Quick Start Guide

TEK-DP 1610D

Integral Orifice Assembly

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Quick Start Guide

1. Before you begin

This guide provides basic guidelines to assist you in quickly getting started.

Installation of the transmitter in an explosive environment must be in accordance with the appropriate local, national, and international standards, codes, and practices. Review the approvals section of the 3800E Multivariable Pressure Transmitter reference manual for any restrictions associated with a safe installation.

Do not remove the transmitter covers in explosive environments when the circuit is live.

Make sure the transmitter is installed by qualified personnel and in accordance with applicable codes of practice.

2. Unpack

Tek-DP 1610D Integral Orifice Assembly

3. Dimensional Drawing

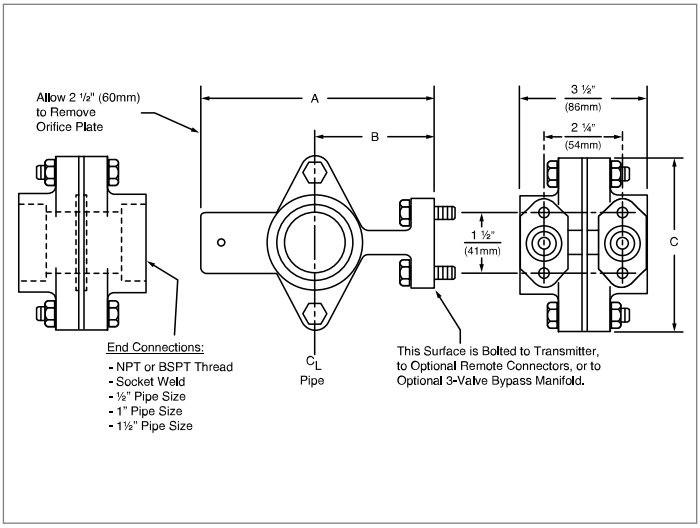


Fig 1: Assembly without Associated Piping

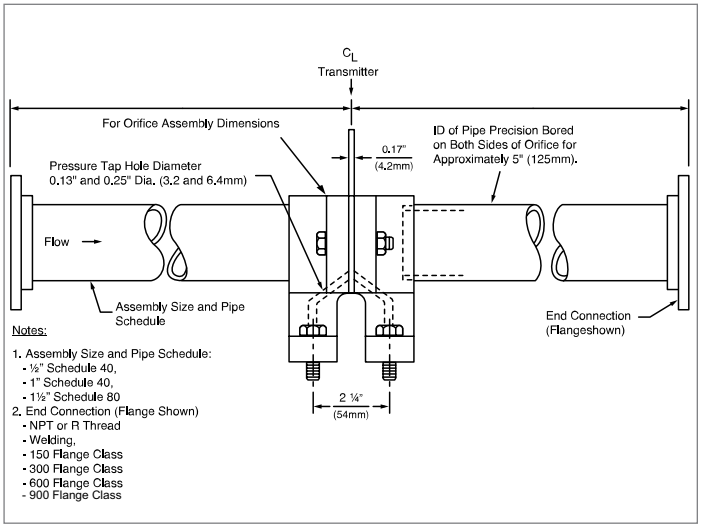


Fig 2: Assembly with Associated Piping

4. Installations

- *Straight Length Requirements*

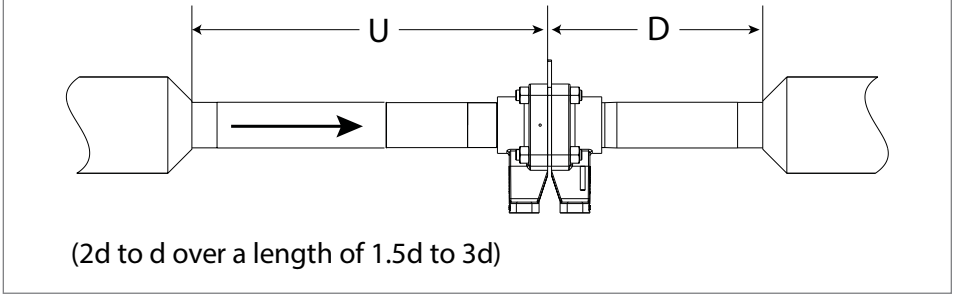


Fig 3: Reducer

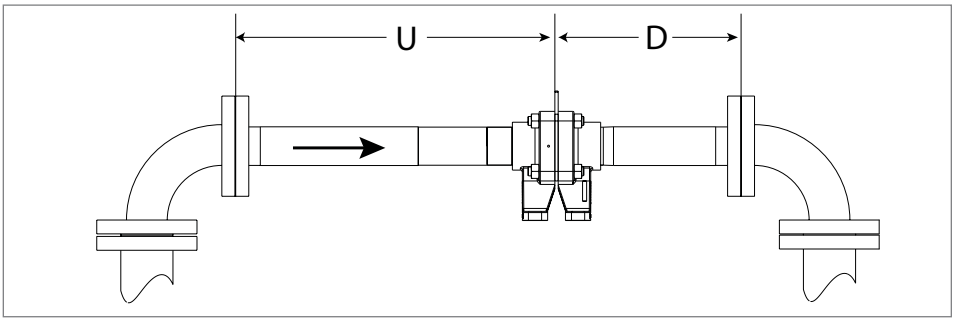


Fig 4: Single 90° Bend Flow from One Branch

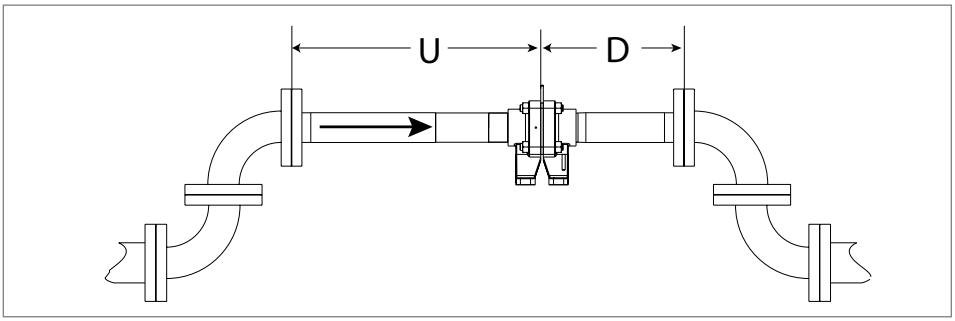


Fig 5: Two or More 90° Bends in Same Planes

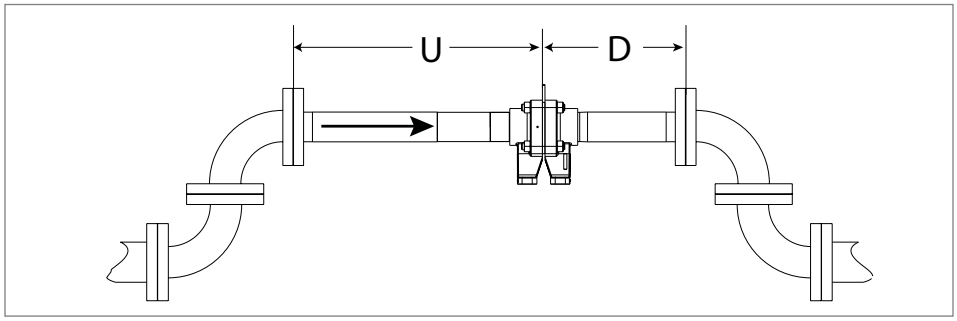


Fig 6: Two or More 90° Bends in Different Planes

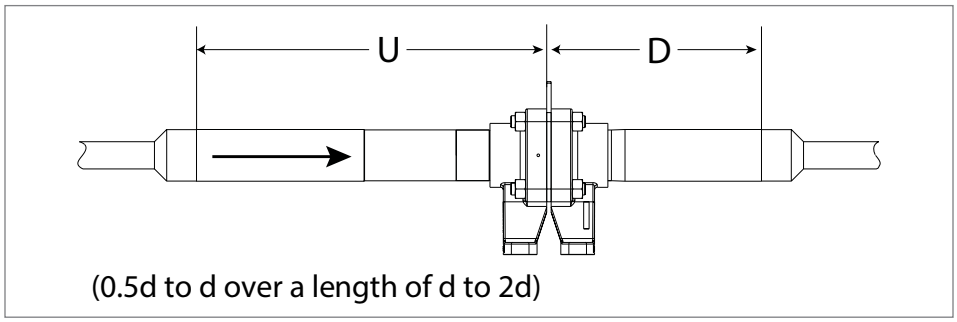


Fig 7: Expander

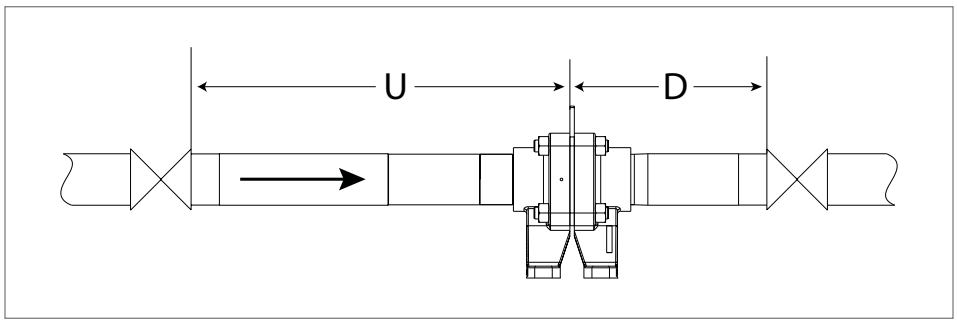


Fig 8: Ball Valve or Gate Valve Fully Open

Table 1: Required Straight Lengths for Orifice Plate, Nozzle

Beta Ratio	Upstream Side of Primary Devices (U1)																		Downstream Primary Devices (D1)			
	Single 90 bend or tee (Flow from one branch only)		Two or 0 more 90 bends in the same plane(*)		Two or 0 more 90 bends in different planes		Reducer 2D to D over a Length of 1.5D to 3D		Expander 0.5D to D over a Length of D to 2D		Globe valve fully poen		Full bore ball valve or gate valve fully poen		Abrupt symmetrical reduction having a diameter ratio >=0.5		Thermo-meter (pocket or well*) of diameter <=0.03D		Thermo-meter (pocket or well*) of diameter between <=0.03D and 0.13D		Fitting (All mentioned in Upstream Side of Primary Devices)	
0.20	10	(6)	14	(7)	34	(17)	5		16	(8)	18	(9)	12	(6)	30	(15)	5	(3)	20	(10)	4	(2)
0.25	10	(6)	14	(7)	34	(17)	5		16	(8)	18	(9)	12	(6)	30	(15)	5	(3)	20	(10)	4	(2)
0.30	10	(6)	16	(8)	34	(17)	5		16	(8)	18	(9)	12	(6)	30	(15)	5	(3)	20	(10)	5	(2.5)
0.35	12	(6	16	(8)	36	(18)	5		16	(8)	18	(9)	12	(6)	30	(15)	5	(3)	20	(10)	5	(2.5)
0.40	14	(7)	18	(9)	36	(18)	5		16	(8)	20	(10)	12	(6)	30	(15)	5	(3)	20	(10)	6	(3)
0.45	14	(7)	18	(9)	38	(19)	5		17	(9)	20	(10)	12	(6)	30	(15)	5	(3)	20	(10)	6	(3)
0.50	14	(7)	20	(10)	40	(20)	6	(5)	18	(9)	22	(11)	12	(6)	30	(15)	5	(3)	20	(10)	6	(3)
0.55	16	(8)	22	(11)	44	(22)	8	(5)	20	(10)	24	(12)	14	(7)	30	(15)	5	(3)	20	(10)	6	(3)
0.60	18	(9)	26	(13)	48	(24)	9	(5)	22	(11)	26	(13)	14	(7)	30	(15)	5	(3)	20	(10)	7	(3.5)
0.65	22	(11)	32	(16)	54	(27)	11	(6)	25	(13)	28	(14)	16	(8)	30	(15)	5	(3)	20	(10)	7	(3.5)
0.70	28	(14)	36	(18)	62	(31)	14	(7)	30	(15)	32	(16)	20	(10)	30	(15)	5	(3)	20	(10)	7	(3.5)
0.75	36	(18)	42	(21)	70	(35)	22	(11)	38	(19)	36	(18)	24	(12)	30	(15)	5	(3)	20	(10)	8	(4)
U2	14		18		31		7		15		16		10		15		3		10			

***Note:**

- The installation of thermometer pockets or wells will not alter the required minimum upstream straight lengths for the other fittings.
- All straight lengths are expressed in multiples of diameter D.
- Values without parentheses are "Zero additional Uncertainty" values.
- Values in parentheses are "0.5% additional Uncertainty" values.

Table 2: Required Straight Lengths for Classical Venturi Tubes

Beta Ratio	Upstream Primary Devices (U1)												Downstream Primary Devices (D1)	
	Single 90° bend(*)		Two or more 90° bends in the same plane(*)		Two or more 90° bends in different plane(*)(**)		Reducer 3D to D over a Length of 3.5 D		Expander 0.75D to D over a Length of D		Full bore ball valve or gate valve fully poen		Fitting (All mentioned in Upstream Side of Primary Devices	
0.30	0.5!		1.5	(0.5)		(0.5)	(0.5)!		1.5	(0.5)	1.5	(0.5)	4	
0.35	0.5!		1.5	(0.5)		(0.5)	1.5	(0.5)	1.5	(0.5)	2.5	(0.5)	4	
0.40	0.5!		1.5	(0.5)		(0.5)	2.5	(0.5)	1.5	(0.5)	2.5	(1.5)	4	
0.45	1	(0.5)	1.5	(0.5)		(0.5)	4.5	(0.5)	2.5	(1)	3.5	(1.5)	4	
0.50	1.5	(0.5)	2.5	(1.5)		(8.5)	5.5	(0.5)	2.5	(1.5)	3.5	(1.5)	4	
0.55	2.5	(0.5)	2.5	(1.5)		(12.5)	6.5	(0.5)	3.5	(1.5)	4.5	(2.5)	4	
0.60	3	(1)	3.5	(2.5)		(17.5)	8.5	(0.5)	3.5	(1.5)	4.5	(2.5)	4	
0.65	4	(1.5)	4.5	(2.5)		(23.5)	9.5	(1.5)	4.5	(2.5)	4.5	(2.5)	4	
0.70	4	(2)	4.5	(2.5)		(27.5)	10.5	(2.5)	5.5	(3.5)	5.5	(3.5)	4	
0.75	4.5	(3)	4.5	(3.5)		(29.5)	11.5	(3.5)	6.5	(4.5)	5.5	(3.5)	4	
U2	14		18		31		7		15		10			

***Note:**

* The radius of curvature of the bend shall be greater than or equal to the pipe diameter.

** As the effect of these fittings may still be present after 40D, no values without parentheses can be given.

! Since no fitting can be placed closer than 0.5D to the upstream pressure tapping in the Venturi Tube, the "Zero Additional Uncertainty" values are only ones applicable in this case.

- All straight lengths are expressed in multiples of diameter D.
- Values without parentheses are "Zero additional Uncertainty" values.
- Values in parentheses are "0.5% additional Uncertainty" values.

- ***For Gas***

Tek-DP 1610D Integral Orifice Assemblies should be mounted above the pipe to ensure that condensate does not collect on the transmitter sensing diaphragms

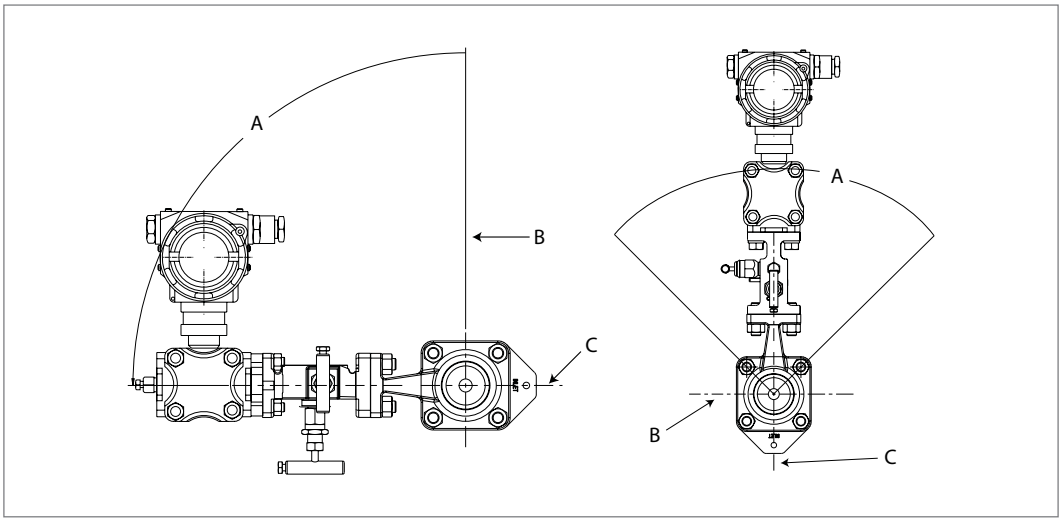


Fig 9: Direct Mount Gas in Horizontal Pipes

Where, A is 90° Recommended Zone
B is Vertical Plane
C is Horizontal Plane

If the fluid is flowing up, a direct mount Tek-DP 1610D should not be used in vertical gas applications because of drain and vent orientation. Consider remote mounting the pressure transmitter to facilitate condensate draining.

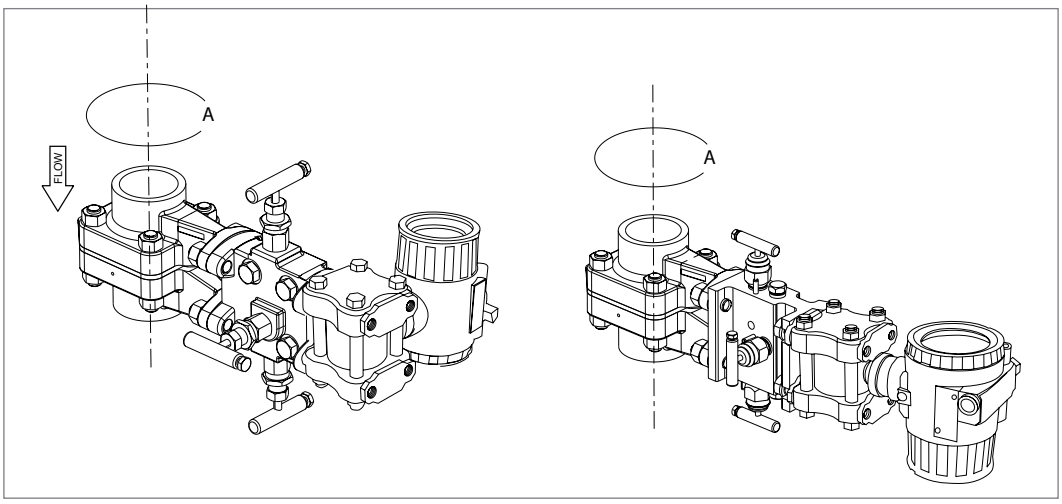


Fig 10: Direct Mount Gas in Vertical Pipes

Where, A is 360° Recommended Zone.

- ***For Liquid and Steam***

Tek-DP 1610D Integral Orifice Assemblies should be mounted below the pipe to ensure that that gases do not collect on the transmitter sensing diaphragms.

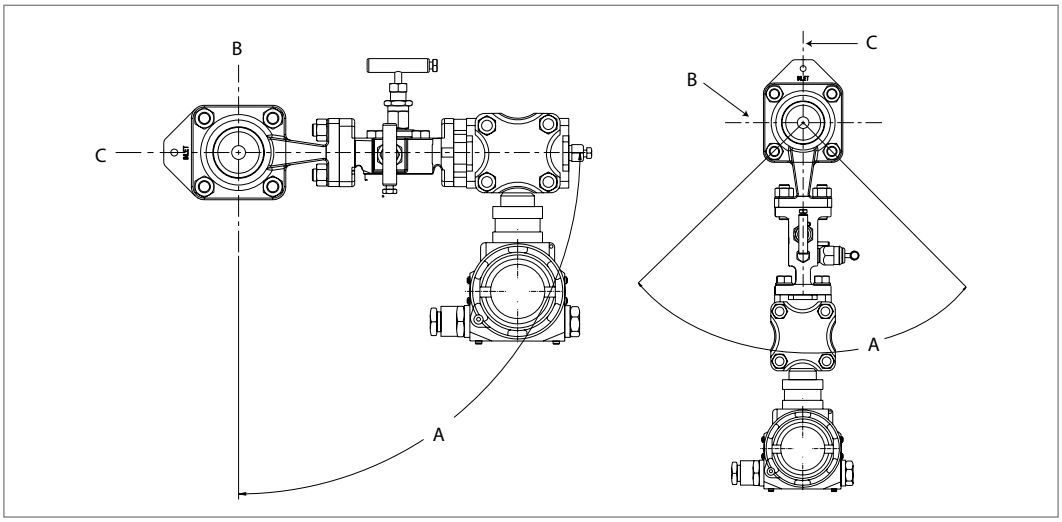


Fig 11: Direct Mount Liquid or Steam in Horizontal Pipes

Where, A is 90° Recommended Zone
B is Vertical Plane
C is Horizontal Plane

If the fluid is flowing down, a direct mount Tek-DP 1610D should not be used in vertical liquid or steam applications. Vertical installation for steam should be remote mount.

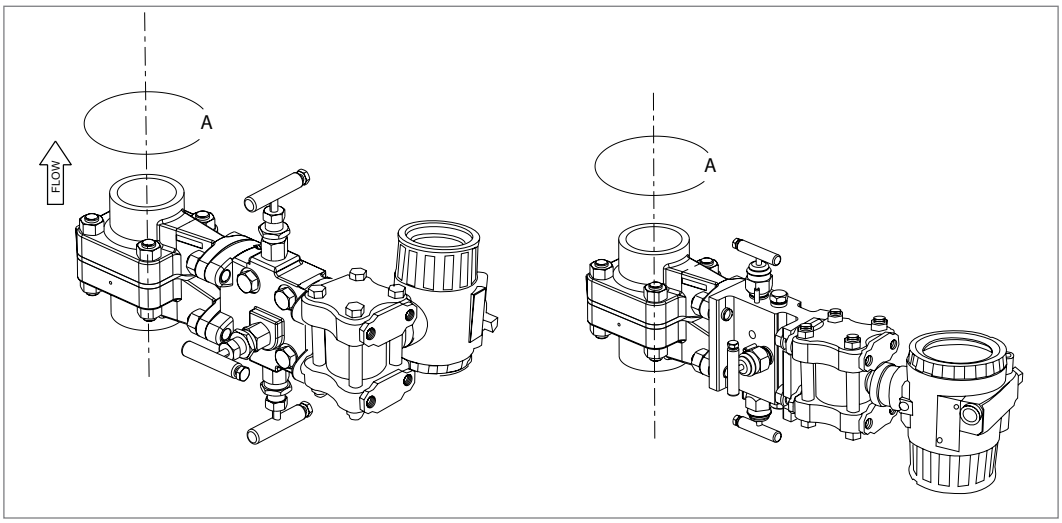
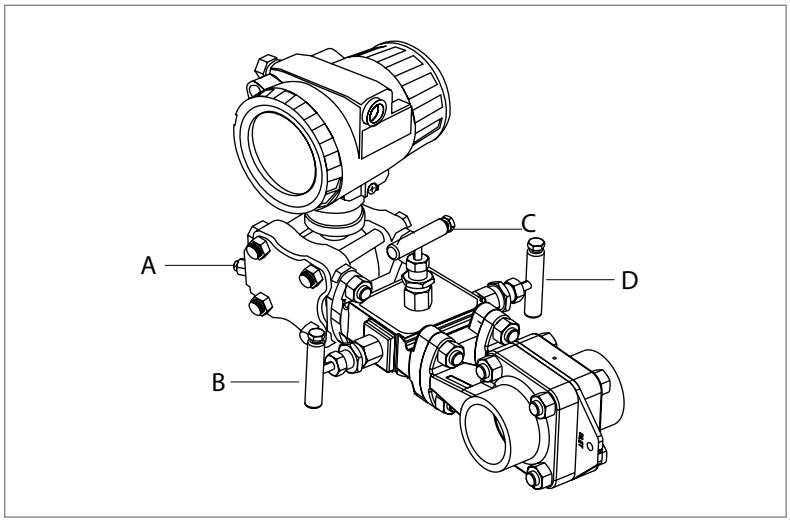


Fig 12: Direct Mount Gas in Vertical Pipes

Where , A is 360° Recommended Zone.

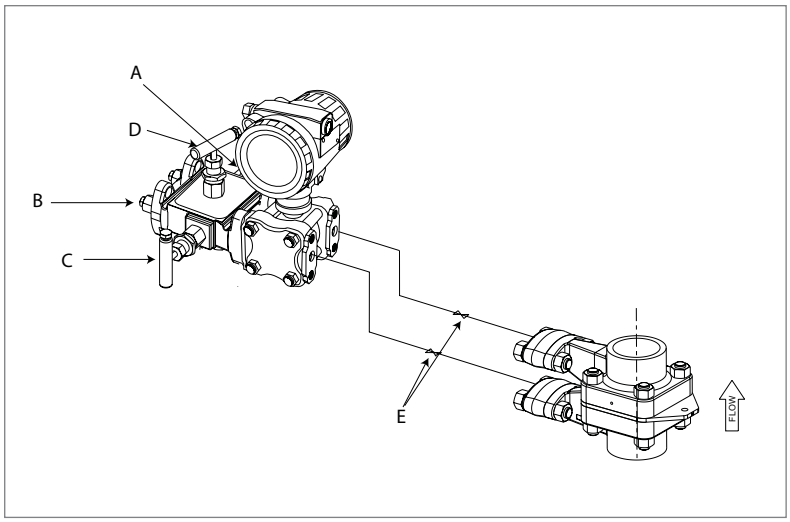
5. Electrical Connection

- *Gas Measurement*



Where,
A is Vent
B is High Valve
C is Equalizer
D is Equalizer Valve

Fig 13: Direct Mount Gas Measurement



Where,
A is Low Valve
B is Vent
C is High Valve
D is Equalizer Valve
E is Block Valves

Fig 14: Remote Mount Gas Measurement

- ***Liquid Measurement***

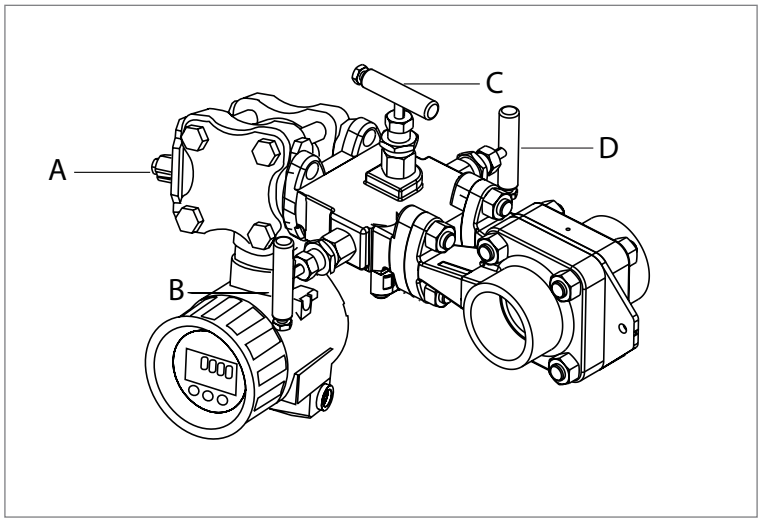


Fig 15: Direct Mount Liquid Measurement

Where,
A is Vent
B is Low Valve
C is Equalizer Valve
D is High Valve

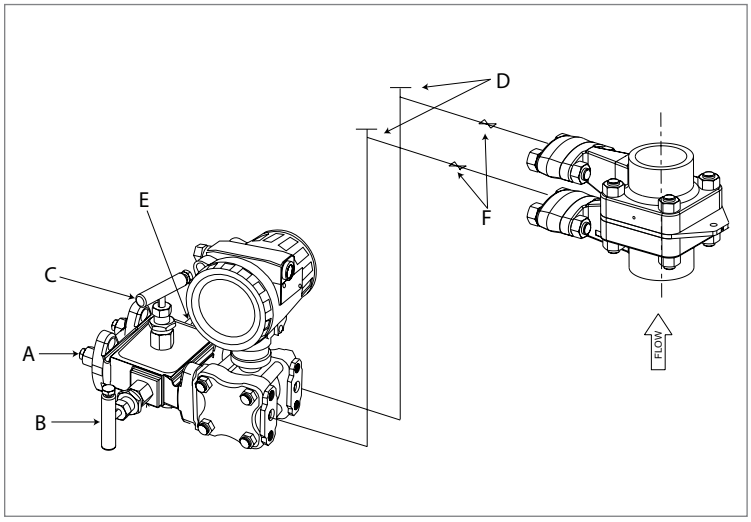
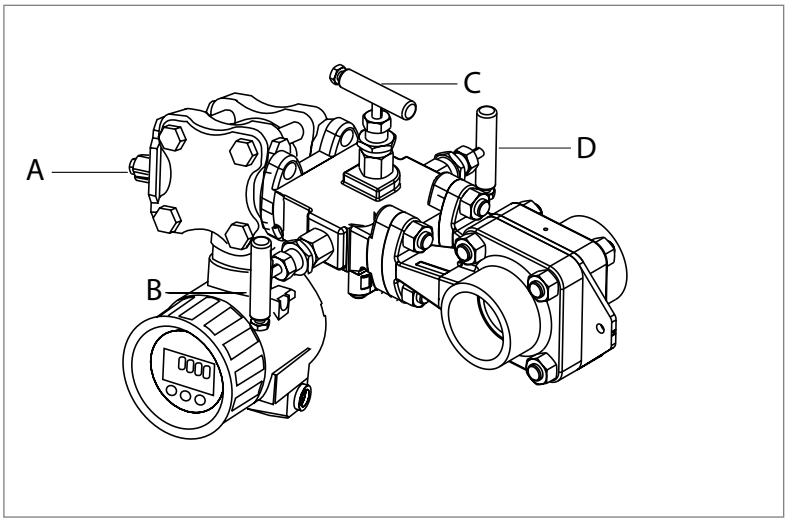


Fig 16: Remote Mount Liquid Measurement

Where,
A is Vent
B is High Valve
C is Equalizer Valve
D is Vent Valves
E is Low Valve
F is Block Valves

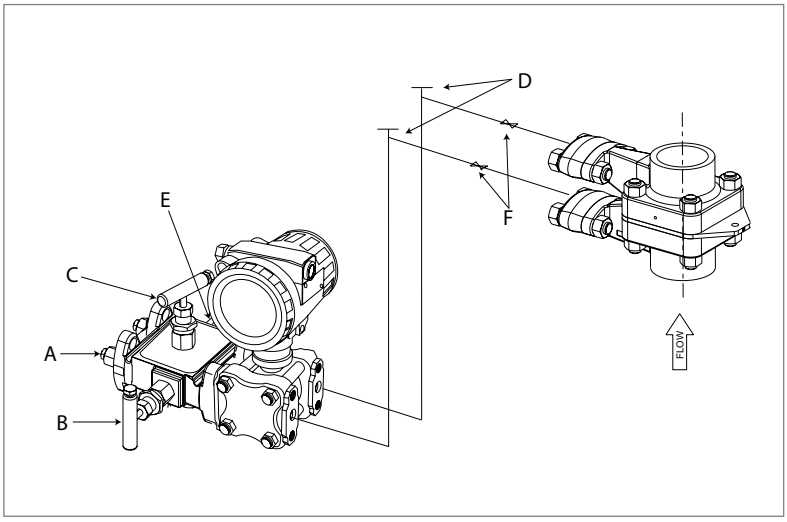
- ***Steam Measurement***



Where,

A is Vent
B is Low Valve
C is Equalizer Valve
D is High Valve

Fig 17: Direct Mount Steam Measurement



Where,

A is Vent
B is High Valve
C is Equalizer Valve
D is Vent Valves
E is Low Valve
F is Block Valves

Fig 18: Remote Mount Steam Measurement

6. Maintenance

- **Check Flow Direction**
  - o Check that the side of the orifice plate marked "Inlet" is facing upstream.
  - o If the DP transmitter is remote mounted from the Tek-DP 1610D, be sure that the impulse tubing is connected correctly from the Tek-DP 1610D to the DP transmitter (high to high and low to low).

- **Check Orientation**
  - o Improper orientation can result in inaccurate measurements.

- **Check Zero**
  - o The transmitter may read off in the high or low direction if not zeroed properly at start-up/ commissioning.

- **Check Valves**
  - o Equalizer valve is fully closed, high and low side valves are fully open to set the correct valve for flow measurement.

- **RTD Maintenance**

To test the 4-wire RTD procedure as follows:

- o Please power off the transmitter.
- o Remove the temperature terminal housing cover.
- o Disconnect the RTD lead wires from the terminal block.
- o Separate the wires so that the un-insulated ends are not affecting.
- o Check that the resistance measured between the two red wires and two white wires is same (within +/- 0.1Ω).
- o Note down the resistance value measured between the two white wires from next step.
- o Measure the resistance between one red and one white wire. Subtract the resistance measured in above step from the resistance measured in this step.
- o If resistance matches the temperature that the RTD is in contact with it.
- o Check the resistance between any wire and the RTD head or sheath and acceptable resistance is 200KΩ or greater.
- o If any of the above measurements are not within the acceptable range as stated above, please contact a Tek-Trol representative for a RTD replacement.
- o To return the RTD to service, connect the lead wires as shown in figure 21.
- o Replace the Temperature Terminal Housing cover.
- o Re-connect power to the transmitter.

7. Troubleshooting

This section provides troubleshooting techniques for most common operating problems shown in table 3.

Table 3: Troubleshooting Techniques

Symptom	Possible Cause	Corrective Actions
Questionable accuracy or erroneous flow signal	Improper Installation	• Check flow arrow pointed in the direction of the flow. • Verify that the cross reservoirs are correctly in level with one another. • Check the sufficient straight runs upstream and downstream of the flow meter.
	System Leaks	• Check instrument piping leaks. • Repair and seal all leaks.
	Contamination or Plugging	• Remove the flow meter and check for contamination.
	Closed Valve	• Verify both High and Low manifold valves are open. • Verify vent, equalizer and line valves are properly positioned per start-up procedure.
	Connections (remote mount only)	• Verify the high side of the transmitter is connected to the high side of the flow meter. • Check the same for the low side.
	Entrapped Air (liquid and steam applications)	• Check uneven water legs caused by air entrapment in the instrument connections, if so, bleed air.
Questionable accuracy or erroneous flow signal	Operating Conditions	• Check the operating conditions in compliance with those given at the time the flow meter was purchased. • Check the flow calculation and the fluid parameters for accuracy. • Cross check pipe inside diameter for proper sizing.
Raising flow signal	Two-phase flow	• The flow meter is a head measurement device and will not measure a two-phase flow accurately.
Raising flow signal (Stream Service)	Improper insulation (vertical pipes only), Excessive vibration	• Additional insulation may be required to ensure a phase change occurs at the cross reservoirs. • Check the impulse piping for vibration.
mA reading is zero		• Check if the power terminals are reversed. • Verify voltage across terminals (should be 10 to 55VDC). • Check for bad diode in terminal block. • Replace the transmitter terminal block.
Transmitter is not communicating		• Check power supply voltage of the transmitter (10.5VDC minimum). • Check load resistance (250Ω minimum). • Check if the unit is addressed properly. • Replace the Transmitter.
mA reading is high or low		• Check pressure variable reading for saturation. • Check if output is in alarm condition. • Perform 4–20mA output trim. • Replace Transmitter.
No response to changes in applied flow		• Check test equipment. • Check impulse piping for blockage. • Check for disabled span adjustment. • Check transmitter security switch. • Verify calibration settings (4 and 20mA points). • Contact factory for replacement.
Low or High reading		• Check impulse piping for blockage. • Check test equipment. • Perform full sensor trim. • Contact factory for replacement.
Unpredictable reading for pressure variable		• Check impulse piping for blockage. • Check damping. • Check for EMF interference. • Contact factory for replacement.

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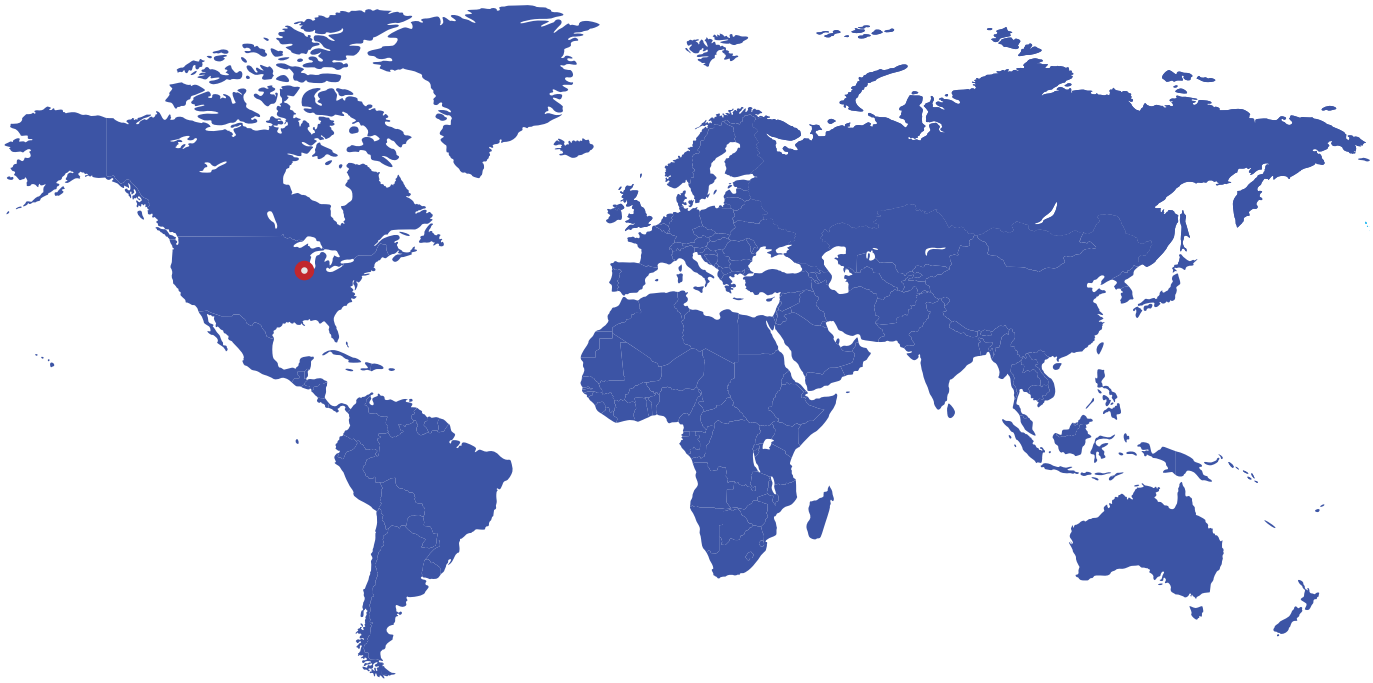

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