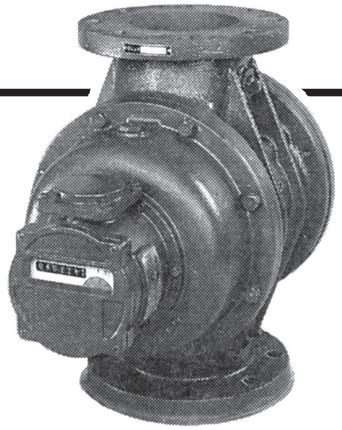
GENERAL SPECIFICATIONS

TOKICO GS-F1190E-03

POSITIVE DISPLACEMENT GAS FLOWMETER



Overview

POSITIVE DISPLACEMENT GAS FLOWMETER is a positive displacement flowmeter for gases which directly measures the flow rate by using two sets of rotors.
Since the two sets of rotors rotate without contact,it is hardly subject to accuracy due to equipment deterioration.

Features

●High Accuracy and Wide Flow Rate Range

This flowmeter has higher accuracy than the calibration tolerance of the measurement regulations,and because a minimum flow can be measured to 5% of the maximum flow, it is suitable for the city gas measurement with a large flow change.

●Wide Pressure Range and Small Pressure Loss

Also, a cast steel body model which is available for gas pressure of 0.97 MPa is prepared.
Moreover, it is suitable also for the measurement of a low-pressure gas, because the pressure loss at the maximum flow rate is less than 0.2 kPa (at normal temperature and low-pressure air).

●Leak-free Transmission System

There is no gas leakage of the transmission system because a magnetic coupling unit is fitted on the rotation transmission from the measurement unit to the indicating unit.

●Small Minimum Sensitivity Flow

Though the minimum sensitivity flow of the rotor type meter is permitted up to 5% of the maximum flow by the measurement regulations, the minimum sensitivity flow of this flowmeter is about 0.1% of the maximum flow.

●Built in Automatic Lubricating Device

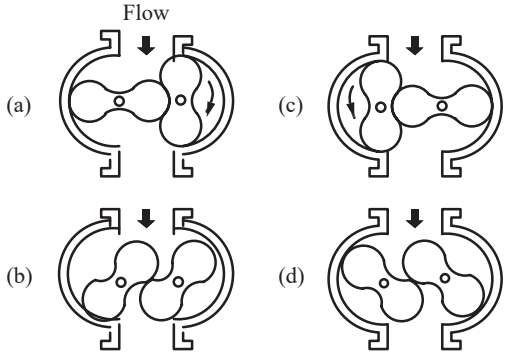
Automatic lubrication of the ball bearings and the driving cogwheels of axis is done even at a low flow rate by a built in automatic lubricating device of small rotation resistance. Moreover, because the oil surface meter is attached to the device, lubricant level check is easy.

Standard Specification (Measuring Unit)

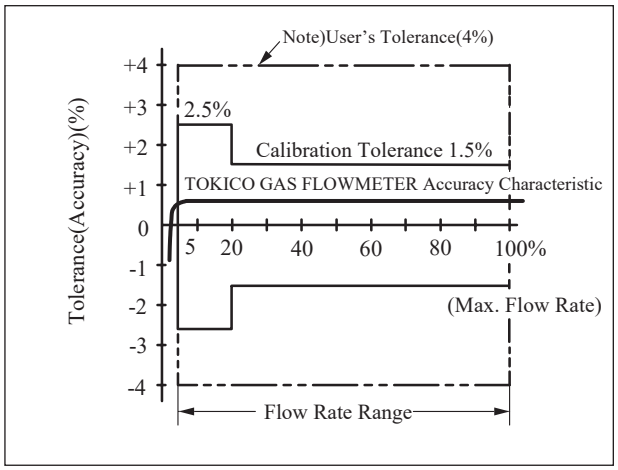
Applicable Fluid Note)1		City Gas,Natural Gas,Methane,Ethane,Propane, Butane,Air,Carbon Gas,Carbon Monoxide, Nitrogen,Helium,Hydrogen etc.	
Accuracy		Calibration Tolerance Note)2	
Flow Rate Range		Refer to the flow rate range table.	
Fluid Temperature		-10～40℃	
Max.Working Pressure		Max.0.49 MPa	Max.0.97 MPa
Test Pressure	Hydraulic Pressure	0.98 MPa	1.57 MPa
	Air Tight Pressure	0.61 MPa	1.27 MPa
Connection Size		50mm(2B)～300mm(12B)	
Flange Rating		JIS 10K FF	JIS 10K RF
Material	Body	FC250	SCPH2
	Rotor	AC(Aluminum)	
	Magnetic Coupling	C3604,etc.	
Piping Installation		Vertical Piping(TOP→BOTTOM)	
Paint Color		Munsell 1.4 PB 3.1/1.2	

Note) 1. The flow rate range might be different from the standard for the gases with small density such as helium and hydrogen.
2.Min.Flow Rate～20% of Max.Flow Rate:±2.5%
20% of Max.Flow Rate～Max.Flow Rate:±1.5%

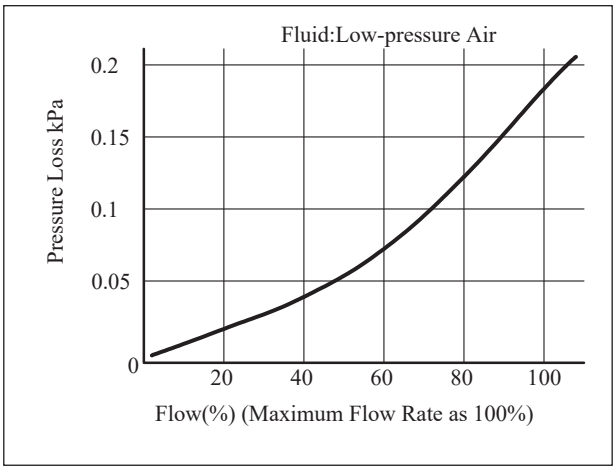
Principle of Operation



Performance Characteristic



Pressure Loss Characteristic



Note) User's tolerance when inspecting the meter while installed.
: ±4%
User's tolerance when inspecting the meter while detached.
20～100% flow : ±3.5%
5～ 20% flow : ±4%

Flow Rate Range

Model	Conn. Size (mm)	Flow rate range (m^3/h)
0050	50	2.5 ～ 50
0125	80	5 ～ 125
0200	100	10 ～ 200
0350	150	15 ～ 350
0500		25 ～ 500
Z500	200	
0700	150	35 ～ 700
1000	200	50 ～ 1,000
2000	300	100 ～ 2,000

Flow rate conversion formula

$V=Vn \cdot Pn/(P+101,325)$

V:Flow rate in use(m^3/h)

P:Pressure in use(Pa)

Vn:Flow rate at standard state (m^3/h [normal])

Pn:Pressure at standard state (=101,325 Pa [abs])

Standard Specification (Counter Type Indicating Unit)

Display	Totalizing Counter	7 digits
	Auxiliary Scale	50-capitation scale
Contact Pulse Transmitter.	Method	Lead switch
	Structure	Drip-Proof Note)
	Output Signal	12V DC 0.1A 1.2W
	Contactor Capacity	Contact pulse (a-contact, c- contact)
	Contactor Life	About 50 Million Transmissions
	Wiring Connection	G1/2
	Signal Cable	2 wicks shield line
	Cross - section Area of Cores	0.75～2mm^2 （Outside diameter of cable：φ9～10.5）
	Transmission Distance	150 m
	Ambient Temperature	-10 ～ 40℃

Note) This transmitter is non-explosion-proof structure. When setting the meter up in a hazardous area, Please install the meter by the intrinsically safe explosion-proofs by using the pulse barrier (contact converter).

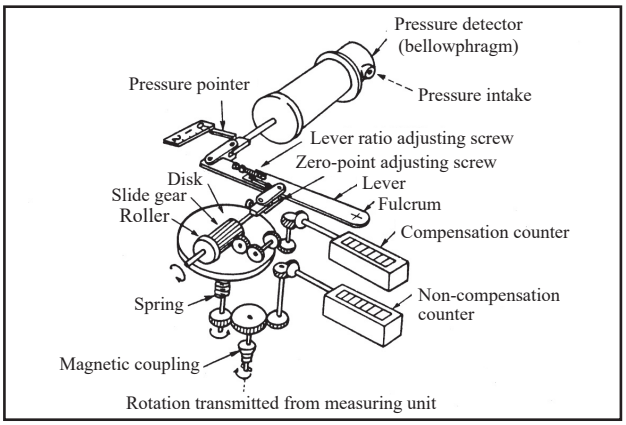
Mechanical Type Pressure Compensator

The mechanical type pressure compensator automatically converts and indicates the volume at base pressure (or any predetermined pressure) on the basis of the actual working pressure and volume of the gas measured by the measuring unit. Adapting a bellowphragm as the pressure detector, measures very accurately and has good response to pressure change.Since the pressure compensator unit adopts an accurate operating mechanism, highly accurate compensation can be done over a wide pressure range. The pressure compensator requires periodical checking/maintenance (lubricating, overhaul cleaning, etc.).

Principle

Pressure change in the piping is detected as displacement by the bellowphragm of the pressure detector and transmitted to the operating unit via the lever mechanism. On the other hand, counting of the volumetric flow is transfered into the operating unit through the magnetic coupling and reduction gear train. The operating unit operates the pressure and volume by means of the stepless speed change transmission mechanism and indicates the volumetric flow under base pressure.

Structure



Pressure Compensation Formula

By the Boyle-charle's law,

$$V_0 = \frac{P_1}{P_0} \cdot \frac{T_0}{T_1} \cdot V_1$$

V:Volume of gas

P:Absolute pressure of gas

T:Absolute temperature of gas

suffix 0 is in the state of the standard.
(0 ℃,101,325 Pa[abs])

suffix 1 is in the state of use.

If only the pressure is considered, the volume ratio at the standard state versus the actual state is proportional to respective pressure.

$$V_0 = \frac{P_1}{P_0} \cdot V_1$$

The equation below is obtained.
If the base pressure P 2 is assumed to be 0.981 kPa{100 mmAq} to be supplied to the user,the gas volume V 2 at the base pressure will be :

$$V_2 = \frac{P_1}{(101{,}325+981)} \cdot V_1$$

The operation by the above formula is auto-matically accomplished by the mechanical pressure compensator.

Standard Specification

Compensating Range	0.050 ～ 0.30 MPa
	0.250 ～ 0.80 MPa
Base Pressure	0.981 kPa
Operation Accuracy	±1%
Structure	Drip- proof

Standard Units of Totalizing Unit and Range of Application

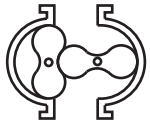
Counter Indicator

Model	Conn. Size (mm)	Max. Flow Rate (m^3 /h)	Indicator type		
			0X, 0T		0T
			Totalizing Counter (7digits) (m^3)	Auxiliary Scale (L)	Contact Pulse (m^3/P)
0050	50	50	0.1	2	0.1
0125	80	125	1	20	1
0200	100	200			
0350	150	350			
0500		500			
Z500	200				
0700	150	700			
1000	200	1,000			
2000	300	2,000			

Mechanical Pressure Compensator

Model	Conn. Size. (mm)	Max. Flow Rate (m^3/h)	Indicator type									
			3X,3T					8X,8T				
			Compensated value			Non-compensated value		Compensated value			Non-compensated value	
			Totalizing Counter (7digits)(m^3)	Auxiliary Scale (L)	Contact Pulse (m^3/P)	Totalizing Counter (7digits)(m^3)	Auxiliary Scale (L)	Totalizing Counter (7digits)(m^3)	Auxiliary Scale (L)	Contact Pulse (m^3/P)	Totalizing Counter (7digits)(m^3)	Auxiliary Scale (L)
0050	50	50	0.1	2	0.1	0.1	2	1	20	1	0.1	2
0125	80	125	1	20	1	1	20	10	200	10	1	20
0200	100	200										
0350	150	350										
0500		500										
Z500	200											
0700	150	700										
1000	200	1,000										
2000	300	2,000	10	200								

Example of Instrumentation

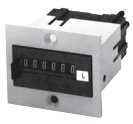


Counter Type
TOKICO GAS FLOWMETER

Contact Pulse Transmitter
(lead switch)

Pulse Barrier

Contact Pulse Signal



Electromagnetic Counter

Basic Models

1	2	3	4	5	6	7	8	9	10	11	12	13	14	Contents
F	R	G												POSITIVE DISPLACEMENT GAS FLOWMETER

Model	Applied Connection Size	Max. Flow Rate
0 0 5 0	2B (50 mm)	50m³/h
0 1 2 5	3B (80 mm)	125m³/h
0 2 0 0	4B (100 mm)	200m³/h
0 3 5 0	6B (150 mm)	350m³/h
0 5 0 0	6B (150 mm)	500m³/h
Z 5 0 0	8B (200 mm)	500m³/h
0 7 0 0	6B (150 mm)	700m³/h
1 0 0 0	8B (200 mm)	1000m³/h
2 0 0 0	12B (300 mm)	2000m³/h

Max. Working Pressure	Max. Working Press. MPa	Outside Material	Applicable Flange Rating
A	0.49	FC250	JIS 10K FF
B	0.97	SCPH2	JIS 10K RF

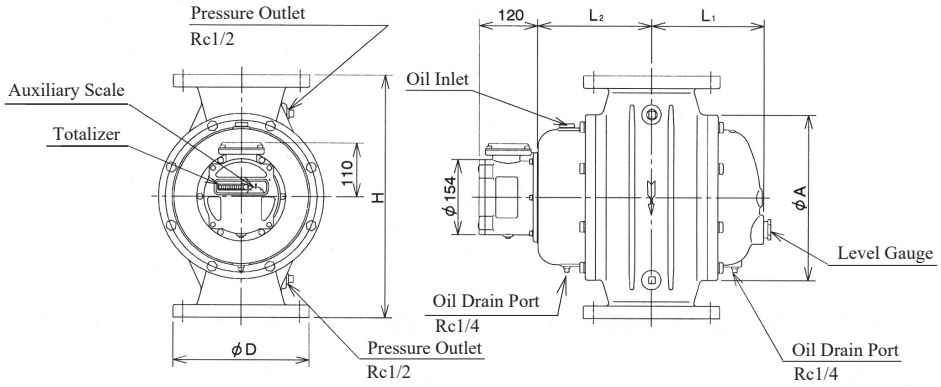
Material	Body	Rotor	Magnetic Coupling
A A	FC250	AC	C3604 etc.
N A	SCPH2		

—	

Indicator		Indicator	Output Pulse	Press. Compensation Range
0 X	Mechanical Type	Direct- Reading	None	———
0 T			Contact Pulse	———
3 X		Pressure Compensation	None	0.05～0.30MPa
8 X				0.25～0.80MPa
3 T			Contact Pulse	0.05～0.30MPa
8 T				0.25～0.80MPa

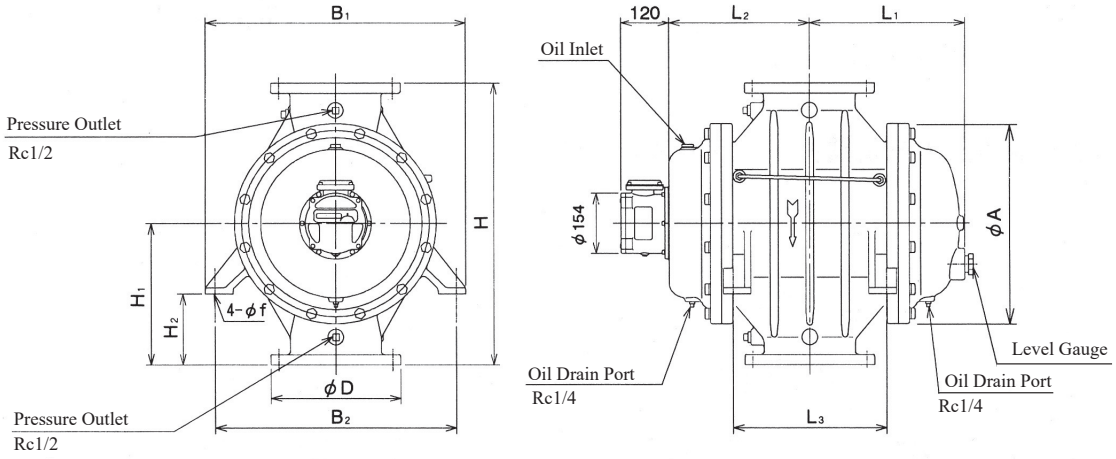
Dimension Drawing

With Counter Indicator (Model 0050～0700)



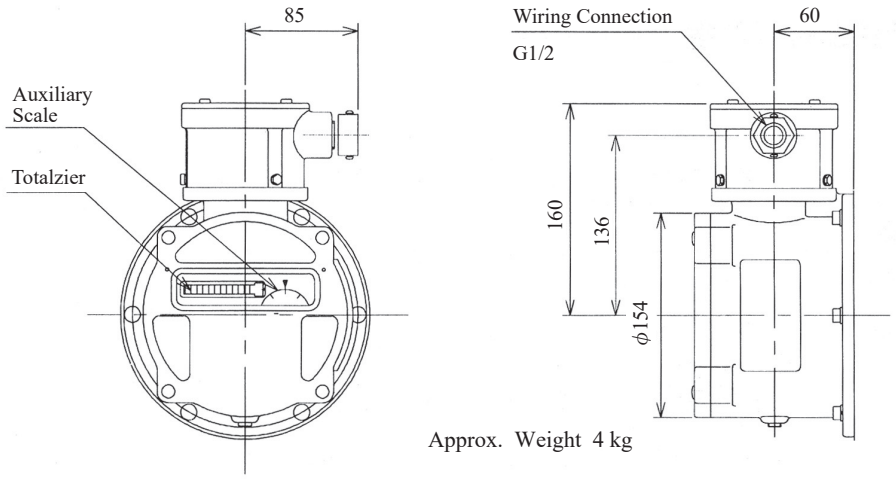
Model	Conn. Size (mm)	Dimensions (mm)					Approx. Weight (kg)
		H	L_1	L_2	ϕA	ϕD	
0050	50	220	130	150	161	155	22
0125	80	340	167	182	235	185	50
0200	100	400	177	185	280	210	60
0350	150	500	230	235	340	280	105
0500		620	265	253	420		175
Z500	200					330	180
0700	150		312	300		280	220

With Counter Indicator (Model 1000～2000)



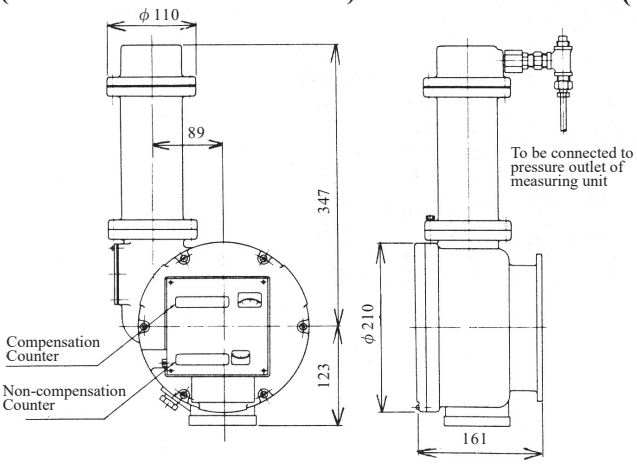
Model	Conn. Size (mm)	Dimensions (mm)											Approx. Weight (kg)
		H	H_1	H_2	L_1	L_2	L_3	ϕA	B_1	B_2	ϕD	ϕf	
1000	200	720	360	180	393	360	390	512	660	612	330	20	360
2000	300	920	460	240	592	636	620	636	780	720	445	22	1,100

Counter Indicator (With Contact Pulse Transmitter)



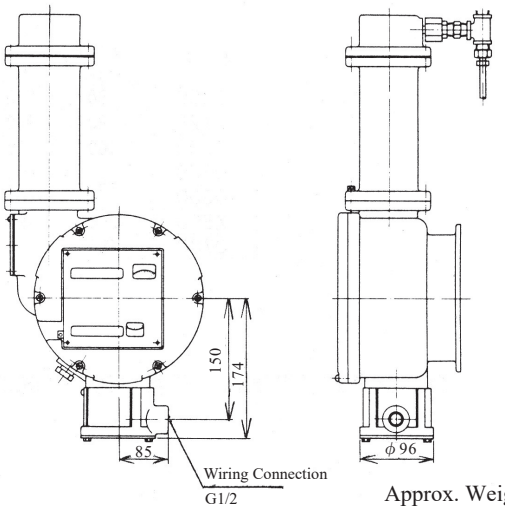
Approx. Weight 4 kg

Mechanical Pressure Compensator (Without Pulse Transmitter)



Approx. Weight 11 kg

Mechanical Pressure Compensator (With Contact Pulse Transmitter)



Approx. Weight 12 kg

Attached Equipment

Strainer for Gas

Two models of “Strainer only for gas”with large filter area and small pressure loss and“Y type strainer for gas” are prepared.

Standard Specification

Model		Strainer Only for Gas	Y Type Strainer for Gas
Fluid Pressure		Max. 0.3MPa	Max. 0.97MPa
Pressure Loss		About0.098 k P a	About0.294 kPa
Test Pressure	Hybraulic Pressure	0.5 MPa	1.57 MPa
	Air Tight Pressure	0.36 MPa	1.27 MPa
Flange Rating		JIS 10K FF	J1S 10K FF or RF
Material	Body	SS400,SGP	SS400,STPG
	Screen	SUS304(200mesh)	SUS304(200mesh)
Paint Color		Munsell1.4PB 3.1/1.2	

Basic Models

1	2	3	4	5	6	7	8	Contents		
F	S	G						Strainer Only for Gas		
Conn. Size			0	8				3 B (80 mm)		
			1	0				4 B (100 mm)		
			1	5				6 B (150 mm)		
Max.Working Pressure					A			Max. Working Press. 0.3 MPa		
Material								Body	Screen	Frame
						B	K	SGP/SS400	SUS304	SS400+Zinc Plating

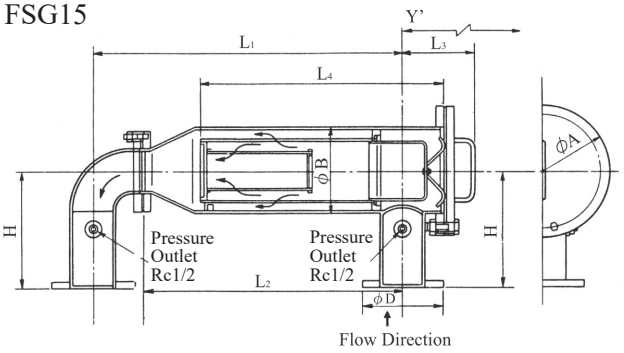
1	2	3	4	5	6	7	8	Contents			
F	S	I						Y Type Strainer for Gas			
Conn. Size			0	5				2 B (50 mm)			
			0	8				3 B (80mm)			
			1	0				4 B (100 mm)			
			1	5				6 B (150 mm)			
Max.Working Presure					B			Max.Working Press.0.97 MPa			
Material								Body	Screen	Frame	Conn.Size
						D	P	FCD450/SS400	SUS304	———	15 Type is excluded
						B	P	STPG/SS400	SUS304	SUS304	15 Type Only

1	2	3	4	5	6	7	8	Contents		
F	S	F						Y Type Strainer for Gas		
Conn. Size			2	0				8 B (200 mm)		
			2	5				10 B (250 mm)		
			3	0				12 B (300 mm)		
Max.Working Presure					B			Max.Working Press.0.97 MPa		
Material								Body	Screen	Frame
						B	P	SGP/SS400	SUS304	SUS304

Dimension Drawing

Strainer Only for Gas

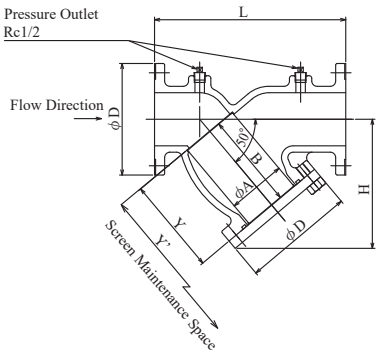
FSG08 ～ FSG15



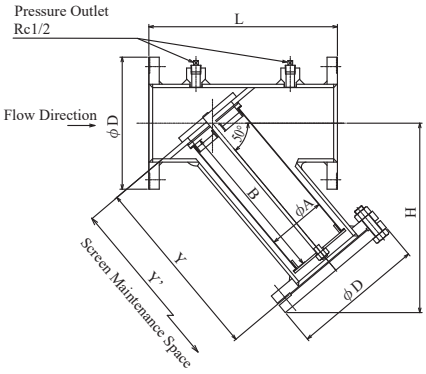
Model	Conn. Size (mm)	Dimensions(mm)									Approx. Weight (kg)
		L1	L2	L3	L4	H	ϕA	ϕB	ϕD	Y'	
FSG08	80	630	529	176	528	200	280	165.5	185	625	53
FSG10	100	750	624	189	616	250	330	216.5	210	726	75
FSG15	150	1100	918	259	926	300	445	318.5	280	1102	157

Y Type Strainer for Gas

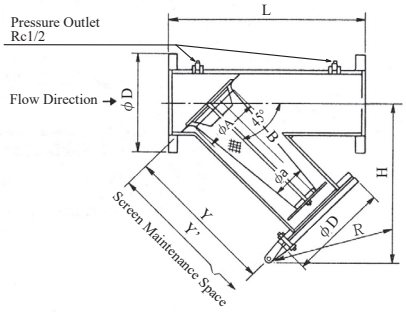
FSI 05～10



FSI 15



FSF20～ FSF30

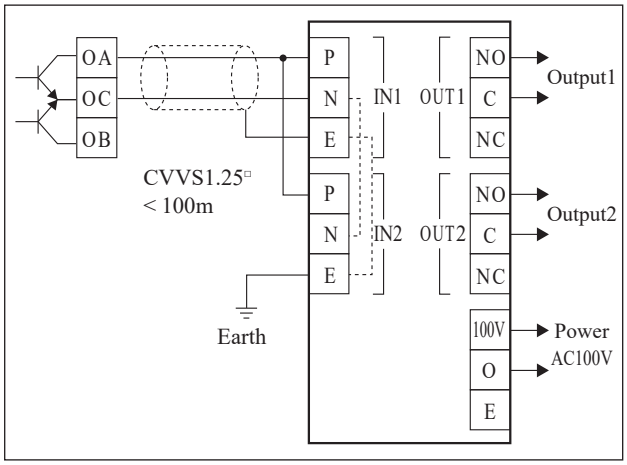


Model	Conn. Size (mm)	Dimensions(mm)									Appeox. Weight (kg)
		L	H	Y	ϕA	ϕa	B	ϕD	R	Y'	
FSI 05	50	320	180	122	56	−	120	155	−	250	16
FSI 08	80	350	220	152	88	−	150	185	−	310	28
FSI 10	100	360	250	182	110	−	180	210	−	370	35
FSI 15	150	400	405	393	126	−	340	280	−	750	55
FSF20	200	650	531	510	183	117	452	330	384	1000	67
FSF25	250	750	620	592	223	143	522	400	461	1200	110
FSF30	300	900	730	720	277	168	642	445	513	1400	135

Pulse Barrier (Contact Converter)

With the pulse barrier, the contact pulse transmitter is classed as an intrinsically safe explosion-proof system,and the intrinsic safety explosion-proof system isachieved by the installation of the barrier between the POSITIVE DISPLACEMENT GAS FLOWMETER with contact pulse transmitter,and an ordinary receiver
（non- explosion-proof area).

Example of Connection



Standard Specification

Model		3001-3R	3002-3R	3003-3R
Number of Channels		1	2	5
Explosion-proof Structure		Intrinsically Safe(Target gas:3nG5)		
Intrinsic Safety Circuit (Load Side)	Input Contact Open CircuitVoltage	15V DC		
	Input Contact Short-Circuit Current	15mA		
Ordinary Circuit	Output Mode (Each Channel)	Contact Relay Output1a Rating:3A(AC220V, DC24V)MAX. Non-inductive Load		
Power Supply		AC100/110V, 200/220V ±10% 50/60Hz		
Power Consumption		2.8VA	3.2VA	4.0VA
Response Time		10ms		
Operation Recovery Time		10ms		
External Wiring	Alllowable Capacitance	0.05μF/ch or Less		
	Allowable Inductance	1mH/ch or Less		
Approx.Weight		0.7kg or Less	0.8kg or Less	1.0kg or Less

Oil for POSITIVE DISPLACEMENT GAS FLOWMETER

Please use our exclusive oil for the POSITIVE DISPLACEMENT GAS FLOWMETER.

Oil Change Interval

Depending on defferent conditions,there is a diffrence in oil changing. Change oil once after a year,then change according to dirt levels.

Required Oil Quantity

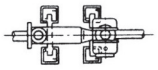
Model	Required Oil Quantity(L)
0050	0.25
0125	0.4
0200	0.75
0350	1.3
0500	2.3
Z500	
0700	
1000	4
2000	9

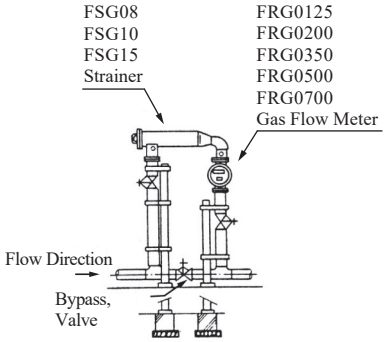
⚠ Cautions for Use

- Be sure to operate the flowmeter within the specification stamped on the name plate.
- Please give the flow direction from top to bottom, and install the flowmeter so that the rotor shaft become horizontal.
- Please provide the space for the convenience of flowmeter disassembly and maintenance.
- Because the dirt in piping causes the breakdown,please note that neither the welding waste nor sand,etc. enter especiallyat the new piping.
- Please inject oil into the flowmeter before the driving because the oil is not poured when the flowmeter is shipped.
- Please do not remove the dustproof seals attached on the entrance and the exit of the flanges of the flowmeter, immediately before the installation.
- The seal paint must not flow in the measurement room when painting the seal for the gas leakage prevention when the gas meter is installed.

Piping Example

Connection Size
:80 ~ 150 mm





Ordering Instructions

	Item	Contents
1	Applicable Fluid Name	Name
2	Accuracy	± % (The standard is to conform to the official approval allowance)
3	Flow Rate	Maximum, Normal use, Minimum (Time of use for each day)(m^3/h)
4	Operating Temperature	Maximum, Normal use, Minimum(℃)
5	Operating Pressure	Maximum, Normal use , Minimum(MPa)
6	Connection Standard	Connection size, Flange standard etc.
7	Pressure Correction	Necessary or no, Range of compensation and standard pressure, etc. if it is necessary
8	Applied Regulations	Name of regulations and standard
9	Attached Equipment	Necessity of Strainer etc.
10	Power Supply	With the Pulse transmitter

*Be sure to read the instruction manual carefully before you use this meter to ensure you use it correctly.
*Note that the contents may be subject to change without notice.

● Contact

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