

# VORTEX FLOWMETER

A Vortex flowmeter is applicable to liquid, gas and steam.



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# VORTEX FLOWMETER

## ■ General

Vortex flowmeter has a sensor of piezo-electric element. Meter has a trigonal prism(delta body) that is right-angled to flow direction of fluid. It has the karman's vortex that is proportioned to the velocity of fluid in the down stream of trigonal prism(delta body). The sensor of piezo-electric element picks up the karman's vortex and the number of karman's vortex is transformed to flowrate. Especially, the meter has the intelligent functions:

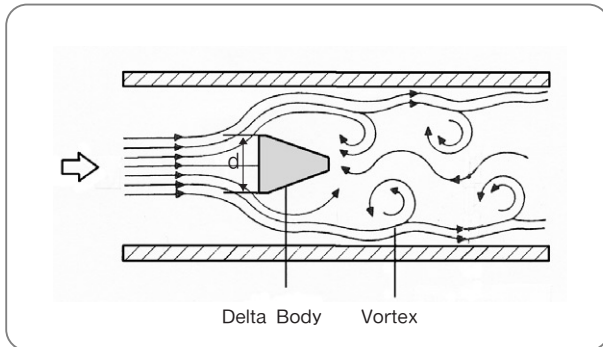
Various compensation computings, readings of ranges and various co-efficients, setting, charging, self-diagnosis and loop check. Furthermore, additionally provided communication function utilizing a smart communication unit and a general purpose Window PC.

## ■ Features

1. Measures the flowrate of steam, gas and low viscosity fluid in high accuracy.
2. It flow range, and high temperature range.
3. The piezo electric element is completely blocked fluid, so durability is high.
4. It hasn't moving parts, has low % in trouble.
5. It is suitable to energy saving meter that has the very low pressure drop.
6. Materialization of 2-wires transmission system for cost reduction and simplification of system to be applied.
7. Ease to data setting, changing, self-diagnosis and loop check with communication system.
8. Maintenance operation such as range and parameter setting, and calibration can be performed.

# MEASURING PRINCIPLE

## ■ MEASURING PRINCIPLE



Installed a delta body with right-angled to flow direction of fluid, as shown in left figure, alternated vortexes are generated in down stream of the delta body.

The frequencies of this alternated vortex are proportional to the velocity of fluid by karman's law.

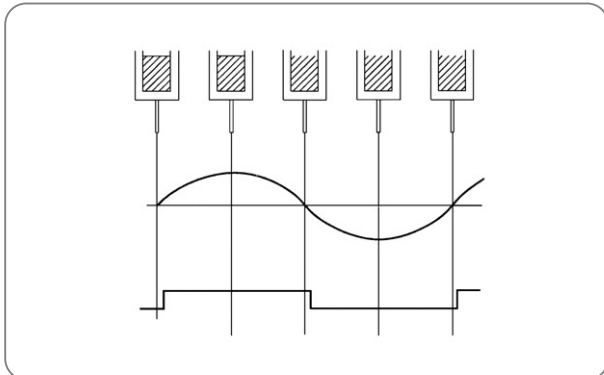
$$f = St \cdot \frac{v}{d}$$

$f$ : frequency of generated vortex

$v$ : average velocity of fluid on delta body

$St$ : strouhal number

$d$ : width of delta body



As shown in left figure, sensor in delta body has the alternating strength generated by this vortex.

This alternating strength let the sensor of piezo-electric element produce the electric charges.

Preamplifier transforms the electric charges to output of current pulse.

Fig. 1 Vortex detection by piezo-electric element

## ■ CONNECTION TO RECEIVER

- Pulse & Analog



### Pulse Output

- · Batch Controller (NF560, BC700)
- Flow Computer (FC400, NF550)
- Flow Indicator (NF530)
- F/I Converter (SU12)
- Pulse Scaler (SU13)

### Analog Output

- · Flow Indicator (NF530)
- Recorder

# GENERAL SPECIFICATION

## ■ Body

Item		Description	
Flange		Wafer Type	Flange Type
Size mm		15, 25, 40, 50, 80, 100, 150mm	15~150mm(Wafer+Flange), 200, 250, 300mm
Flange Rating		KS (JIS) 10, 20, 30K ANSI 150, 300#	
Pipe Rating		Sch. 40 (Standard)	
Applicable fluid		Gas, Liquid, Steam	
Flow Range		See Page 6, 7, 8	
Operating Temp.Range		-40 ~ +300℃	
		Nominal Size 200~300mm 0 ~ +300℃ (Temp. limitation depends on the flange material used)	
Max.Operating Pressure		Depends on flange rating(Design pressure : 5.0MPa)	
Accuracy		±1% of indicated reading or better (※ IN Analog Output, ±0.1% Full Scale is added)	
Repeatability		±0.2% or better	
Material	Body	CF8M (SCS14A)	15~150mm:Body(CF8M)/Flange(SUS304) 200~300mm:Body(SUS304)/Flange(SS400)
	Bluff Body	CF8M (SCS14A) / SUS304(200, 250, 300mm)	
	Support	CF8 (SCS13A)	
Installation		No restrictions to cause loss of accuracy on physical orientation (Maintainability and waterproof work for cable entry should be taken into consideration )	
Coating Color (Measuring Pipe)		Nominal Size 200~300mm: Munsell 7.5 B4/4	

## ■ Flange Rating(MPa)

Size 15~150mm

Flange Operating Temp.	JIS 10K	JIS 20K	JIS 30K	ANSI 150	ANSI 300
Below 220℃	1.18	2.45	4.51	1.21	3.20
220℃ ~ 300℃	0.98	2.26	4.22	1.02	2.91

Size 200~300mm

Flange Operating Temp.	JIS 10K	JIS 20K	JIS 30K	ANSI 150	ANSI 300
Below 220℃	1.18	3.04	4.51	1.32	4.31
220℃ ~ 300℃	0.98	2.84	4.22	1.02	3.87

# GENERAL SPECIFICATION

## ■ Converter Specification

Item	Description	
Model	VT20(No Display)	VT25(Totalizer, Digital Indicator)
Water proof construction	IP 66	
Explosionproof construction	ExdIIC T4 Flameproof construction	
Ambient temperature	Explosionproof construction : -20 ~ +60℃	
Case Material	Aluminum Diecast	
Case Painting (Munsell)	Body:Light Gray(5Y8.5/0.5) / Cover:Sky Blue(7.5 B4/4)	
Output	Select one of the Followings; ① Scaled Pulse      Pulse Level : 「0」:4mA, 「1」:20mA Pulse Width : 10~1000ms(St'd 50ms) ② Unscaled Pulse      Pulse Level : 「0」:4mA, 「1」:20mA Pulse Width : 200μs ③ Analog 4~20mA DC at 0~FS      Time Constant: 0~100s (St'd: 2.5s)	
Display (Option)		Display: 7 Segment LCD Content: One of the following 4 ways display is possible with switching over of an internal switch ①Totalizer flow throughput: 8Digit Unit of totalizing: Same as scaled Pulse output ※ Upon power interruption, Totalized counts are held by non-volitized memory ※ Totalized counts are resettable by an internal switch ②Actual instantaneous flow rate: 7Digit (3½ Digits are effective) ③% instantaneous flow rate: Unit of display: %FS Discrimination: 0.1% Full Scale: Same as that of Analog output ④Cummulated total flow: 8Digit Unit of flow: Same as scaled Pulse output Cummulated totalized counts are resettable by an internal switch or Communication
Power Supply	12~35V DC	
Cable Entry	½ NPT	
Cable	Converter to receiving: 1.25mm Min., 2-conductor Shield cable	
Transmission length	Converter to receiving: 1Km Max Sensor to converter: 200 Max (applicable to separate type)	
Communication	HART Protocol Communication ※ 1	
Computation	Actual flow rate computation : Gas, Liquid, Steam Temp./Press. correcting computation : Gas, Steam	

※ 1: In case a specification for Pulse output is given, Communication function is available only under the following conditions:

① During flow interruption

② Upon Power "ON" (Continuous Communication is available if started within 15 sec. after Power "ON")

# FLOW RANGES

## ■ Gas

In this table, flow rates are specified in [actual] base. Therefore, in case of [normal] base, make it sure to convert the flow rate to [actual] condition and flow range and the nominal diameter based on this table

Unit: m³/h

	Size	Density (kg/m³)	Minimum flow rate (m³/h)										Max. flow rate (m³/h)	
			0.38	0.7	1.2	2	3.6	6	11	19	34	60	±1% of Reading	±1.5% of Reading
Table A	15	±1% of Reading	-	-	12	7.2	4.0	3.2	2.6	2.2	1.8	1.5	33	-
		±1% of Full scale	9.4⊙	6.9⊙	5.4⊙	4.6	3.8	3.2	2.6	2.2	1.8	1.5		
	25	±1% of Reading	68	37	22	13	10	8	7	6	5	4	130	-
		±1% of Full scale	23	17	13	12	10	8	7	6	5	4		
	40	±1% of Reading	110	57	33	20	16	13	11	9	8	6	290	-
		±1% of Full scale	39	29	23	19	16	13	11	9	8	6		
	50	±1% of Reading	110	73	43	31	26	22	18	15	12	10	490	-
		±1% of Full scale	63	46	37	31	26	22	18	15	12	10		
	80	±1% of Reading	200	108	80	67	56	47	38	32	26	22	1100	1380
		±1% of Full scale	140	101	80	67	56	47	38	32	26	22		
	100	±1% of Reading	260	171	110	115	95	80	66	55	45	37	1850	2370
		±1% of Full scale	240	174	140	115	95	80	66	55	45	37		
	150	±1% of Reading	520	380	300	260	210	180	150	120	110	110	4180	5160
	200	±1% of Full scale	898	662	521	439	361	305	253	253	253	253	6779	9039
	250	±1% of Reading	1987	1464	1153	972	799	674	551	487	487	487	10501	14002
	300	±1% of Reading	2849	2099	1653	1394	1146	967	837	837	837	837	15055	20073

	Type of Gas	Dens. kg/N m³	Gas pressure(kgf/cm² gauge) at 20°C										Gas Viscosity(cP)
			-	-	0	0.8	2.3	5.5	9.0	16.5	30	(54)	
Table B	Acetylene	1.175	-	-	0	0.8	2.3	5.5	9.0	16.5	30	(54)	0.00943
	Argon	1.785	-	-	-	0.2	1.2	2.6	5.5	10.5	20	36	0.007
	Ammonia	0.771	-	0	0.7	2.1	4.2	7.5	14.5	25.5	46	-	0.0092
	Carbon Monoxide	1.25	-	-	0	0.7	2.1	4.2	8.5	15.5	28	(52)	0.0166
	Ethane	1.357	-	-	0	0.6	1.8	3.7	8	14	26	48	0.0085
	Ethylene	1.264	-	-	0	0.7	2.1	4.2	8.5	15.5	28	(52)	0.0097
	Air	1.293	-	-	0	0.7	2.0	4.0	8.5	15	27	50	0.017
	Oxygen	1.429	-	-	0	0.5	1.7	3.5	7.5	13.5	25	44	0.0192
	Hydrogen	0.0899	3.5	7.3	13.3	23	42	-	-	-	-	-	0.0084
	Carbon Dioxide	1.977	-	-	-	0.1	1.0	2.3	5	9.5	17	33	0.0138
	Nitrogen	1.251	-	-	-	0.7	2.1	4.2	8.5	15.5	28	(52)	0.0166
	City Gas	0.828	-	0	0.6	1.7	3.8	7.0	14	24.5	45	-	0.01
	Natural Gas	0.828	-	0	0.6	1.6	3.7	6.8	13.5	24	43	-	0.0107
	Freon-12	5.533	-	-	-	-	0	0.2	1.2	2.7	5.6	11	0.0127
	Propane	2.02	-	-	-	0.1	0.7	2.2	4.9	9	17	32	0.0075
	Butane	2.703	-	-	-	0	0.4	1.4	3.4	6.5	12	24	0.0069
	Methane	0.717	-	0	0.8	2	4.4	8	15.5	28	50	-	0.0103

Note: In nominal size 15mm, figures marked ⊙ indicate ±2% of Full scale



# FLOW RANGES

## How to Determine the Minimum Flow Rate.

Find a value nearest (lower side) to the applicable gas pressure in Table D, follow the same column upwards and find a value intersecting the desired nominal size in Table C for the minimum flow rate.

If it is desired to determine the minimum flow rate more accurately, calculate it as follows:

### Example. 1

Find the minimum flow rate where: Fluid: Air, Temperature: 20°C,

Pressure: 0.5MPa (gauge) and nominal size: 80mm

SOLUTION: Minimum flow rate at 0.4MPa and 0.85MPa of air with respect to nominal diameter 80mm in Table D are 47m³/h and 38m³/h, respectively, from Table C. The minimum flow rate at 0.5MPa is therefore determined in proportion to as follows:

$$Q_{\min}=38 + \frac{0.85-0.5}{0.85-0.4} \times (47-38) \approx 45\text{m}^3/\text{h}$$

It can also be determined by calculating the actual density. Actual density of air  $\rho$  at 20°C at 0.5MPa is

$$\rho=1.293 \times \frac{273.15}{273.15+20} \times \frac{0.1013+0.5}{0.1013} \approx 7.04\text{kg}/\text{m}^3$$

From Table C, the minimum flow rate at a density of 6 and nominal size 80mm is 47m³/h; at a density of 11 is 38m³/h. The minimum flow rate at a density of 7.04 therefore can be found in proportion to as follows:

$$Q_{\min}=38 + \frac{11-7.04}{11-6} \times (47-38) \approx 45\text{m}^3/\text{h}$$

NOTE: In cases where obtained results of calculation are figures with decimal places, round off fraction below the decimal point in the maximum flow rate, or round out fractions to a round number in the minimum flow rate.

## ■ Liquid

Select the minimum flow rate Table C (based on Sp. Gr.) or Table D (based on viscosity), whichever is greater.

Unit:m³/h

Sp.Gr	Minimum flow rate								Max. Rate
SIZE	0.5	0.6	0.7	0.8	0.9	1	1.1	1.2	
15	0.40	0.4	0.4	0.4	0.30	0.3	0.3	0.3	6
25	1.0	0.9	0.9	0.8	0.8	0.7	0.7	0.7	20
40	1.7	1.5	1.4	1.3	1.3	1.2	1.2	1.1	48
50	2.07	2.5	2.3	2.2	2.1	2.0	1.9	1.8	79
80	6.0	5.5	5.1	4.7	4.6	4.6	4.6	4.6	172
100	11	11	11	11	11	11	11	11	296
150	33	33	33	33	33	33	33	33	645
200	67.2	61.3	56.8	53.1	50.1	47.5	45.3	43.4	1130
250	149	136	126	118	111	106	100	96	1750
300	213	195	180	169	159	151	144	138	2509

Table C (based on specific gravity)

Unit:m³/h

SIZE	Accuracy	1	2	3	5	10	15	20	25	30	40
15	±1% of RD ±1% of FS	0.8 0.4	1.6 1.2	2.4 1.8	3.9 2.9						
25	±1% of RD ±1% of FS	1.6 1.8	3.1 5.9	4.6 7.6	7.6 16		11	15	19		
40	±1% of RD ±1% of FS	2.4 2.8	4.7 6.5	7.0 14	12 35	24	35	22	29	35	
50	±1% of RD ±1% of FS	3.0 3.6	6.0 7.1	9.0 15	15 30	45	60				
80	±1% of RD ±1% of FS		8.9 14	23	45	67	89	110	130		59
100	±1% of RD ±1% of FS		12 18	29	58	87	120	150	180	230	
150	±1% of RD ±1% of FS			43	86	130	170	220	260	340	
200	±1% of RD ±1% of FS				113	170	230	280	340	420	560
250	±1% of RD ±1% of FS				140	210	280	350	420	500	680
300	±1% of RD ±1% of FS				170	250	340	420	500	600	800

Table D (based on viscosity)

# 유량범위

## ■ 포화증기(유량범위)

단위: kg/h(Size:15~40mm), t/h(Size:50~300mm)

SIZE 압력	25mm(1")		40mm(3/2")		50mm(1/2")		80mm(3")		100mm(4")		125mm(5")		150mm(6")		200mm(8")		250mm(10")		300mm(12")		온도 ℃	밀도 kg/m <sup>3</sup>
	최소	최대	최소	최대	최소	최대	최소	최대	최소	최대	최소	최대	최소	최대	최소	최대	최소	최대	최소	최대		
0.5	14	112	32	250	52	423	113	951	193	1.60	300	2.4	400	3.61	736	6.05	1.14	9.09	1.64	12.9	111.4	0.8653
1	20	146	36	326	59	551	129	1.23	220	2.08	340	3.15	479	4.70	840	7.88	1.31	11.8	1.87	16.8	120.1	1.126
2	21	212	47	475	77	802	168	1.80	288	3.03	450	4.55	28	6.84	1.10	11.4	1.71	17.1	2.45	24.5	133.3	1.638
3	24	278	56	620	92	1.04	201	2.35	345	3.95	540	5.94	750	8.94	1.32	14.9	2.04	22.4	2.92	32.0	143.3	2.140
4	27	342	65	764	105	1.29	231	2.89	396	4.87	618	7.32	862	11.0	1.51	18.4	2.34	27.6	3.36	39.5	151.4	2.635
5	30	406	72	906	118	1.53	259	3.43	444	5.78	694	8.68	966	13.0	1.79	21.8	2.63	32.8	3.76	46.9	158.3	3.127
6	34	469	80	1.04	130	1.77	285	3.97	489	6.68	764	10.04	1.07	15.1	1.87	25.3	2.89	37.9	4.14	54.2	164.4	3.615
7	37	532	87	1.18	142	200	310	4.50	531	7.58	829	11.39	1.16	17.1	2.03	28.6	3.14	43.0	4.50	61.4	169.8	4.099
8	39	595	93	1.32	152	2.24	334	5.03	572	8.47	894	12.72	1.25	19.1	2.19	32.0	3.38	48.0	4.85	68.7	174.7	4.581
9	42	658	100	1.46	163	2.48	357	5.57	612	9.36	956	14.06	1.34	21.1	2.34	35.4	3.62	53.1	5.18	75.9	179.2	5.064
10	45	721	106	1.61	173	2.72	379	6.10	650	10.3	1.02	15.48	1.42	23.2	2.49	8.87	3.85	58.3	5.51	83.2	183.3	5.553
11	47	784	112	1.74	183	2.95	401	6.63	687	11.1	1.08	16.68	1.50	25.2	2.63	42.2	4.07	63.3	5.83	90.4	187.2	6.033
12	50	846	118	1.88	193	3.18	422	7.15	723	12.0	1.13	18.03	1.58	27.2	2.76	45.5	4.28	68.3	6.13	97.6	190.8	6.509
13	52	907	123	2.02	202	3.42	442	7.67	757	12.9	1.18	19.38	1.65	29.1	2.89	48.8	4.48	73.2	6.42	104.0	194.2	6.980
14	54	969	129	2.16	211	3.65	461	8.20	792	13.7	1.24	20.38	1.73	31.1	3.02	52.1	4.68	78.3	6.71	111.0	197.5	7.456
15	57	1.03	135	2.30	219	3.88	481	8.72	825	14.6	1.29	21.93	1.80	33.1	3.15	55.5	4.88	83.3	6.99	119.0	200.5	7.934
16	59	1.09	140	2.44	229	4.12	501	9.26	858	15.5	1.34	23.29	1.87	35.1	3.28	58.9	5.08	88.3	7.27	126.0	203.5	8.419
17	61	1.15	146	2.58	237	4.35	519	9.78	890	16.4	1.39	24.64	1.94	32.1	3.40	62.2	5.27	93.4	7.55	133.0	206.2	8.897
18	63	1.22	151	2.72	246	4.60	538	10.3	922	17.3	1.44	26.00	2.01	39.2	3.53	65.7	5.46	98.5	7.86	140.0	208.9	9.388
19	66	1.28	155	2.86	254	4.83	556	10.8	954	18.2	1.49	27.30	2.08	41.2	3.65	69.0	5.64	103.0	8.26	148.0	211.5	9.868
20	68	1.34	161	3.00	262	5.07	574	11.3	985	19.1	1.54	28.70	2.15	43.2	3.76	72.4	5.82	108.0	8.66	155.0	213.9	10.35
30	87	1.97	207	4.41	338	7.45	743	16.7	1.27	28.1	1.98	42.20	2.78	63.5	4.86	106.0	7.53	159.0	12.8	228.0	234.6	15.21
40	106	2.62	251	5.86	409	9.90	898	22.2	1.53	37.3	2.40	56.06	3.35	84.4	5.87	141.0	9.86	212.0	17.0	303.0	250.7	20.21
43	111	2.82	264	6.30	429	10.6	942	23.9	1.61	40.2	3.52	60.04	3.52	90.8	6.17	152.0	10.6	228.0	18.2	326.0	254.9	21.74

주 1, 압력단위 : kgf/cm<sup>2</sup> (Gauge) (1kgf/cm<sup>2</sup> = 0.098Mpa)

2. 소수점이 없는 유량값은 kg/h 임.

# INSTALLATION CONDITIONS

## ■ TYPICAL PIPING INSTRUCTION

It is generally required that the flow pattern of a fluid flowing in and out of an inferential type flow meter be as uniform as possible for higher accurate metering performance.

All account of this, proper flow straightening measures have to be applied for piping installation of meter.

The standard piping instructions are shown in the following table.

Applied flow straightener, 5D or longer shall be provided down stream of the meter.

### (1) Applied to size, >25mm

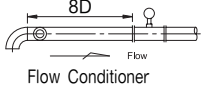
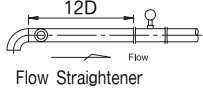
NO	Item	Piping Arrangement	Remark	Straight Pipe Length
1	Flow Conditioner	 Flow Conditioner	→Refer to Fig 4.1	8D
2	Flow Straightener	 Flow Straightener	→Refer to Fig 3.2	12D

Fig 3.1

### (2) Not-Applied to straightener

Use Sch.40 Pipe for standard Piping.

Straight Pipe length based on ISO-5167


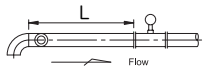


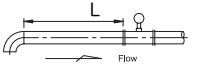
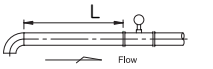
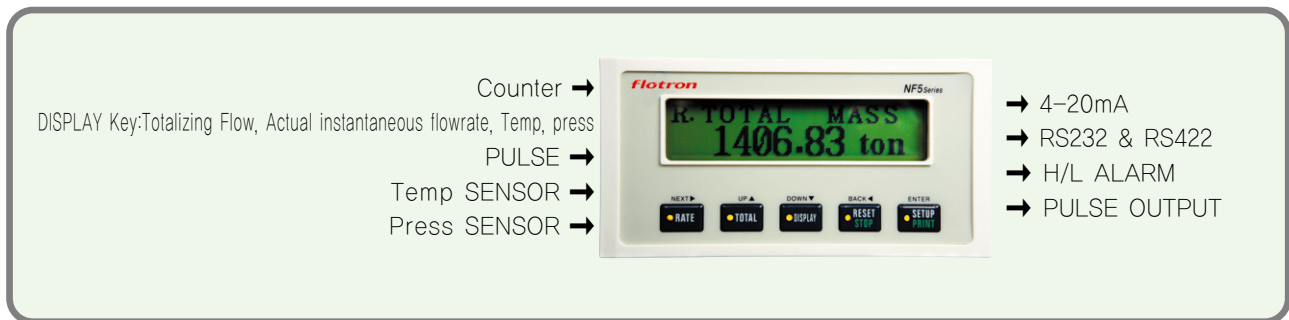
NO	Item	Piping Arrangement	Remark	Straight Pipe Length
1	Reducer	 Flow	A concentric reducer is installed at the upstream of a meter.	15D Min.
2	Elbow	 Flow	An elbow is installed at the upstream of a meter.	23D Min.
		 Flow	Two elbows are installed at the upstream of a meter.	25D Min.
		 Flow	Two elbows are vertically installed at the upstream of a meter.	40D Min.
3	Gate Valve Full Open	Full Open  Flow	A full-Open gate valve is installed at the upstream of a meter.	15D Min.
4	Gate Valve Partially Open	Partially Open  Flow	A partially open gate valve, sharp orifice or something that markedly disturbs the flow pattern is upstream of a meter.	50D Min.

Fig 3.2

# CONNECTION TO RECEIVER



## ■ NF550 Compensator and flow computer (Gas, Temp, Press)

### • General

NF550 is electronic instruments capable of flow rate conversion by receiving the flow signal from a flowmeter. As needed, NF 550 is available Pulse Analog, Hi-Low Alarm, RS232/422 output and is designed for panel mount.

### • Feature

1. You can choose a conversion method required for your applications for saturated steam, superheated steam, air, liquid
2. The case where becomes the power failure, various data is stored with automatic.
3. The central functional circuits are consist of unit, input-output are electrically isolated so have high reliability and easy maintenance.

## ■ FC400

### • General

FC400 is electronic instruments capable of flow rate conversion by receiving the flow signal from a flowmeter and the temperature signal from a temperature sensor.

As needed FC400 is available Pulse, Analog, Hi-Low Alarm, RS232/422 output and is designed for panel mount.

### • Feature

1. You can choose a conversion method required for your applications for applications for petroleum product, LPG, liquid, etc.
2. The case where becomes the power failure, various data is stored with automatic.
3. Dual Pulse Input will be possible and there will be an input inability of the pulse or mixing of noise, Flow Alarm occurs in case and the operation stands still automatically
4. Input-output are electrically isolated, so have high reliability and easy maintenance.

## ■ NF530

### • General

NF530 are electronic instruments capable of flow rate conversion by receiving the flow signal from a flowmeter.

As needed, NF 530 is available Pulse, Analog, Hi-Low Alarm, RS232/422 output and is designed for panel mount.

### • Feature

1. Rate, Total and Accumulated Total can be displayed as digital on large LCD display.
2. Rate, Total and Accumulated Total can be displayed in other different engineering units.
3. In cases the flow rate will make shake display with effect of pulsation etc, and there is a possibility which will reduce the change width with sensitivity regulation.
4. The case where becomes the power failure, various data is stored with automatically.

# MODEL

KV	VORTEX FLOWMETER	
	CODE	METER CONNECTION
	015	15mm
	025	25mm
	040	40mm
	050	50mm
	080	80mm
	100	100mm
	150	150mm
	200	200mm
	250	250mm
	300	300mm
	000	OTHER
	CODE	CONNECTION TYPE
	W	Wafer Type (Size 15~150mm)
	F	Flange Type (Size 200mm or Large: Flange Type is std.)
	CODE	MATERIAL
	C	Wafer Type : 15~150mm CF8M (SCS14A)
	D	Flange Type : 15~150mm *Body : CF8M (SCS14A), Flange : SUS304
	T	200mm or Large PIPE(SUS304)+FLANGE(A105or SS400)
	E	OTHER
	CODE	FLANGE RATING
	1	JIS 10K
	2	JIS 20K
	3	JIS 30K
	5	ANSI 150#
	6	ANSI 300#
	7	OTHER
CODE	FLUID	
G	GAS	
S	STEAM	
L	LIQUID	
CODE	TRANSMITTER CONSTRUCTION	
1	INTEGRAL TYPE	
2	SEPARATE TYPE	
CODE	DISPLAY	
1	NO DISPLAY	
2	DISPLAY (Totalizer, Digital indicator)	
CODE	OUTPUT SIGNAL	
CU	UNSCALED PULSE (CURRENT PULSE)	
CS	SCALED PULSE (CURRENT PULSE)	
AN	ANALOG (4/20mA)	

<NOTE> 1. TRANSMITTER MODEL ■ VT20: No Display ■ VT25: Display  
 2. TEMPERATURE : When 300°C or higher, Please contact us.

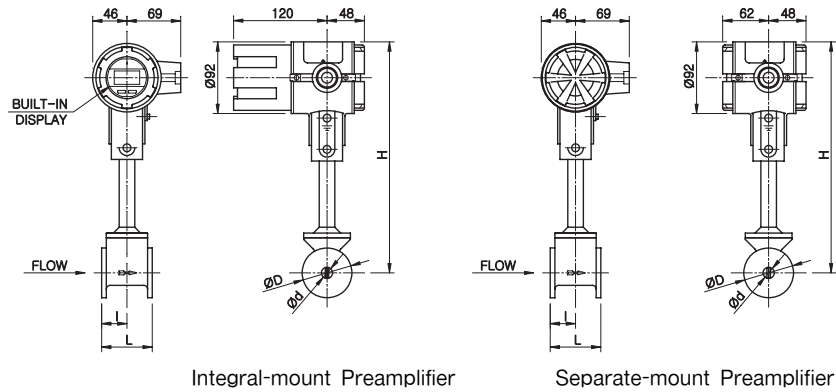
# OUTLINE DIMENSIONS

## ■ VORTEX

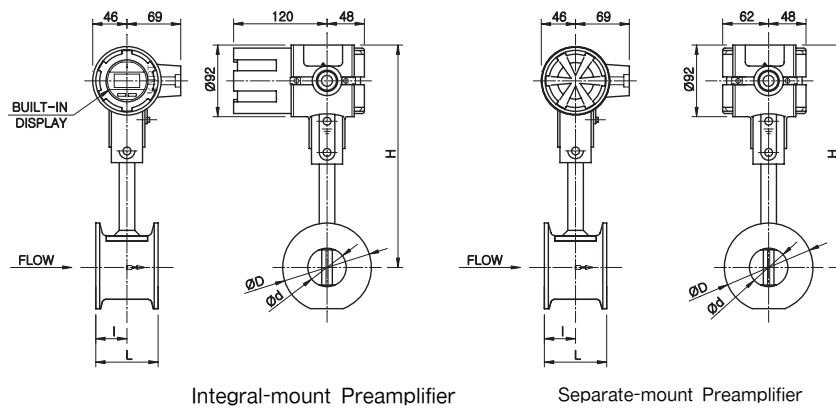
< Wafer Type >

● Nominal Dia. 15mm, 25mm

ALL DIMENSIONS IN MILLIMETERS.  
NOTE: FIGURES IN BRACKET ( ) SHOW  
METER WITH BUILT-IN DISPLAY



● Nominal Dia. 40~150mm



Size		L	I	Ø d (I.D)	Ø D (O.D)	H	Weight (kg)		
mm	inch						PA20	PA25	Separate PA25
15	½	65	32.5	14.3	60	277	2.6	2.9	2.4
25	1	65	32.5	26.6	76	277	3.2	3.5	3.0
40	1½	80	40	38.4	91	262	3.9	4.2	3.7
50	2	80	40	49.5	106	266	4.0	4.3	3.8
80	3	100	40	73.9	136	282	6.8	7.1	6.6
100	4	125	48.3	97.1	161	302	10.5	10.8	10.3
150	6	165	54.5	143.2	222	332	20.4	20.7	20.2

\* Dimensions & Mass are based on JIS 10K

\* Detail dimensions are referred to approval drawings

\* Cable entry: ½ NPT

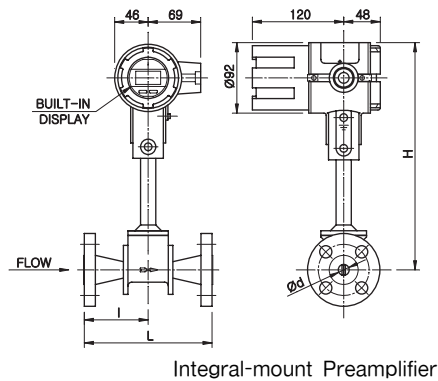


# OUTLINE DIMENSIONS

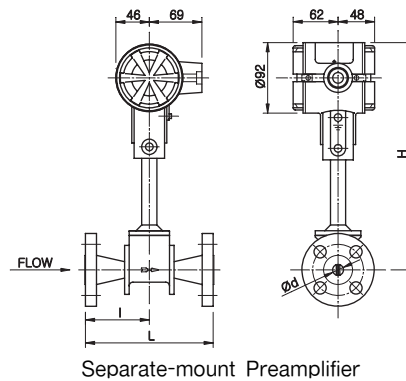
## ■ VORTEX

### < Flange Type >

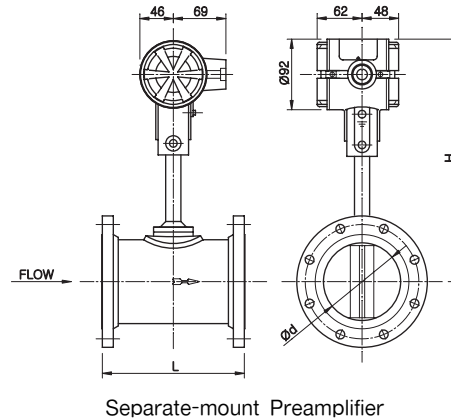
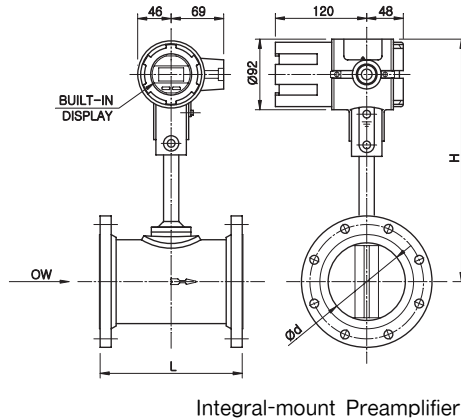
#### ● Nominal Dia. 15~150mm



ALL DIMENSIONS IN MILLIMETERS.  
NOTE: FIGURES IN BRACKET ( ) SHOW  
METER WITH BUILT-IN DISPLAY



#### ● Nominal Dia. 200~300mm



Size		L	I	Ød (I.D.)	H	Weight (kg)		
mm	inch					PA20	PA25	Separate PA25
15	½	126	63	14.3	277	4.1	4.5	4
25	1	137.6	68.8	26.6	277	5.2	5.5	5
40	1½	162.4	81.2	38.4	262	7.4	7.7	7.2
50	2	165.8	82.9	49.5	266	9.0	9.3	8.8
80	3	206	93	73.9	282	15.2	15.5	15.0
100	4	233.6	102.6	97.1	302	21.2	21.5	21.0
150	6	295.6	119.8	143.2	332	43.7	44.0	43.5
200	8	350	-	199.9	-	38.3	39.1	38.6
250	10	450	-	248.8	-	68.8	69.1	68.6
300	12	500	-	297.9	-	88.8	89.1	68.6

\* Dimensions & Mass are based on JIS 10K

\* Detail dimensions are referred to approval drawings



## PRODUCTION AND SALES ITEMS

### 1. FLOW METERING SYSTEM

- Flow Metering System (Gas/Liquid–Mass/Ultrasonic/Turbine/PD/Orifice)
- Proving System (Pipe/Tank)
- Load/Unload System (Truck/Rail/Ship)
- Analyzer for Gas (Gas Chromatography) and Moisture
- Auto Sampling System
- Calibration Facilities

### 2. ENVIRONMENT AND WATER TREATMENT SYSTEM

- Remote meter reading system on potable water
- Leakage detecting system on city water
- Drain and wastewater treatment system

### 3. FLOWMETER

- PD Flowmeter (Oil, Water, Chemical Fluid)
- Turbine Flowmeter (Oil, Water, Chemical Fluid)
- Vortex Flowmeter (Steam, Gas, Liquid)
- Bi-Flowmeter
- Mag Flowmeter
- Mass Flowmeter

### 4. VALVE

- Diaphragm Valve
- Ball Valve, Butterfly Valve etc

### 5. VALVE ACTUATOR

- Air Motor Operated Valve Actuator (AOV)
- Electric Actuator (MOV)

### 6. FLOWRATE TEST EQUIPMENT

(Pipe Prover, Small Volume Prover, Tank Prover, Master Meter etc)

### 7. ANALYZING SYSTEM

### 8. AUTO DRAIN SYSTEM

### 9. ELECTRICAL EQUIPMENT

### 10. NATIONAL CERTIFIED ORGANIZATION

**flotron**

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