack of the process fluid.

Before completing the bolting process, be sure that the gaskets are properly centered so that protrusion into the pipe opening is minimized. Misalignment may cause added flow turbulence. However, performance effects are typically minimal depending upon the application. Bolt the element in line with suitable hardware using recommended bolt torques for the type and class rating of the flanges.

Torque all models per ANSI flange ratings.

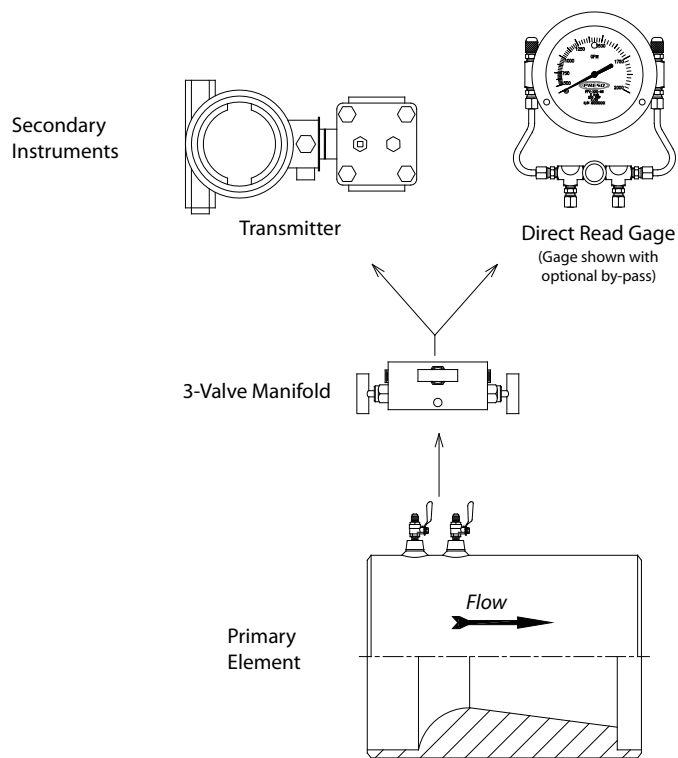
Tighten the flange bolts in a progressive "star" pattern to avoid localized stress on the gaskets.



**CAUTION:**  
 Do not exceed specified torque!

## Differential Pressure Connections

The high pressure connection is always on the upstream side of the flow direction arrow and the low pressure connection on the downstream side. Fittings used must be able to withstand the process temperature and pressure conditions, as well as provide proper corrosion resistance. Refer to appropriate secondary instrument instructions for connections to the secondary instrument high and low ports. All fitting threads should be coated with a process compliant thread sealant prior to tightening. Once tightened, torque mark all fittings for future reference.



**FIGURE 9**  
*Secondary Instrument Illustration*

# NOTES



## F L O W M E T E R I N G E Q U I P M E N T

### Limited Warranty and Disclaimer

Preso Flow Metering Equipment, Division of Racine Federated Inc. warrants to the end purchaser, for a period of one year from the date of shipment from the factory, that all flow meters manufactured by it are free from defects in materials and workmanship. This warranty does not cover products that have been damaged due to misapplication, abuse, lack of maintenance, modified or improper installation. Preso's obligation under this warranty is limited to the repair or replacement of a defective product, at no charge to the end purchaser, if the product is inspected by Preso and found to be defective. Repair or replacement is at Preso's discretion. A return goods authorization (RGA) number must be obtained from Preso before any product may be returned for warranty repair or replacement. The product must be thoroughly cleaned and any process chemicals removed before it will be accepted for return.

The purchaser must determine the applicability of the product for its desired use and assumes all risks in connection therewith. Preso assumes no responsibility or liability for any omissions or errors in connection with the use of its products. Preso will under no circumstances be liable for any incidental, consequential, contingent or special damages or loss to any person or property arising out of the failure of any product, component or accessory.

All expressed or implied warranties, including **the implied warranty of merchantability and the implied warranty of fitness for a particular purpose or application are expressly disclaimed** and shall not apply to any products sold or services rendered by Preso.

The above warranty supersedes and is in lieu of all other warranties, either expressed or implied and all other obligations or liabilities. No agent or representative has any authority to alter the terms of this warranty in any way.



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