General Specifications

Model UYF200, UYFA21
Ultrasonic Vortex Flowmeter

ULTRA YEWFLO

GS 1F5B2-E

OVERVIEW

When a vortex shedder is installed in a process flow line, the regular Karman vortex street is shed at the downstream of the shedder. This UYF200 Ultrasonic Vortex Flowmeter uses this principle to detect the shed vortices by ultrasonic waves. The associated converter provides a pulse output and a 4 to 20mA DC signal proportional to the flow rate.

FEATURES

- This simply structured model without moving or sealing parts offers excellent reliability and durability. The flow route involves only a vortex shedder that is cast integral with the flow tube.
- The generated vortex frequency is detected by ultrasonic sensor fixed on the outside of the piping section. The sensor and fluid do not come into contact with each other.
- The ultrasonic sensor can be on-line removed if required. (only available for flange type)
- As the range of temperature and fluid pressure are wide, this model is ideal for a variety of liquids.
- Output is directly proportional to volume flow rate. The output of 4 to 20 mA DC and pulse can be obtained simultaneously.
- With the Indicator/Totalizer, the totalized flow as well as instantaneous flow rate in engineering unit or percent (%) of span can be displayed. Alternative display is also possible.
- With the BRAIN communication function, it is easy to set parameters by BRAIN TERMINAL (BT200). Also it is possible to make on-line communication with computer in the case of 4 to 20 mA DC output.

STANDARD SPECIFICATIONS

Fluid to be Measured : Liquid

Measuring condition :
Sound velocity 500 to 2000 m/s
Be sure there are no bubbles in the flow.
In case of sever sticky and slurry fluid metering, and pulsating flow/pulsating pressure existing, consult Yokogawa sales person.

Measurable Flow Rates: Refer to item “Sizing”

Accuracy: ± 1.0% of reading
± 0.5% of reading is also available as an option. (Optional Code : /HAC)
(For accuracy-guaranteed range refer to item “Sizing”)

Note: The above shows the accuracy of pulse output. For analog output, add up ± 0.1% of full scale to the above values.

Model UYF200, Model UYFA21
Ultrasonic Vortex Flowmeter

Repeatability: ± 0.2% of reading

Process Temperature Range: –40 to 200 °C
(–40 to 150 °C for size 15mm only)

Process Pressure Limit: Up to flange rating.

Ambient Temperature Range:
–40 to 85 °C (general)
–30 to 80 °C (with Indicator/Totalizer)
–20 to 60 °C (JIS Flame proof)
–40 to 75 °C (CENELEC Flame proof)
–40 to 60 °C (CENELEC Intrinsically safe)
–40 to 60 °C (FM Explosion proof)
–40 to 60 °C (FM Intrinsically safe)
–40 to 60 °C (CSA Intrinsically safe)
–40 to 60 °C (CSA Explosion proof)
(Model UYF200 is affected by fluid temperature. See Figure 2, 3)

Ambient Humidity: 5 to 100 RH (at 40 °C)
(No Condensation)

Power Supply Voltage: 10.5 to 42 V DC
(Refer to Figure 1 Relationship Between Power Supply Voltage and Load Resistance)

Output signal:Analog, Pulse
Both Analog and Pulse output can be obtained simultaneously. In this case refer to the item “Remarks on installation” for power supply and pulse output wiring.

Analog: 4 to 20 mA DC, 2-wire system.

Pulse: transistor contact (open drain), 3-wire system.
Contact rating: 30 V DC, 120 mA DC
Low level: 0 to 2 V DC.
Pulse frequency: Max. 6 kHz

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Duty cycles: Approx. 50% (1:2 to 2:1)

Dumping time constant: 0 to 64 Sec (can be set in 8 steps)

Delay time: 0.5 Sec

Analog output circuit time constant: 0.3 Sec

Mounting:

Model UYF200;flange mounting or wafer mounting by flange adjacent to the pipeline.

Model UYFA21;2 inch pipe or wall mounting.

Refer to item Remarks on Installation for details.

Material: Model UYF200;body and shedder bar; SCS 14 A casting stainless steel (equivalent to CF8M, SUS316)

Sensor; SUS316 stainless steel

Bracket; SCS13 casting stainless steel

Model UYF200, UYFA21;

Converter case; Aluminum alloy

Coating Color:Converter case, cover; Deep sea moss green (Munsell 0.6GY 3.1/2.0) (Polyurethane corrosion-resistant coating)

Construction:IP67 immersion proof and dust proof. (Equivalent to NEMA 4X).

Electrical Classifications:see P.4

Electrical Connection:

JIS G1/2 female, ANSI 1/2 female, DIN Pg13.5 female, ISO M20 X 1.5 female

Signal Cable:

Model UYF021, used for remote detector and converter.

Max. length: 20 m.

Outer Sheath Material: Heat resisting vinyl.

Durable Temperature; 100°C

Weight: Refer to the external dimension.

Calibration:This flowmeter is factory-calibrated using a water flow.

Communication signal:

BRAIN communication signal (superimposed on a 4 to 20 mA DC signal)

Conditions of Communication Line:

Load resistance; 250 to 600 Ω (including cable resistance)

Maximum Cable Length:

2km (6500ft) (when polyethylene-insulated PVC-sheathed control cables (CEV cables) are used.)

Load capacitance: 0.22 m µF Maximum

Load inductance: 3.3 mH Maximum.

Refer to Figure 1.

Space from Power Line:15cm (0.6ft) or more (Parallel wiring should be avoided.)

Input Impedance of Receiver Connected to the Receiving Resistance:10kΩ or larger (at 2.4kHz)

Indicator/Totalizer:

Six-digit LCD display. Totalizer value is protected by an EEPROM at the time of a power failure.

The totalized flow as well as instantaneous flow rate in engineering unit or percent (%) of span can be displayed. Alternative display is also possible.

In mounting direction, the right and left 90° is rotatable.

EMC Conformity Standards:

EN55011 for EMI (Emission)

EN50082 for EMS (Immunity)

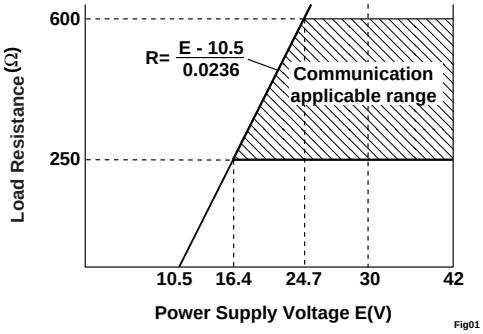

Figure 1. Relationship Between Power Supply Voltage and Load Resistance

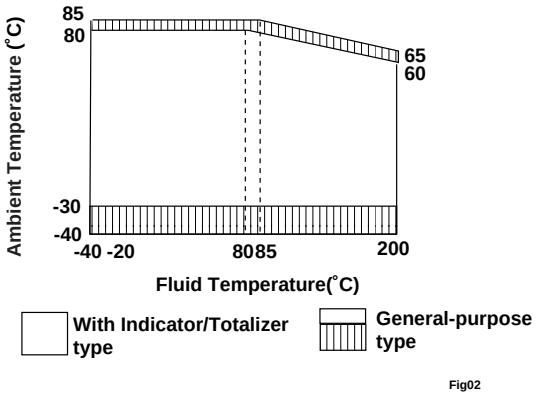

Figure 2. Ambient Temperature Range (General type, Indicator / Totalizer type)

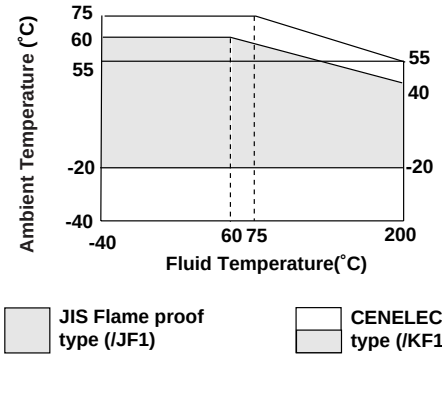

Figure 3. Ambient Temperature Range (Explosion proof type)

Model Model and Suffix Codes (Style Code: S2)

UYF200 Ultrasonic Vortex Flowmeter (Integral type, Remote type detector)

Model	Suffix Code	Description
UYF201J	·····	15 mm (1/2 inch)
UYF202J	·····	25 mm (1 inch)
UYF204J	·····	40 mm (1-1/2 inch)
UYF205J	·····	50 mm (2 inch)
UYF208J	·····	80 mm (3 inch)
UYF210J	·····	100 mm (4 inch)
UYF215J	·····	150 mm (6 inch)
UYF220J	·····	200 mm (8 inch)
Converter	–A·····	Integral Type
	–N·····	Remote Type
Output Signal	D·····	4 to 20 mA DC, Pulse,BRAIN communication
	N·····	Remote Type
Body Material	–S·····	Casting stainless steel (SCS 14A)
Process Connection (Note 1)	J1·····	JIS10K Flange
	J2·····	JIS20K Flange
	A1·····	ANSI Class 150 Flange
	A2·····	ANSI Class 300 Flange
	K1·····	JIS10K Wafer
	K2·····	JIS20K Wafer
	B1·····	ANSI Class 150 Wafer
	B2·····	ANSI Class 300 Wafer
Electrical Connection	0·····	JIS G1/2 female
	2·····	ANSI 1/2 NPT female
	3·····	DIN Pg 13.5 female
	4·····	ISO M20mm X 1.5 female
Indicator/ Totalizer (Note 2)	–D···	With Indicator/Totalizer
	–N···	None
Electrical Classification	/JF1	JIS Flame proof
	/FF1	FM Explosion proof
	/FS1	FM Intrinsically safe
	/KF1	CENELEC (KEMA) Flame proof
	/KS1	CENELEC (KEMA) Intrinsically safe
	/CF1	CSA Explosion proof
	/CS1	CSA Intrinsically safe
Options	/☐	Refer to table Option Specifications

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Table 1. Flowmeter Selection Guide

Body Material	Process Connection	Nominal Size mm (inch) 15 (1/2)	25 (1)	40 (1-1/2)	50 (2)	80 (3)	100 (4)	150 (6)	200 (8)
Casting Stainless Steel	Wafer Type	YES	YES	YES	YES	YES	YES	NO	NO
	Flange Type	YES	YES	YES	YES	YES	YES	YES	YES

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UYFA21 Ultrasonic Vortex Flowmeter Converter

(Remote type)

Model	Suffix Code	Description
UYFA21J	·····	Ultrasonic Vortex Flow Converter
Output Signal	–D·····	4 to 20 mA DC, Pulse,BRAIN communication
Electrical Connection	0·····	JIS G1/2 female
	2·····	ANSI 1/2 NPT female
	3·····	DIN Pg 13.5 female
	4·····	ISO M20 mm X 1.5 female
Indicator/ Totalizer	–D·····	With Indicator/Totalizer
	–N·····	None
Mounting Bracket	A·····	SECC For 2 inch Pipe Mounting
	B·····	SUS304 For 2 inch Pipe Mounting
	N·····	None
Electrical Classification	/JF1	JIS Flame proof
	/FF1	FM Explosion proof
	/FS1	FM Intrinsically safe
	/KF1	CENELEC (KEMA) Flame proof
	/KS1	CENELEC (KEMA) Intrinsically safe
	/CF1	CSA Explosion proof
	/CS1	CSA Intrinsically safe
Options	/☐	Refer to table Option Specifications

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UYF021 Signal Cable

Model	Suffix Code	Description
UYF021J	·····	Signal cable
Cable End	–0·····	Without End finish (Note 3)
	–1·····	With End finish
Cable Length	–05·····	5 m
	–10·····	10 m
	–15·····	15 m
	–20·····	20 m
	–☐☐·····	☐☐ m (Note 4)
Options	/C☐ (Note 5)	Cable end finish part

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Note 1: Refer to table 1.
Note 2: Indicator/Totalizer is not available for remote type detector.
Note 3: One set of end finish part is attached.
Note 4: Fill in two digit figure per 5 m unit. The cable can be cut at required length within 20 m at customer side. In this case, select Cable End Code [-0].
Note 5: An entered digit figure shows required set quantity.

Option Specifications (for model UYF200, UYFA21)

■Electrical Classifications and optional code.

ITEM	Specifications	Applicable Model	Code
Japanese Industrial Standards (JIS)	JIS Flame proof Approval Flame proof Ex d IIC T6 Certified by TIIS. (TIIS is the abbreviation of Technology Institution of Industrial Safety.) Electrical connection : JIS G1/2 female	UYF200J UYFA21J	JF1
Factory Mutual (FM)	FM Explosion proof Approval Explosion proof for Class I, Division 1, Groups B, C and D Dust-ignition proof for Class II/III, Division 1, Groups E, F and G Hazardous (classified) locations, indoors and outdoors (NEMA 4X) Division 2, SEALS NOT REQUIRED, Temperature class: T6 Amb. Temp: -40 to 60°C (-40 to 140°F) Electrical connection: ANSI 1/2NPT female	UYF200J UYFA21J	FF1
	FM Intrinsically safe Approval Intrinsically safe for Class I, Division 1, Groups A, B, C & D, Class II, Division 1, Groups E, F & G and Class III, Division 1 Hazardous Locations Nonincendive for Class I, Division 2, Groups A, B, C 6 D, Class II, Division 2, Enclosure: “NEMA 4X”, Temp. Class: T4, Amb. Temp.:-40 to +60°C (-40 to 140°F) Intrinsically Safe Apparatus Parameters [Groups A, B, C, D, E, F and G] Vmax=30V, Imax=165mA, Pmax=0.9W, Ci=22.5nF, Li=730µH [Groups C, D, E, F and G] Vmax=30V, Imax=165mA, Pmax=0.9W, Ci=22.5nF, Li=730µH Electrical connection: ANSI 1/2NPT female	UYF200J UYFA21J	FS1
CENELEC (KEMA)	CENELEC (KEMA) Flame proof Approval KEMA No. Ex-97.D.2342 EExd IIC T6...T3, Amb.Temp.:-40 to +75°C (-40 to 167°F) Max. process temp.: T6(85°C), T5(100°C), T4(135°C), T3(200°C) (UYFA21:T6 only) Electrical connection: ANSI 1/2NPT female, DIN PG13.5 female and ISO M20 x 1.5female	UYF200J UYFA21J	KF1
	CENELEC (KEMA) Intrinsically safe Approval KEMA No. Ex-97.D.4156 EEx ia IIC T4, T3, Amb.Temp.: -40 to +60°C (-40 to 140°F) Ui=30V, Ii=165mA, Pi=0.9W, Ci=6nF, Li=730µH Electrical connection: ANSI 1/2NPT female, DIN PG13.5 female and ISO M20 x 1.5female	UYF200J UYFA21J	KS1
Canadian Standards Association (CSA)	CSA Explosion proof Approval Explosion proof for Class I, Groups B, C and D; Class II, Groups E, F and G; Class III For Class I, Division 2 Locations "FACTORY SEALED, CONDUIT SEAL NOT REQUIRED." Enclosure: “Type 4X”, Ambient Temp.:-40 to +60°C (-40 to 140°F) Temperature code : T6, T5, T4, T3(UYF200-A and UYF200-N), T6(UYFA21) Supply Voltage; 42Vdc Max, Output Signal; 4 to 20mA and Pulse output MWP; 5MPa(UYF200-A and UYF200-N)	UYF200J UYFA21J	CF1
	CSA Intrinsically safe Approval Class I, Groups A, B, C and D Class II and III, Groups E, F and G Enclosure: “NEMA 4X”, Temp.Class: T4, Amb. Temp.:-40 to +60°C (-40 to 140°F) Vmax=30V, Imax=165mA, Pmax=0.9W, Ci=6nF, Li=730µH Electrical connection: JIS G1/2 female, ANSI 1/2 NPT female, DINPg13.5 female or ISO M20X1.5 female	UYF200J UYFA21J	CS1

Note : Electirical connection is specified by each approval body.

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Item	Specifications	Applicable Model	Code
JIS Flameproof Packing Adapter	Power source connection port : G1/2 female thread. Applicable Cable ø8.5 to ø11.	UYF200J UYFA21J	PG5
Stainless Steel Bolt & Nut Assembly	Used when a wafer type is installed for a process. Material SUS304.	UYF200 wafer type	BLT
Stainless Steel Tag Plate	SUS304 tag plate hung on converter case.	UYF200J UYFA21J	SCT
Paint Color Change	Only for converter covers. Refer to Table 2.	UYF200J UYFA21J	See Table 2
Material Certificate	Reproduced material certificate for body from material manufacture. (Note 2)	UYF200J	M01
Static Pressure and Leakage Test Certificate	Refer to Table 3 for Pressure test value. Test time 10 minutes. (Note 2)	UYF200J	T01
Degrease Treatment (Note 3)	The body is cleaned by trichloroethene.	UYF200J	K1
Epoxy Coating	Epoxy coating for meter case and cover.	UYF200J UYFA21J	X1
Converter Installing Direction 180° Change	Converter installing direction 180° change inversely when shipped.	UYF200J	CRC
Lightning Protector	There is an arrester inside converter for power supply line.	UYF200J-A UYFA21J	A
Down-Scale burn-out in CPU failure (Note 4)	Set output under 3.6 mA (low) when burn-out occurred.	UYF200J-A UYFA21J	C1
Accuracy ± 0.5% Type	For accuracy guaranteed range refer item “Sizing”.	UYF200J (Note 5)	HAC

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Note 1: In the case of JIS Flame proof (/JF1), specify in the option code with Flameproof packing adapter (PG5) for the cable wire construction.
Note 2: Only available for standard version described in this GS.
Note 3: There is a case that a little calibration water should stay in the meter tube. So this is not degrease treatment in strict sense.
Note 4: When this option is chosen, the output is set at 3.6 mA when burn-out. Otherwise is set at 21.6 mA at shipping.
Note 5: It is not applicable for Model UYF201J, UYF202J, UYF215J, UYF220J (Nominal Size: 15mm, 25mm, 150mm, 200mm).

Table 2. Paint Color and Codes

Codes	Munsell Renotation Code	Color
P1	N1.5	Black
P2	7.5BG4/1.5	Jade green
P3	————	Metallic silver

T02.EPS

Table 3. Pressure Test Value

Flange Rating	Pressure
JIS 10K	2.1 MPa (21 kgf/cm²)
JIS 20K	5.0 MPa (51 kgf/cm²)
ANSI Class 150	2.9 MPa (29 kgf/cm²)
ANSI Class 300	7.5 MPa (76 kgf/cm²)

T03.EPS

Sizing

■ **Range of Measurable Flow Velocity (The velocity out accuracy-guaranteed flow range is included)**

Minimum Velocity	Maximum Velocity
If the velocity at Reynolds number of 5000 is larger than 0.2 m/s (15mm 0.3m/s), use this larger value. Otherwise use the value 0.2 m/s.	6 m/s

T006.EPS

■ **Accuracy-guaranteed Flow Velocity Range (Within ± 1.0%)**

Minimum Velocity	Maximum Velocity
If the velocity at Reynolds number of 20000 is larger than 0.2 m/s use this larger value. Otherwise use the value 0.2 m/s. (for the size 15, 25 mm is not 0.2 but 0.3 m/s)	6 m/s

T007.EPS

■ **Accuracy-guaranteed Flow Velocity Range (Within ± 0.5%)**

(only available for /HAC model but except for size 15mm, 25 mm,150mm, 200 mm)

Minimum Velocity	Maximum Velocity
If the velocity at Reynolds number of Nominal size multiply 1000 is larger than 0.2 m/s use this larger value Otherwise use the value 0.2 m/s.	If the velocity at Reynolds number of Nominal size multiply 4000 is less than 6 m/s use this smaller value. Otherwise use the value 6 m/s.

T008.EPS

Note: Out of the above range, ±1.0 % specification is to be applied.

■ Using the Figure 4, the velocity at Reynolds number of 5000 can be obtained.

With this value the velocity at Reynolds number over 5000 can be calculated.

For example 4 times the value obtained from Figure 4, it is the velocity at Reynolds number of 20000.

■ Obtain the volume flow rate at operating conditions:

● $Q_f = \frac{v \times D^2}{354}$ or $Q_f = 3600 \times v \times S$

■ Obtain the flow velocity at Reynolds number 5000:

● $v = 5 \times \frac{V}{D}$

however,

● $Re = \frac{345 \times 10^3 \times Q_f}{v \times D}$

● $V = \frac{\mu}{\rho_f} \times 10^3$

where,

Q_f : volumetric flow rate (m^3/h),

D : inner diameter of ULTRA YEWFLO (mm),

S : cross-section of ULTRA YEWFLO (m^2),

v : flow velocity (m/s),

Re : Reynolds number (no unit),

ρ_f : density at operating conditions (kg/m^3),

μ : viscosity at operating conditions (cP),

ν : kinematic viscosity at operating conditions (cSt).

Table 4. Nominal Pulse Rate and K-Factor

Nominal Size		Inner Diameter (mm)	Nominal-Factor (Pulse/,litre)	Nominal Pulse Rate	
mm	inch			Hz/m/s	$Hz/m^3/h$
15	1/2	12.8	54.0	69.5	15.0
25	1	23.4	87.0	37.4	24.2
40	1-1/2	36.6	22.7	23.9	6.31
50	2	47.5	10.4	18.4	2.89
80	3	71	3.11	12.3	0.863
100	4	93.8	1.35	9.32	0.375
150	6	138.8	0.427	6.47	0.119
200	8	185.6	0.179	4.84	0.050

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Table 5. Water Flow Rate
(At standard of conditions of 20 °C)

Nominal Size		Measurable Flow Rate in m^3/h	Accuracy-guaranteed Range in m^3/h (± 1.0% Class)	Accuracy-guaranteed Range in m^3/h (± 0.5% Class)
mm	inch			
15	1/2	0.14 to 2.78	0.23 to 2.78	———
25	1	0.34 to 9.2	1.4 to 9.2	———
40	1-1/2	0.76 to 22	2.2 to 22	4.2 to 16
50	2	1.3 to 38	2.7 to 38	6.8 to 26
80	3	2.9 to 85	4.1 to 85	17 to 64
100	4	5.0 to 149	5.4 to 149	27 to 106
150	6	11 to 326	11 to 326	———
200	8	20 to 583	20 to 583	———

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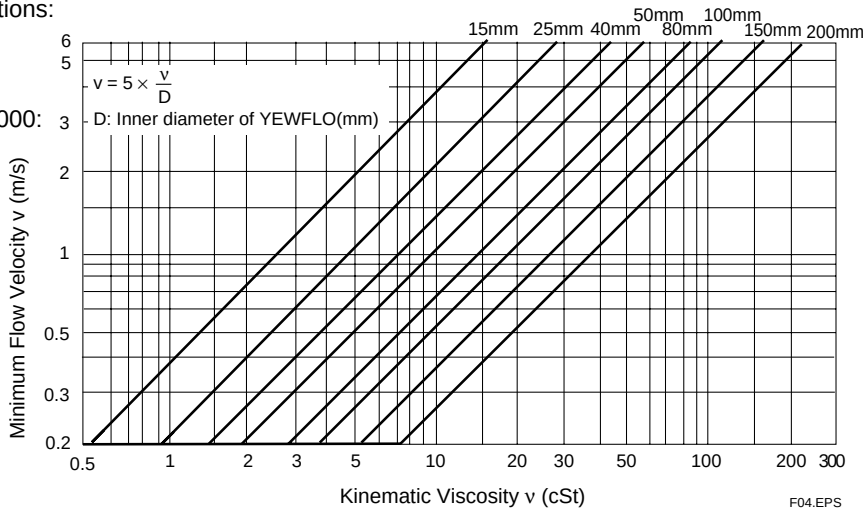

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Figure 4. Relationship between Minimum Velocity and Kinematic Viscosity (Reynolds Number 5000)

PRESSURE LOSS

At a velocity of 6 m/s for water; DP = 39 kPa (0.40 kgf/cm^2), the pressure loss is obtained from the following equations:

$$\Delta P = 108 \times 10^{-5} \times p_f \times v^2 \quad \text{.....(1)}$$
$$(\Delta P = 1.1 \times 10^{-5} \times p_f \times v^2)$$

or

$$\Delta P = 135 \times p_f \bullet \frac{Q_f^2}{D^4} \quad \text{..... (2)}$$
$$(\Delta P = 1.38 \times p_f \times v^2)$$

where,

ΔP : pressure loss (kPa (kgf/cm^2))
p_f : density at operating conditions (kg/m^3)
v : flow velocity (m/s)
Q_f : volumetric flow rate at operating conditions (m^3/h)
D : inner diameter of ULTRA YEWFLO (mm)

Figure 5, which represents the above equations, shows the pressure loss versus actual flow rate. When the adjacent pipeline is Sch 80, the pressure loss will be approximately 10% smaller than the calculated value.

(Example) Calculation of pressure loss

Calculate the pressure loss when the nominal size is 50 mm (2 inch) and the flow rate of water at operating temperature 80 ˚C is 20 m^3/h.

1, Since the density of water at 80 ˚C is 971.8 kg/m^3, substitute this value in equation (2):

$$\Delta P = 135 \times 971.8 \times \frac{20^2}{47.5^4}$$
$$= 10.3 \text{ kPa } (0.105 \text{ kgf/cm}^2)$$

2, Obtain the pressure loss using equation (1). The flow velocity when the flow rate is 20 m^3/h is given by:

$$v = \frac{354 \times Q_f}{D^2} = \frac{354 \times 20}{47.5^2} = 3.14 \text{ m/s.}$$

Therefore, substitute this value in equation (1):

$$\Delta P = 108 \times 10^{-5} \times 971.8 \times 3.138^2$$
$$= 10.3 \text{ kPa } (0.105 \text{ kgf/cm}^2).$$

3, Obtain the pressure loss using Figure 5. Since the liquid pressure loss factor can be read as 10.8, then:

$$\Delta P = 98.1 \times 10.8 \times 971.8 \times 10^{-5}$$
$$= 10.3 \text{ kPa } (0.105 \text{ kgf/cm}^2).$$

CAVITATION (Minimum Line Pressure)

Cavitation occurs when the flow line pressure is low and flow velocity is high during fluid measurement, preventing correct measurement of flow rate. The optimum line pressure can be obtained from the following equation:

$$P = 3.8 \times \Delta P + 1.3 \times P_0 \quad \text{.....(3)}$$

where,

P: line pressure, 2 to 7 times as large as inner diameter on downstream of flowmeter body surface (kPa abs (kgf/cm^2 abs)),
ΔP = pressure loss (kPa (kgf/cm^2)),
P_0:saturated steam pressure at operating temperature (kPa abs (kgf/cm^2 abs)).

Example:

Confirmation of presence of cavitation

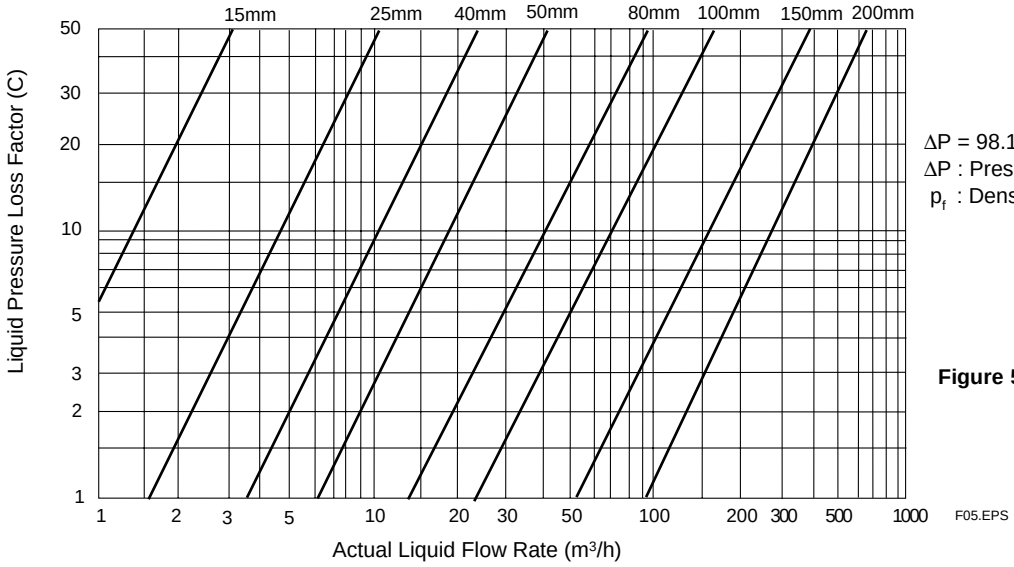
Suppose that the line pressure is 150 kPa abs (1.53 kgf/cm^2 abs) and the flow rate scale is 0 to 20 m^3/h. It is only necessary to confirm the pressure at the maximum flow rate; therefore, the saturated steam pressure of water at 80 ˚C is as follows from the table of saturated steam pressures:

P_0 = 47.4 kPa abs (0.483 kgf/cm^2 abs).

Therefore, substitute this value in equation (3):

$$P = 3.8 \times 10.3 + 1.3 \times 47.4$$
$$= 101 \text{ kPa abs } (1.03 \text{ kgf/cm}^2 \text{ abs}).$$

Since the operating pressure of 150 kPa abs (1.53 kgf/cm^2 abs) is higher than 101 kPa abs (1.03 kgf/cm^2 abs), no cavitation occurs.



$\Delta P = 98.1 \times C \times p_f \times 10^{-5}$
ΔP : Pressure Loss (kPa)
p_f : Density (kg/m^3)

Figure 5. Relationship between Pressure Loss and Flow Rate

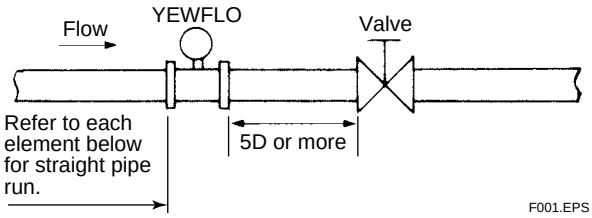
Remarks on Installation

■ Installation direction: Vertical installation require that the pipe always be filled with liquid and positioned for an upward flow direction. If the pipe is installed horizontally, the pipe should either always be filled with fluid or contain none at all. A gas-liquid, two-phase flow make the zero point fluctuation.

■ Adjacent pipes: Pipes of Sch 80 or less are recommended.

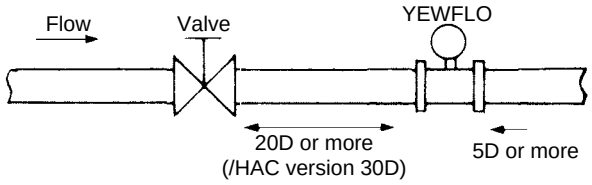
■ Valve position and straight pipe length:

Install the valve on the downstream side of the flowmeter. The upstream straight pipe length dependent on the element located on the upstream such as reducer/expander, bent and etc., refer to description as below. Keep 5D or more for downstream straight pipe length.



F001.EPS

In case the valve has to be installed on the upstream of the flowmeter, ensure the upstream straight pipe length to be 20D or more (for /HAC version is 30D), and the downstream straight pipe length be 5D or more.

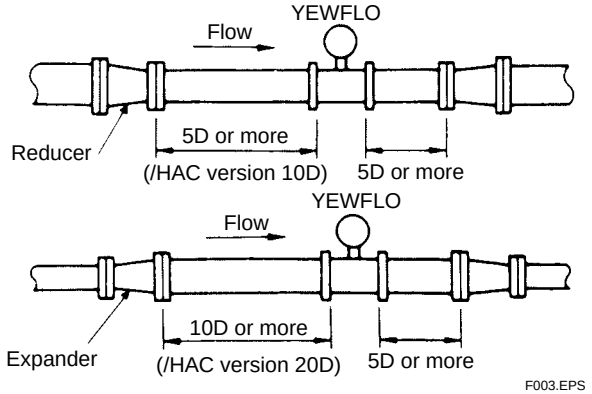


F002.EPS

■ Reducer or expander pipe:

Ensure the upstream straight pipe length be 5D or more (for /HAC version is 10D), and the downstream straight pipe length to be 5D or more for per reducer pipe.

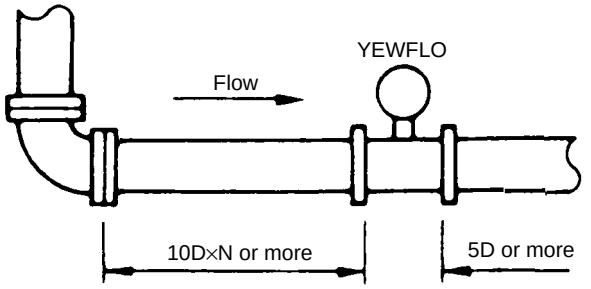
Ensure the upstream straight pipe length be 10D or more (for /HAC version is 20D), and the downstream straight pipe length be 5D or more for per expander pipe.



F003.EPS

■ Bent pipe and straight pipe length:

Ensure the upstream straight pipe length to be 10D or more, and the downstream straight pipe length be 5D or more for per bent pipe.

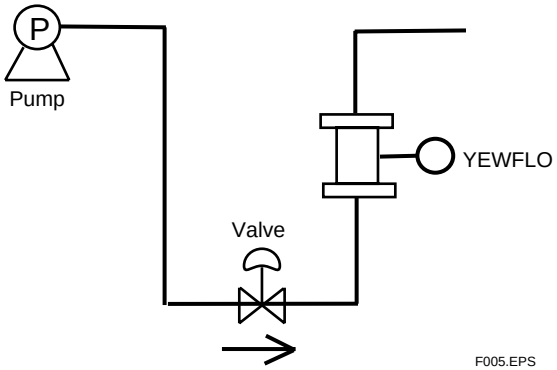


F004.EPS

■ In case of pulsating pressure existing:

• When pulsating pressure caused by a pump exist, install the flowmeter on the upstream of the stop valve.

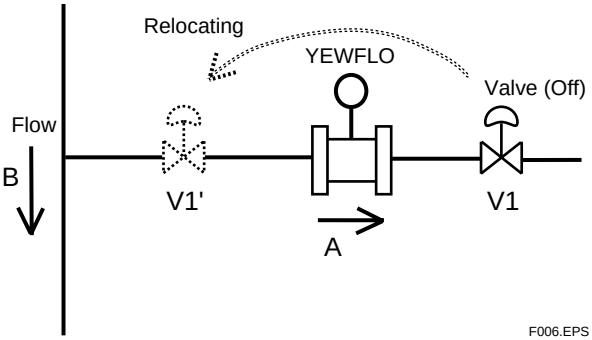
Installation Example



F005.EPS

• When pulsating pressure caused by a T-type piping exist, install the valve on the upstream of the flowmeter.

Example: As shown in the figure below, when the valve V1 is turned off, the fluid flow through B, as to meter A the flow is zero. But due to the pulsating pressure is detected, the meterís zero point become fluctuating. To avoid this, change the valve V1 location to V1'.



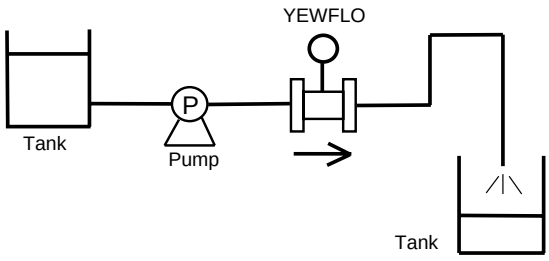
F006.EPS

■ The case of downstream open to the air:

If downstream open to the air, the cavitation possibly occurs. Avoid this kind use.

If such piping cannot avoid, up and down the downstream pipe as shown the figure below, or, install a valve on the downstream side.

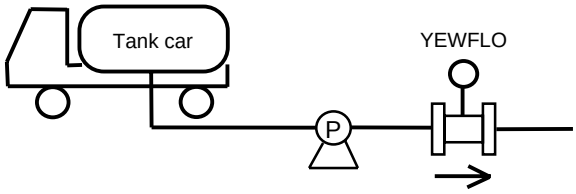
Installation Example



F007.EPS

■ Avoid the application of inflow from a tank. For example, when fluid flows from a tank car, it is possible to generate the bubbles by the whirl phenomenon ocurred when the liquid level decreases.

Incorrect Example



F008.EPS

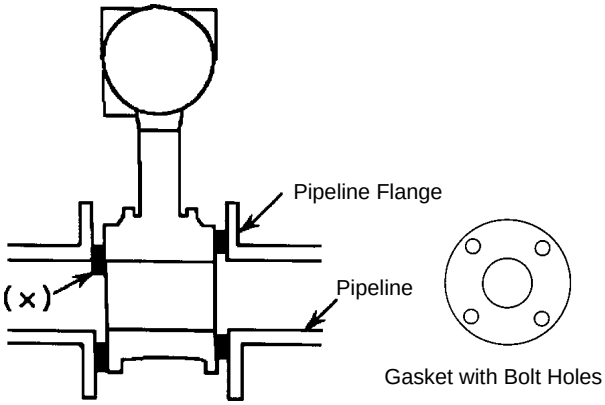
■ When the flow contains bubble, it is difficult to carry out metering.

■ When measuring dirty fluid which contains sticky stuff, and those stick is bond to the tube, clean them up.

■ When flushing, the flow should through bypass piping to avoid damaging the flowmeter. If there is no bypass, install short pipe instead of the flowmeter.

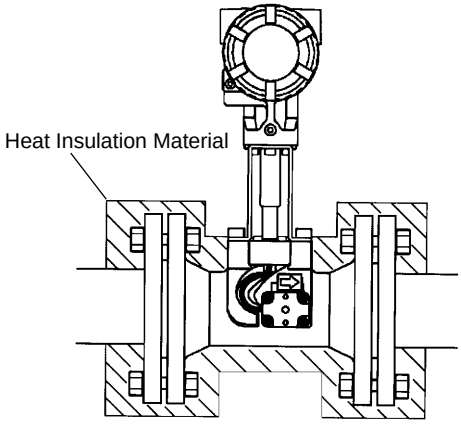
■ Avoid mounting gaskets which protrude into the pipe line. This may cause inaccurate reading.

Use gaskets with bolt holes as shown the figure below, even if ULTRA YEWFLO is a wafer type.



F009.EPS

■ When the pipe carries high-temperature fluids and heat-insulated, do not warp the heat-insulation material around the installation bracket of the converter.



Heat Insulation Method

F010.EPS

Remarks on installation

■ The range of pull-up resistor R for the pulse output

The pull-up resistor R for the pulse output is subjected to the output rating current and frequency. This range is shown as below.

$$\frac{E(V)}{120} \leqq R(k\Omega) \leqq \frac{0.1}{C(\mu F) \times f(kHz)}$$

E : Voltage of power supply for pull-up
C : Capacity of cable
f : Pulse output frequency

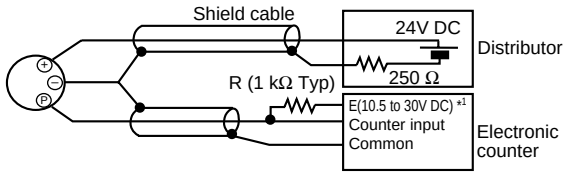
■ The wiring example for simultaneous analog and pulse output

When analog and pulse output are used, the length of communication line is subjected to wiring conditions. Refer to example 1 to 3. If the communication carries out from amplifier, no need to consider wiring conditions.

As shown in the installation case 1 and 2, use 2-wire individual shield cable.

■ Installation case 1

Communication applicable (When CEV cables are used, the communicable distance is up to 2 km.)

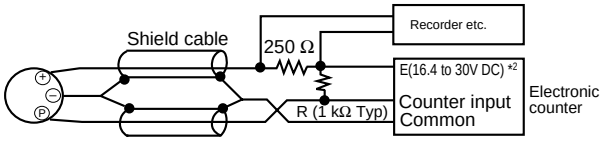


*1: For the maximum output current, the power current should be more than E/R.

F011.EPS

■ Installation case 2

Communication applicable (When the pull-up R is 1 k , the communicable distance is up to 200 m.)

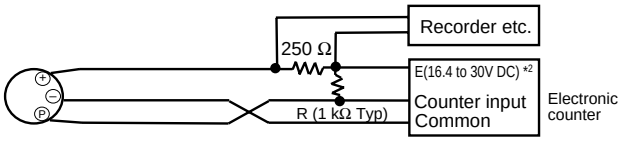


*2: For the maximum output current, the power current should be more than E/R + 25 mA.

F012.EPS

■ Installation case 3 (When shield cable is not used.)

Communication not applicable



*2: For the maximum output current, the power current should be more than E/R + 25 mA.

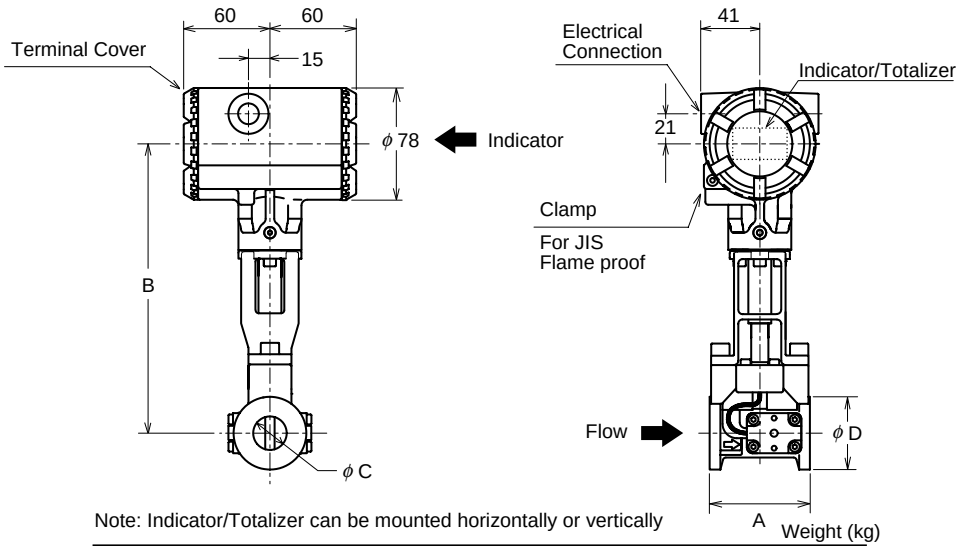
F013.EPS

EXTERNAL DIMENSIONS

■ Model UYF200 (Integral type, Remote type detector)

● Wafer type

Unit : mm

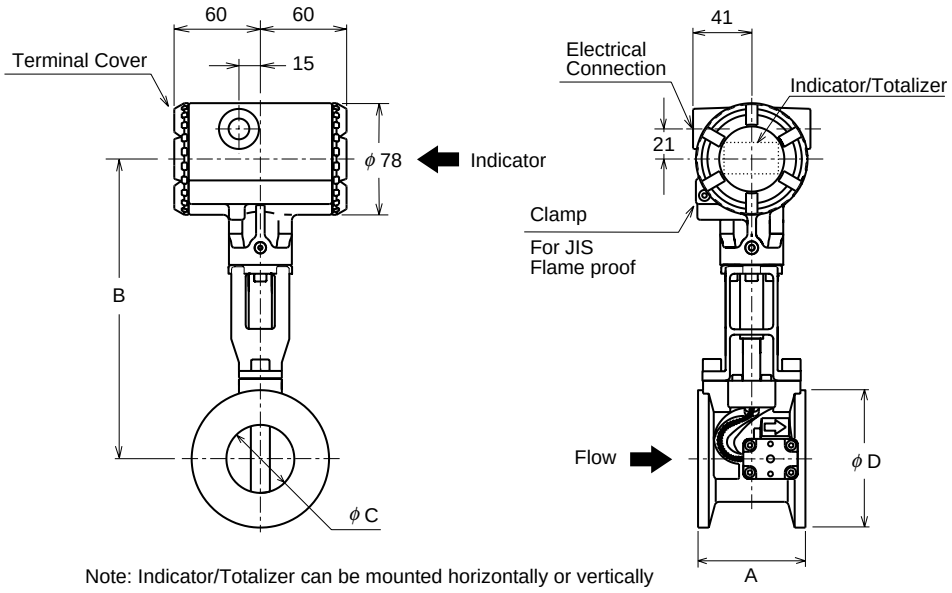


Note: Indicator/Totalizer can be mounted horizontally or vertically

Weight (kg)

Nominal Size	A	B	ϕ C	ϕ D	Weight(kg)
15 mm	70	202	12.8	51	2.2
25 mm	70	202	23.4	51	2.5
40 mm	70	204	36.6	73	3.0

Note: For flowmeter with Indicator/Totalizer, add 0.1 kg.



Note: Indicator/Totalizer can be mounted horizontally or vertically

Weight (kg)

Nominal Size	A	B	ϕ C	ϕ D	Weight(kg)
50 mm	75	210	47.5	96	3.5
80 mm	100	224	71.0	126	5.0
100 mm	120	237	93.8	152	7.5

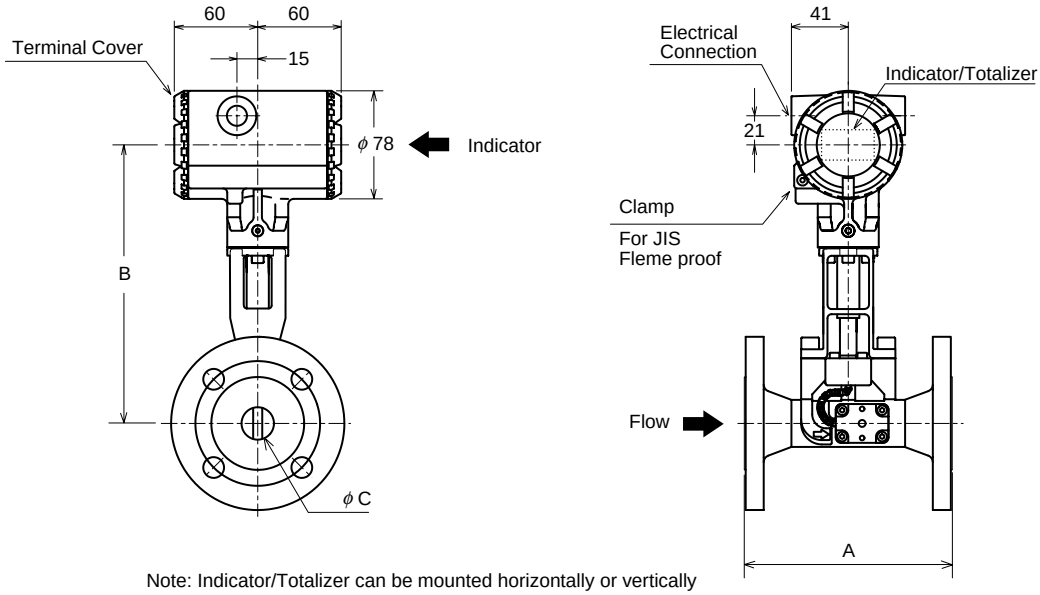
Note: For flowmeter with Indicator/Totalizer, add 0.1 kg.

F014.EPS

■ Integral type

● Flange type

Unit : mm



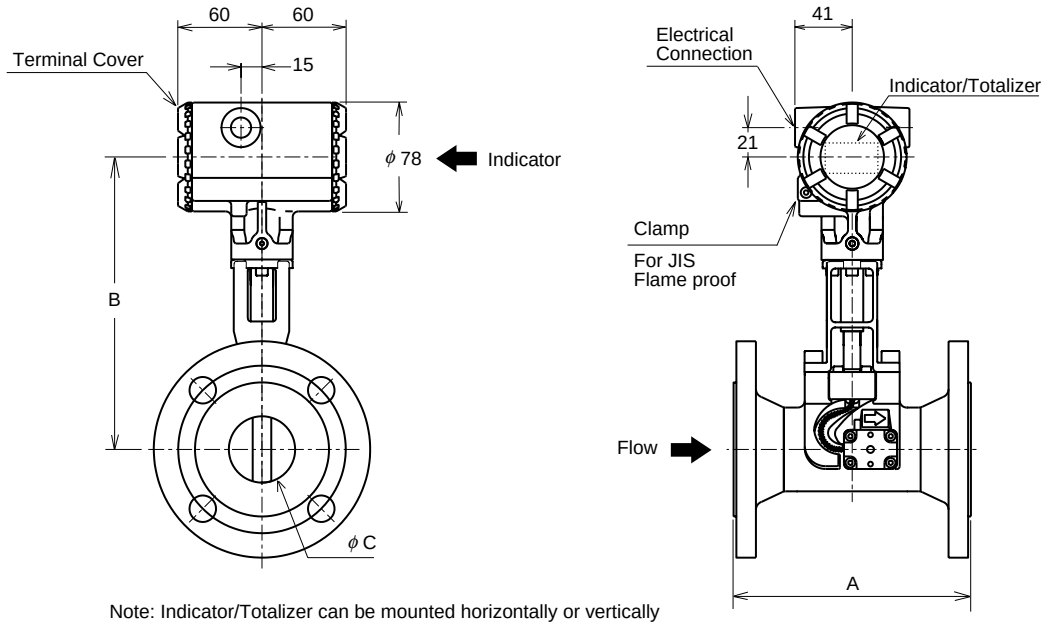
Note: Indicator/Totalizer can be mounted horizontally or vertically

Weight (kg)

Nominal Size	A	B	ϕ C
15 mm	130	202	12.8
25 mm	150	202	23.4
40 mm	150	204	36.6

Nominal Size	JIS Flange		ANSI Flange	
	10K	20K	class 150	class 300
15 mm	4.8	5.1	4.2	5.3
25 mm	5.0	5.5	4.5	5.5
40 mm	6.5	6.5	6.0	8.5

Note: For flowmeter with Indicator/Totalizer, add 0.1 kg.



Note: Indicator/Totalizer can be mounted horizontally or vertically

Weight (kg)

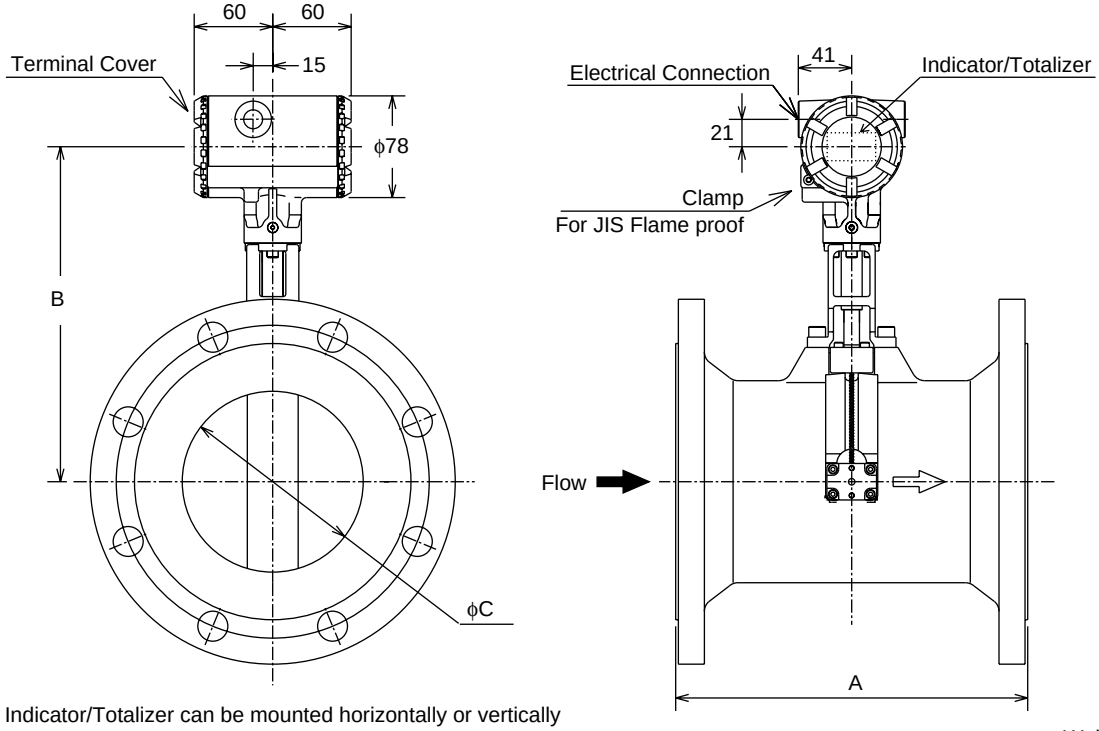
Nominal Size	A	B	ϕ C
50 mm	170	210	47.5
80 mm	200	224	71.0
100 mm	220	237	93.8

Nominal Size	JIS Flange		ANSI Flange	
	10K	20K	class 150	class 300
50 mm	7.5	8.0	8.5	9.5
80 mm	11.5	13.5	14.0	17.5
100 mm	16.0	18.5	20.0	28.0

Note: For flowmeter with Indicator/Totalizer, add 0.1 kg.

F015.EPS

Unit: mm



Note: Indicator/Totalizer can be mounted horizontally or vertically

Weight (kg)

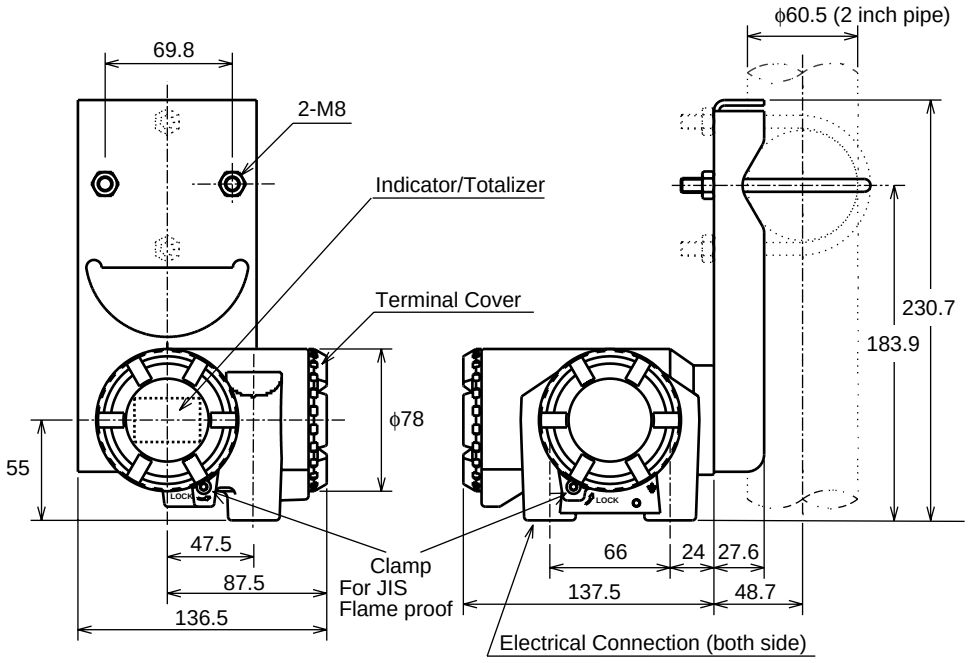
Nominal Size	A	B	ϕC
150mm	270	257	138.8
200mm	310	282	185.6

Nominal Size	JIS Flange		ANSI Flange	
	10K	20K	class 150	class 300
150mm	27.0	34.0	29.0	45.0
200mm	37.0	48.0	46.0	70.0

Note: For flowmeter with Indicator/Totalizer, add 0.1 kg.

F016.EPS

■ Model UYFA21

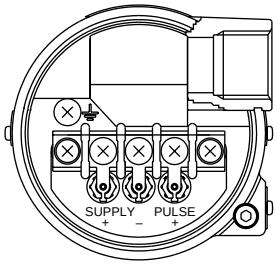


Mass : 2.3 kg
Note : For flowmeter with Indicator/Totalizer, add 0.1 kg.

F017.EPS

■ Terminal Configuration and Terminal Wiring

Terminal configuration



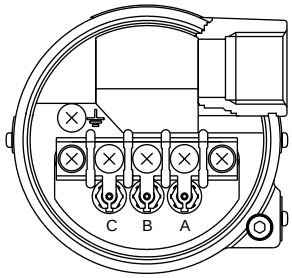
Terminal Wiring

SUPPLY	+	Power and 4 to 20 mA DC output
	–	
PULSE	+	Pulse output
	⏚	Ground terminal

F018.EPS

• Remote Type (Detector Part)

Terminal configuration



Terminal Wiring

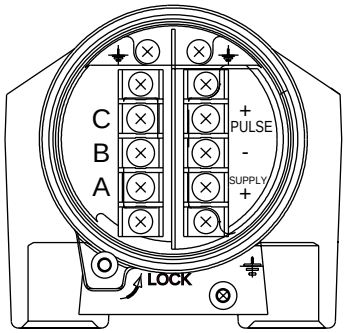
A		Terminal to remote converter
C		
B		Connect C terminal of signal cable

* Use UYF021 Signal Cable

F019.EPS

• Remote Type (Converter Part)

Terminal configuration



Terminal Wiring

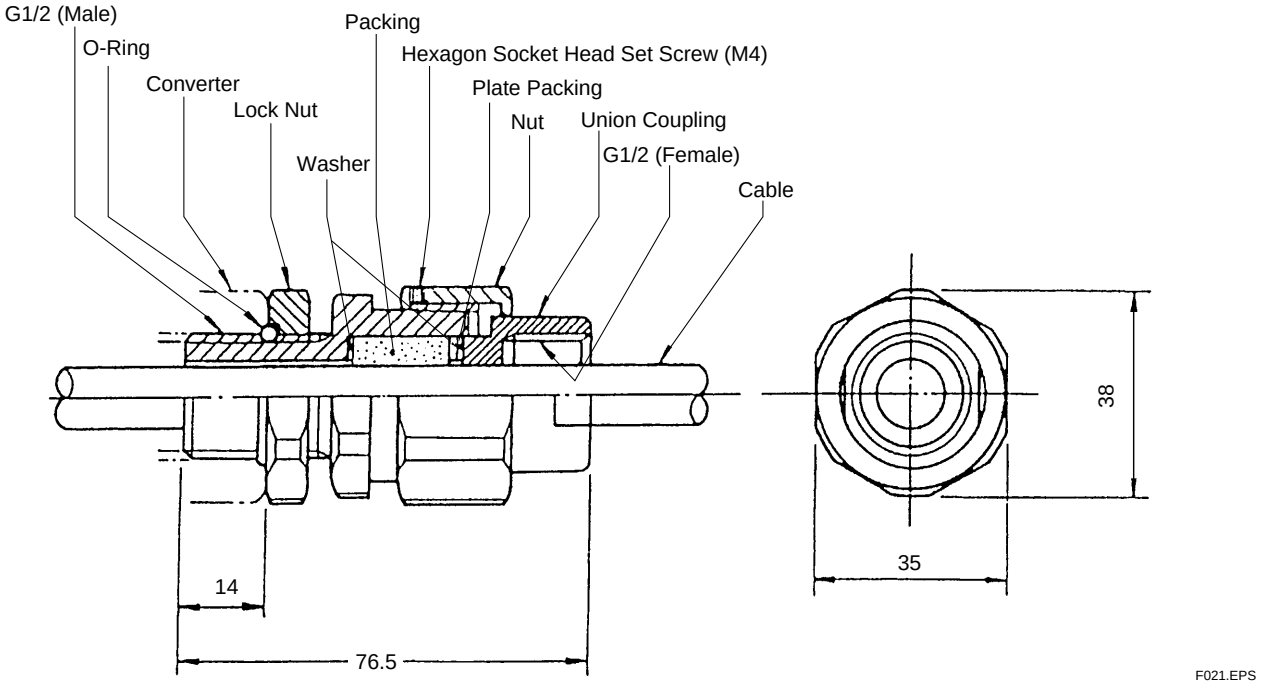
SUPPLY	+	Power and 4 to 20 mA DC output
	–	
PULSE	+	Pulse output
A		Terminal to remote converter
C		
B		Connect C terminal of signal cable
⏚		Ground terminal

* Use UYF021 Signal Cable

F020.EPS

■ **JIS Flameproof Packing Adapter (Option code: /PG5)**

Unit: mm



F021.EPS

ORDERING INSTRUCTIONS

Specify the following when ordering:

1. Model and suffix codes
2. Tag No. (Only when is neccessary)
3. Flow conditions
   a. Name of fluid
   b. Maximum flow rate, and minimum flow rate
   c. Maximum and normal operating temperatures
   d. Density at normal operating conditions
   e. Viscosity at normal operating conditions
   f. Specify the display for Indicator/Totalizer (when the option is chosen)
      Instantaneous flow rate (% or engineering unit) or Totalize value
   g. Totalize rate (Only when is necessary)
   h. Pulse output rate (Only when is necessary)

RELATED INSTRUMENTS

SDBT Distributor ..... See GS 1B4T1-E
GS 1B4T2-E
Field-mounting Indicator (4914, 4915) See GS 1S1B1-E
BRAIN TERMINAL ..... See GS 1C0A11-E

ULTRA YEWFLO	**Ultrasonic Vortex Flowmeter Calculation Worksheet**	Shop Order No.	SEC No.
		Serial No.	LOOP No.
			ITEM No.

Customer		Plant name	
End User		Tag No. (Up to 16 English capital character)	
Model & Suffix Code	**UYF**	Quantity	
		Order No.	

Fluid Name		Operating Temp B31	°C	Maximum Temp.	°C
Maximum Flow Rate B40, B41, B42		Operating Press	☐ kPa G ☐ kg/cm² G	Maximum Press	
Minimum Flow Rate		Suturated Steam Press		☐ kPa abs ☐ kg/cm² abs	
Density at Opr. Condition B32, B33	kg/m³				
Normal Viscosity at Opr. Condition	cP				

Flowrate unit
☐ m³ ☐ /sec
☐ ℓ ☐ /min
☐ kg ☐ /h
☐ ton ☐ /day

Items to be Specified (when necessary)

- With Indicator/Totalizer
  - ☐ Instantaneous flow rate (%)
  - ☐ Instantaneous flow rate (Engineering unit)
  - ☐ Totalized value
- Totalize rate p/☐ *
- Pulse rate p/☐ *

* Up to 2 items can be selected.

* The unit specified with the maximum, minimum flow rate is applied.

■ First list up the parameters for sizing

Q_1: Maximum Flow Rate ☐ (m^3/h)

Q_2: Minimum Flow Rate ☐ (m^3/h)

ν : Kinematic viscosity ☐ (cSt)

D : Inner diameter ☐ (mm)

✵ When the mass flow rate is given, change it using the formula below.

$$Q = \frac{\text{Mass flow rate (kg/h)}}{\text{Density at Opr. Condition (kg/m}^3\text{)}} \qquad \nu = \frac{\text{Viscosity at Opr. Condition (cP)}}{\text{Density at Opr. Condition (kg/m}^3\text{)}} \times 1000$$

Nominal size	25 mm	40 mm	50 mm	80 mm	100 mm	150 mm	200 mm
D (mm)	23.4	36.6	47.5	71.0	93.8	138.8	185.6

■ Sizing is completed when the calculation data satisfies the conditions which are marked with a double-line rectangle as below. (Refer to GS 1F5B2-E)

1. Maximum flow velocity $V_1 = \frac{354 \times Q_1}{D^2} =$ ☐ m/s

$V_1 \leqq 6$ m/s

2. Accuracy-guaranteed minimum flow velocity

$V_2 = \frac{354 \times Q_2}{D^2} =$ ☐ m/s

$V_3 = \frac{20 \times \nu}{D} =$ ☐ m/s

(Flow velocity at Reynolds Number of 20000)

$V_4 =$ ☐ m/s

(Full in 0.3 m/s for size 25 mm meter, full in 0.2 m/s for size 40 to 100 mm.)

Larger value V_3 or $V_4 \leqq V_2$

3. Measurable minimum flow velocity

$V_5 = \frac{5 \times \nu}{D} =$ ☐ m/s

(Flow velocity at Reynolds Number of 5000)

Larger value V_5 or 0.2 m/s $\leqq V_2$

The range for ± 0.5% accuracy (option)
(Confirm the following conditions when /HAC is selected)

1. Accuracy-guaranteed maximum flow velocity

$V_6 = \frac{4\nu}{D} \times$ nominal size = ☐ m/s

(Flow velocity at Reynolds Number of nominal size multiply 4000)

$V_1 \leqq$ smaller value V_6 or 6 m/s

2. Accuracy-guaranteed minimum flow velocity

$V_7 = \frac{\nu}{D} \times$ nominal size = ☐ m/s

(Flow velocity at Reynolds Number of nominal size multiply 1000)

Larger value V_4 or $V_7 \leqq V_2$

■ Minimum line pressure

Refer to GS 1F5B2-E to calculate minimum line pressure to confirm no cavitation occur.

△					Received by (Order Processing sect.)	Issued by (Sales Dept.)
△						1. 2. 3.
△						
REV	n	REMARKS	DATE	PEV. BY		

YOKOGAWA ◆

WS 1F5B2-E