VORTEX FLOWMETER (DELTA FLOWPET)

DATA SHEET

FMR, M

This instrument is a Karman vortex flowmeter capable of measuring the flow rate of liquid, gas, and vapor. The heavy-duty detecting section made of stainless steel ensures high accuracy of the instrument.

FEATURES

1. The total flow and instantaneous flow rate can externally be selected and monitored.
2. The standard is a rainproof type that can be used outdoors.
3. Heavy-duty stainless steel main body having the structure without moving part ensures high durability
4. It does not impose limitations to its mounting positions.
5. Remotely controllable external output (total pulse or instantaneous analog) is available.

SPECIFICATIONS (Type: FMR)

Item		Description
Nominal diameter, connection		10, 15, 25, 40, 50, 80, 100mm, wafer type
Fluid		Liquid, gas, vapor
Flow rate range		See Table 1
Permissible temperature range	Fluid	-10 to +80°C, or -10 to +200°C
	Environment	-10 to +50°C
Maximum pressure		Depends on connection standard (designed pressure: 5 MPa)
Accuracy		Within ±1% of full scale (or, for nominal diameter 10 mm, within ±2% of full scale).(Note) For liquid: FS = 8 m/s. For gas with nominal diameter 10 to 50 mm: FS = 30 m/s. For gas with nominal diameter 80, 100 mm: FS = 50 m/s.
Length of straight pipe		See Fig. 3
Material	Main body	SCS14A (for nominal diameter 10 mm, main body: SCS14A, vortex source: SUS316)
	Sensor	10 to 25mm: SUS316, 40 to 100mm: XM19 (made of super stainless steel)
	Mounting cylinder	SCS13A
	Transducer case	Polycarbonate
Mounting posture		No limitation from viewpoint of accuracy
Installation site		Avoid site exposed to direct sunshine
Indicator (LCD digital display)		(1) Total flow: 8 digits (2) Instantaneous flow rate (per hour) 5 digits (3) Instantaneous flow rate (per minute) 5 digits (4) Resettable total flow 7 digits (1), (2), (3), or (4) can be selected by push button. Flow rate unit [L, m^3, g, kg, t, L (normal), m^3 (normal)], and decimal point are indicated on LCD. (Orientation of the indicator can be adjusted freely over 360°.) * Alarm is indicated with LED (red).
Output signal	Battery type	None
	Externally energized type	4 to 20 mA DC analog (instantaneous flow rate) (see Fig. 1 Load Resistance Range); or Pulse output (open collector) (available if with indicator). Rated values: 30 V DC, 20 mA. ON voltage: 1 V or less. Pulse width: 30 ms (correct pulse) or 1 ms (non-correct pulse). Alarm output (H, L) ... Open collector. Rated values: 30 V DC, 20 mA. ON voltage: 1 V or less.
Cable		5-core shielded cable (1 m) ... For externally energized type
Power supply	Battery type	Lithium battery unit. Life time: 4 years (at normal temperature) ... With weak battery alarm function.
	Externally energized type	12 to 45V DC
Structure		Rainproof type (conforms to JIS C0920 protection class 3, IP53s), non-explosion-proof type. Direct sunshine is not permissible.
Backup		Parameter settings and total value are held in EEPROM

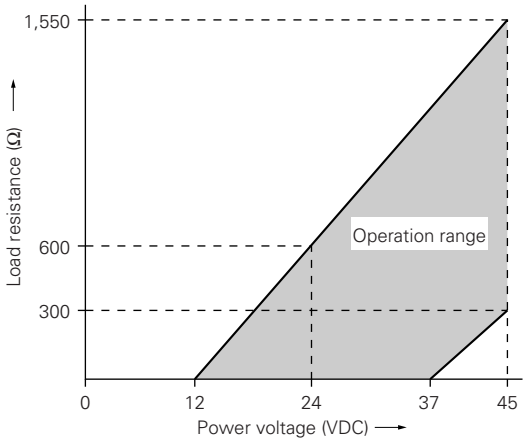
Note: Plus ±0.5% of full scale in case of analog output.

CODE SYMBOLS

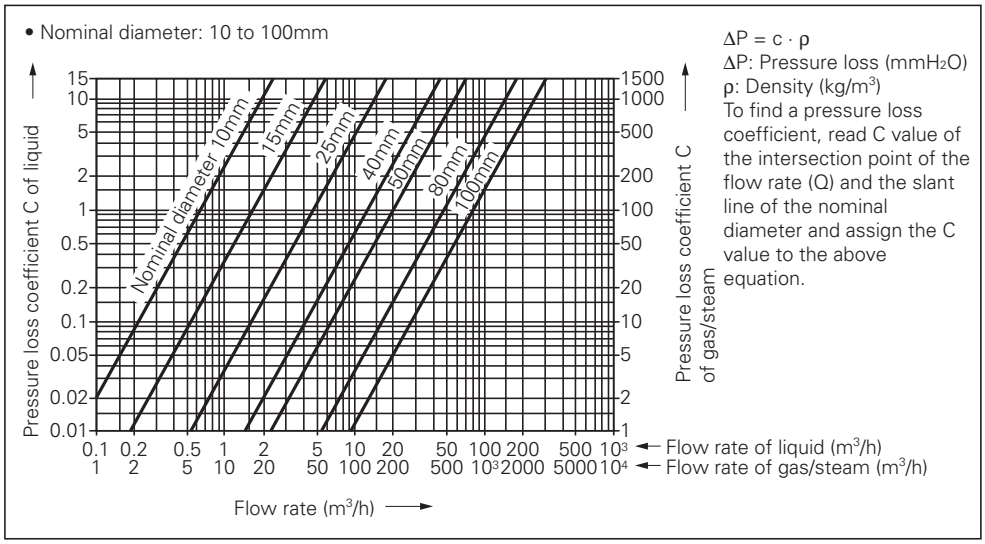
Digit	Description	Note	FMR	4	5	6	7	8	–	9	10 ← Digit
								2	–		
4	<Nominal diameter>										
5	10mm			0	1	0					
6	15mm			0	1	5					
	25mm			0	2	5					
	40mm			0	4	0					
	50mm			0	5	0					
	80mm			0	8	0					
	100mm			1	0	0					
7	<Connecting flange standard>										
	JIS 10k						1				
	JIS 16k						2				
	JIS 20k						3				
	JIS 30k						4				
	ANSI 150	Note1					5				
	ANSI 300	Note1					6				
	JPI 150	Note1					7				
	JPI 300	Note1					8				
8	<Modification No.>							2			
9	<Applied fluid>										
	For gas (Max. 80˚C)									G	
	For liquid (Max. 80˚C)									L	
	For gas and saturated vapor									S	
	(Max. 200˚C)	Note2									
	For liquid (Max. 200˚C)	Note2								H	
10	<Output signal>										
	None (battery drive type)										0
	Non-correct pulse output										1
	Corrective pulse output										2
	4 to 20mA DC output										3
	Upper and lower limit alarm output										4
	Correct pulse + upper and lower limit alarm output										5
	Non-correct pulse + upper and lower limit alarm output										6

Note 1) Nominal diameter 10 mm is not in application range.
Note 2) Radiator fins are provided if applied to hot gas, saturated vapor, or hot liquid.
In case of saturated vapor, nominal diameter 10 mm cannot be selected.

LOAD RESISTANCE RANGE [Fig. 1]



Pressue loss [Fig. 2]



FLOW RATE RANGE [Table1]

● Liquid

Retain the minimum flow rate in Tables A (according to specific gravity) and B (according to viscosity), whichever is the greater.

Table A (according to specific gravity) unit: m^3/h

Nominal diameter mm \ Specific gravity	Minimum flow rate								Max. flow rate
	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	
10	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	2.2
15	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	4.7
25	1.0	0.9	0.9	0.8	0.8	0.7	0.7	0.7	16
40	1.7	1.5	1.4	1.3	1.3	1.2	1.2	1.1	31
50	2.7	2.5	2.3	2.2	2.1	2.0	1.9	1.8	53
80	6.0	5.5	5.1	4.7	4.6	4.6	4.6	4.6	118
100	11	11	11	11	11	11	11	11	205

Table B (according to viscosity) Viscosity unit: mm^2/s

Nominal diameter mm \ Kinematic viscosity	Minimum flow rate (m^3/h)									
	1	2	3	5	10	15	20	25	30	40
10		0.3	0.4	0.6	1.1					
15	0.4	1.2	1.8	2.9						
25				1.8	5.9					
40				2.8	6.5	14				
50				3.6	7.1	15	24			
80					11	16	26	38		
100					14	21	28	45	55	

Unmeasurable

● For hatched area, retain Table A (according to specific gravity).

● Gas

The flow rate range is indicated in actual base.

If the flow rate was given at standard status, be sure to convert it to actual flow rate and then, according to this table, determine the flow rate range or nominal diameter.

	Nominal diameter mm \ Density kg/m^3		Minimum flow rate (m^3/h)										Maximum flow rate (m^3/h)
			0.38	0.7	1.2	2.0	3.6	6	11	19	34	(60)	
Table C	10		4.5	3.3	2.6	2.2	1.8	1.5	1.3	1.1	0.9	0.7	8.5
	15		9.4	6.9	5.4	4.6	3.8	3.2	2.6	2.2	1.8	1.5	18
	25		23	17	13	12	10	8	7	6	5	4	60
	40		39	29	23	19	16	13	11	9	8	6	119
	50		63	46	37	31	26	22	18	15	12	10	199
	80		140	101	80	67	56	47	38	32	26	22	741
	100		240	174	140	115	95	80	66	55	45	37	1280
Table D	Gas kind	Density kg/Nm^3	Gas pressure MPa (gauge), temperature 20°C										Reference: Gas viscosity
	Argon	1.785	—	—	—	0.02	0.12	0.26	0.55	1.05	2	3.6	0.007 (mPa·s)
	Air	1.293	—	—	0	0.07	0.20	0.4	0.85	1.5	2.7	—	0.017
	Oxygen	1.429	—	—	0	0.05	0.17	0.35	0.75	1.35	2.5	4.4	0.0192
	Carbon dioxide	1.977	—	—	—	0.01	0.1	0.23	0.5	0.95	1.7	3.3	0.0138
	Nitrogen	1.251	—	—	—	0.07	0.21	0.42	0.85	1.55	2.8	—	0.0166

○ Determination of minimum flow rate

In Table D, find a value that is nearest to and lower than the pressure of gas desired, trace it upward in the same column, and retain the value at the intersection with the desired nominal diameter in Table C as minimum flow rate. If it is necessary to exactly determine a minimum flow rate, proceed to a calculation in the following manner.

Example 1

Suppose the fluid is air, the temperature 20°C, the pressure 0.5 MPa (gauge), and the nominal piping diameter 80 mm. How can the minimum flow rate nominal diameter be found?

The minimum flow rate at nominal diameter of 80 mm at air of 0.4 and 0.85 MPa in Table D is, according to Table C, 47 and 38 m^3/h, respectively. At a pressure of 0.5 MPa, therefore, the minimum flow rate is, according to interpolation,

$$Qmin = 38 + \frac{0.85-0.5}{0.85-0.4} \times (47-38) \fallingdotseq 45 m^3/h$$

Or the minimum flow rate can be obtained upon calculating an actual density.

Actual density ρ of air at 20°C and 0.5 MPa is:

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

From Table C, the minimum flow rate at density of 6 and nominal diameter of 80 mm is 47 m^3/h and, likewise, at density of 11, is 38 m^3/h. At density of 7.04, therefore, the minimum flow rate is, according to interpolation,

$$Qmin = 38 + \frac{11-7.04}{11-6} \times (47-38) \fallingdotseq 45 m^3/h$$

Example 2

Suppose the fluid is carbon dioxide, the temperature 5 to 30°C, the pressure 0.8 to 1.5 MPa, and the maximum flow rate 800 m^3/h (normal). How can the minimum flow rate and the applicable nominal diameter be found? First obtain the actual maximum flow rate, and then determine the nominal diameter. For calculating the maximum flow rate when the temperature and pressure have ranges, retain the higher temperature and lower pressure. Therefore, the actual maximum flow rate is:

$$QMax. = 800 \times \frac{273.15+30}{273.15} \times \frac{0.1013}{0.1013+0.8} \fallingdotseq 99 m^3/h$$

Therefore, the nominal diameter is 40 mm. For obtaining the minimum flow rate, retain the lower temperature and higher pressure.

From Tables C and D, the minimum flow rate at nominal diameter of 40 mm and pressure of 0.95 MPa is 9 m^3/h or, at pressure of 1.7 MPa, is 8 m^3/h. Therefore, according to interpolation,

$$Qmin = 8 + \frac{1.7-1.5}{1.7-0.95} \times (9-8) \fallingdotseq 8.3 m^3/h$$

Note: If the calculated result has a value below decimal point, truncate it for maximum flow rate, or round it up for minimum flow rate.

● Saturated vapor

Unit: kg/h

Pressure MPa (gauge)	Nominal diameter											
	15mm		25mm		40mm		50mm		80mm		100mm	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
0.049	5.4	15	14	51	22	102	36	172	79	641	135	1100
0.098	6.1	20	15	67	25	133	41	224	90	834	154	1440
0.196	8.0	29	20	98	33	194	54	325	118	1210	202	2090
0.294	9.5	38	24	128	40	254	64	425	141	1580	241	2730
0.392	11	47	27	158	45	313	74	524	162	1950	277	3370
0.490	13	56	30	187	51	371	83	621	181	2310	310	4000
0.588	14	65	33	216	56	429	91	718	199	2670	342	4620
0.686	15	73	36	245	61	487	99	815	217	3030	372	5240
0.785	16	82	39	275	65	545	107	912	234	3390	400	5860
0.883	17	91	42	303	70	602	114	1000	250	3750	428	6480
0.981	18	99	44	333	74	661	121	1100	265	4110	455	7100
1.08	19	108	47	362	78	718	128	1200	281	4470	481	7730
1.18	20	117	49	391	83	776	135	1290	295	4830	507	8350
1.27	21	125	52	417	86	827	141	1380	308	5150	529	8900
1.37	22	133	54	446	90	885	147	1480	323	5510	553	9520

Transducer integration reading unit

The integration reading is in the same unit system as for flow rate.

<Example> If the flow rate is in "m^3/h", the integration reading is in "m^3". The number of digits below decimal point is the same as for correct pulse unit. (If the value of correct pulse is "1" or more, the decimal point will not be indicated.)

Transducer correct pulse unit

The present table indicates correct pulse units for volumetric flow rate.
In case of fixed conversion to other than volumetric flow rate such as normal flow rate, refer to Tables A through D.

Fluid	Nominal diameter mm	Maximum flow rate m^3/h (non-correct pulse frequency Hz)	Nominal meter coefficient (Note) L/P (nominal non-correct pulse unit)	Non-correct pulse output frequency Hz Q: Volumetric flow rate m^3/h	Correct pulse unit
					Standard m^3/P
Liquid	10	2.2 (142.6)	0.004285	64.8 Q	0.01
	15	4.7 (97.83)	0.01335	20.8 Q	0.01
	25	16 (55.11)	0.08065	3.44 Q	0.01
	40	31 (189.0)	0.04556	6.10 Q	0.01
	50	53 (147.1)	0.1001	2.78 Q	0.1
	80	118 (98.49)	0.3328	0.835 Q	0.1
	100	205 (75.25)	0.7567	0.367 Q	0.1
Gas	10	8.5 (110.2)	0.02143	13.0 Q	0.01
	15	18 (74.93)	0.06673	4.16 Q	0.01
	25	60 (41.33)	0.4033	0.689 Q	0.1
	40	119 (145.1)	0.2278	1.22 Q	0.1
	50	199 (110.4)	0.5005	0.555 Q	0.1
	80	741 (123.7)	1.664	0.167 Q	1
	100	1280 (93.98)	3.784	0.0734 Q	1

Note: In case of saturated vapor, multiply it by density. (Nominal meter coefficient) × density kg/L

Correct pulse unit for fixed conversion

Use the following unit selection table for determining a correct pulse unit for fixed conversion to standard status (normal) flow rate or mass flow rate by multiplying the volumetric flow rate by conversion coefficient.

Case	Fluid	Fixed conversion	Use Table:
1	Gas	Conversion to standard (normal) status	Table A
2	Saturated vapor	Conversion to mass flow rate	Table B
3	Gas	Conversion to mass flow rate	Table C
4	Liquid	Conversion to mass flow rate	Table D

● Case 1

Calculate the "conversion coefficient" by:

$$\text{Conversion coefficient} = \frac{273.15}{T+273.15} \times \frac{P+0.1013}{0.1013} \times \frac{Z_0}{Z}$$

(Unless particularly affected, retain $Z_0/Z = 1$.)
T: Operating temperature (°C)
P: Operating pressure (MPa [gauge])
Z_0: Compressibility factor at standard status
Z: Compressibility factor at operating status

Table A

Nominal diameter mm	Conversion coefficient	Standard correct pulse unit m^3 (normal)
10	0.50 to 4.66	0.01
	4.67 to 46.6	0.1
	46.7 to 60.0	1
15	0.50 to 1.49	0.01
	1.50 to 14.9	0.1
	15.0 to 60.0	1
25	0.50 to 2.47	0.1
	2.48 to 24.7	1
	24.8 to 60.0	10
40	0.50 to 4.38	0.1
	4.39 to 43.8	1
	43.9 to 60.0	10
50	0.50 to 1.99	0.1
	2.00 to 19.9	1
	20.0 to 60.0	10
80	0.50 to 1.99	0.1
	2.00 to 19.9	1
	20.0 to 60.0	10
100	0.50 to 2.64	1
	2.65 to 26.4	10
	26.5 to 60.0	100

● Case 2

Table B

Nominal diameter mm	Saturated vapor pressure MPa	Standard correct pulse unit kg
15	0.05 to 0.167	0.01
	0.168 to 1.46	0.1
25	0.05 to 0.355	0.1
	0.356 to 1.46	1
40	0.05 to 0.745	0.1
	0.746 to 1.46	1
50	0.05 to 0.265	0.1
	0.266 to 1.46	1
80	0.05 to 1.03	1
	1.04 to 1.46	10
100	0.05 to 0.392	1
	0.393 to 1.46	10

● Case 3

Table C

Nominal diameter mm	Operating fluid density kg/m^3	Standard correct pulse unit kg
10	0.50 to 4.66	0.01
	4.67 to 46.6	0.1
	46.7 to 60.0	1
15	0.50 to 1.49	0.01
	1.50 to 14.9	0.1
	15.0 to 60.0	1
25	0.50 to 2.47	0.1
	2.48 to 24.7	1
	24.8 to 60.0	10
40	0.50 to 4.38	0.1
	4.39 to 43.8	1
	43.9 to 60.0	10
50	0.50 to 1.99	0.1
	2.00 to 19.9	1
	20.0 to 60.0	10
80	0.50 to 1.99	0.1
	2.00 to 19.9	1
	20.0 to 60.0	10
100	0.50 to 2.64	1
	2.65 to 26.4	10
	26.5 to 60.0	100

● Case 4

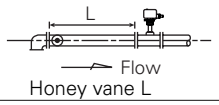
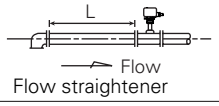
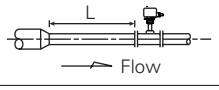
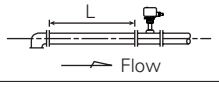
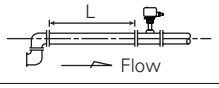
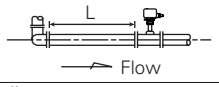
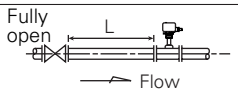
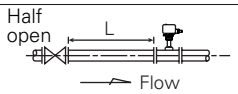
Table D

Nominal diameter mm	Specific gravity of liquid	Standard correct pulse unit kg
10	0.500 to 2.00	1
15	0.500 to 0.749	1
	0.750 to 2.00	10
25	0.500 to 1.23	10
	1.24 to 2.00	100
40	0.500 to 2.00	10
50	0.500 to 0.999	10
	1.00 to 2.00	100
80	0.500 to 2.00	100
100	0.500 to 1.32	100
	1.330 to 2.00	1000

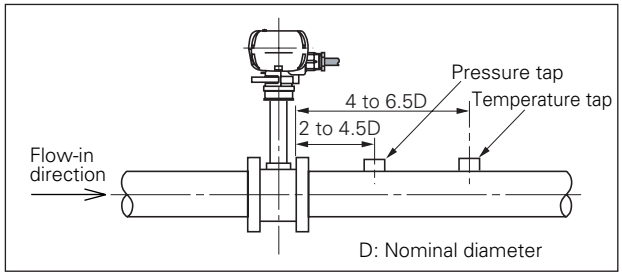
Installation procedure [Fig. 3]

1. Length of straight pipe: Conforms to ISO 5167

D = Nominal diameter.

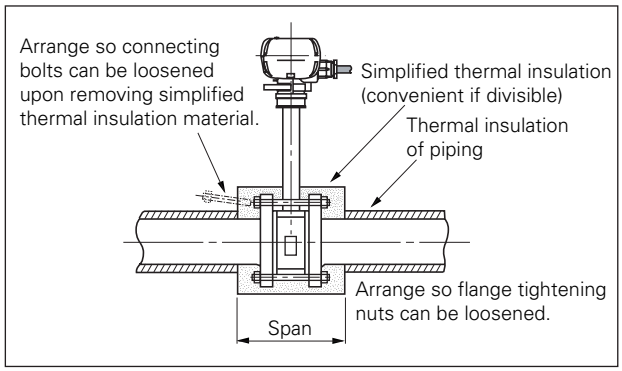
No.	Piping status		Length (L) of straight pipe. D: Nominal diameter.	Remarks
1	Fuji's regulating pipe		8D	For nominal diameter 25 mm or more (for details, contact us)
			12D	
2	Reducer		15D or more	If coaxial reducer is located upstream
3	Elbow		23D or more	If elbow is located upstream
			25D or more	If 2 elbows are located horizontally upstream
			40D or more	If 2 elbows are located vertically upstream
4	Fully open sluice valve		15D or more	If fully open sluice valve is located upstream
5	Half open sluice valve		50D or more	If half open sluice valve, abrupt restrictor, or otherwise excessively flow disturbing objects upstream

Notes
1. The concept is intended for Sch.40 pipe. Therefore, use Sch.40 pipe as standard.
2. Be sure to provide a straight pipe section of 5D or more downstream.
3. Provide pressure and temperature detectors downstream the flowmeter (figure below).



2. Thermal insulation procedure

For thermal insulation of piping, we recommend you to adopt a simplified thermal insulation (without mortar finish) on the flowmeter mounting section for facilitating disassembly or checkup. This arrangement allows to loosen flowmeter connecting bolts without breaking the thermal insulating material covering.



3. Considerations regarding process conditions

(1) Prevention of cavitation

If liquid is used, so that no cavitation will occur, secure a line pressure higher than calculated by:

$P \geq 2.60 \quad \Delta P + 1.25 Po$ (MPa [abs])

where,

ΔP: Pressure loss (MPa)

P_0: Liquid vapor pressure (MPa [abs])

(2) Pulsation

If the flowmeter is to be installed on a line where Roots blower, compressor, or other pulsating pressure generating instruments are mounted, it may be affected by pulsation. The allowable pulsating pressure is calculated by:

$$N < \frac{2.25 \rho V^2}{100} \text{ (kPa)}$$

where,

N: Pulsating pressure (kPa)

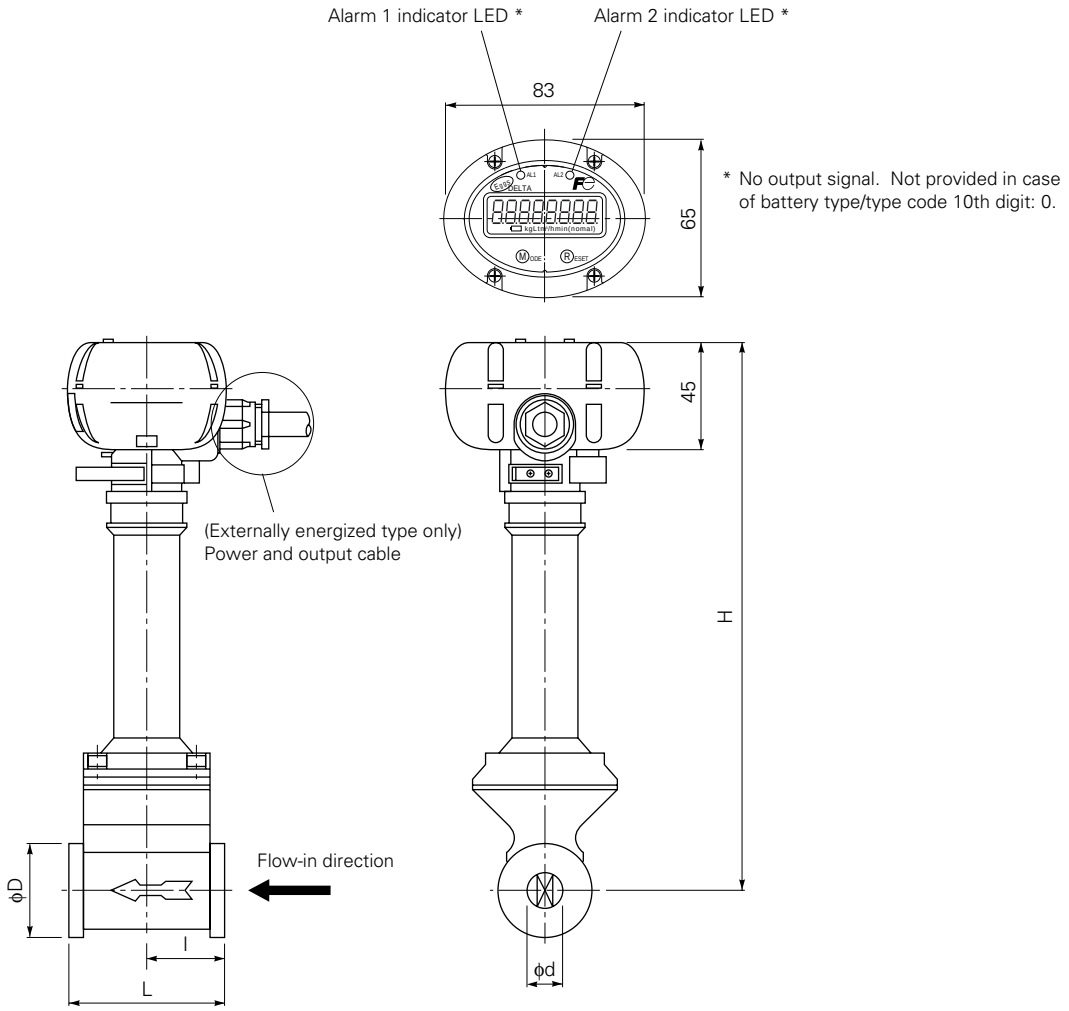
ρ: Density (kg/m^3)

V: Minimum velocity (m/s)

OUTLINE DIAGRAM (Unit: mm)

For liquid and gas (80°C max.)

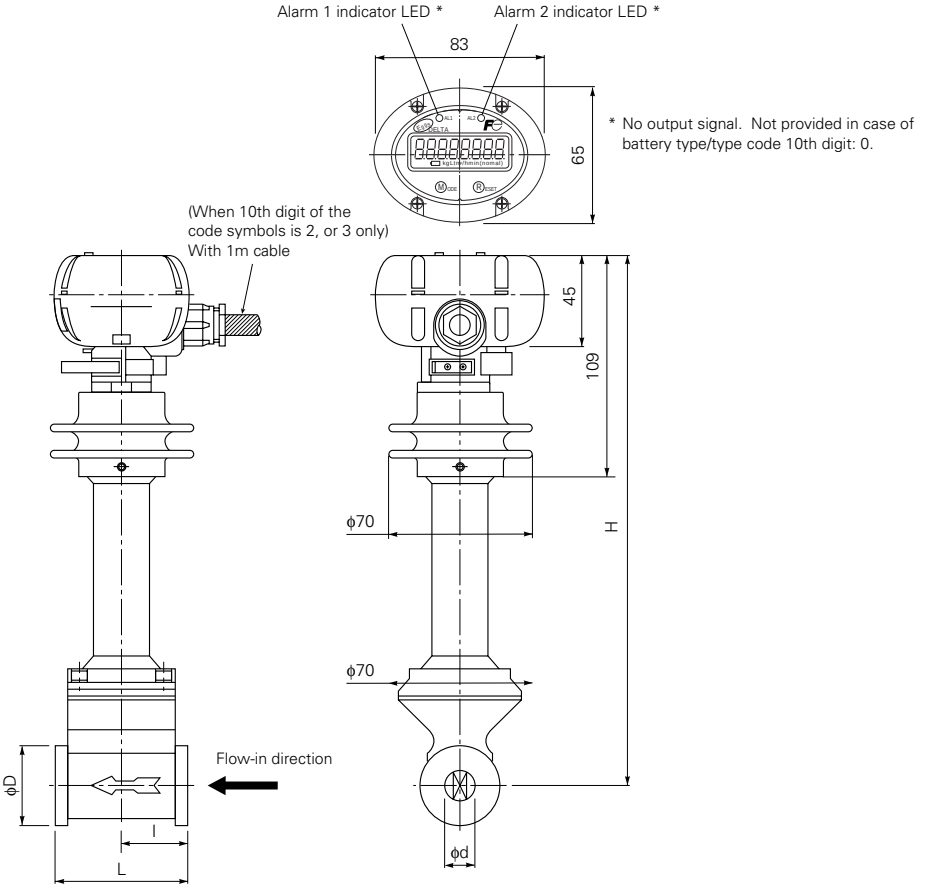
Nominal diameter (mm)	L (mm)	l (mm)	ϕd (mm)	ϕD (mm)	H (mm)		Approximate mass (kg)	
					–10 to +80°C	–10 to +200°C	–10 to +80°C	–10 to +200°C
10	65	32.5	10	40	232	264	1.4	1.6
15	65	32.5	14.5	40	232	264	1.4	1.6
25	65	32.5	26.6	67	232	264	2.0	2.2
40	80	40	37.6	81	217	249	2.7	2.9
50	80	40	48.5	91	221	253	2.8	3.0
80	100	40	72.4	126	237	269	5.6	5.8
100	125	48	95.2	156.2	257	289	9.3	9.5



OUTLINE DIAGRAM (Unit: mm)

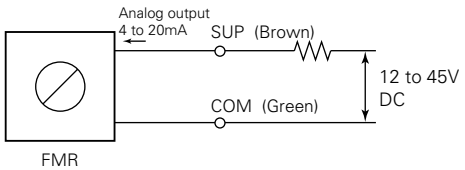
For high temperature (200°C max.) of liquid, gas and vapor

Nominal diameter (mm)	L (mm)	l (mm)	ϕd (mm)	ϕD (mm)	H (mm)		Approximate mass (kg)	
					–10 to +80°C	–10 to +200°C	–10 to +80°C	–10 to +200°C
10	65	32.5	10	40	232	264	1.4	1.6
15	65	32.5	14.5	40	232	264	1.4	1.6
25	65	32.5	26.6	67	232	264	2.0	2.2
40	80	40	37.6	81	217	249	2.7	2.9
50	80	40	48.5	91	221	253	2.8	3.0
80	100	40	72.4	126	237	269	5.6	5.8
100	125	48	95.2	156.2	257	289	9.3	9.5

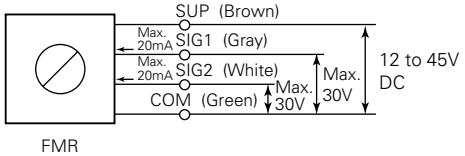


CONNECTION DIAGRAM (with 1m cable)

<Analog output>



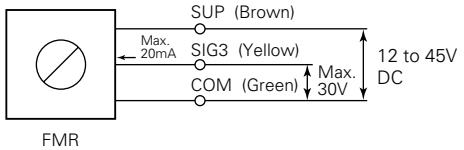
<Upper and lower limit alarm output>

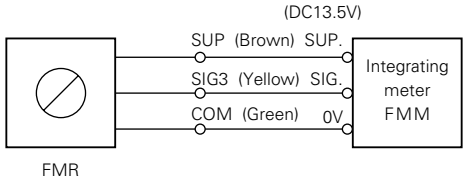


● Polarity

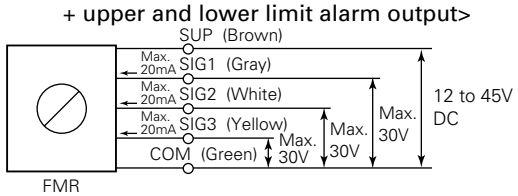
Wire color	Description
Brown	SUP (and analog output)
Gray	SIG. 1 ... Alarm 1 output (upper limit/lower limit)
White	SIG. 2 ... Alarm 2 output (upper limit/lower limit)
Yellow	SIG. 3 ... Correct/non-correct pulse output
Green	COM

<Correct or non-correct pulse output>





<Correct or non-correct pulse output + upper and lower limit alarm output>



Note: Analog output and pulse output or upper/lower limit alarm cannot be combined.

INTEGRATING METER (Type: FMM)

OVERVIEW

This instrument is a compact type LCD display counter that receives pulse signal from vortex flowmeter and indicates total flow and digital instantaneous flow rate (with power supply for the oscillator built in).

Flush mount type

Wall type

FEATURES

1. One-chip CPU mounted on this instrument has permitted many functions.
   Pressing pushbutton enables switching to the following 4 display modes.
   ① Total flow, ② Zero reset total, ③ Instantaneous flow rate (switching between per hour display and per minute display is possible.), ④ Meter coefficient
2. This instrument has a function of a scaler and of a divider.
3. It converts input pulse signal representing flow rate into an analog signal through built-in F/I conversion circuit. (Option)
4. Equipped with pulse output before or after the correction

SPECIFICATIONS

<table>
<tr><th colspan="4">Item</th><th>Description</th></tr>
<tr><td rowspan="3">Display</td><td colspan="3">Display method</td><td>LCD Height of letters: 12.7mm</td></tr>
<tr><td colspan="3">Items to be displayed</td><td>Pressing "MODE" switch allows the following display modes to rotate. (Mode display such as b1, b2, and c is displayed on the most significant and the second digit of the display window.)
<table>
<tr><th>Mode</th><th>Display</th><th>Digit</th><th>Description</th></tr>
<tr><td>—</td><td>Total flow</td><td>8</td><td>Not resettable to 0</td></tr>
<tr><td>b1</td><td>Instantaneous flow rate</td><td>5</td><td>Per hour **</td></tr>
<tr><td>b2</td><td>Instantaneous flow rate</td><td>5</td><td>Per minute **</td></tr>
<tr><td>c</td><td>Total flow</td><td>7</td><td>Resettable to 0</td></tr>
<tr><td>d</td><td>Divided value*</td><td>1</td><td>0 (1/1), 1 (1/10), 2 (1/100)</td></tr>
<tr><td>F</td><td>Meter coefficient*</td><td>5</td><td>0.0001 to 1.9999</td></tr>
<tr><td>A</td><td>Number of cycle samples</td><td>3</td><td>1 to 128</td></tr>
</table>
*: Not displayed when "SELECT" switch is turned to "0" or "8".
When "SELECT" switch is turned to "4" or "c", the values of the above 7 items are displayed.
The setting of "Divided value", "Meter coefficient", and "Number of cycle samples" can be changed easily by the operation on the front panel of this instrument. However, do not change them except when the change is unavoidable, because the setting has been adjusted to meet the specifications of the flowmeter combined to this instrument.
**: Effectively indicated only when the input pulse has small frequency variation.</td></tr>
<tr><td colspan="3">Weak battery voltage alarm</td><td>"BATT" blinks.</td></tr>
<tr><td rowspan="2">Input signal</td><td colspan="3">Trigger level</td><td>3V DC hysteresis 0.8V DC</td></tr>
<tr><td colspan="3">Response pulse</td><td>200Hz (50Hz in the case of contact input).....Standard
Note that it can be followed up to 2kHz by setting the input division to 1/10 or 1/100. When the scaler value is more than 1, 150Hz max.</td></tr>
<tr><td colspan="4">Power supply for the oscillator</td><td>13.5V DC or 24V DC, 50mA, with overcurrent protection</td></tr>
<tr><td rowspan="12">Output signal</td><td rowspan="4">Pulse</td><td colspan="2">Types of signals</td><td>Open collector pulse, Corrective pulse (the same unit as the display), Standard…or non-corrective pulse</td></tr>
<tr><td colspan="2">Capacity</td><td>30V DC, 50mA max.</td></tr>
<tr><td colspan="2">ON-state voltage</td><td>1.5V DC max.</td></tr>
<tr><td colspan="2">Pulse width</td><td>1ms, 50ms, 100ms, 250ms</td></tr>
<tr><td rowspan="5">Analog (option)</td><td colspan="2">Signal</td><td>4 to 20mA DC and 1 to 5V DC</td></tr>
<tr><td colspan="2">Load resistance</td><td>Current output: 350Ω max. When output voltage is short-circuited: 600Ω max. Output voltage: 1MΩ min.</td></tr>
<tr><td colspan="2">Conversion accuracy</td><td>Within ±0.1% of the full scale</td></tr>
<tr><td colspan="2">Ripple</td><td>Within 1% of the full scale at 10% of the full scale</td></tr>
<tr><td colspan="2">Time constant</td><td>Full scale puls
4(2) to 19.99Hz: 6.5s [The value in ( ) shows the value when an internal step-up circuit is used.]
20 to 199.9Hz: 2.1s
200 to 2000Hz: 1.5s</td></tr>
<tr><td rowspan="3">Upper/lower limit alarm (option)</td><td colspan="2">Output signal</td><td>Open MOS-FET × 2</td></tr>
<tr><td colspan="2">Capacity</td><td>230 V AC/340 V DC, 200 mA or less</td></tr>
<tr><td colspan="2">ON resistance</td><td>16 Ω or less (leakage current 1 μA or less when OFF)</td></tr>
<tr><td rowspan="2">Setting</td><td colspan="3">Scaler</td><td>0.0001 to 1.9999, Adjustable in steps of 0.0001</td></tr>
<tr><td colspan="3">Dividing</td><td>Selection of the unit to be displayed: 1/1, 1/10, or 1/100</td></tr>
<tr><td colspan="4">Backup function</td><td>The counter display value and setting are backed up by built-in E^{2}PROM</td></tr>
<tr><td colspan="4">Ambient temperature</td><td>-10 to +50 C</td></tr>
<tr><td colspan="4">Power voltage</td><td>85 to 264V AC, 50/60Hz</td></tr>
<tr><td colspan="4">Power consumption</td><td>16VA max.</td></tr>
<tr><td colspan="4">Insulation resistance</td><td>Batch power terminals and ground terminal, 10MΩ or more, 500V DC megger</td></tr>
<tr><td colspan="4">Withstand voltage</td><td>Batch power terminals and ground terminal, 1500V AC, 1 minute</td></tr>
<tr><td colspan="4">Mass</td><td>Approx. 0.6kg (flush mount type), approx. 0.8kg (wall type)</td></tr>
<tr><td colspan="4">Case</td><td>Resin frame and aluminum case (flush mount type), plastic case (wall type)</td></tr>
<tr><td colspan="4">Finish color of the instrument frame</td><td>Munsell color code N1.5 equivalent</td></tr>
</table>

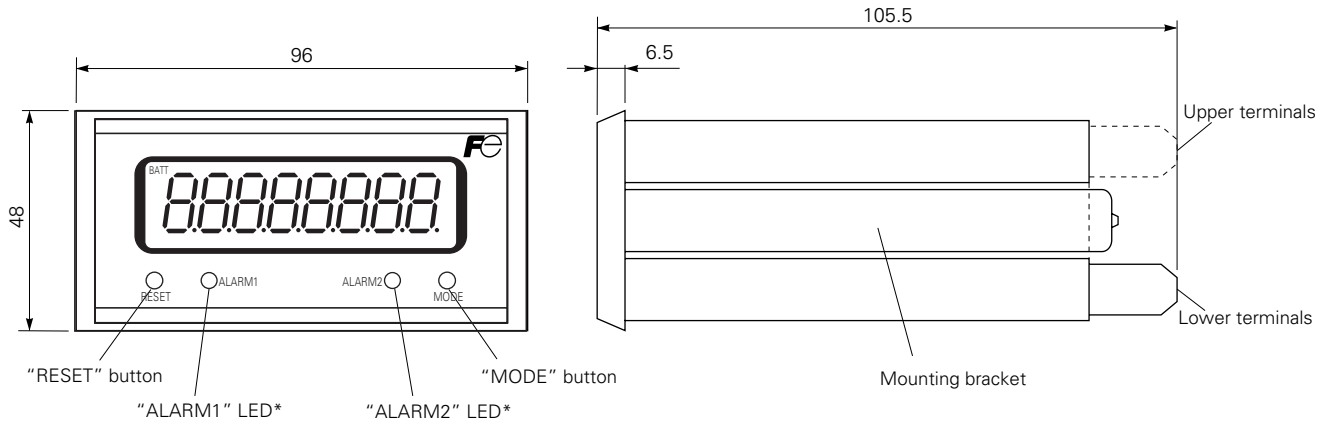
CODE SYMBOLS

Digit	Description
4	<Power voltage> 85 to 264V AC 50/60Hz
5	Input signal 3-wire open corrector pulse
6	Output signal (open collector) Pulse width: Approx. 1ms Pulse width: Approx. 50ms Pulse Width: Approx. 100ms Pulse width: Approx. 250ms
7	<Analog output and alarm output signal> None (Standard) Analog output (4 to 20mA DC / 1 to 5V DC) and upper/lower limit alarm output
8	<Modification No.>
9	Additional function None (Standard) With a battery for lighting the LCD when power is OFF
10	<Construction> Flush mount type Wall type

	4	5	6	7	8		9	10	← Digit
FMM					3	–			
	7								
		6							
			2						
			5						
			6						
			7						
				0					
				1					
					3				
							0		
							1		
								1	
								2	

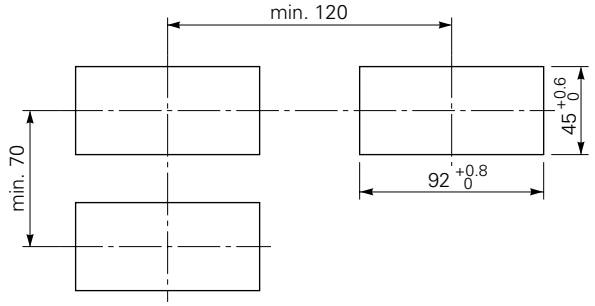
OUTLINE DIAGRAM (Unit: mm)

(Flush mount type)



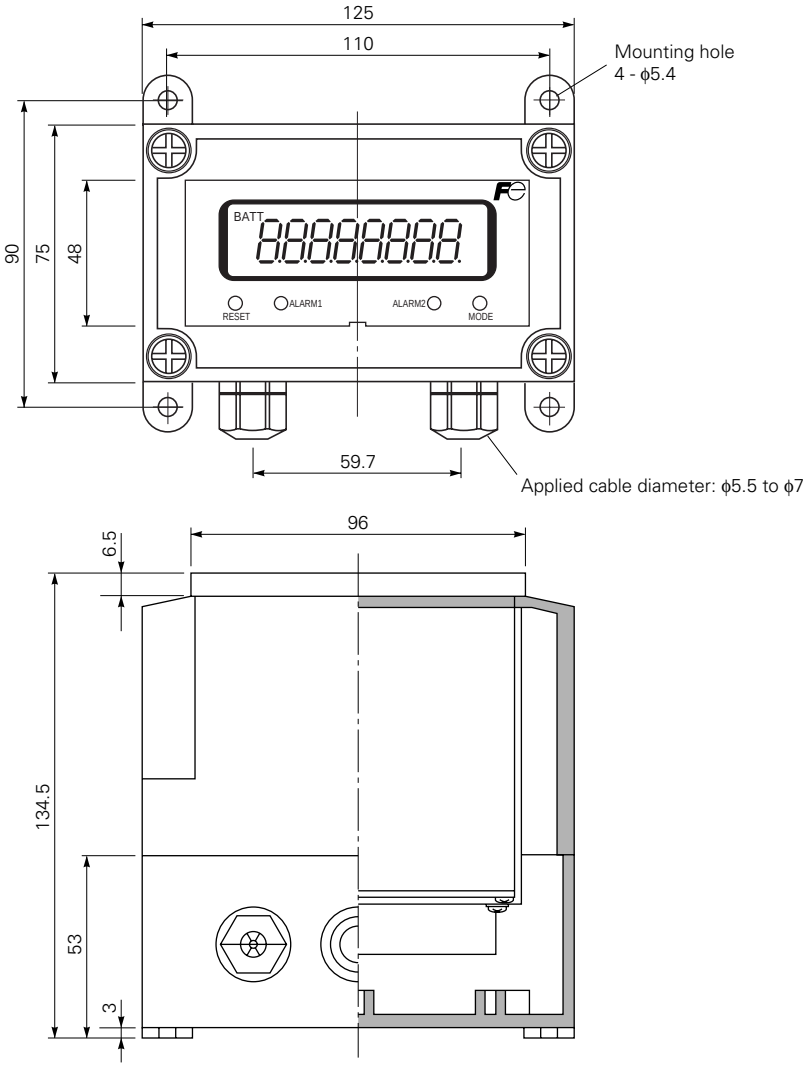
* Only for analog/alarm output (Code symbol 7th digit: "1")

PANEL CUTOUT DIMENSIONS



OUTLINE DIAGRAM (Unit: mm)

(Wall type)



CONNECTIONS

Category	Terminal No.	Display		Description	
Lower terminals	1	SUP.	FLOW INPUT	Flow rate input	3-wire pulse input
	2	SIG.			
	3	0V			
	4	+	PULSE OUT	Pulse output	Open collector output
	5	-			
	6	L1 (+)	POWER	Power	AC power
	7	L2 (-)			
	8	⏚		Grounding	Grounded (Earth)
Upper terminals	1	+	ANALOG OUT	Current output	4 to 20mA DC <option>
	2	-			
	3	+		Voltage output	1 to 5V DC <option>
	4	-			
	5	ALARM1 OUT		Alarm output	Open MOS-FET <option> (non polar)
	6				
	7	ALARM2 OUT		Alarm output	Open MOS-FET <option> (non polar)
	8				

Terminal connecting screw: M3.5

WHEN PLACING AN ORDER, SPECIFY:

1. Integrating meter type
2. Type of combined flowmeter
3. Unit of integration and output pulse
4. Kind of output signal
   ☐ Correct pulse / ☐ Non-correct pulse
5. Source voltage
6. Installation site conditions, etc.

For enquiry, show us the following specifications.

Fill out the required portions or make check marks in the squares.

Setting item	Specification
1. Measured fluid	
2. Range of flow rate*1	Max._____ Usual_____ Min._____ ☐L ☐kL ☐m³ ☐g ☐kg ☐t ☐/h ☐/min * Analog full scale corresponds to maximum value. ☐normal ☐actual
3. Temperature range	Max._____ Usual_____ Min._____ °C
4. Pressure range	Max._____ Usual_____ Min._____ MPa [gauge]
5. Gravity or density	Gravity_____ ☐kg/m³ [normal] ☐kg/m³ [actual] Density _____
6. Viscosity*2	_____ ☐mPa·s (cP) ☐mm²/s at _____ °C
7. Connection	Nominal diameter_____ ☐mm, ☐", Flange standard ☐JIS_____K ☐ANSI/JPI _____RF
8. Correction reference*3	Reference temperature _____ °C Reference pressure _____ MPa [gauge]
9. Pulse signal	☐Non-correct pulse, ☐Correct pulse
10. Special comment	

*1: Specify vapor in terms of kg/h.
*2: Depending on the viscosity, the measurement could be impossible. (See flow rate range table B.)
*3: In case of normal flow rate, specify reference temperature and reference pressure.
In case of vapor, specify reference pressure.

⚠ Caution on Safety

*Before using this product, be sure to read its instruction manual in advance.

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