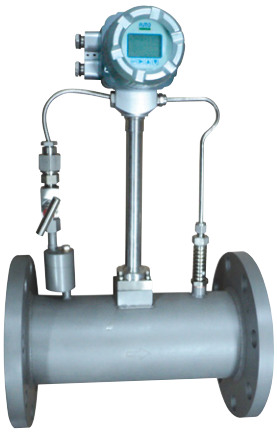
INNOBIZ
기술혁신형 중소기업
품질, 환경 경영시스템 인증 기업
ISO 9001/2008 ISO 14001/2004
연구개발전담부서

Vortex Flowmeter





볼텍스 유량계(온도/압력보정)



AUTO F·L·O·W
유량계 전문제작/판매
(株) 오토후로



AVT2000



AVT4000



AVT5000

▶ Introduction

Vortex Flowmeter is on the principle of Karmon vortex street, to measure liquid, gas and vapour even turbid liquid including micro grain and impurity.
Main Applications : petroleum, chemical industry, paper making, metallurgy, electric force, environmental protection, food industry and etc.

▶ Technology Parameters

◆ Medium : liquid
◆ Inside Nominal Diameter ~ AVT Pipeline-type : DN50
◆ Accuracy : AVT-Pipeline type 1.0%
◆ Flow range : 0000m^3/hr ~ 90000m^3/hr (see testin report)
◆ Nominal Pressure- : AVT-Pipelined Flanged Type : DN10 ~ DN500 ~ DN2000
◆ Medium temperature : AVT-Pipeline type -40℃ ~ +280℃
◆ Ambient temperature : -20℃ ~ +40℃ (Explosion-proof Mold)
◆ Relative humidity : 5% ~ 95%RH
◆ Atmospheric Pressure : 86kPa-106kPa
◆ Electrical Interface : M20*1.5 female screw
◆ Working Power : 24VDC±5%
◆ Protection level : IP65 (IP67 & IP68 FOR OPTIONAL)
◆ Explosion-proof grade : Exia II CT4
◆ Housing material : stainless steel 304
◆ Pressure lose : $\Delta P \leq 1.2\rho_T V^2$ (ΔP unit Pa ; ρ_T unit kg/m^3 ; V unit m/s)
◆ Calibration : factory calibration, following China Standard date from International Standard)
◆ Display : English Version (flow rate, totalizer, working condition flow rate, working condition temperature, working condition pressure, battery power, density, output, time, menu changes records.....Essential setting as per customer provided specifications and parameters)

Above specifications is reference, some description will not selected in you flowmeter.
But we strictly follow sales confirmation confirmed specification.

▶ technical parameter

Series	 AVT/AVM2000	 AVT4000	 AVT5000
Typical Diameter	Wafer design DN15~DN300, Flanges DN15~DN600, Insert design〉= DN300		
Typical pressure	(1.6, 2.0, 2.5, 4.0, 5.0, 6.4)Mpa, other special pressure classes upon request		
Fluid temperature	Standard(−40 ~ +150)℃, M−tem(−40 ~ +280)℃, H−tem(−40 ~ +420)℃		
Sensor design	Single sensor, Double sensor		
Body material	SUS304, SUS316		
Accuracy	0.2% ~ 2.5%		
Reproducibility	〈=0.33%		
Flow Range	1:10 ~ 1:20		
Converter type	Compact Remote Submersible		
Communication	RS485, RS232		
Display	2×8 characer −	4×12 characer accumulate/tempora	Accumulate/ Tem´/Pressure
Temp/Pressure compensation	−	−	YES
Supply power	Transmitter power : 24VDC, 24VDC(Digital filtering required), 3.6V Li Battery(LCD without signal output), 3.6V & 24VDC(LCD with signal output)		
Contact output	AVT2000 : 4−20mA VM2000 Pulse Voltage : L〈1V, H≥5V	current : 4−20mA	current : 4−20mA Pulse Voltage : L〈1V, H≥5V
Battery power	−	−	YES
Linear correction	−	−	YES
remote flow cut−off	AVT2000YES, AVM2000NO	YES	YES
Ex−Design	Ex ia II CT2−T4, Ex d II CT6		
Protection Class	IP65, IP67		
Required fluid	gas,liquid,steam		
Ambient conditions	Ambient temperature : (−40~+40)℃ Relative humidity : 5%~95% air pressure : (86~106)kPa		

▶ Gas

DN	flowrate range	option flowrate range	Max Frequncy
DN15	5–30	5–36	3500
DN20	6–50	6–60	3400
DN25	9–60	8–120	2700
DN40	18–180	18–290	1400
DN50	30–300	30–400	1000
DN80	70–700	70–1000	600
DN100	110–1000	100–1750	550
DN125	150–1500	140–2800	460
DN150	200–2000	200–3700	350
DN200	400–4000	320–7500	320
DN250	600–6000	550–13000	225
DN300	1000–10000	800–18400	210

REMARK

Refer to following conditions:
Temperature T0=20xx
Pressure P0=0.1013MPa
Density x=1.205Kg/m3
Viscosity U0=15x10——

Operating Flowrate Range of air

Gas	Density(kg/m³)	Gas	Density(kg/m³)
Air	1.2928	Gas Hydrogen	0.08988
Acetylene	11.1717	Methane	0.7167
Ammonia	10.7710	Ethane	1.3567
Oxygen	11.4289	Propane	2.0050
Carbon monoxide	11.2504	Butane	2.7030
Carbon dioxide	11.9770	Nitrogen	1.2506
Fluorin	11.7840	Neon	0.9000
Ethylene	11.2604	Nitrogen monoxide	1.3401
Propylene	11.9140	Nitrogen dioxide	2.0550

Normal Density for Various Gases

■ Meter Size Selection Example for Gases

Calculate the measurable minimum flowrate for DN100 Vortex Flowmeter : gas fluid, density = 1.780Kg/m3, kinematic viscosity U = 14 X 10m/s

(1) Calculate the minimum operating flowrate decided by density :
Per Table.1, the minimum flowrate of DN100 for Air is 100, take it into Equation. (1)
That's to say th0e measurableminimum flowrate for DN100 is 82.3m3/h°o

(2) Calculate the linear minimum operating flowrate decided by kinematic viscosity, according to Equ.(2)
$Q_U = Q_0 \times U / U_0 = 100 \times 14 / 15 = 93.3$
So the linear minimum operating flowrate is 93.3m³/h

(3) Qu>Qp, so the measurable minimum flowrate is 82.3m³/h, the linear minimum flowrate is 93.3m³/h

▶ Liquids

DN	flowrate range	option flowrate range	Max Frequncy
DN15	0.6–5	0.5–6	650
DN20	1.5–12	1–12	480
DN25	2–16	1.6–16	356
DN40	3–30	2.4–36	180
DN50	4–40	3–55	150
DN80	13–130	10–170	97
DN100	20–200	15–270	90
DN125	36–360	25–450	75
DN150	50–500	40–630	60
DN200	100–1000	80–1100	44
DN250	150–1500	120–1800	40
DN300	200–2000	180–2500	31

REMARK

(1) it is for water;

(2) it is under following conditions :
Temperature T0 = 20 – –
Density x = 1000Kg/m^3

(3) if the fluid is not water, and the density & viscosity are specified the measurable operating flowrate can be calculated according to Equ.(1) & (2)

(4) when calculate the measurable minimum flowrate for another liquids, Normal density should be x = 1000Kg/m^3

(5) the maximum fluid flowrate prefer to < = 7m/s

Table.3 : Liquids flowrate range(U=1cst)

▶ Steam

The flowrate range of saturated steam shown as in Table.4

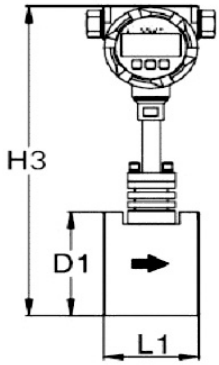
■ Example for Saturated Steam

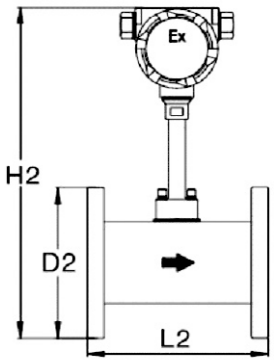
Find the flowrate range of DN50 Vortex Flowmeter uses in saturated steam(pressure P = 0.7Mpa) Per Table.4,
the flowrate range of DN50 for 0.7Mpa saturated steam is 95~1554Kg/h, another information as below : Temperature is 165– – –,
density is 3.667Kg/m^3.

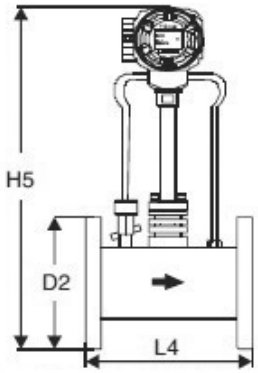
Pressure(MPa)	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.2	1.4	1.6	1.8	2.0
Temp(℃)	120.2	133.5	143.6	151.8	158.9	165.0	170.4	175.4	180.0	188.0	195.0	201.4	207.1	212.4
Den (kg/m³)	1.129	1.651	2.163	2.669	3.170	3.667	4.162	4.665	5.147	6.127	7.106	8.085	9.065	10.050
DN15 Q_{min}	6	9	11	13	16	18	19	20	21	22	24	26	28	31
Q_{max}	27	40	51	64	76	88	100	110	124	135	170	194	218	240
upper	27	40	51	64	76	88	100	110	124	135	170	194	218	240
DN20 Q_{min}	11	13	15	16	18	19	20	21	22	24	26	28	31	34
Q_{max}	77	112	147	160	180	190	200	210	220	240	260	280	310	340
upper	77	112	147	181	215	249	282	316	349	416	482	548	615	682
DN25 Q_{min}	14	17	19	22	23	25	27	28	30	33	37	43	48	53
Q_{max}	120	170	190	220	230	250	270	280	300	330	370	430	480	530
upper	120	175	229	283	336	389	441	494	545	649	753	857	961	1065
DN40 Q_{min}	31	38	44	48	53	57	60	64	70	83	96	110	123	136
Q_{max}	306	380	440	480	530	570	600	640	700	830	960	1100	1230	1360
upper	306	448	587	724	860	995	1129	1266	1496	1662	1928	2193	2459	2727
DN50 Q_{min}	52	63	73	81	88	95	101	107	112	130	150	171	192	213
Q_{max}	479	630	730	810	880	950	1010	1070	1120	1300	1500	1710	1920	2130
upper	479	700	917	1131	1344	1554	1764	1977	2182	2597	3012	3427	3843	4260
DN80 Q_{min}	122	148	170	188	205	221	235	253	279	332	385	439	492	545
Q_{max}	1220	1480	1700	1880	2050	2210	2350	2530	2790	3320	3850	4390	4920	5450
upper	1225	1792	2347	2896	3440	3979	4517	5062	5585	6649	7711	8774	9837	10906
DN100 Q_{min}	175	212	242	269	293	315	353	395	436	520	600	685	768	852
Q_{max}	1750	2120	2420	2690	2930	3150	3530	3950	4360	5200	6000	6850	7680	8520
upper	1914	2799	3668	4526	5375	6218	7057	7910	8727	10389	12049	13709	15371	17041
DN125 Q_{min}	262	317	363	404	440	473	551	618	682	812	941	1071 1	201	1331
Q_{max}	2620	3170	3630	4040	4400	4730	5510	6180	6820	8120	9410	10710	12010	13310
upper	2991	4374	5731	7071	8399	9715	11027	12359	13636	16233	18826	21420	24017	26626
DN150 Q_{min}	350	423	484	538	586	631	794	890	982	1169	1356	1542	1729	1917
Q_{max}	3500	4230	4840	5380	5860	6310	7940	8900	9820	11690	13560	15420	17290	19170
upper	4307	6299	8252	10183	12094	13990	15878	17797	19636	23375	27110	30845	34584	38340
DN200 Q_{min}	700	846	969	1076	1173	1261	1411	1582	1745	2078	2410	2742	3074	3408
Q_{max}	7000	8460	9690	10760	11730	12610	14110	15820	17450	20780	24100	27420	30740	34080
upper	7657	11198	14670	18102	21500	24871	28228	31640	34909	41556	48196	54836	61482	68163
DN250 Q_{min}	1050	1269	1453	1641	1759	1943	2205	2472	2727	3247	3765	4284	4803	5325
Q_{max}	10500	12690	14530	16410	17590	19430	22050	24720	27270	32470	37650	42840	48030	53250
upper	11965	17496	22922	28285	33594	38861	44107	49437	54545	64931	75306	85681	96066	106505
DN300 Q_{min}	1750	2116	2442	2690	2932	3153	3175	3559	3927	4675	5422	6169	6917	7668
Q_{max}	17500	21160	24420	26900	29320	31530	31750	35590	39270	46750	54220	61690	69170	76680
upper	20100	25195	33008	40730	48375	55960	63514	71190	78545	93500	108440	123380	138336	153367
Pressure(MPa)	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.2	1.4	1.6	1.8	2.0
Temp(℃)	120.2	133.5	143.6	151.8	158.9	165.0	170.4	175.4	180.0	188.0	195.0	201.4	207.1	212.4
Den(kg/m³)	1.129	1.651	2.163	2.669	3.170	3.667	4.162	4.665	5.147	6.127	7.106	8.085	9.065	10.050

Saturated Steam Flow Ranges

▶ SIZE

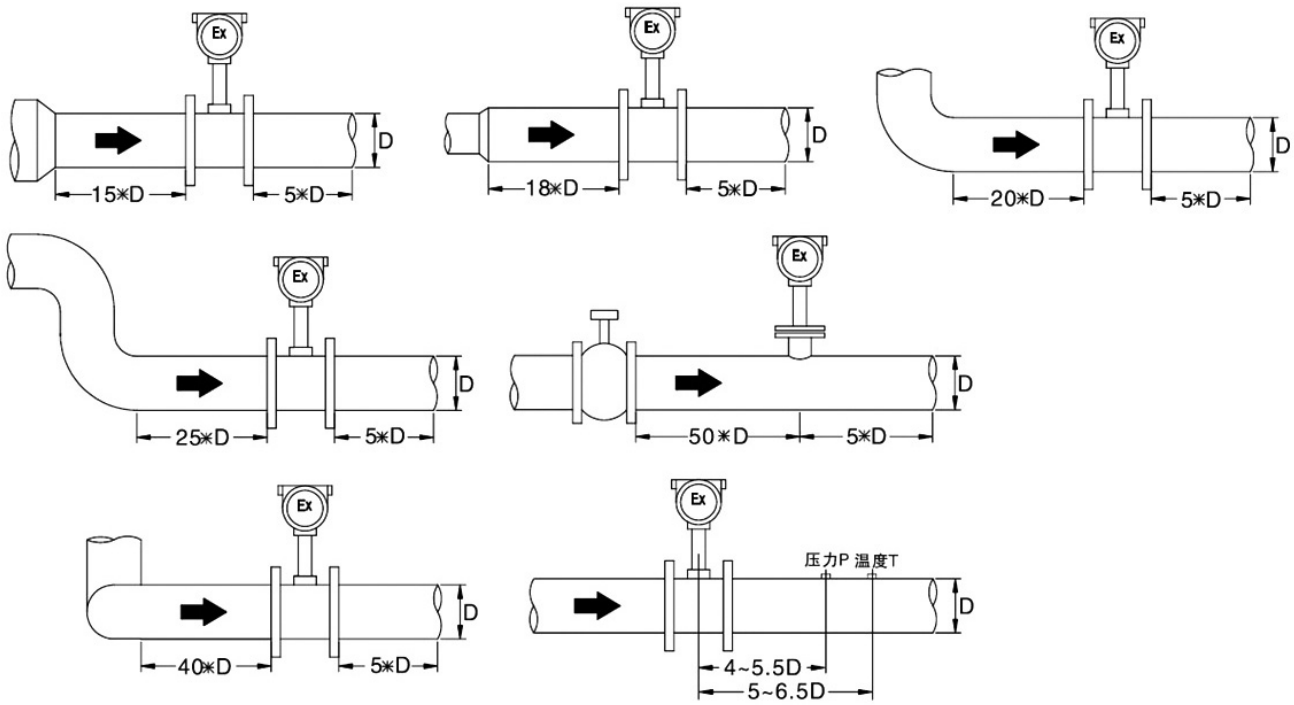






Size	H1	H2	H3	H4	H5	H6	H7	D1	D2	D3	L1	L2	L3	L4
10	441	428						90			50	200		
15	445	430						95			50	200		
20	450	435						100			50	200		
25	451	440						100			50	200		
32	456	452						105			54	200		
40	435	468	477	505	505			92	150		78	200	112	250
50	438	480	484	518	518			98	165		78	200	112	250
65	453	502	495	535	535			110	185		78	200	112	275
80	476	515	519	550	550			134	200		90	225	112	300
100	499	534	543	571	571			158	220		78	250	112	350

▶ Vortex Straight Length Size Drafts



1. shorten pipeline diameter
2. enlarge pipeline diameter
3. 1x90Deg C syphon (coplanar)
4. 2x90Deg C syphon
5. disconnecting valve
6. 1x90Deg C syphon (non-coplanar)
7. position of vortex flow meter, pressure transmitter and temperature transmitter.

■ 취급품목

- 면적식 유량계
- 볼텍스 유량계
- 터빈 유량계
- 판넬취부용 유량계
- 금속튜브형 유량계
- 오발기어식(용적식) 유량계
- 오리피스 유량계
- 기타 유량계
- 질량 유량계
- 전자 유량계
- 유량 감시계
- Mass 유량계



FLOWMETERS

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