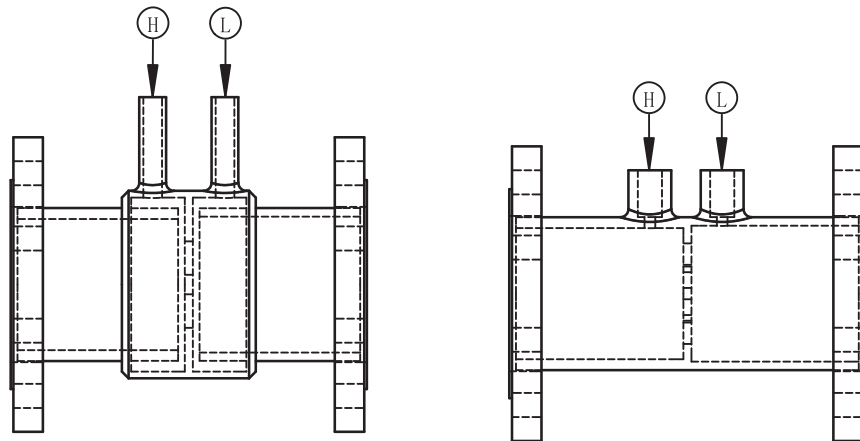


CUCKOO

Installation and Instruction Manual



MODEL VCD
Flow Meters



Summary

The Conditioning Orifice Plate is a revolutionary innovative technology based on the most common differential primary element in the industry. While not complying with the standards of AGA Report Number 3, ASME MFC 3M or ISO 5167, it is designed based on those standards and provides superior performance in short straight pipe run, tight fit applications with upstream flow disturbances.

- Requires 2 diameters upstream of a flow disturbance and 2 diameters downstream.
 - Decreased straight runs can lower installed cost.
 - Provides flexibility of flowmeter placement and design.
- Compact design reduces installation costs as compared to standard orifice plates.
- Highly accurate and repeatable primary elements.
- Simplified ordering and reduction in inventory, only two betas to choose; one for high flows, one for low flows.
- Suitable for most gas, liquid and steam applications.

Whether compliance to a standard is required or if it is not required, CUCKOO INSTRUMENT INC has the flowmeter to fit the application.



FIGURE 1. Conditioning Orifice Plate



FIGURE 2. Compact Series



FIGURE3. Pipe Series

Benefit

- *Designed to provide superior performance in short straight pipe run, tight fit applications, and upstream flow disturbances.*
- *Comprehensive offering*
- *Easy to use, prove, and troubleshoot*
- *Complies with sections of AGA, ASME, and ANSI ensuring precision flow measurement*
- *Accurate and repeatable*
- *Suitable for most gas, liquid, and steam applications*

Specification

Functional

Service and Flow Range

Liquid, gas or vapor turbulent flow, for pipe Reynold's Numbers greater than 2,000.

Pipe Sizes

2 to 24-in. (50 to 600 mm). Contact Emerson Process Management for other pipe sizes.

Operating Temperature Limits

-100 to 700 °F (-73 to 370 °C) (Contact Cuckoo Process Management for temperatures above 700 °F)

Maximum Working Pressure

- Flange rating per ANSI B16.5.

Physical Specifications

Materials of Construction

Orifice Plate

- SS304, SS316, HC-276, Monel, 2205, etc

Flange Mounting Hardware

- CS, SS304, SS316, HC-276, Monel, 2205, etc

Orifice Bore Sizes

Beta (β) is calculated by $2 \times d / \text{pipe size}$.

	Beta (β) = 0.40	Beta (β) = 0.65
2-in. (50.8 mm)	0.413	0.620 ⁽¹⁾
3-in. (76.2 mm)	0.609	0.092
4-in. (101.6 mm)	0.813	1.203
6-in. (152.4 mm)	1.213	1.971
8-in. (203.2 mm)	1.596	2.594
10-in. (254.0 mm)	2.004	3.257
12-in. (304.8 mm)	2.400	3.900
14-in. (355 mm)	2.800	3.900
16-in. (406.4 mm)	3.200	4.550
18-in. (457.2 mm)	3.600	5.200
20-in. (508.0 mm)	4.000	6.500
24-in. (609.6 mm)	4.800	7.800

(1) Beta (β) = 0.60 for 2-in. (50.8 mm) line size.

Type

- Slip-on Flanges
- Weld Neck Flanges
- Plain
- SPECIAL

Performance

Flow Coefficient Uncertainty

TABLE 1. Discharge Coefficient Uncertainty

Beta Ratio	Accuracy
$\beta = 0.40$	0.50%
$\beta = 0.65$	0.75%

Sizing

Perform a flow calculation using the Instrument Toolkit™ software package. Alternatively, contact a Cuckoo Process Management sales representative or Cuckoo Process Management Customer Central at 86-21-55152032 for assistance.

Straight Pipe Requirement

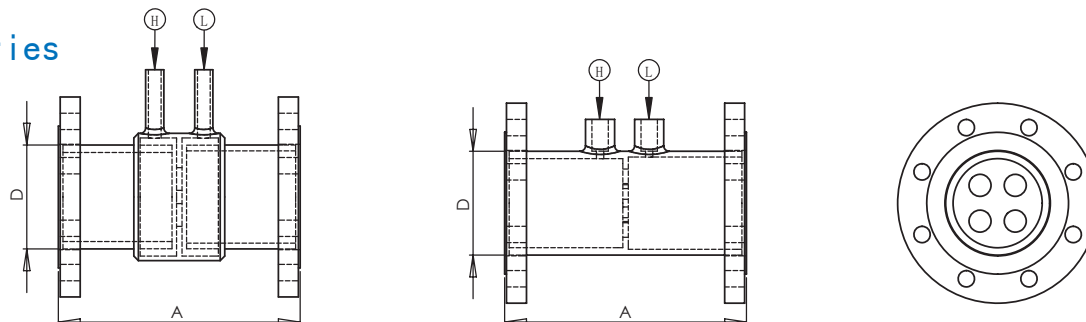
Use the appropriate lengths of straight pipe upstream and downstream of the VCD to minimize the effects of moderate flow disturbances in the pipe. Table 2 lists recommended lengths of straight pipe.

TABLE 2. 1595 Straight Pipe Requirements

	Beta	0.40	0.65
Upstream (inlet) side of primary	Single 90° bend or tee	2	2
	Two or more 90° bends in the same plane	2	2
	Two or more 90° bends in different plane	2	2
	Up to 10° of swirl	2	2
	Reducer (1 line size)	2	2
	Butterfly valve (75% open)	2	2
Downstream (outlet) side of primary		2	2

Dimensions of Standard models

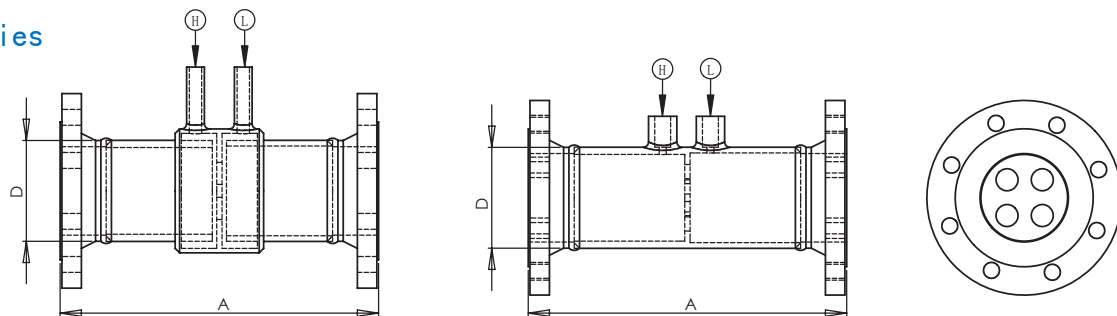
VCDS Series



	SIZE		D (mm)		A (mm)		H L
	in	mm	I	II	HG20592 / BS4504 / DIN2576	ANSI B16.5/HG20615	
					PN0.25/0.6/1.0/1.6/2.5/4.0	150#/2.0 300#/5.0 600#/11.0	
0A	3/4"	DN20	27	25	226	226	1/2"
01	1"	DN25	34	32	226	226	1/2"
0B	1-1/2"	DN40	48	45	226	226	1/2"
02	2"	DN50	60	57	228	228	1/2"
0C	2-1/2"	DN65	76	76	228	228	1/2"
03	3"	DN80	89	89	228	228	1/2"
04	4"	DN100	114	108	248	248	1/2"
05	5"	DN125	140	133	250	250	1/2"
06	6"	DN150	168	159	292	292	1/2"
08	8"	DN200	219	219	334	334	1/2"
10	10"	DN250	273	273	376	376	1/2"
12	12"	DN300	324	325	416	416	1/2"
14	14"	DN350	356	377	456	456	1/2"
16	16"	DN400	406	426	500	500	1/2"
18	18"	DN450	457	480	540	540	1/2"
20	20"	DN500	508	530	580	580	1/2"
24	24"	DN600	610	630	620	620	1/2"
28	28"	DN700	711	720	660		1/2"
32	32"	DN800	813	820	700		1/2"
36	36"	DN900	914	920	740		1/2"
40	40"	DN1000	1016	1020	780		1/2"
48	48"	DN1200	1219	1220	820		1/2"
56	56"	DN1400	1422	1420	860		1/2"
64	64"	DN1600	1626	1620	900		1/2"
72	72"	DN1800	1829	1820	940		1/2"
80	80"	DN2000	2030	2020	980		1/2"

Dimensions of Standard models

VCDW Series



	SIZE		D (mm)		A (mm)								H L
	in	mm	I	II	PN1.0	PN1.6	PN2.5	PN4.0	PN6.3	PN10	PN16	PN25	
0A	3/4"	DN20	27	25	300	300	300	300	324	324	324	350	1/2"
1	1"	DN25	34	32	300	300	300	300	336	336	336	350	1/2"
0B	1-1/2"	DN40	48	45	310	310	310	310	344	344	348	380	1/2"
2	2	DN50	60	57	316	316	316	316	344	356	370	390	1/2"
0C	2-1/2"	DN65	76	76	316	316	324	324	356	372	384	410	1/2"
3	3"	DN80	89	89	320	320	336	336	364	376	392	424	1/2"
4	4"	DN100	114	108	344	344	370	370	396	420	440	480	1/2"
5	5"	DN125	140	133	350	350	376	376	416	450	470	520	1/2"
6	6"	DN150	168	159	390	390	430	430	470	510	536	600	1/2"
8	8"	DN200	219	219	444	444	480	496	540	580	600	700	1/2"
10	10"	DN250	273	273	496	500	536	570	610	674	670	790	1/2"
12	12"	DN300	324	325	536	556	584	630	680	740	750		1/2"
14	14"	DN350	356	377	576	604	640	690	740	818			1/2"
16	16"	DN400	406	426	624	650	700	750	800	890			1/2"
18	18"	DN450	457	480	664	694	740	790					1/2"
20	20"	DN500	508	530	710	740	810	840					1/2"
24	24"	DN600	610	630	760	790	850	900					1/2"
28	28"	DN700	711	720	800	840	890						1/2"
32	32"	DN800	813	820	860	890	950						1/2"
36	36"	DN900	914	920	910	940	1010						1/2"
40	40"	DN1000	1016	1020	950	1000	1070						1/2"
48	48"	DN1200	1219	1220	1030	1060							1/2"
56	56"	DN1400	1422	1420	1080	1130							1/2"
64	64"	DN1600	1626	1620	1140	1200							1/2"
72	72"	DN1800	1829	1820	1200	1260							1/2"
80	80"	DN2000	2030	2020	1260	1340							1/2"

NUMBER CONFIGURATION

VCD	CONDITIONING FLOWMETER		
SERIES	S	Slip-on Flanges	
	W	Weld Neck Flanges	
	P	Plain	
	E	SPECIAL	
TRANSMITTER	-T	Compose	
	-S	Separate	
SIZE DN20-DN1000	0A	DN20	
	01	DN25	
	0B	DN40	
	02	DN50	
	0C	DN65	
	03	DN80	
	04	DN100	
	—	—	
MATERIAL	-Q	SS304/SS304L	
	-L	SS321	
	-A	SS316/SS316L	
	-C	CS tube & flanges,SS304 Wedge & fitting	
	-U	CS tube & flanges,SS316 Wedge & fitting	
	-S	SPECIAL	
SCHEDULE	A	Pipe S20	
	B	Pipe S40	
	C	Pipe S60	
	D	Pipe S80	
	E	Pipe S100	
	P	Pipe XS	
END CONNECTIONS	AN	ANSI B 16.5	
	AI	ANSI B 16.1	
	DN	DIN 2633/2655	
	SP	SPECIAL	
PRESSRUE	16	PN16	
	40	PN40	
	125	CL125	
	150	CL150	
	250	CL250	
	300	CL300	
	600	CL600	
	900	CL900	
	—	—	
FITTING	-N1	1/2"NPT	
	-W	WELD	

Straight pipe required in pipe diameters

	Beta = 0.4	Conditioning Orifice Plate	ASME MFC 3M	AGA Report Number 3	ISO 5167
Upstream	Single 90 Degree Bend	2	14 86%	16 88%	16 88%
	Single Tee	2	14 86%	9 78%	9 78%
	Two or more Bends in the same plane	2	18 (17) 89% (88%)	10 80%	10 80%
	Two or more Bends in a different plane	2	36 (19) 94% (89%)	50 (29) 96% (93%)	50 (30) 96% (93%)
	Reducer	2	10 80%	6 67%	5 60%
	Valve	2	12 83%	21 90%	12 83%
Downstream		2	5 60%	3.2 38%	6 67%

	Beta = 0.65	Conditioning Orifice Plate	ASME MFC 3M	AGA Report Number 3 ⁽¹⁾	ISO 5167 ⁽¹⁾
Upstream	Single 90 Degree Bend	2	22 91%	44 (29) 95% (93%)	44 (30) 95% (93%)
	Single Tee	2	22 91%	44 (29) 95% (93%)	36 (30) 94% (93%)
	Two or more Bends in the same plane	2	32 (22) 94% (91%)	44 (29) 95% (93%)	44 (30) 95% (93%)
	Two or more Bends in a different plane	2	54 (25) 96% (92%)	95 (29) 98% (93%)	60 (30) 97% (93%)
	Reducer	2	12 83%	11 82%	12 83%
	Valve	2	16 88%	35 (29) 94% (93%)	18 89%
Downstream		2	5 60%	4.2 48%	7 71%

⁽¹⁾The piping requirements specified are for Beta = 0.67.

NOTE

The values in *Italics* reflect the reduction in straight pipe requirements.

The values in **(Bold)** reflect the piping requirements if a 19-tube bundle flow straightener is used.

PRIMARY ELEMENT ORIENTATION

Direct Mount

Figure 1. Gas (Horizontal)

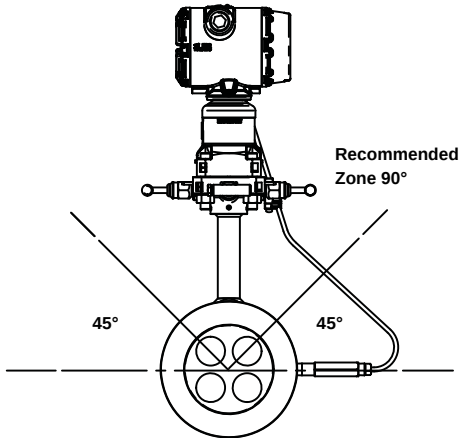


Figure 3. Liquid and Steam (Horizontal)

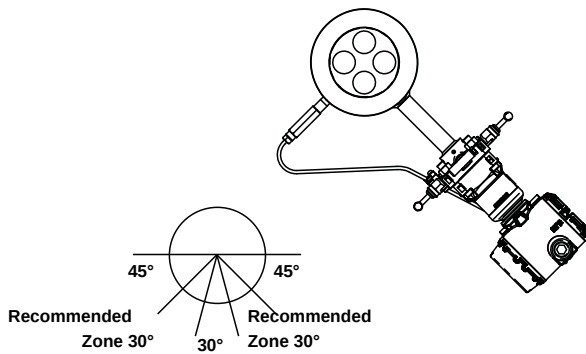


Figure 5. Top Mounting for Steam (direct mount up to 400 °F (205 °C))

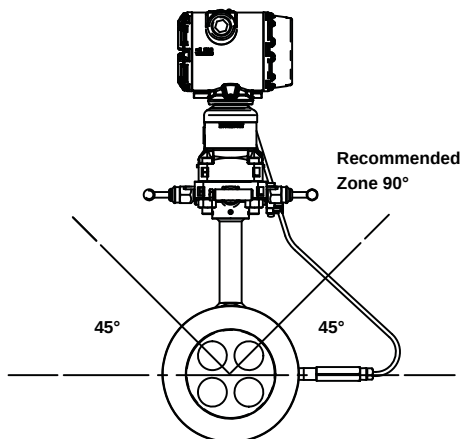


Figure 2. Gas (Vertical)

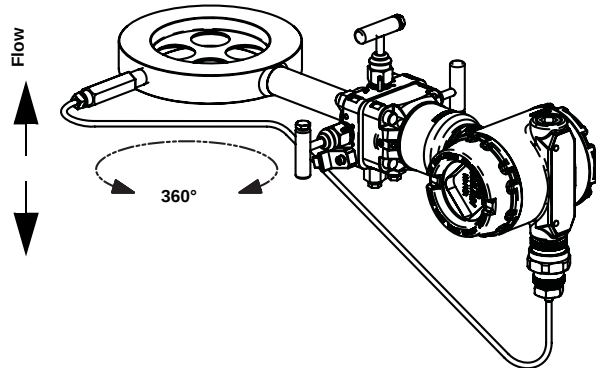
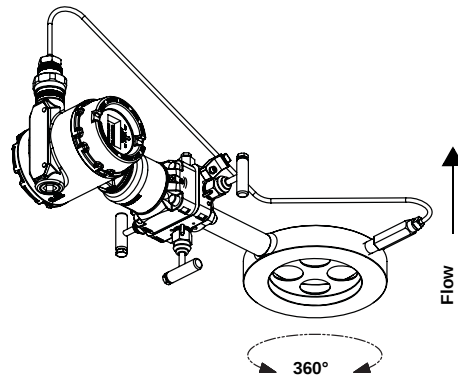


Figure 4. Steam (Vertical)



PRIMARY ELEMENT ORIENTATION

Remote Mount

Figure 6. Gas and Top Mounting for Steam (Horizontal)

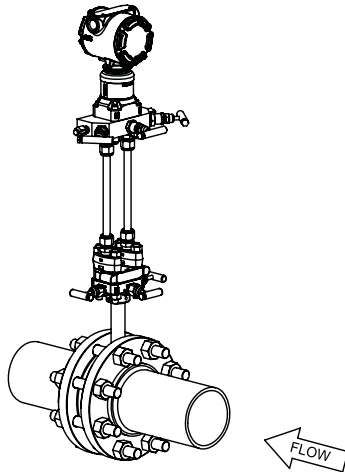


Figure 7. Gas (Vertical)

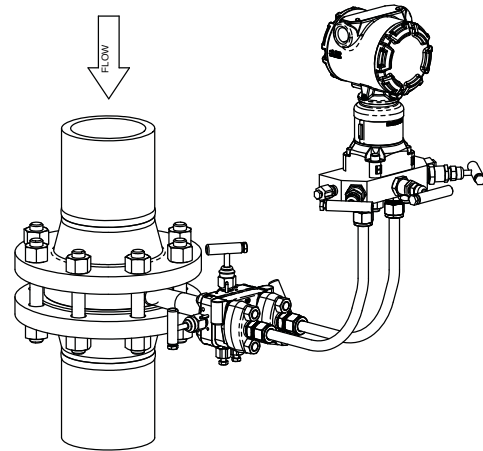


Figure 8. Liquid and Steam (Horizontal)

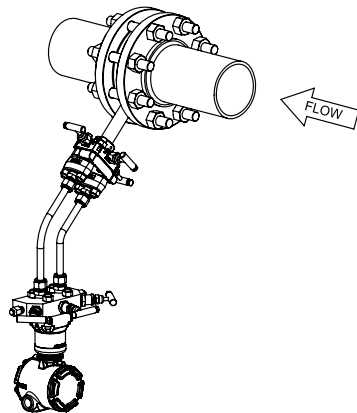
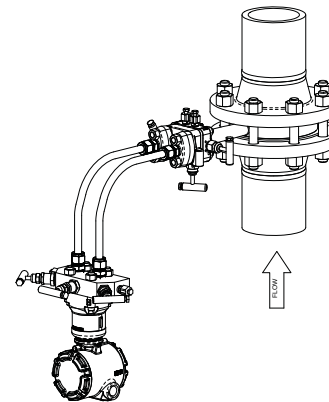


Figure 9. Liquid and Steam (Vertical)





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