aobo instrument

2024
PRODUCT
INTRODUCTION

Vortex Flowmeter

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Company Profile

Weifang AOBO Instrument Technology Development Co., Ltd., founded in 2002, with registration capital of 10 million RMB, is a "High-Tech" and "Double-Software Certification" enterprise specialized in "flow measurement and intelligent measurement & control" industry, integrating R&D, production, sales and service.

The company has a core R&D team for computer software and technology, automatic intelligent control, HVAC engineering design and flow measurement. It has the ability to provide customers with specific solutions and complete sets of products according to their different needs, based on years of practical experience. Especially in the heating industry, by the customer's recognition, has a high reputation in the industry.

The products are mainly used in the measurement and control of "steam, liquid, gas, sewage and tap water"; and especially suitable for energy monitoring and energy-saving control in many industries, such as thermal power plants, thermal companies, residential heating, petroleum, chemical industry, papermaking, food, coating, printing & dyeing and HVAC.

Since its foundation, based on self-developed and leading technology, reliable quality, high-quality service and good reputation, our company has been warmly accepted by customers, and become a designated supplier for many central enterprises and listed companies.

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I. Product Overview

The vortex flowmeter is mainly used for the flow measurement of the pipeline medium fluid, such as gas, liquid, steam and other mediums, which is almost not affected by the fluid density, pressure, temperature and viscosity. The vortex flowmeter adopts a piezoelectric stress sensor, with high reliability, long service life and wide operating temperature range of (-20-420) ℃. With analog standard signal and digital pulse signal output, easy to use with computers and other digital systems, it is a relatively advanced and ideal measurement instrument.

II. Operational Principle

The vortex flowmeter is a fluid vibration instrument developed by the principle of "Karman vortex" (Fig.1). A non-fluid vortex generator is placed in the fluid, which alternately separates on the sides of the vortex generator, releasing two columns of regular staggered arranged vortices.

Within a certain flow velocity range, the separation frequency of the vortices is proportional to the flow rate, which is detected by the piezoelectric ceramic detection element. It is transformed into alternating electric signals. After amplifying, filtering and shaping, it outputs a voltage pulse signal or (4-20) mA standard current signal proportional to the flow rate.

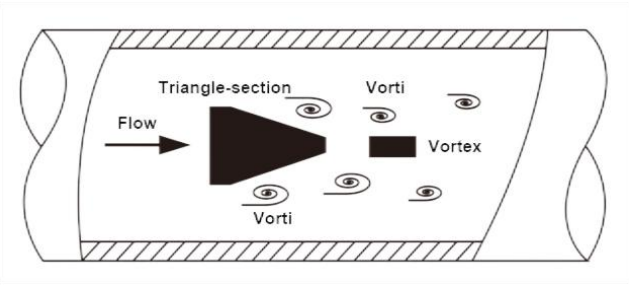


Fig.1

III. Product Characteristics

(1) Wide measurement range;

(2) High measurement accuracy;

(3) Simple and firm structure, no moving parts, and long service life;

(4) Simple maintenance, easy to install, small workload and low cost;

(5) It has a wide range of applications. The flow of steam, gas and liquid can be measured;

(6) It has a small pressure loss, high accuracy, good repeatability and good long-term working stability;

(7) The output frequency signal is not affected by the fluid temperature, pressure, viscosity, density, etc.

IV. Technical Parameter(s)

Nominal general diameter: DN15~DN800

Nominal pressure: 1.6MPa, 2.5MPa, 4.0MPa, Other ranges can be customized

Measurement medium(s): liquid, gas, steam or other single phase or considered single phase mediums.

Medium temperature: (-20~420) ℃

Accuracy: grade 1.0 and grade 1.5.

Range degree: 1:10~1:15; intelligent type: above 1:15

Pressure loss factor: Cd=2.4

Power supply: DC 24V, DC 12V, DC 3.6V lithium battery

Case material: 1Cr18Ni9Ti, and other materials are required for the strong corrosion mediums.

Environmental conditions: (-40~55) ℃ [Field display type(-20~55) ℃], humidity of (5~90)%RH, atmospheric pressure of (8~106) KPa, explosion-proof type (-20~40) ℃

Protection grade: IP65 IP68

Explosion-proof grade: ExdIICT6Gb, explosion-proof number: SYEx19.12246

Connection: Wafer type

Output signal: Pulse

Display: Without display

V. Structural Form and Installation Dimensions

Outline dimension table of wafer type(Unit:mm, Fig.2)

DN Diameter	15	20	25	32	40	50	65	80	100
L1	65	65	65	70	75	75	75	84	90
L2	97	97	97	106	111	113	119	128	134
H	387	385	382	386	389	395	403	411	421
DN Diameter	125	150	200	250	300	350	400	450	500
L1	100	120	150	160	160	200	220	240	240
L2	148	172	202	212	214	278	302	320	320
H	434	447	472	498	523	548	573	598	623

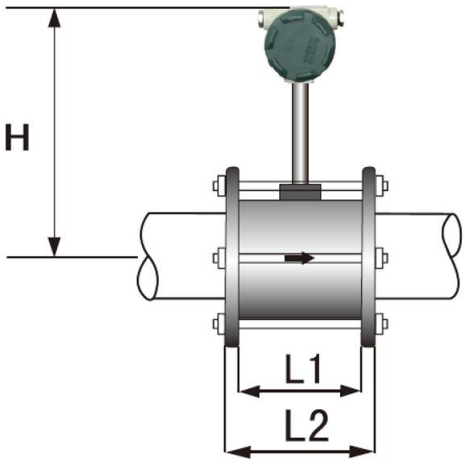
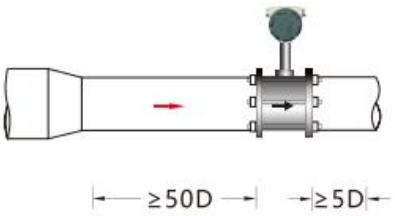


Fig.2 Installation diagram of wafer type

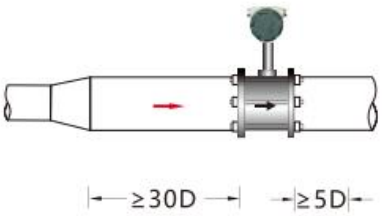
VI. Installation Requirements

(1) The upstream and downstream of the vortex flow sensor shall have a long enough

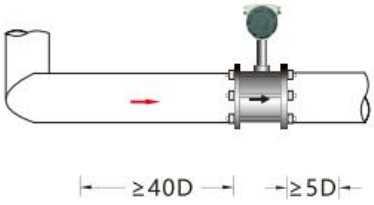
straight pipe section (D is the sensor diameter) as required in the figure below.



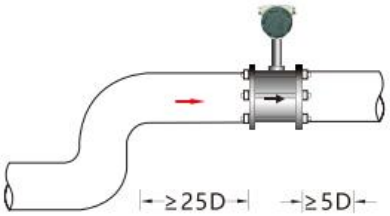
Concentric contraction, full open valve



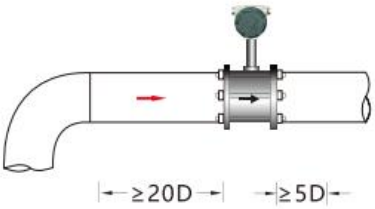
Concentric pipe-expanding



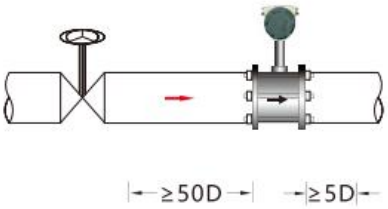
Two 90-degree bends in different planes



Two 90-degree bends in the same plane



A 90-degree bend



Adjustment valve semi-open valve (not recommended)

(2)When temperature&pressure compensation is required, the pressure and temperature measurement points shall be set at the downstream end surface of the flow sensor (3~5) D and (6~8) D respectively, the pressure hole diameter (6~12) mm. The root of the pressure-taking short pipe is flush with the inner wall of the pipeline and shall not go deep into the inner wall of the pipeline. Insert the front end of the thermal resistance sheath into the center of the pipe as far as possible.(Fig.3)

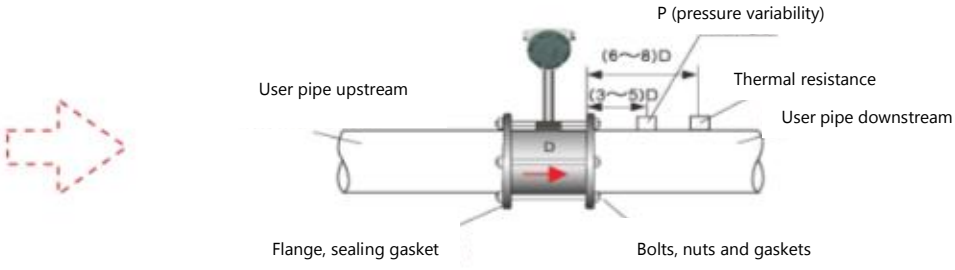


Fig.3 Sensor installation diagram

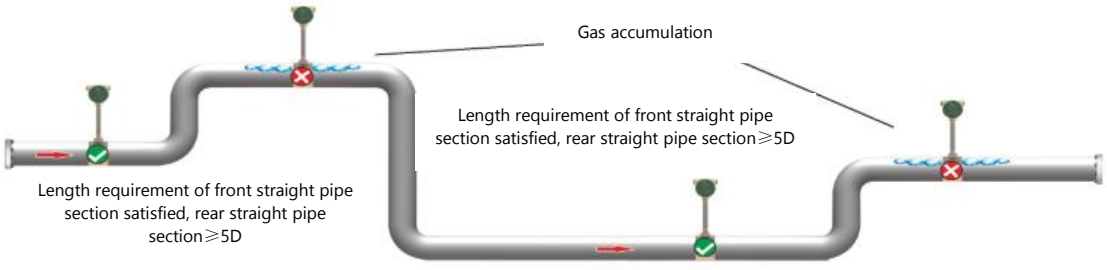
(3) The inner diameter of upstream and downstream piping shall be the sensor diameter. If it is not, pipes that are slightly larger than the sensor diameter shall be used, The error shall be ⩽ + 3%, and do not exceed 5mm; piping shall be concentric with the sensor, axiality<0.05D; gasket shall not protrude into the pipe and the inner diameter shall be larger than the sensor diameter (1-2) mm.

(4) To avoid the influence of pipeline vibration, it should be considered to add fixed support about 2D upstream of the flowmeter or add elastic hose on the premise of satisfying the length requirement of straight pipe section before adding support.(Fig.4)

Fig.4 Schematic diagram of sensor shock absorption support

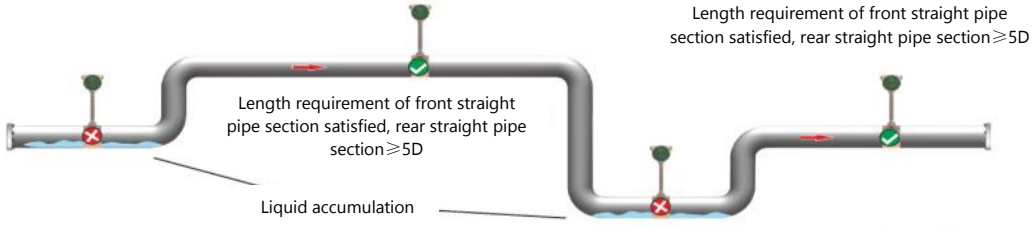
(5) The vortex flow sensor shall be installed in a safe place for installation, commissioning, overhaul and good environment. Enough operation space shall be left around. An operating platform shall be provided when installation at high altitude. Avoid installation in strong electromagnetic field, strong mechanical vibration environment and the environment of temperature and humidity not consistent with the service conditions.

(6) The vortex flow sensor can be installed in the horizontal, vertical or inclined pipe, but the specific position shall be selected to ensure that the pipe is full and avoid the influence of bubbles when measuring liquid; the influence of liquid accumulation must be avoided when measuring gas (steam).(Fig.5)



Liquid measurement

When measuring the liquid, the vortex flow sensor shall be installed at the lower part of the pipeline.



Gas measurement

Fig.5

When measuring gas (steam) flow, the vortex flow sensor shall be installed in the higher part of the pipeline.

Fig.6

The vortex flow sensor is installed in the vertical pipeline. When measuring the gas (steam) flow, the flow direction of the medium is not limited; when measuring the liquid flow, the flow direction should be from bottom to top.

(7)When the vortex flow sensor is installed in a horizontal pipeline, the meter head shall not be downward and shall be installed at an inclination of 45 degrees upward.

(8)When installing the insert type vortex flow sensor, ensure that its axis coincides with the pipeline center line and it is perpendicular to the pipeline axis. The insertion depth meets the requirements and the flow direction is correct. The measuring head axis is parallel to the pipeline axis and the angle error is less than 7°. After the flow direction is adjusted, it should be locked to avoid rotation.

(9)Before welding, the vortex flow sensor shall be removed. Welding with meter is prohibited; the flow sensor connecting rod cannot be insulated during pipeline insulation.(Fig.6)

(10)If necessary, the vortex flowmeter shall be reliably grounded, with a grounding resistance≤ 10Ω.

VII. Product Type Selection

Vortex Flowmeter Specification Model

AOBO - LUGB	a	b	c	d	e	f	g	h	i	j	k	l

Series	LUGB												Vortex Flow Sensor
	LUB												Vortex Flowmeter
a	Connection	1											Flange Connection
		2											Wafer Connection
		3											Plug-in
b	Measured Medium	2											Liquid
		3											Gas (Steam)
c	Nominal Diameter(mm)	15											DN15
		20											DN20
		25											DN25
		32											DN32
		40											DN40
		50											DN50
		65											DN65
		80											DN80
		100											DN100
		125											DN125
		150											DN150
		200											DN200
		250											DN250
		300											DN300
		350											DN350
		400											DN400
		500											DN500
		600											DN600
		700											DN700
d	Nominal Pressure	16											1.6MPa
		25											2.5MPa
		40											4.0MPa
e	Temperature	A											（-195）℃-0℃
		B											0℃-160℃
		C											0℃-250℃
		D											0℃-300℃
		E											0℃-350℃
		F											0℃-400℃
		G											0℃-420℃
f	Accuracy Class	0											1.0 Class
		1											1.5 Class
g	Output Signal	F											Pulse Output
		M											Pulse Output + (4-20)mA
h	Compensation Type	0											Without Temperature & Pressure Compensation
		1											Integrated Temperature & Pressure Compensation
		2											Integrated Pressure Compensation
		3											Integrated Temperature Compensation
i	Shell Protection	1											IP65
		2											IP68
		3											Other
j	Explosion-proof	0											None
		1											Flameproof
		2											Intrinsically Safe Explosion-proof
k	Communication	0											None
		1											RS485 MODBUS RTU Protocol
		2											HART Protocol
		3											Other
l	Power Supply	1											DC12V
		2											DC24V
		3											DC3.6V
		4											Dual Power Supply（DC24V & DC3.6V）

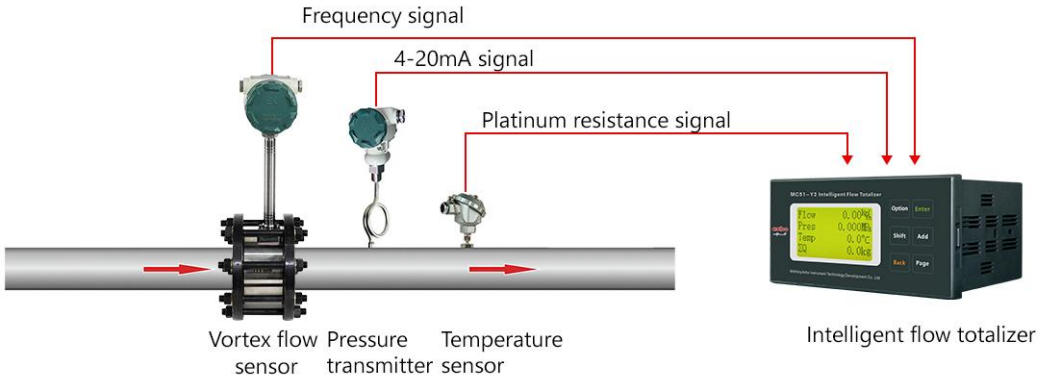
The accessory products of wafer type vortex flowmeter

Pressure transmitter

Thermal resistance

MC51-Y2 Flow totalizer

AOBO-FC6000 Flow totalizer



Installation Diagram

Annex 1 Vortex flow sensor flow measurement range table

Pipe Diameter DN(mm)	Liquid: AMB Water ρ =998.2(kg/m³) v=1.006x10⁻⁶ (㎡/s)		Gas: N.T.P Air 20℃,101325Pa ρ =1.205kg/m³,v=15x10⁻⁶ (㎡/s)	
	Standard type(m³/h)	Intelligent type (m³/h) Extendable measuring range	Standard type (m³/h)	Intelligent type (m³/h) Extendable measuring range
12.5	0.42~2.5		3.2~16	
15	0.5~4		4.2~25	
20	0.75~6	0.4~10	8.0~40	
25	1.0~8	0.6~14	10~60	
32	1.5~12	1.0~20	16~100	10~170
40	2.0~20	1.5~30	20~160	16~400
50	3.0~30	2.0~50	31~250	26~400
65	5.0~50	3.0~90	50~400	50~620
80	8.0~80	6.0~130	75~600	70~1000
100	12~120	8.0~200	120~1000	100~1600
125	20~200	15~300	200~1600	160~2600
150	30~300	20~400	310~2500	240~3800
200	50~500	40~800	500~4000	450~6800
250	80~800	50~1400	750~6000	600~10000
300	100~1000	70~1800	1000~8000	900~15000
350	160~1600		1500~12000	
400	200~2000		2000~16000	
450	250~2500		2500~20000	
500	300~3000		3100~25000	

Annex 2 Superheated steam density table(kg/m^3)

Absolute pressure (MPa)	Temperature℃								
	150	160	170	180	190	200	210	220	230
0.2	1.0488	1.0228	0.9982	0.9749	0.9527	0.9317	0.9116	0.8924	0.8741
0.25	1.3153	1.2820	1.2506	1.2210	1.1929	1.1662	1.1408	1.1166	1.0934
0.3	1.5844	1.5435	1.5050	1.4688	1.4345	1.4020	1.3712	1.3417	1.3137
0.4	2.1310	2.0735	2.0199	1.9697	1.9224	1.8778	1.8355	1.7953	1.7571
0.5		2.6137	2.5434	2.4780	2.4168	2.3592	2.3048	2.2533	2.2044
0.6		3.1653	3.0763	2.9943	2.9179	2.8465	2.7793	2.7158	2.6558
0.7			3.6193	3.5189	3.4263	3.3400	3.2592	3.1831	3.1113
0.8				4.0527	3.9423	3.8400	3.7447	3.6554	3.5712
0.9				4.5964	4.4664	4.3470	4.2362	4.1327	4.0356
1.0				5.1510	4.9992	4.8611	4.7338	4.6155	4.5047
1.1					5.5413	5.3830	5.2380	5.1038	4.9787
1.2					6.0937	5.9130	5.7489	5.5979	5.4576
1.3						6.4517	6.2671	6.0980	5.9417
1.4						6.9998	6.7928	6.6045	6.4313
1.5						7.5580	7.3264	7.1177	6.9265
1.6							7.8686	7.6378	7.4275
1.7							8.4199	8.1651	7.9346
1.8							8.9809	8.7002	8.4481
2.0								9.7953	9.4953
2.5									12.248
3.0									
3.5									
4.0									

Annex 2 Superheated steam density table(kg/m^3)

Absolute pressure (MPa)	Temperature℃								
	240	260	280	300	320	340	360	380	400
0.2	0.8565	0.8235	0.7930	0.7648	0.7386	0.7141	0.6913	0.6698	0.6497
0.25	1.0713	1.0297	0.9914	0.9559	0.9230	0.8923	0.8636	0.8368	0.8116
0.3	1.2868	1.2366	1.1903	1.1475	1.1078	1.0708	1.0363	1.0040	0.9737
0.4	1.7206	1.6524	1.5898	1.5321	1.4786	1.4289	1.3826	1.3392	1.2986
0.5	2.1579	2.0711	1.9917	1.9186	1.8511	1.7884	1.7300	1.6754	1.6243
0.6	2.5987	2.4927	2.3960	2.3071	2.2252	2.1492	2.0785	2.0126	1.9509
0.7	3.0433	2.9173	2.8026	2.6977	2.6009	2.5114	2.4283	2.3508	2.2783
0.8	3.4918	3.3449	3.2118	3.0902	2.9784	2.8751	2.7793	2.6900	2.6067
0.9	3.9442	3.7757	3.6235	3.4848	3.3576	3.2402	3.1315	3.0303	2.9359
1.0	4.4007	4.2097	4.0378	3.8816	3.7385	3.6068	3.4849	3.3716	3.2660
1.1	4.8614	4.6470	4.4547	4.2804	4.1212	3.9748	3.8396	3.7140	3.5970
1.2	5.3266	5.0878	4.8744	4.6815	4.5057	4.3444	4.1955	4.0574	3.9290
1.3	5.7962	5.5320	5.2967	5.0848	4.8920	4.7154	4.5527	4.4020	4.2618
1.4	6.2705	5.9797	5.7219	5.4903	5.2802	5.0880	4.9111	4.7475	4.5956
1.5	6.7497	6.4312	6.1500	5.8982	5.6702	5.4621	5.2709	5.0942	4.9303
1.6	7.2339	6.8865	6.5811	6.3084	6.0622	5.8378	5.6320	5.4420	5.2659
1.7	7.7232	7.3456	7.0151	6.7210	6.4561	6.2151	5.9944	5.7909	5.6025
1.8	8.2179	7.8088	7.4522	7.1361	6.8519	6.5940	6.3581	6.1409	5.9400
2.0	9.2243	8.7475	8.3361	7.9736	7.6497	7.3568	7.0897	6.8444	6.6179
2.5	11.850	11.173	10.605	10.114	9.6807	9.2933	8.9430	8.6235	8.3299
3.0	14.6650	13.727	12.967	12.325	11.768	11.275	10.833	10.433	10.067
3.5		16.432	15.436	14.615	13.915	13.304	12.762	12.274	11.831
4.0		19.322	18.027	16.994	16.130	15.386	14.732	14.149	13.623

Annex 3 Saturated Vapor Density Table (kg/m³)

Temperature ℃	Absolute pressure MPa	Density kg/m³	Temperature ℃	Absolute pressure MPa	Density kg/m³	Temperature ℃	Absolute pressure MPa	Density kg/m³
100	0.1013	0.5977	151	0.4888	2.6130	202	1.6210	8.1880
103	0.1127	0.6601	154	0.5292	2.8160	205	1.7242	8.6940
106	0.1250	0.7277	157	0.5723	3.0320	208	1.8326	9.2250
109	0.1385	0.8008	160	0.6181	3.2600	211	1.9462	9.7820
112	0.1532	0.8798	163	0.6666	3.5020	214	2.0650	10.370
115	0.1691	0.9650	166	0.7183	3.7580	217	2.1896	10.980
118	0.1863	1.0830	169	0.7730	4.0290	220	2.3198	11.620
121	0.2049	1.1550	172	0.8310	4.3160	223	2.4559	12.300
124	0.2250	1.2610	175	0.8924	4.6180	226	2.5981	13.000
127	0.2467	1.3750	178	0.9573	4.9370	229	2.7466	13.740
130	0.2701	1.4970	181	1.0259	5.2740	232	2.9010	14.520
133	0.2953	1.6270	184	1.0983	5.6290	235	3.0631	15.330
136	0.3222	1.7660	187	1.1746	6.0030	238	3.2316	16.180
139	0.3513	1.9150	190	1.2551	6.3970	241	3.4070	17.060
142	0.3823	2.0730	193	1.3397	6.8120	244	3.5897	17.990
145	0.4155	2.2420	196	1.4289	7.2480	247	3.7797	18.970
148	0.4510	2.4220	199	1.5225	7.7060	249	3.9107	19.640

Annex 4 Table of standard state density of common gas medium (20℃, 101325Pa)

Gas	Ammonia	Nitrogen	Oxygen	Fluorine	Neon	Air (dry)	Carbon Monoxide
Density (kg/m³)	0.7080	1.1646	1.3302	1.5798	0.83914	1.2041	1.165
Gas	Hydrogen	Acetylene	Ethylene	Propylene	Natural gas	Coal gas	Carbon dioxide
Density (kg/m³)	0.0838	1.083	1.166	1.7495	0.828	0.8020	1.829
Gas	Methane	Ethane	Propane	Butane	Hydrogen sulfide	Sulfur dioxide	Carbon Monoxide
Density (kg/m³)	0.6669	1.25	1.8332	2.4163	1.4169	2.726	1.2474

Annex 5 Table of measurement range of saturated steam mass flow measured by vortex flow sensor

Flow unit	Absolute pressure MPa		0.2	0.3	0.4	0.5	0.6	0.7	0.8	1.0	1.2	1.4
	Temperature °C		120	134	144	152	159	165	170	180	188	195
	Density Kg/m³		1.13	1.65	2.16	2.67	3.17	3.67	4.16	5.15	6.13	7.11
Kg/h	DN20	Qmin	10	12	15	17	19	21	23	26	30	33
		Qmink	6.2	7.6	9.1	10	12	13	14	16	18	20
		Qmax	68	99	130	160	190	220	250	300	360	420
	DN25	Qmin	18	23	28	31	35	38	42	48	54	59
		Qmink	7.5	9.2	11	12	14	15	17	19	21	23
		Omax	140	200	260	320	380	440	500	610	740	850
	DN32	Qmin	20	25	30	35	38	42	45	52	60	65
		Qmink	16	20	24	28	30	34	38	42	48	54
		Qmax	192	281	367	454	539	624	707	876	1042	1208
	DN40	Qmin	30	37	45	50	57	65	70	80	90	100
		Qmink	18	23	28	31	35	38	42	48	55	60
		Qmax	271	396	518	641	761	881	998	1236	1471	1706
	DN50	Qmin	50	63	76	80	95	100	110	130	150	160
		Qmink	30	38	45	50	57	65	70	80	90	100
		Qmax	452	660	864	1068	1268	1468	1664	2060	2452	2844
t/h	DN65	Qmin	0.08	0.09	0.10	0.11	0.12	0.13	0.14	0.16	0.18	0.20
		Qmink	0.06	0.07	0.08	0.09	0.10	0.11	0.13	0.15	0.16	0.18
		Qmax	0.70	1.02	1.34	1.66	1.97	2.28	2.58	3.19	3.80	4.41
	DN80	Qmin	0.12	0.15	0.18	0.21	0.23	0.25	0.28	0.32	0.36	0.40
		Qmink	0.08	0.09	0.11	0.12	0.14	0.15	0.17	0.19	0.21	0.24
		Qmax	1.13	1.65	2.16	2.67	3.17	3.67	4.16	5.15	6.13	7.11
	DN100	Qmin	0.20	0.24	0.28	0.32	0.38	0.42	0.46	0.52	0.58	0.63
		Qmink	0.10	0.12	0.14	0.16	0.18	0.20	0.22	0.25	0.30	0.32
		Qmax	1.81	2.64	3.46	4.27	5.07	5.87	6.66	8.24	9.81	11.38
	DN125	Qmin	0.22	0.28	0.36	0.42	0.48	0.56	0.64	0.72	0.80	0.88
		Qmink	0.18	0.23	0.28	0.33	0.35	0.40	0.45	0.50	0.55	0.60
		Qmax	2.94	4.29	5.62	6.94	8.24	9.54	10.82	13.39	15.94	18.49
	DN150	Qmin	0.42	0.51	0.60	0.70	0.79	0.85	0.90	1.1	1.2	1.4
		Qmink	0.26	0.32	0.38	0.44	0.50	0.56	0.62	0.68	0.76	0.85
		Qmax	4.29	6.27	8.21	10.15	12.05	13.95	15.81	19.57	23.29	27.02
	DN200	Qmin	0.65	0.8	0.95	1.1	1.2	1.3	1.5	1.7	1.9	2.1
		Qmink	0.45	0.53	0.6	0.7	0.8	0.8	0.9	1	1.2	1.3

		Qmax	7.68	11.22	14.69	18.16	21.56	24.96	28.29	35.02	41.68	48.35
	DN250	Qmin	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.5	2.9	3.2
		Qmink	0.6	0.75	0.9	1.0	1.1	1.2	1.3	1.4	1.6	1.8
		Qmax	11.30	16.50	21.60	26.70	31.70	36.70	41.60	51.50	61.30	71.10
	DN300	Qmin	1.2	1.5	1.8	2.1	2.3	2.5	2.8	3.2	3.6	3.9
		Qmink	0.75	0.9	1.1	1.2	1.4	1.6	1.8	2.1	2.4	2.7
		Qmax	16.95	24.75	32.40	40.05	47.55	55.05	62.40	77.25	91.95	106.65
	DN350	Qmin	1.8	2.3	2.8	3.3	3.8	4.4	5.0	5.6	6.2	6.8
		Qmink	1.5	1.8	2.1	2.4	2.7	3.0	3.4	3.8	4.2	4.6
		Omax	30	40	54	70	80	90	110	130	150	180
	DN400	Qmin	2.4	3.0	3.6	4.2	4.7	5.2	5.7	6.5	7.2	8.0
		Qmink	1.8	2.3	2.8	3.2	3.5	3.9	4.2	4.7	5.2	5.8
		Qmax	34	50	65	80	100	110	130	150	180	210
	DN450	Qmin	3.2	3.8	4.5	5.3	5.9	6.5	7.0	8.0	9.0	10.0
		Qmink	2.4	3.0	3.6	4.2	4.7	5.2	5.7	6.5	7.4	8.1
		Qmax	45	66	90	110	130	150	170	200	250	280
	DN500	Qmin	3.8	4.6	5.4	6.3	7.0	7.8	8.5	10	11	12
		Qmink	3.2	3.8	4.5	5.3	5.9	6.5	7.0	8.0	9.0	10
		Qmax	60	80	110	130	160	180	210	260	310	360

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