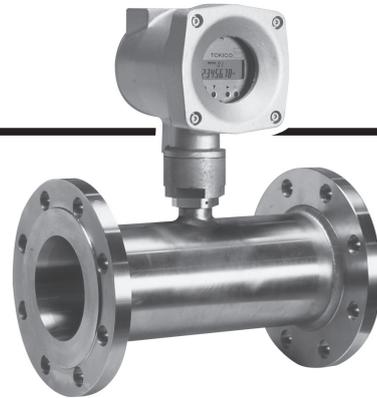


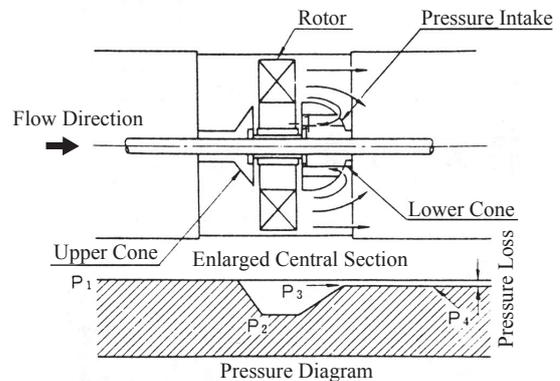
# GENERAL SPECIFICATIONS

# TOKICO TURBINE METER

**TOKICO** GS-F2011E-00



**Principle of Floating Rotor**



## Overview

Turbine meter has an excellent performance with its distinctive structure. Comparing with the flow meter using other method, it has compact and lighter design and is also able to make highly precision measurement in the wide measurement range. This is a typical turbine meter being extensively adopted among the every industrial fields such as trading, for the use in the process management and control etc.

## Features

### ● Wide Measurement Range and High Accuracy

Compared with other types of flowmeters, TOKICO turbine meter is much smaller and lighter and can measure accurately in a very wide flow range. The high precision integrating accuracy of  $\pm 0.2\%$  can be always maintained for business transaction purpose and  $\pm 0.5\%$  for general purpose with excellent accuracy repeatability.

### ● Extremely Wide Range of Application

#### Applicable fluid

Being of stainless steel construction, the meter has very high corrosion resistance. Therefore, the range of application is extremely wide, including water, petroleum and chemical liquids.

#### Temperature

By selecting a suitable pickup coil for the standard measuring unit according to the temperature of the fluid to be handled, the meter can be applied for a wide range of temperature from  $-250\text{ }^{\circ}\text{C}$  to  $500\text{ }^{\circ}\text{C}$ .

#### Pressure

As the housing is of pressure resistant cylindrical form, the meter can be used for high pressure fluid measuring purposes. (highest record of performance: 343MPa)

### ● Unique Rotor Floating Structure

The rotor rotates in a floating state by a unique fluid-dynamic balancing structure, which facilitates to provide very high accuracy in a wide flow range and superb durability.

### ● Light and Compact Structure for Easy Maintenance

The light and compact structure facilitates easy handling and maintenance.

## Standard Specification (Measuring Unit)

Applicable Fluid	Water, Petroleum, Chemical Liquid, LPG, LNG, etc	
Accuracy	$\pm 0.2\%$ or $\pm 0.5\%$	
Flow Rate Range	0.36~3500 m <sup>3</sup> /h	
Fluid Temperature	$-250\sim 500\text{ }^{\circ}\text{C}$ (From $-10$ to $80\text{ }^{\circ}\text{C}$ in case of the one with an intelligent counting unit)	
Max. Working Pressure	Rated Pressure of Flange	
Fluid Viscosity	5 mm <sup>2</sup> /s or below	
Connection Size	20~350 mm (3/4~14B)	
Flange Rating	J I S 10K, 20K FF or RF ASME·JPI 150, 300 RF	
Material	Housing	SUS304
	Blade	SUS631 (For Capacity Model 54 or less)
		SUS430 (For Capacity Model 57 or more)
	Bearing	Super Hard Alloy
Others	SUS304	
Piping Installation	Horizontal Piping	
Paint Color	Silver (Painting is only applied to the counting unit)	

# Type of Preamplifier and Specifications

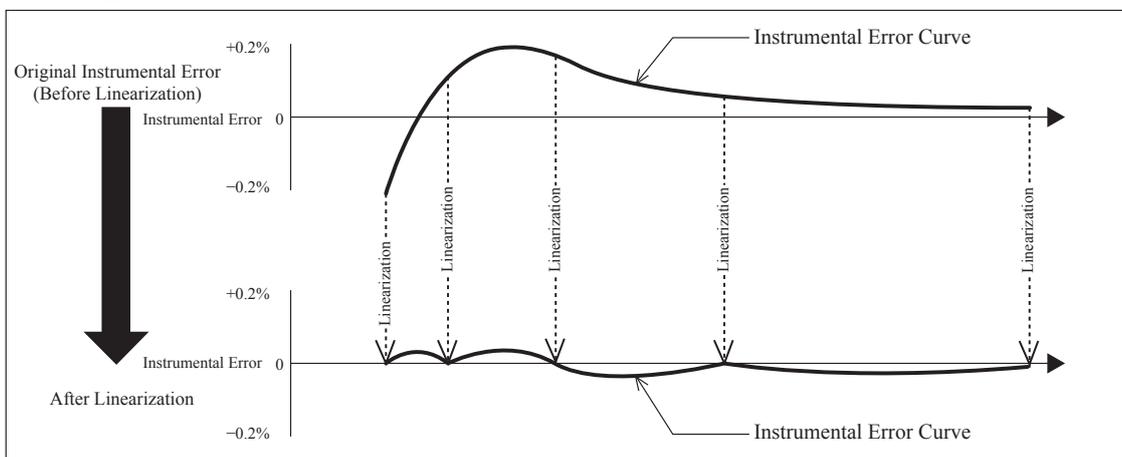
Composition Specification	Without Intelligent Counting Unit			
	Standard Type	Highly Sensitive Type	Non-frequency Multiply Meter	Frequency Multiplication Type
Type	MA	NA	OX	PX
Code	MA	NA	OX	PX
Applicable Object	Standard for the Capacity Model 60 or below	For the Pick Up Coil B		Standard for the Capacity Model 63 or above
Power Supply	12V DC $\pm$ 1.2V		24V DC $\pm$ 2.4V	
Current Consumption	30 mA		100 mA	
Output Pulse	4V $\pm$ 1V <sup>P-P</sup> (Non-correction) (Floating Voltage: 6.5 V or less)		7V $\pm$ 1.5V <sup>P-P</sup> (Non-correction) (Floating Voltage: 3 V or less)	6V $\pm$ 1.5V <sup>P-P</sup> (Non-correction) (Floating Voltage: 3.5 V or less)
Load Resistance	1k $\Omega$ (+ side)		200 $\Omega$ (- side)	
Ambient Temperature	-10~80 $^{\circ}$ C			
Explosion Proof Structure	Explosion Proof (Exd II BT4) (Separated Type: Explosion proof (d2G4) )		Explosion Proof (Exd II BT4)	
Wiring	2-core shield wire (Core wire cross sectional area: 0.75 to 2 mm <sup>2</sup> )			
Transmitting Distance	2km (When cross sectional area of core wire is 0.75 to 2 mm <sup>2</sup> )			
Wiring Connector	G1/2 (PF 1/2 Female Thread)			

## Basic Model with Intelligent Counting Unit

We have greatly improved maintenance performance by combining the Intelligent counting unit that has a communication function to the Turbine meter. The intelligent counting unit receives the pulse detected in the pickup coil and carries out the linearization and various corrective calculations such as the correction in volumetric expansion. And selectively displays the amount of totalized flow, momentary flow rate etc. It also outputs the pulse signal or analog signal to the receiver according to the flow volume. Also, the calculation for temperature correction is capable by connecting resistance temperature sensor from the outside.

Write in or read out of the various set data and flow rate value etc. can be made by the button or smart communication. The communication signal is layered to the analog signal (4 to 20mA) from digital signal after the modulation of FSK (Frequency Shift Keying), the communication can be made without use of any special communication line.

## Example of the Linearization



## Flow Range and Specification

Capacity Model	Conn. Size (mm)	Minimum Flow Rate (m <sup>3</sup> /h)				Max. Flow Rate (m <sup>3</sup> /h)		Meter Constant (P/L)	Max. Output Frequency (Hz)	Strainer Standard Screen Mesh
		Accuracy $\pm 0.5\%$		Accuracy $\pm 0.2\%$		Continuous	Intermittent			
		1mm <sup>2</sup> /s or below	5mm <sup>2</sup> /s or below	1mm <sup>2</sup> /s or below	5mm <sup>2</sup> /s or below					
33(05)	20	0.36	0.9	1.2	1.6	2.2	2.7	830	620	200
36(06)	25	0.48	1.5	1.8	2.5	3.6	4.5	490	610	100
38(07)	25	0.6	2.0	2.0	3.0	6.6	8.0	270	600	100
41(08)	25	1.0	3.5	4.5	6.5	14	18	130	650	80
43(09)	50	1.4	4.5	6.0	9.0	21	26	85	610	80
45(10)	50	2.0	5.6	8.0	12	30	36	60	600	80
47(11)	50	3.6	7.2	10	18	58	72	35	700	80
50(12)	80	6.0	15	17	30	90	110	20	610	80
52(13)	80,100	10	25	23	38	150	180	12	600	80
54(15)	100	20	37	40	53	280	340	5.5	520	40
57(16)	150	35	47	63	66	450	580	2.4	390	40
58(17)	200 <sup>※1</sup>	50	61	80	90	660	820	1.25	280	40
60(18)	250 <sup>※1</sup>	75	100	110	120	1,200	1,450	0.58	230	40
63(19)	300 <sup>※1</sup>	150	160	210	230	1,800	2,230	0.58 <sup>※2</sup>	360	40
64(20)	350 <sup>※1</sup>	220	225	280	300	2,800	3,500	0.38 <sup>※2</sup>	370	40

Note) 1. Capacity in ( ): former type

2. Meter constant and max.output frequency are approx. values (to be confirmed by calibration).

3. This table shows values for standard specification.

4. Continuous run means the hours of operation from 8 to 24 hours per day, Intermittent run means the operation of 8 hours or less.

5. ※1 : Connection of 4 models for capacity model (from 58 to 64) can be made with one size smaller connection as an option.

6. ※2 : Meter constant for the model 63 and 64 is the case of PX (frequency multiplying type amplifier) is used.

In the case that the meter constant with intelligent counting unit, 0.29P/L for model 63 and 0.19 P/L for model 64.

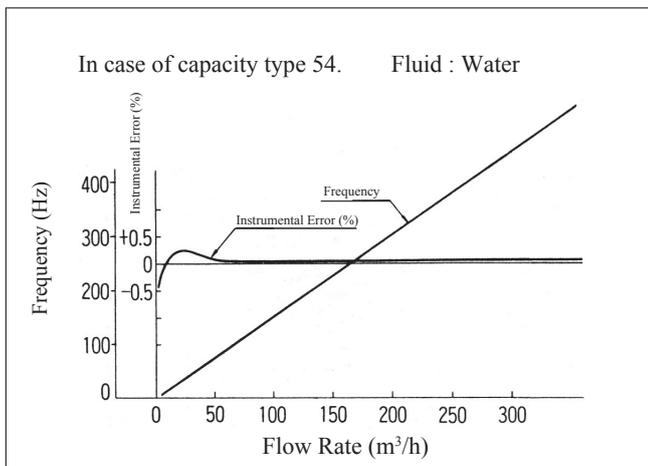
7. The flow rate at minimum sensitivity (flow rate that can be detected by the meter) is the 1/2 value of minimum flow rate at accuracy  $\pm 0.5\%$ .

Flow rate under this may not be detected.

(It depends the flow rate that exceeds the minimum sensitivity may not be detected under the certain circumstance.)

The range from minimum sensitivity flow rate to minimum flow rate at accuracy  $\pm 0.5\%$  is out of our guarantee.

## Performance Characteristic



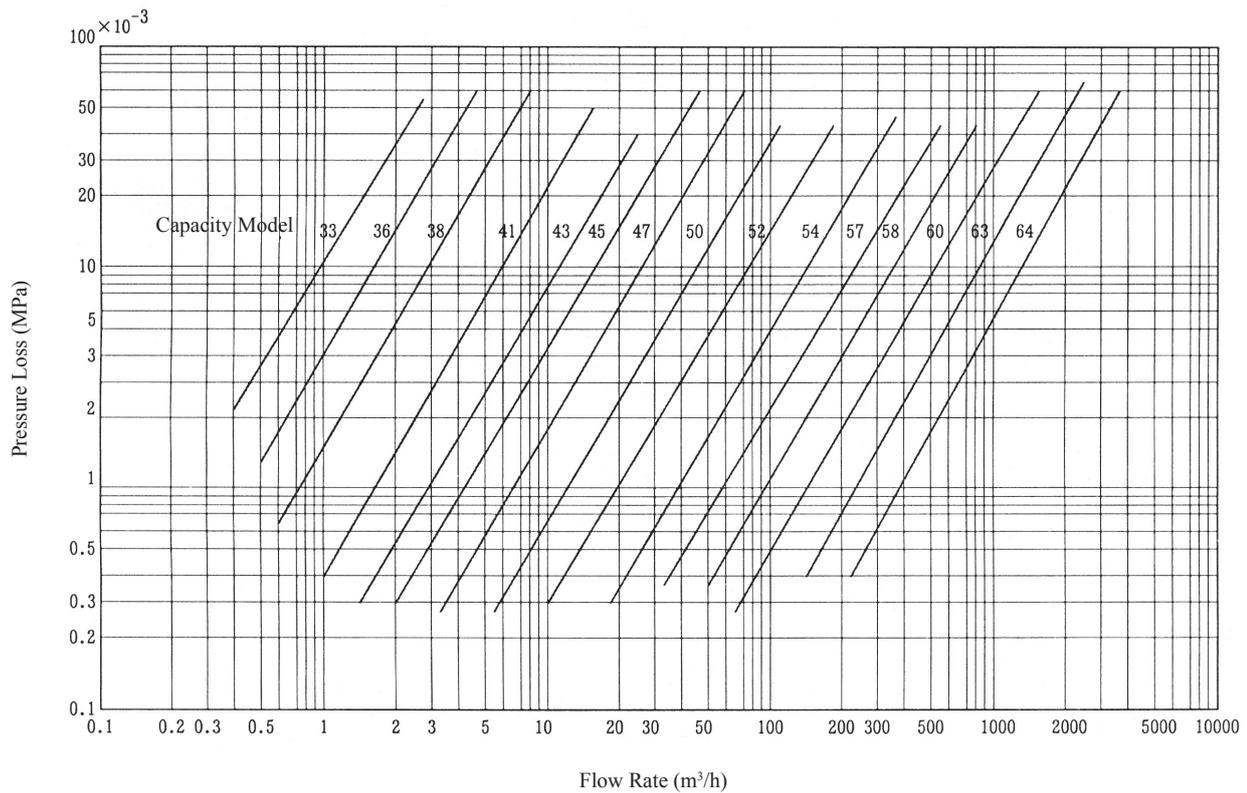
# Standard Specification of Intelligent Counting Unit

Disolay	Display	LCD Display
	Totalizing Counter	8 digits Select between compensation and non-compensation.
	Reset Counter	(Note: Compensation can be selected if the temperature compensation function is available) Unit: L, m <sup>3</sup> , kL
	Instantaneous flow	Maximum 7 digits, Unit: /min, /h
	Temperature Display	Maximum 5 digits (If temperature input is available)
	Mode	Indicates Display Mode or Test Mode
	Alarm	Displays Number of Occurrences and Elapsed Time of Alarm
	Selection of Display	Selection by Use of Magnet
Functions	* Linearization	Approximate Compensation of 4-line sections(5 Points) (up to 10-line Sections as an option)
	* Temperature Compensation	Range of Compensation: - 50 ~ 150°C Temperature Input: Resistance Temperature Sensor(Pt100,Specified Current:2mA) The Temperature span of the resistance temperature sensor can be adjusted.Compensation by JIS K 2249 Petroleum or General Quadratic Expression
	Coefficient Compensation	Set the Constant number of the flowmeter between 0.0001 and 1.9999
	Measuring Chamber Thermal Expansion Compensation	Compensation of the Thermal Expansion of Measuring Chamber
	* Compensation of Resistance Temperature Sensor	Approximate Compensation of 2-line sections (3 points) (up to 10-line Sections as an option)
	Elapsed Time since occurrence of Abnormal Condition	Measurement of Elapsed time since Occurrence of Abnormal Condition
Accuracy	Accuracy of linearization Computation	Within ±0.005 % (at the point of measurement)
	Accuracy of Temperature Compensation Computation	Within ±0.075 %
	Analogue Output Accuracy	Within ±0.5 % FS
Pulse Output	Output Signal	Select Open Drain (FET) output (3 wire type or 4 wire type), Current Pulse (2 wire type) or Voltage Pulse (3 wire type)
	Description of Output	Select Compensated/ non-compensated Pulse, and Alarm Output (Note: Compensation can be selected if the temperature compensation function is available)
	Capacity of Output	30V, 0.1A
	Pulse Width	Select from 0.3 ~ 0.7 ms, 6 ~ 14 ms, 60 ~ 140 ms
	Transmission Distance	1 km or less (For 1.25 mm <sup>2</sup> Cable Conductor), 2 km or less (For 2 mm <sup>2</sup> Cable Conductor)
Analogue Output	Output Signal	4 ~ 20 mA (2 wire type)
	Description of Output	Select Compensated/ non-compensated Instantaneous flow (Note: Compensation can be selected if the temperature compensation function is available)
	Response Time	0.5 ~ 60s (Set at intervals of 0.5s)
	Transmission Distance	1 km or less (For 1.25 mm <sup>2</sup> Cable Conductor), 2 km or less (For 2 mm <sup>2</sup> Cable Conductor)
Communication Protocol	Smart Communication (When selected 4 wire type Open Drain or 2 wire type Analogue Output only)	
Power Supply	DC 24 V ±10% (When Open Drain or Voltage Pulse, DC 12 V ± 10% can be used)	
Power Consumption	28 mA or less	
Backup Function	Compensated / Non-compensated Integrated Value	
Parameter Setting	Set the push button on the display panel or via communication protocol.	
Waterproof Construction	IP66	
Explosion-Proof Construction	Explosion-Proof Construction (Exd II BT4)	
Ambient Temperature	-10 ~ 60°C (Storage Temperature Range: -20 ~ 80°C)	
Ambient Humidity	5 ~ 90% RH	

Note) 1.\* marked item is option.

2. Pulse output and analogue output cannot be done at the same time.

# Pressure Loss Characteristic



Note) This diagram indicates the case of water at Specific Gravity: 1.00, Viscosity: 1.00mm<sup>2</sup>/s.

$$\Delta P = \{\text{Viscosity}(\text{mPa} \cdot \text{s})\}^{1/4} \times \{\text{Specific Gravity}\}^{3/4} \times \Delta P(\text{Water})$$

## Standard Unit of Receiver

Capacity Model	Receiver	
	Coefficient Correction Output Unit : L/P	Totalizing Meter Standard Unit : L
33(05)	0.01	1
36(06)	0.01	1
38(07)	0.01	1
41(08)	0.01	1
43(09)	0.1	10
45(10)	0.1	10
47(11)	0.1	10
50(12)	0.1	10
52(13)	0.1	10
54(15)	1	100
57(16)	1	100
58(17)	1	100
60(18)	10	1,000
63(19)	10	1,000
64(20)	10	1,000

Note) Figure in the ( ) of capacity model shows the former model code.

## Standard Unit of Intelligent Counting Unit

Capacity Model	Intelligent Counting Portion		
	Totalizing Meter Standard Unit : kL	Momentary Flow Rate Specified Unit : kL/h	Coefficient Correction Output Unit : L/P
33(05)	1 (L)	1 (L/h)	0.01
36(06)	1 (L)	1 (L/h)	0.01
38(07)	1 (L)	1 (L/h)	0.01
41(08)	1 (L)	1 (L/h)	0.01
43(09)	0.01	0.01	0.1
45(10)	0.01	0.01	0.1
47(11)	0.01	0.01	0.1
50(12)	0.01	0.01	0.1
52(13)	0.01	0.01	0.1
54(15)	0.1	0.1	1
57(16)	0.1	0.1	1
58(17)	0.1	0.1	1
60(18)	1	1	10
63(19)	1	1	10
64(20)	1	1	10

Note) Figure in the ( ) of capacity model shows the former model code.

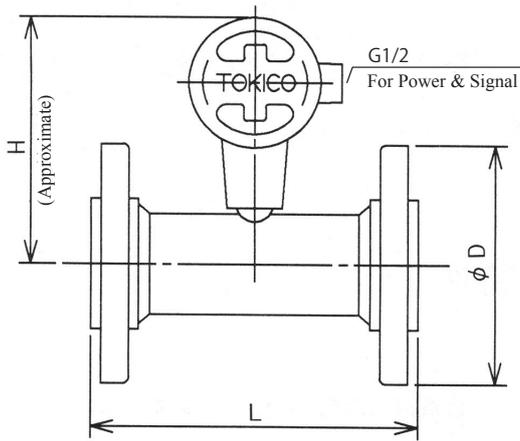
# Basic Model without Intelligent Counting Unit

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Contents					
F	P	L																Potter Meter				
Conn. Size.	B	6																3/4 B	( 20mm)			
	B	8																1 B	( 25mm)			
	0	5																2 B	( 50mm)			
	0	8																3 B	( 80mm)			
	1	0																4 B	( 100mm)			
	1	5																6 B	( 150mm)			
	2	0																8 B	( 200mm)			
	2	5																10 B	( 250mm)			
	3	0																12 B	( 300mm)			
3	5																14 B	( 350mm)				
Capacity Model			Intermittent Maximum Flow Rate (connection)																			
	3	3																2.7 m <sup>3</sup> /h	( 20mm)			
	3	6																4.5 m <sup>3</sup> /h	( 25mm)			
	3	8																8 m <sup>3</sup> /h	( 25mm)			
	4	1																18 m <sup>3</sup> /h	( 25mm)			
	4	3																26 m <sup>3</sup> /h	( 50mm)			
	4	5																36 m <sup>3</sup> /h	( 50mm)			
	4	7																72 m <sup>3</sup> /h	( 50mm)			
	5	0																110 m <sup>3</sup> /h	( 80mm)			
	5	2																180 m <sup>3</sup> /h	( 80, 100mm)			
	5	4																340 m <sup>3</sup> /h	( 100mm)			
	5	7																580 m <sup>3</sup> /h	( 150mm)			
	5	8																820 m <sup>3</sup> /h	( 200mm)			
6	0																1450 m <sup>3</sup> /h	( 250mm)				
6	3																2230 m <sup>3</sup> /h	( 300mm)				
6	4																3500 m <sup>3</sup> /h	( 350mm)				
Pressure																	Max. Working Press.	Hydraulic Test Pressure	Applicable Flange Standard			
																	MPa	MPa	J I S	ASME·JPI		
	B																1.20	1.80	10 K			
	D																1.90	2.85		15 0		
	F																3.10	4.65	20 K			
G																4.96	7.44		30 0			
Material																	Housing	Blade	Object to be applied			
	P	P															SUS304	SUS631	Standard for the Model 54 or below			
	P	B																SUS430	For the Model 57 or more			
Always use - (Hyphen)																						
Transmitter																	Structure		Fluid Temperature			
	A																	Integrated Model	-10~80 °C			
	C																	Separated Model	-10°C or below 80°C or more			
Pickup Coil																	Type		Fluid Temperature	Blade Material		
	A																Reluctance Coil	For Norm. Temp.	-20°C ~180°C			
	B															For High Temp.		180°C or more				
C															For Low Temp.	-20°C or below						
Preamplifier																	Type		Applied Capacity Model	Fluid Temperature	Power	Explosion Proof
	M	A															Standard Type	33 ~ 60 Type	180°C or below	12V DC	Exd II BT4 (Separated Model : d2G4)	
	N	A														Highly Sensitive Type	33 ~ 64 Type	180°C or more				
	O	X														Non-frequency Multiplication Type	33 ~ 60 Type	-10~ 80°C	24V DC	Exd II BT4		
P	X														Frequency Multiplication Type	63 ~ 64 Type						
Always use - (Hyphen)																						
Extension																	L	Extension for Low Temperature (-20°C or less)				
																	H	Extension for High Temperature (80°C or more)				
																	X	None				

Note) For maximum pressure in use : 220 °C or less for JIS, and 38°C or less for ASME-ANSI



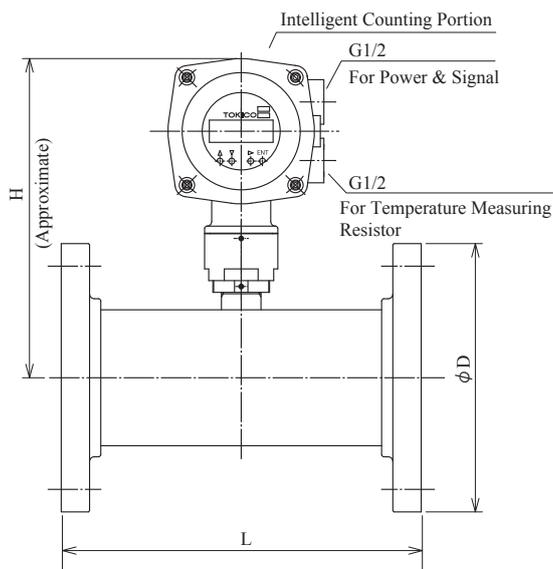
## Dimension Drawing



Model Code	Conn.Size. (mm)	Dimension (mm)			Approx. Weight (kg)
		L	H	φD	
FPL B633	20	140	210	98	5
FPL B836	25	140	215	108	6
FPL B838	25	140	215	108	6
FPL B841	25	140	215	108	6
FPL 0543	50	165	225	152	11
FPL 0545	50	165	225	152	10
FPL 0547	50	165	225	152	9
FPL 0850	80	254	240	190	16
FPL 0852	80	254	240	190	15
FPL 1052	100	305	240	229	29
FPL 1054	100	305	250	229	24
FPL 1557	150	356	275	279	36
FPL 2058	200	406	300	343	65
FPL 2560	250	508	325	406	105
FPL 3063	300	610	350	483	160
FPL 3564	350	711	365	533	200

Note) This table is for ASME·JPI 150 Flange. However, the Dimension "L" is the same as JIS 20K, ASME·JPI 300.

## Dimension Drawing



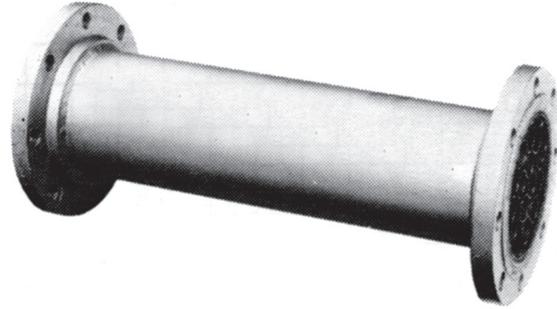
Model Code	Conn.Size. (mm)	Dimension (mm)			Approx. Weight (kg)
		L	H	φD	
FPL B633	20	140	235	98	6
FPL B836	25	140	240	108	7
FPL B838	25	140	240	108	7
FPL B841	25	140	240	108	7
FPL 0543	50	165	250	152	12
FPL 0545	50	165	250	152	11
FPL 0547	50	165	250	152	10
FPL 0850	80	254	265	190	17
FPL 0852	80	254	265	190	16
FPL 1052	100	305	265	229	30
FPL 1054	100	305	275	229	25
FPL 1557	150	356	300	279	37
FPL 2058	200	406	325	343	66
FPL 2560	250	508	350	406	106
FPL 3063	300	610	375	483	161
FPL 3564	350	711	390	533	201

Note) This table is for ASME·JPI 150 Flange. However, the Dimension "L" is the same as JIS 20K, ASME·JPI 300.

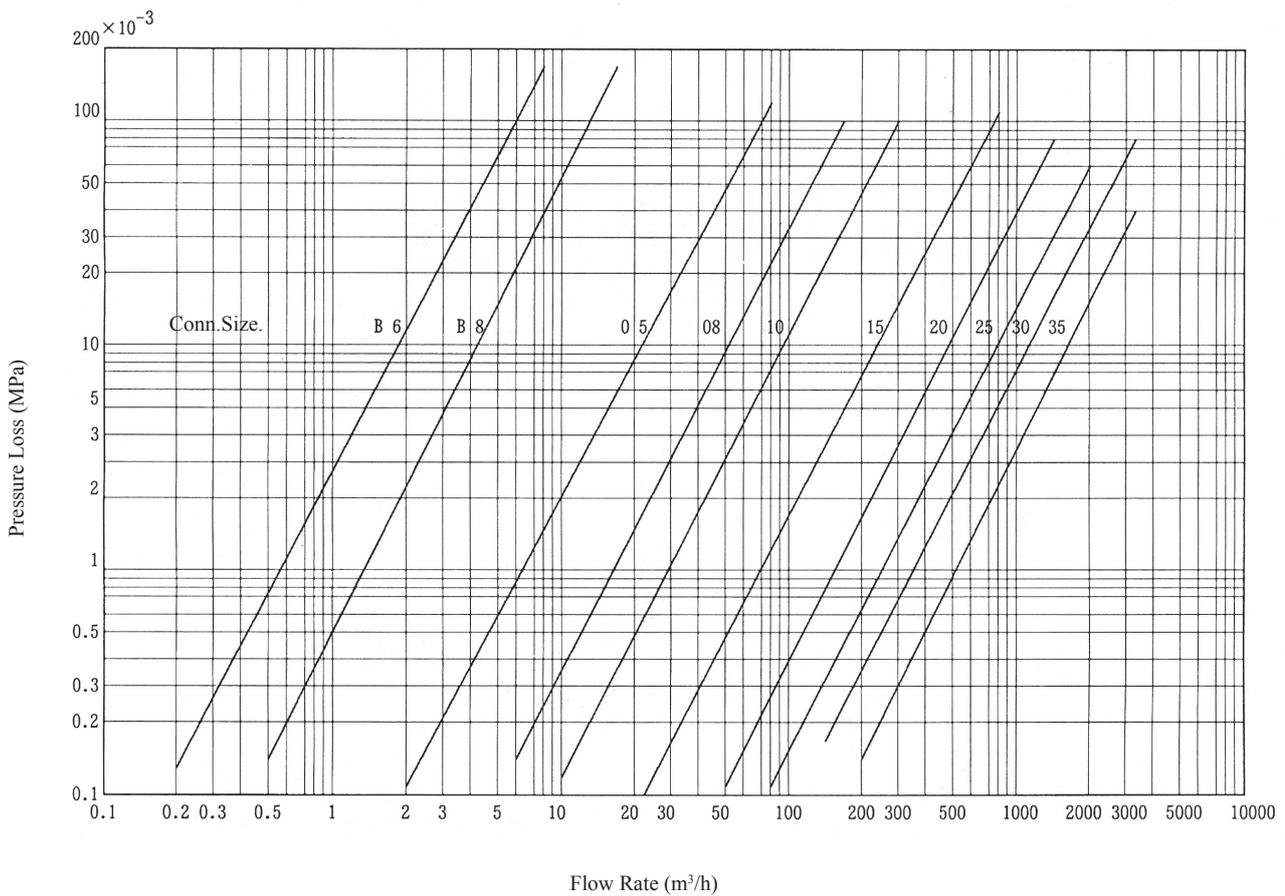
# Accessories [Straightener]

## Overview

The straightener has multiple flow straightening fine tubes inside the main body. In order to keep the accuracy stable, the straightener shall be installed on the upstream side of the turbine meter.



## Pressure Loss Characteristic



Note) This diagram indicates the case of water at Specific Gravity: 1.00, Viscosity: 1.00mm²/s.

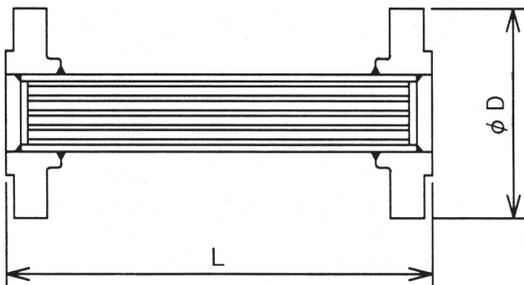
$$\Delta P = \{\text{Viscosity}(\text{mPa} \cdot \text{s})\}^{1/4} \times \{\text{Specific Gravity}\}^{3/4} \times \Delta P(\text{Water})$$

## Basic Model

1	2	3	4	5	6	7	8	Contents	
F	L	S						Straightener	
Conn. Size.	B	6						3/4 B	(20mm)
	B	8						1 B	(25mm)
	0	5						2 B	(50mm)
	0	8						3 B	(80mm)
	1	0						4 B	(100mm)
	1	5						6 B	(150mm)
	2	0						8 B	(200mm)
	2	5						10 B	(250mm)
	3	0						12 B	(300mm)
	3	5						14 B	(350mm)
Pressure								Max. Working Press. MPa	Applicable Flange Standards
	B							1.20	J I S 10 K / ASME·JPI
	D							1.90	150
	F							3.10	J I S 20 K / ASME·JPI
	G							4.96	300
Material								Housing	Rectifying Pipe
	B	P						STPG 370(Standard)	SUS 304
	P	P						SUS 304	

Note) For maximum pressure in use : 220 °C or less for JIS, and 38°C or less for ASME-ANSI

## Dimension Drawing



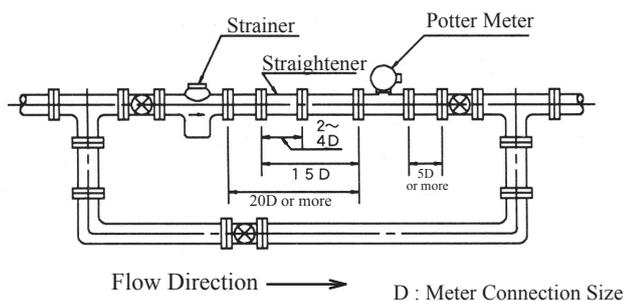
Conn. Size. (mm)	Dimension (mm)		Approx. Wight (kg)
	L	φ D	
20	100	98	1.6
25	110	108	2.2
50	210	152	7
80	330	190	15
100	410	229	22
150	610	279	42
200	810	343	82
250	1010	406	130
300	700	483	145
350	800	533	200

Note) This table is for ASME·JPI 150 Flange. However, the Dimension "L" is the same as JIS 20K, ASME·JPI 300.

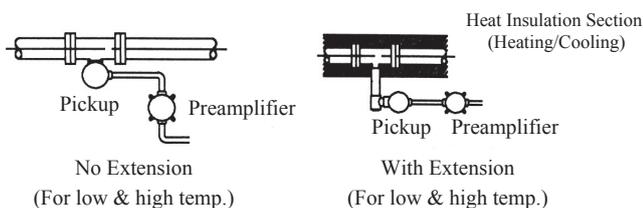
# Cautions for Use

## (1) Caution for Flowmeter Piping Installation

Example of Standard Piping (According to JIS Z8765)



If the fluid temperature is  $-10^{\circ}\text{C}$  less or  $80^{\circ}\text{C}$  more, please separate the Pickup and Preamplifier. (Please remind that the wire length between Pickup and Preamplifier shall be 5 m or less.)



- Please install straight tubes upstream and the downstream of turbine meter like left drawing to correctly reproduce the accuracy at the time of calibration. And, please set up the straightener in turbine meter.
- Please set up the detection edges such as thermometer and pressure gauges (Well) from meter exit to the downstream sides of 5 D or more. And, adjust the flow on the downstream sides of the meter.
- Please use a concentric reducer when you install reducer at the entrance of the meter.
- For the evaporation prevention of the fluid, please maintain the value which satisfies the following expression in fluid pressure P on the meter exit side.

$$P \geq 2\Delta P + 1.25P_v \text{ (According to API MPMS 5.3)}$$

$\Delta P$  : Pressure Loss of meter in the maximum flow rate

$P_v$  : Steam pressure of fluid at maximum working temperature

- Please avoid the installation in the following places to prevent a turbulence and secure a normal signal because turbine meter detects a minute flow signal. Please separate as a standard by 10 m or more.
  - ① High voltage or high current source and the vicinity of that wiring
  - ② Place of magnetic field
- The Turbine meter shall be placed where the vibration is as little as possible. If large vibration is existed, the flow rate is detected in error even there is no state of flow (Output of pulsation in error)

## (2) Caution for Wiring

- Wiring must be used 2 wick shield line. The relation between the thickness and the transmission distance of the wick wire is shown in the table below.

Core Cross Section Area	Transmission Distance
0.9 mm <sup>2</sup>	1.2 km and less
1.25 mm <sup>2</sup>	1.2~1.5 km
2.0 mm <sup>2</sup>	1.5~2.5 km

- Please ground the earth by one point on the receiver side.
- Wiring must not coexist with the electric wire tube etc. of the same position duct as power line of 100 V AC or more. Please separate by 1 m or more when adjoining concurrently even in the case of an different duct.

## Ordering Instructions

Item	Contents
1 Applications	To classify the usage in the Process Control, Trading, Receiving or Shipment etc.
2 Applicable Fluid Name	Name, Composition, With or without contaminant
3 Accuracy	$\pm 0.2\%$ , $\pm 0.5\%$
4 Flow Rate	Maximum, Normal, Minimum (Time of Use For Each Day) (L/h or m <sup>3</sup> /h)
5 Operating Temperature	Maximum, Normal, Minimum ( $^{\circ}\text{C}$ )
6 Operating Pressure	Maximum, Normal, Minimum (MPa)
7 Viscosity and Specific Gravity	Viscosity (at $^{\circ}\text{C}$ ), Specific Gravity (at $^{\circ}\text{C}$ )
8 Connection Standard	Connection Size and Flange Standard, etc.
9 Flow Direction	From the Right to the Left / From the Left to the Right
10 Counting Unit	Unit of Counter (for the Intelligent Counting Unit) (L)
11 Sending Unit	Unit of the Output Pulse (for the Intelligent Counting Unit) (L/P)
12 Applied Regulations	Name of Regulation and Standards
13 Attached Equipment	Necessity of the Strainer, Straightener or Valve etc.
14 Power Supply	

- Contact

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