

Installation and Flowmeter Orientation

Annubar installation considerations

Table 1. Annubar Straight Run Requirements⁽¹⁾

Upstream (inlet) side		Annubar products			
		3051SFC_A, 3051CFC_A, 2051CFC_A, 3051SFA, 3051CFA, 2051CFA, 485, 405A, 585 ⁽²⁾			
		Without straightening vanes ⁽³⁾		With straightening vanes ⁽⁴⁾	
		In plane	Out plane	From disturbance	From straightening vane
Reducer	12	12	8	4	
Expander	18	18	8	4	
Single Elbow (90°) or tee	8	10	8	4	
Two Elbows in plane	11	16	8	4	
Two Elbow out of plane	23	28	8	4	
Butterfly Valve (75-100% open)	30	30	8	4	
Ball / Gate Valve full open	8	10	8	4	
Downstream (outlet) side		4	4	4	4

- (1) Consult an Emerson Process Management representative if a disturbance is not listed or if multiple disturbances are present.
- (2) Consult the factory for instructions regarding use in square or rectangular ducts.
- (3) In Plane means the Annubar is in the same plane as the elbow. Out of Plane means the bar is perpendicular to the plane of the upstream elbow. Refer to [Figure 1](#) on page 181.
- (4) Use straightening vane to reduce the required straight run length.

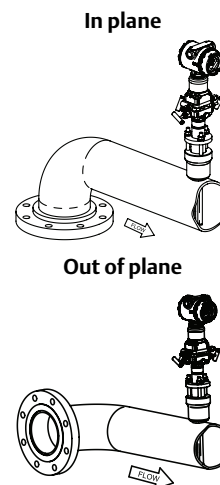
Table 2. 3051SFA, 3051CFA, 2051CFA, 485 Drill Hole Size According to Sensor Size

Sensor size	Diameter
1	³ / ₄ -in. (19 mm)
2	1 ⁵ / ₁₆ -in. (34 mm)
3	2 ¹ / ₂ -in. (64 mm)

Table 3. 585 Drill Hole Size According to Sensor Size

Sensor size	Hole diameter	
11	¹ / ₈ -in. (23 mm)	+ 1/32-in (0,80 mm)
		- 0.00
22	1 ⁵ / ₁₆ -in. (34 mm)	+ ¹ / ₁₆ -in. (1,59 mm)
		- 0.00
44	2 ¹ / ₂ -in. (64 mm)	+ ¹ / ₁₆ -in. (1,59 mm)
		- 0.00

Figure 1. Annubar In Plane and Out of Plane



Orifice plate installation considerations

Table 4. 405C Straight Pipe Requirements⁽¹⁾

	Beta	0.40	0.50	0.65
Upstream (inlet) side of primary	Reducer	2	2	2
	Single 90° bend or tee	2	2	2
	Two or more 90° bends in the same plane	2	2	2
	Two or more 90° bends in different planes	2	2	2
	Up to 10° of swirl	2	2	2
	Butterfly valve (75% to 100% open)	2	N/A	N/A
Downstream (outlet) side of primary		2	2	2

(1) Consult an Emerson Process Management representative if a disturbance is not listed.

Table 5. 405P Straight Pipe Requirements⁽¹⁾⁽²⁾⁽³⁾

	Beta	0.40	0.50	0.65
Upstream (inlet)	Reducer	5	8	12
	Single 90° bend or tee	16	22	44
	Two or more 90° bends in the same plane	10	18	44
	Two or more 90° bends in different plane	50	75	60
	Expander	12	20	28
	Ball / Gate valve fully open	12	12	18
Downstream (outlet) side of primary		6	6	7

(1) Consult an Emerson Process Management representative if disturbance is not listed.

(2) Recommended lengths represented in pipe diameters per ISO 5167.

(3) Refer to ISO 5167 for recommended lengths when using flow straighteners.

Table 6. Integral Orifice Plate Straight Run Requirements⁽¹⁾⁽²⁾⁽³⁾

		3051SFP, 3051CFP, 2051CFP, 1195					
Upstream (inlet) side		<0.20 Beta	0.40 Beta	0.50 Beta	0.60 Beta	0.70 Beta	0.75 Beta
	Reducer	20	20	20	20	23	25
	Expander	22	22	23	25	28	30
	Single Elbow (90°) or tee	24	25	25	27	32	35
	Two Elbows in plane	25	27	28	31	35	38
	Two Elbows out of plane	30	31	33	37	42	45
	Butterfly Valve fully open	22	22	23	25	28	30
	Gate Valve fully open	22	22	23	25	28	30
Downstream (outlet) side		10	10	10	10	10	10

(1) Recommended lengths are guidelines based on ASME MFC-14M.

(2) All straight lengths are expressed as multiples of the pipe inside diameter D and shall be measured from the upstream face of the orifice plate to the disturbance.

(3) For beta ratios not listed, use requirements of next higher beta ratio listed.

Orifice plate pipe orientation

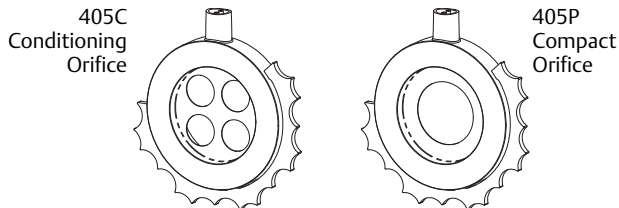
Pipe orientation for both 3051SFC, 3051CFC, 2051CFC, 405C, 405P, 3051SFP, 3051CFP, 2051CFP AND 1195.

Orientation/ flow direction	Process ⁽¹⁾		
	Gas	Liquid	Steam
Horizontal	D/R	D/R	D/R
Vertical Up	R	D/R	R
Vertical Down	D/R	NR	NR

(1) D = Direct mount acceptable (recommended).
 R = Remote mount acceptable.
 NR = Not recommended.

Compact flowmeter pipe centering

Improper centering of any orifice type device can cause an error of up to ±5% in small line sizes. A centering mechanism (centering ring) independent of flange rating comes standard with the 405 Compact Flowmeter Series.



1595 pressure tap orientation

Orient the 1595 Conditioning Orifice Plate so that the pressure taps are centered between any 2 (of 4) orifice bore holes. In addition, the pressure taps should be located at 90° to the plane of the last upstream elbow under these conditions:

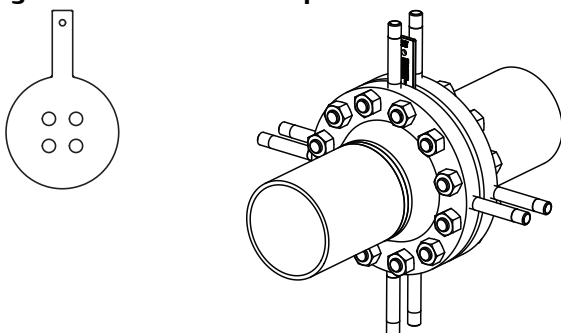
- with less than 6 upstream pipe diameters
- with a 0.65 Beta

Pressure tap locations

At least six upstream pipe diameters

If the installation location has at least six upstream pipe diameters, the pressure taps can be located between any two of the four holes of the 1595 Orifice Plate. See Figure 2.

Figure 2. 1595 Pressure Tap Locations



Within six diameters of an elbow

If the installation location has less than six upstream pipe diameters, the pressure taps can be located between two of the four holes of the 1595 Orifice Plate 90° from the plane of the elbow. See Figure 3 and Figure 4.

Figure 3. 1595 Pressure Tap Locations

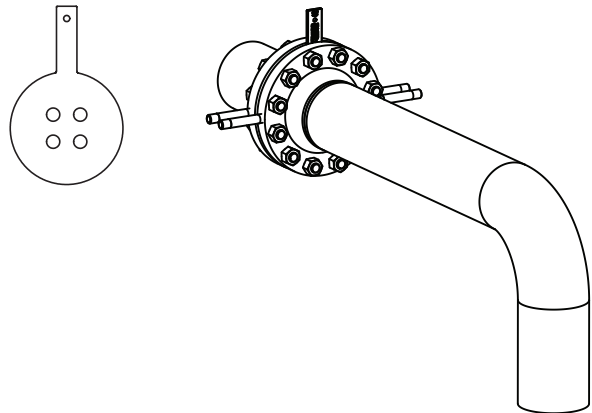
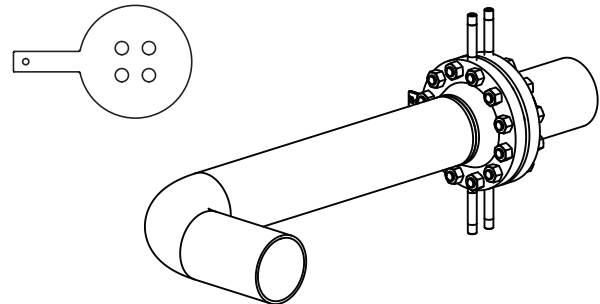


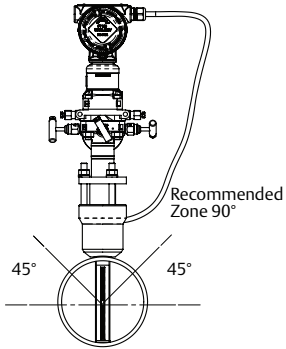
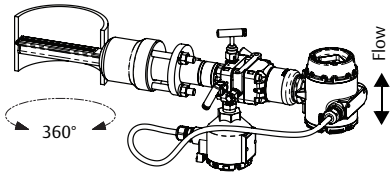
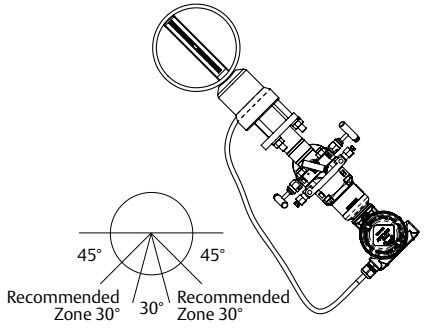
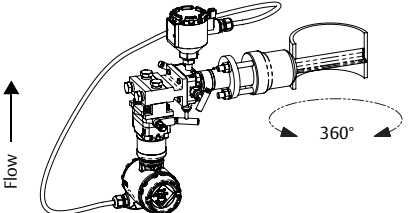
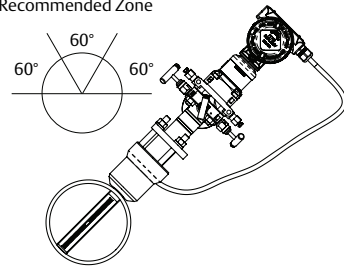
Figure 4. 1595 Pressure Tap Locations



Annubar® flowmeter orientation

For 3051SFA, 3051CFA, 2051CFA, 485, 585

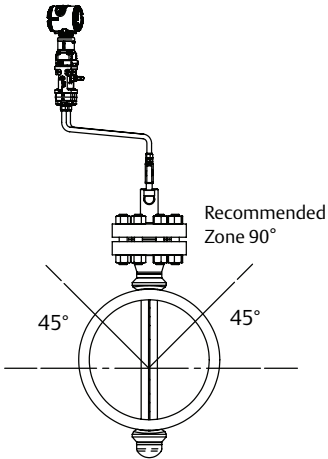
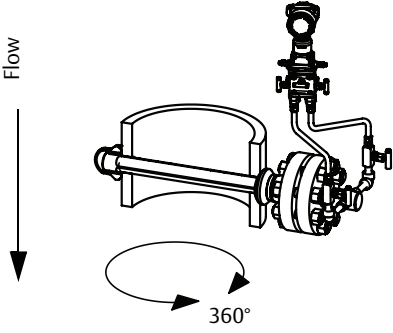
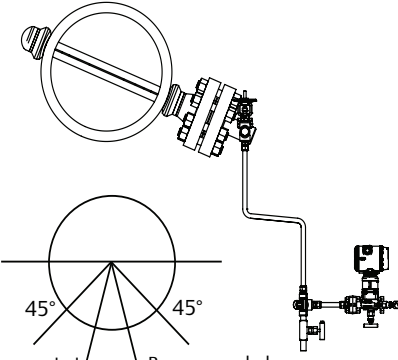
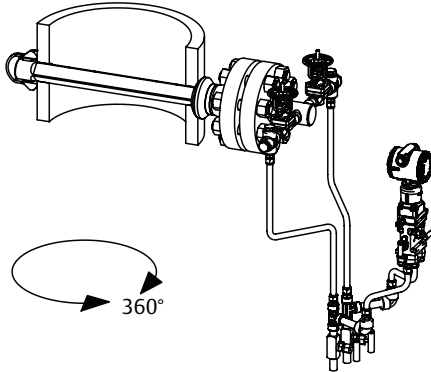
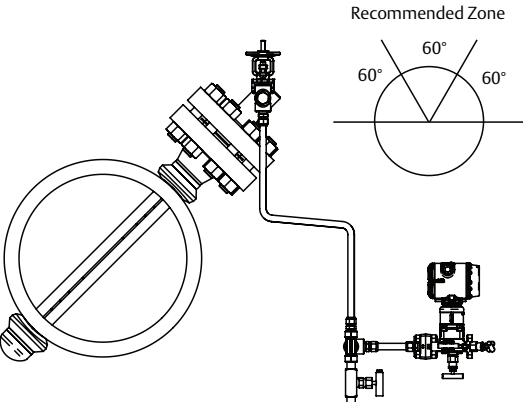
Annubar Direct Mount Flowmeter orientation (recommended) ⁽¹⁾

Gas (horizontal)	Gas (vertical)
 <p>Recommended Zone 90°</p> <p>45° 45°</p>	 <p>360°</p> <p>Flow</p>
Liquid and steam (horizontal)	Steam (vertical)
 <p>Recommended Zone 30° 30°</p> <p>45° 45°</p>	 <p>360°</p> <p>Flow</p>
Alternate top mounting for steam (horizontal) ⁽²⁾	
 <p>Recommended Zone</p> <p>60° 60°</p> <p>Note: If steam quality is not 100%, mount the Annubar 15° from the vertical position.</p>	

(1) The flowmeter orientation recommendations may vary for the Manual and Gear-Drive Flo-Tap Annubar Types.

(2) This mounting orientation is not recommended for the 585 Annubar Type L (Main Stream Line). For 585 Main Steam Line, use Liquid and Steam (Horizontal) orientation for mounting recommendations. Contact Rosemount or see Rosemount white paper 00870-0200-4809 for more details.

Annubar Remount Mount Flowmeter orientation (recommended) ⁽¹⁾

Gas (horizontal)	Gas (vertical)
 <p>Recommended Zone 90°</p> <p>45° 45°</p>	 <p>Flow</p> <p>360°</p> <p>Note: Can also be mounted for Gas Vertical up applications.</p>
Liquid and steam (horizontal)	Steam (vertical)
 <p>Recommended Zone 30°</p> <p>45° 45°</p> <p>Recommended Zone 30°</p>	 <p>Flow</p> <p>360°</p>
Top mounting for steam (horizontal) ⁽²⁾	
 <p>Recommended Zone</p> <p>60° 60°</p>	

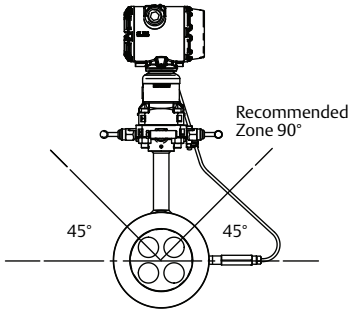
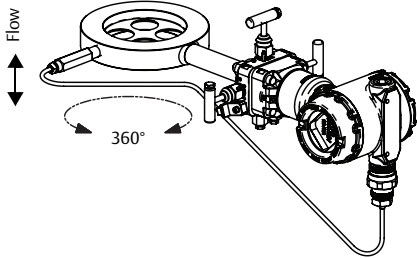
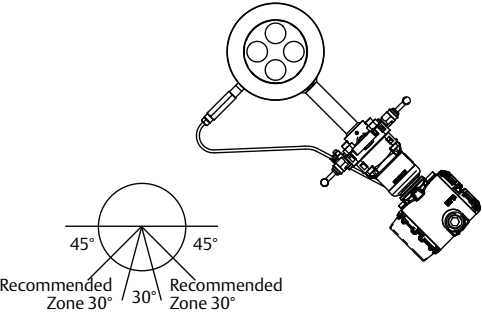
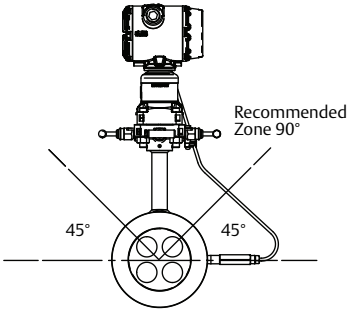
(1) The flowmeter orientation recommendations may vary for the Gear-Drive Flo-Tap Annubar Type.

(2) This mounting orientation is not recommended for the Annubar Type L (Main Steam Line). For 585 Main Steam Line, use Liquid and Steam (Horizontal) orientation for mounting recommendations.

405 Flowmeter orientation

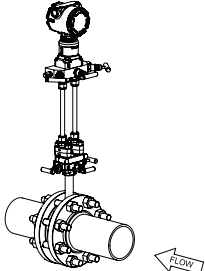
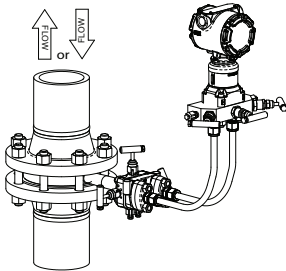
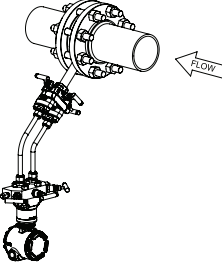
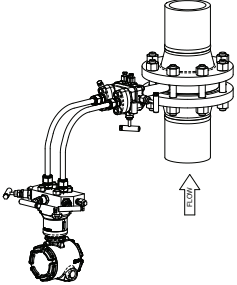
For 3051SFC, 3051CFC, 2051CFC, 405C, 405P

405 Direct Mount Flowmeter orientation (recommended)

Gas (horizontal)	Gas (vertical)
 <p>Recommended Zone 90°</p> <p>45°</p> <p>45°</p>	 <p>Flow</p> <p>360°</p>
Liquid and steam (horizontal)	Alternate top mounting for steam (horizontal) ⁽¹⁾
 <p>Recommended Zone 30°</p> <p>30°</p> <p>Recommended Zone 30°</p> <p>45°</p> <p>45°</p>	 <p>Recommended Zone 90°</p> <p>45°</p> <p>45°</p>

(1) Contact Rosemount or see Rosemount white paper 00870-0200-4809 for more details.

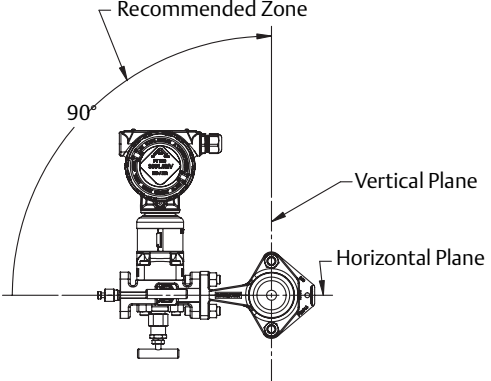
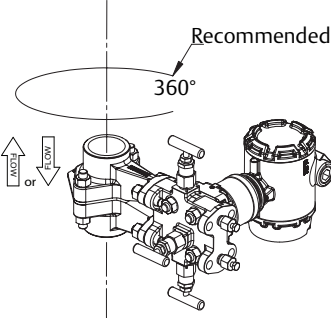
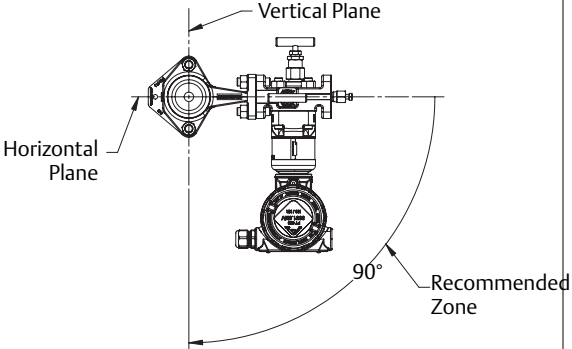
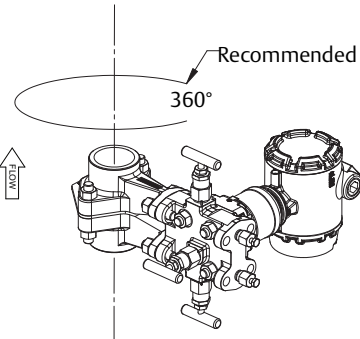
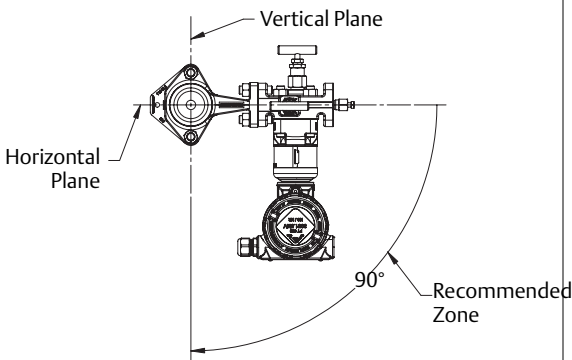
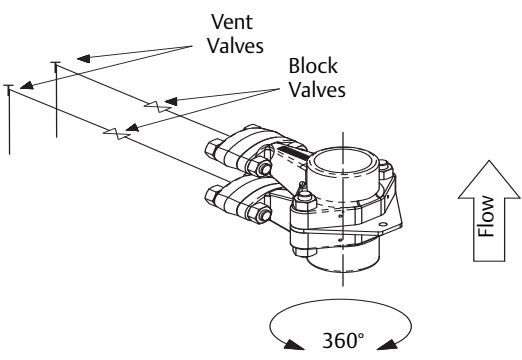
405 Remote Mount Flowmeter orientation (recommended)

Gas (horizontal)	Gas (vertical)
 <p>FLOW</p>	 <p>FLOW</p> <p>or</p> <p>FLOW</p>
Liquid and steam (horizontal)	Liquid and steam (vertical)
 <p>FLOW</p>	 <p>FLOW</p>

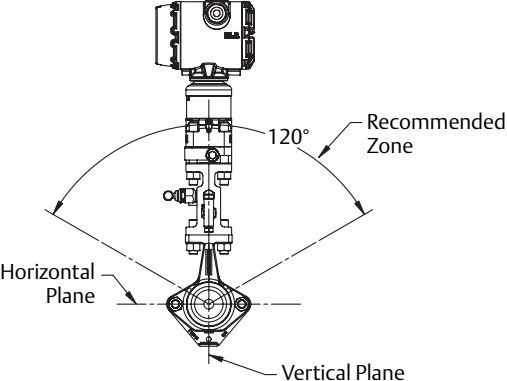
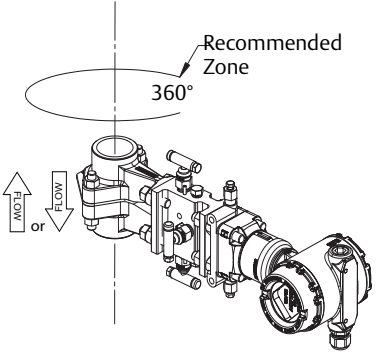
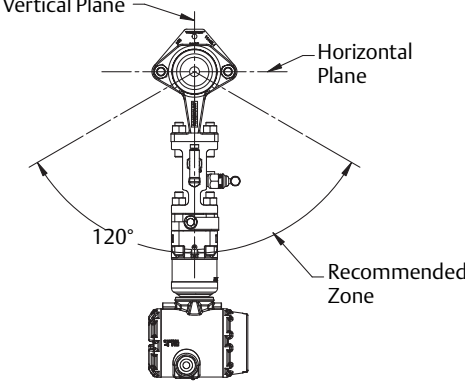
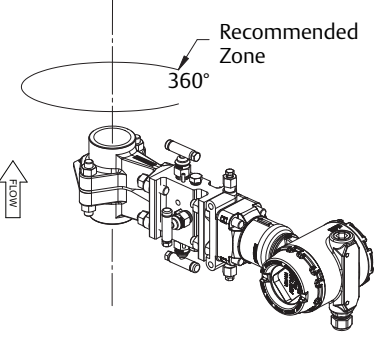
1195 Integral Orifice Flowmeter orientation

For 3051SFP, 3051CFP, 2051CFP, 1195

1195 Flowmeter orientation with traditional style manifold (recommended)

Gas (horizontal)	Gas (vertical)
 <p>Recommended Zone</p> <p>90°</p> <p>Vertical Plane</p> <p>Horizontal Plane</p>	 <p>Recommended Zone</p> <p>360°</p> <p>HIGH</p> <p>LOW</p>
Liquid (horizontal)	Liquid (vertical)
 <p>Vertical Plane</p> <p>Horizontal Plane</p> <p>Recommended Zone</p> <p>90°</p>	 <p>Recommended Zone</p> <p>360°</p> <p>HIGH</p>
Steam (horizontal)	Steam (vertical)
 <p>Vertical Plane</p> <p>Horizontal Plane</p> <p>Recommended Zone</p> <p>90°</p>	 <p>Vent Valves</p> <p>Block Valves</p> <p>Flow</p> <p>360°</p>

1195 Flowmeter orientation with H-pattern manifold (recommended)

Gas (horizontal)	Gas (vertical)
	
Liquid (horizontal)	Liquid (vertical)
	
Steam (horizontal)	Steam (vertical)
