FLOWMETER

Integral mold flowmeter
available for ultra-pure water/chemicals

Instruction manual
for

FM-PF Series
(Excel type)

Caution

Before use, please read this Instruction manual with caution for your safety operation. Please always keep this Instruction Manual at hand for your quick reference when necessary.

TOFLO CORPORATION

37-R06

Safety precaution

We highly appreciate your purchasing our products of flowmeter modeled " **FM-PF Series (Excel type)** ". Please read thoroughly this Instruction Manual ensuring the following descriptions in order to properly use and for your safety operation, and also for the purpose of prevention from disaster that might be caused.
The " **Safety precaution** " intends to prevent the users or persons in charge from injury or to take precaution against preventing damage to the property which may happen so that it is required to read through with a better understanding.

⚠ **Warning**	This is the safety –alert symbol which indicates the potential for the death or serious injury which might be caused.
⚠ **Caution**	This is the safety-alert symbol which indicates the potential for injury or material damage which might be caused.

Table of Contents

1. Features

FM-PF Series (Excel type) is a flowmeter which has been designed for the use in pure water (and ultra-pure water) requisite for the semiconductor industry and excellent in leakage resistance and the fluid to be measured can be measured as it is left clean, because it is made from an integral moulding. And as not alone the appearance but all the body is made from fluorocarbon resin, it can be securely used in the corrosive atmosphere and even under the harsh conditions.

- ☆ Due to the employment of PFA integral moulding (made from all Teflon), there is no fear of eakage, and the cutting area has been reduced to the utmost.
- ☆ Available for the strong acid and alkali chemicals, and also for the flow measurement of highly purified gases.
- ☆ If setting the sensor head to the desired values of flow, it can produce an abnormal signal of flow.

2. Type selection

FM-PF	Std	Shape 1	Shape 2	Name of fluid	Units of flow	Max flow	Pipe size	Opt.	For specif. item	
FM-PF	200	-0	3	1	-B	2	-21	-PD1	For instance of entry / Description	
								PF	Perfluoro packing	
								PD 1	With photosensor formed dark-on at 24VDC±10% ＊7	
								PL 1	With photosensor formed light-on at 24VDC±10% ＊7	
								PD 2	With photosensor formed dark-on at 12VDC±10% ＊7	
								PL 2	With photosensor formed light-on at 12VDC±10% ＊7	
								W	Cap to be welded	
							02		Rc3/8	400
							03		1/2	500
							04		3/4	
							21		TV1/4	200
							22		3/8	300
							23		1/2	400
							24		3/4	500
						2			It indicates max flowrate. ＊6	
					A				mL/min	
					B				L/min	
					Z				For specif. unit ＊5	
				1					Pure water	
				9					For specif. fluid ＊4	

Shape 1	
0	With no needle valve
2	With needle valve at upper side
9	For specif. shape ＊1

Shape 2	
0	With no sensor
1	With contact A of magnetic side switch ＊2
2	With contact B of magnetic side switch ＊2
3	With contact A of magnetic rear switch
4	With contact B of magnetic rear switch
9	For specif. shape ＊3

Std	Maximum flowrates
200	Up to 2 L/min
300	Up to 3.5 L/min
400	Up to 15 L/min
500	Up to 50 L/min

＊1, ＊3, ＊4, and ＊5: For specif. items specify them at the end of this Type Selection in order.
＊2: For installation of magnetic switch, standard installation is on right as one faces.
＊6: See a table of flowrates shown below
＊7: When selecting photosensor, select the item 9 in Shape 2, and specify it at the Optional items.

3. Specifications

Flow accuracy	FS±5%	
Max operating pressure	0.35Mpa(G)	
Operating fluid temperature	Max 40℃	
Ambient temperature	0 – 40 ℃ (Non condensing)	
Contact form	**Magnetic switch**	**Photosensor**
	Contact A	Dark-on
	Contact B	Light-on
Contact capacity	0 – 24VDC	12VDC or 24VDC
	Max 0.2A	Max 80mA
Cord length	50 cm	2 m
Cleanliness factors	Grade – (Compliant with our standards)	
	Ultrasonic cleaning by alcohol	
	Assembled in clean room	
	Nitrogen gas charging packing	

⚠ Warning

※ Use the FM-PF Series Excel typed fowmeter within the rated pressure.
※ Use the FM-PF Series Excel typed flowmeter within the range of the operating heat resistance.
※ If exceeded the rated pressure and temperature, it may cause damage to the tapered tube.
※ Use the FM-PF Series Excel typed flowmeter filled fully with fluid inside the meter body. Mixing of the bubbles into the inside of the flowmeter can cause it to read inaccurately and/or malfunction.

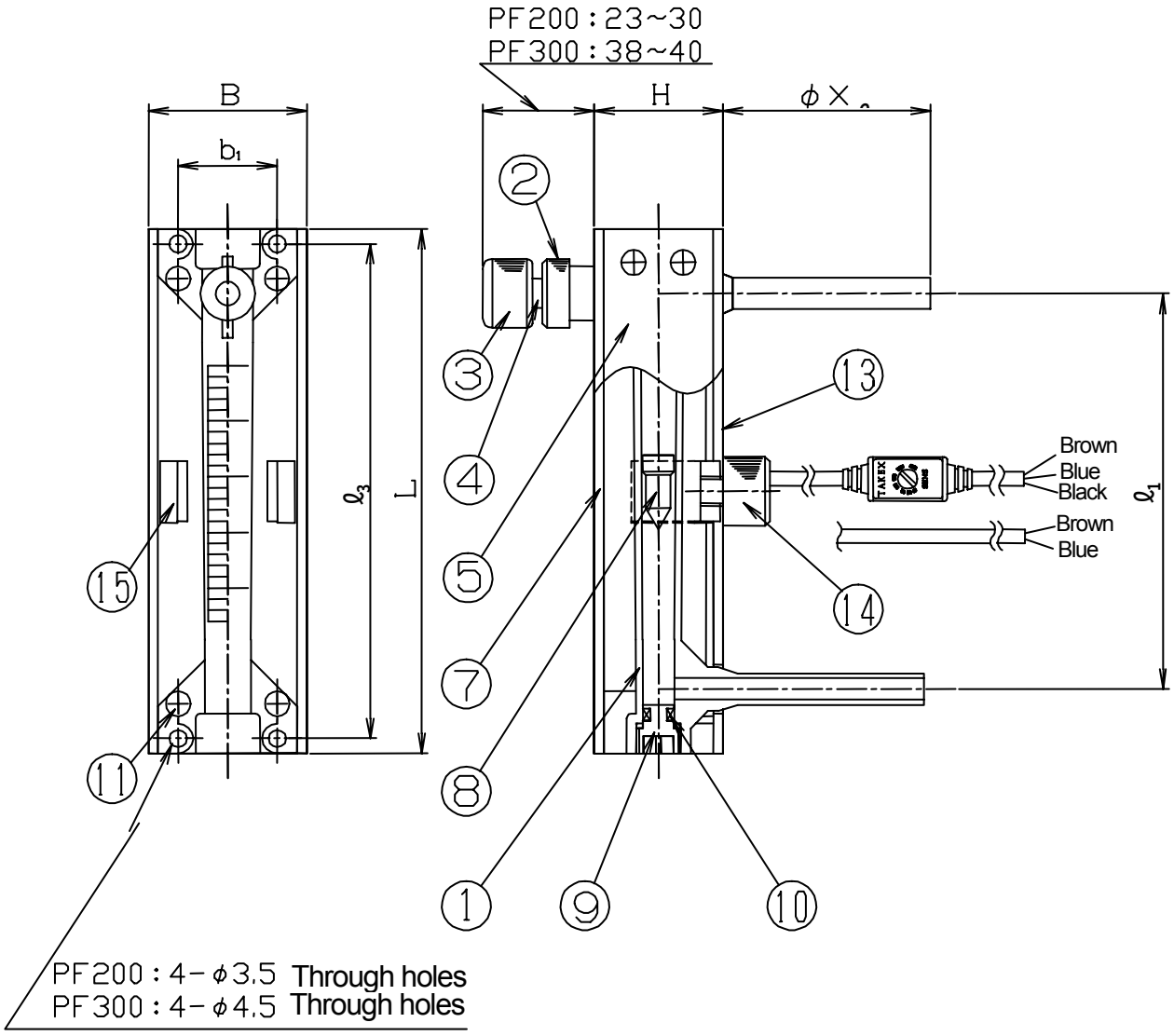
4. A table of flowrates and standard dimensions

Std	Flow indication	Dimensions (m/m)																
		L	ℓ1	ℓ2	ℓ3	ℓ4	ℓ5	ℓ6	Ho	H	B	b1	b2	b3	D	Do	Rc	Φxℓ	Remarks
200	**mL/min** 2 ~ 20	106 (110)	80	60	100	—	10	—	—	26	32	20	26	30	—	17	—	6.35 X 4.35 X 42	Magnetic sensor impossible to use
	5 ~ 50																		
	10 ~ 100																		
	20 ~ 200																		
	20 ~ 300																		
	50 ~ 500																		
	L/min 0.1 ~ 1																		
	0.2 ~ 2																		
300	0.1 ~ 1	134 (138)	100	76	124	—	12	80	—	32	37	26	28	33	15	21	—	9.53 X 6.33 X 47	Magnetic sensor impossible to use
	0.2 ~ 1.5																		
	0.2 ~ 2																		
	0.2 ~ 2.5																		
	0.2 ~ 3																		
	0.4 ~ 3.5																		
400	0.2 ~ 3	169 (165)	115	80	90	75	12.5	63	57	51	42	28	30	43	29	29	Rc 3/8	12.7 x 9.5 x 100	Mg sensor impossible to use
	0.4 ~ 5																		
	1 ~ 10																		
	2 ~ 15																		
500	2 ~ 15	206 (198)	150	100	112	90	19	80	65	57	52	30	32	52	39	37	Rc 1/2 3/4	19 x 15.8 x 100	Magnetic sensor impossible to use
	2 ~ 20																		
	3 ~ 30																		
	4 ~ 40																		
	4 ~ 50																		

* Flowrates shown above are ones equivalent to water at 20℃.

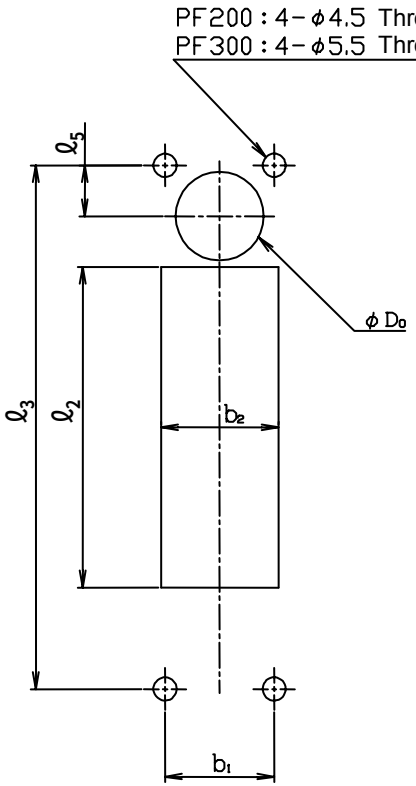
5. Structural drawing

◆ PF200/300 types with photosensor



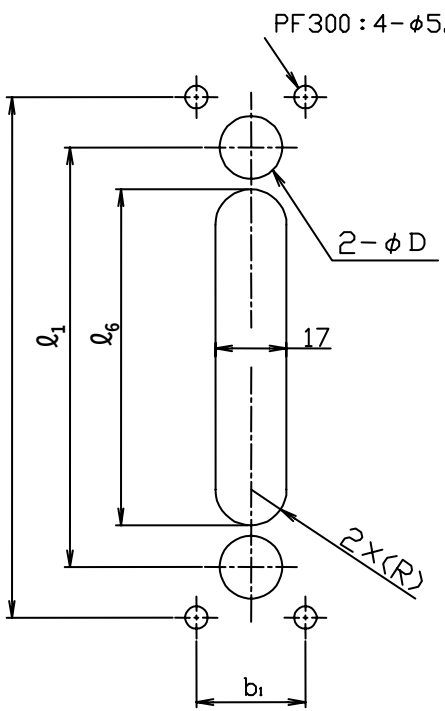
■ **For panel cut-out (Panel embedded type)**

◆ **PF200/300**



■ **For panel cut-out for the type with rear magnetic switch (Front panel type)**

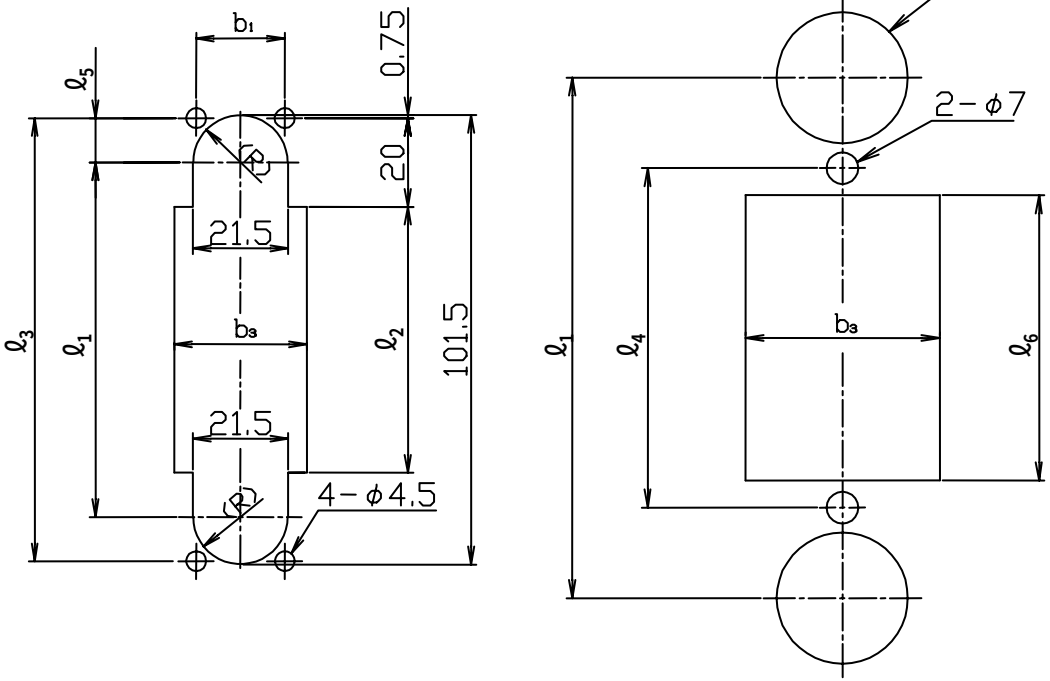
◆ **PF300**



■ **For panel cut-out for the type with Photosensor (Front panel type)**

◆ **PF200**

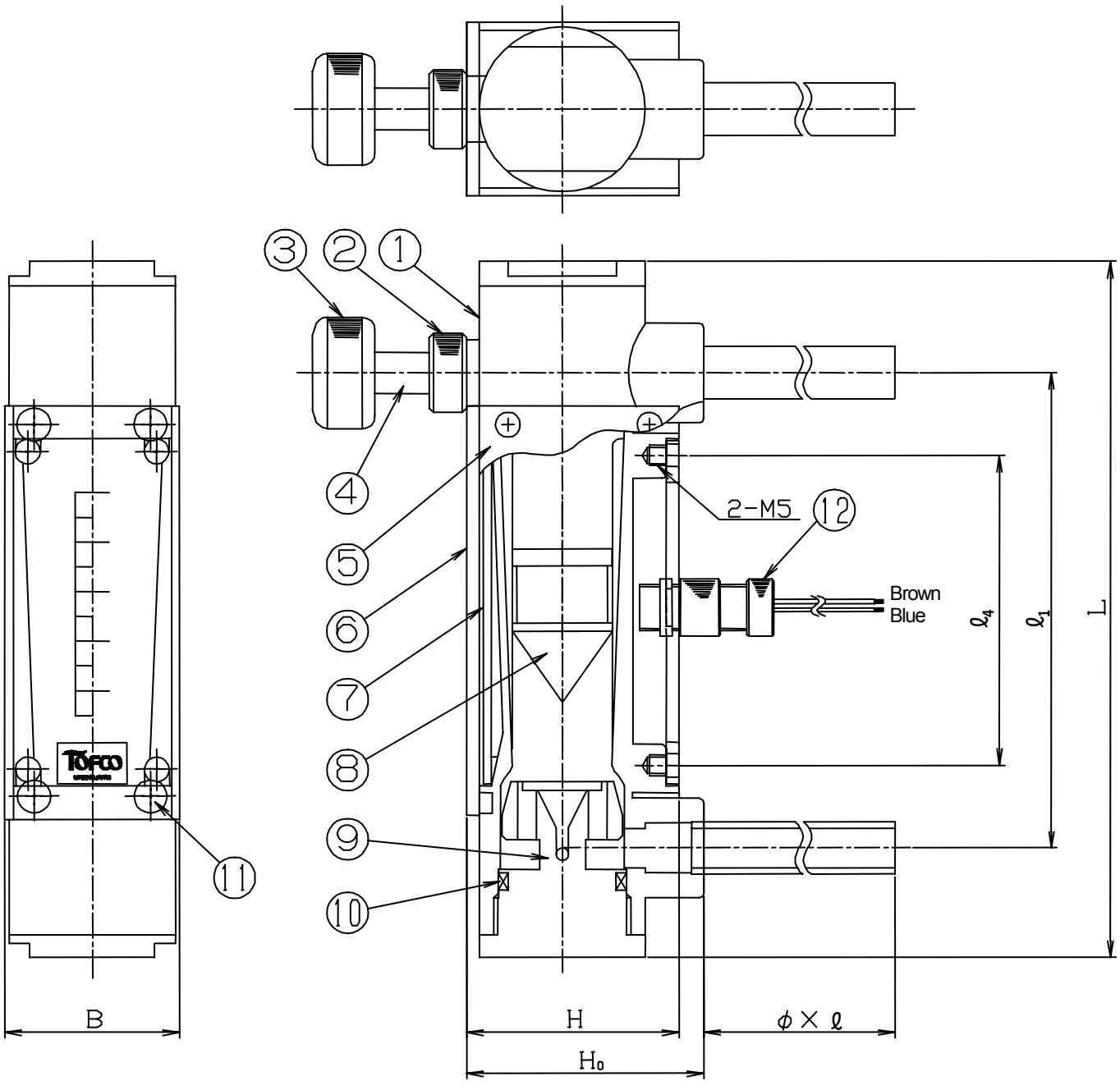
◆ **PF300**



∗ **If the type is without needle valve, there is no need to provide with φ Do.**

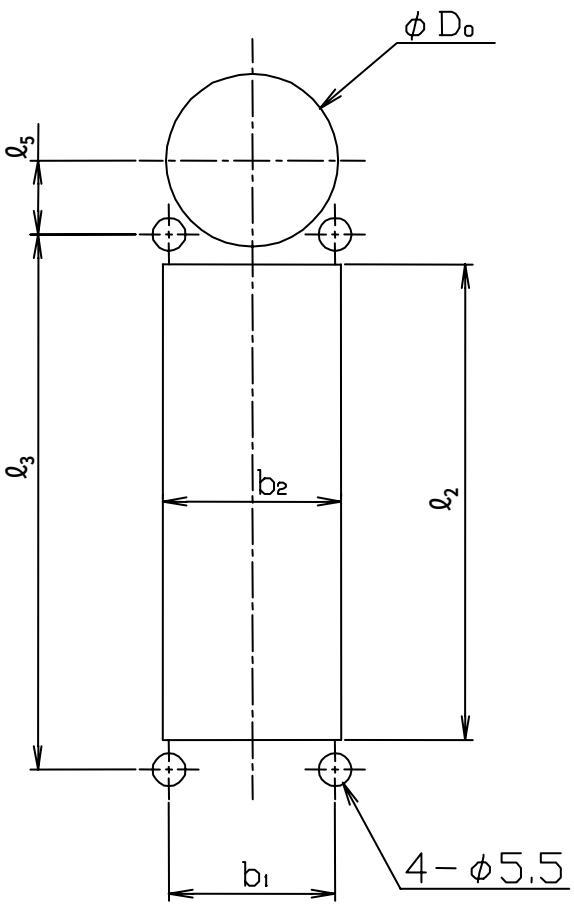
6. Structural drawing

◆ PF400/500 types with rear magnetic switch



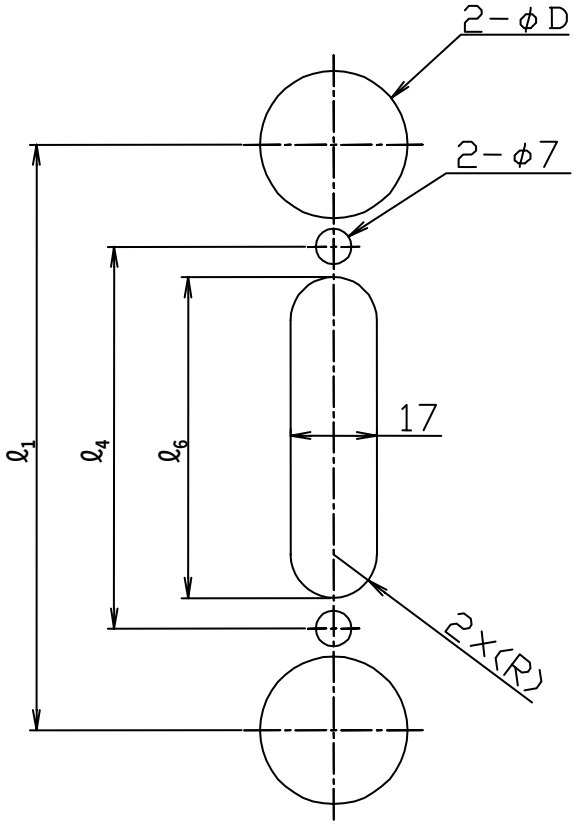
■ **For panel cut-out (Panel embedded type)**

◆ **PF400/500**



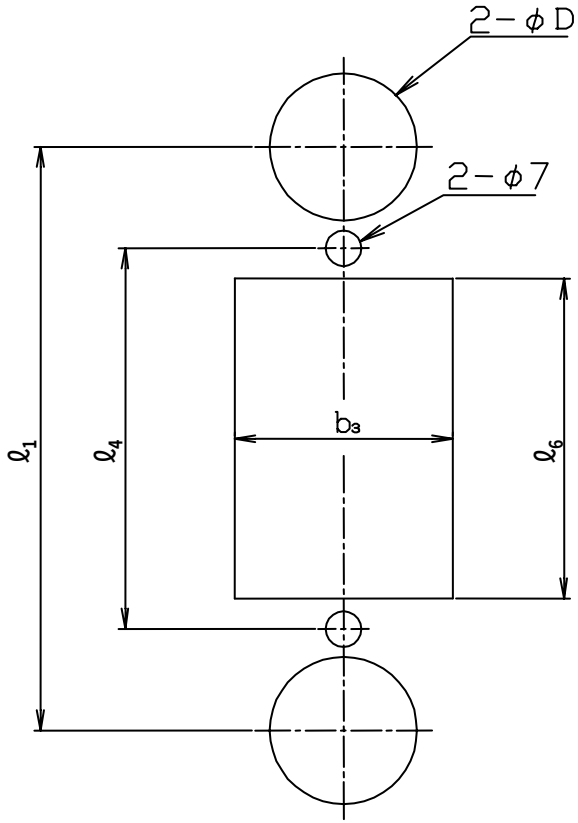
■ **For panel cut-out for the type with rear magnetic switch (Front panel type)**

◆ **PF400/500**



■ **For panel cut-out for the type with Photosensor (Front panel type)**

◆ **PF400/500**



∗ **If the type is without needle valve, there is no need to provide with φ Do.**

7. Materials

Item No.	Names of parts	Materials
①	Body	PFA
②	Gland	PCTFE
③	Handle	PCTFE/PP
④	Needle valve	PFA
⑤	Side plate	PVC
⑥	Front plate	PVC
⑦	Scale plate	PVC
⑧	Float	PTFE
⑨	Cap	PFA
⑩	O-ring	FPM (PF also available)
⑪	Countersunk screw	PEEK
⑫	Magnetic switch	SUS303, etc.
⑬	Switch plate	PVC
⑭	Switch bracket	PVC
⑮	Photosensor	

＊ For O-ring used for PF200 type, PF is a standard.

8. A table of sensors classified by sensor

	Photosensor	Magnetic sensor
PF200	○	—
PF300	○	○
PF400	○	○
PF500	○	○

⚠ Caution

9. Assembling and disassembling procedures

- The warranty period is in principle for one year after delivered.
- If disassembled by your customer during that time for maintaining the flowmeter, it should be noted that it shall not be covered by warranty.

※ There are some products which cannot be disassembled according to the product specifications.

1. In the case that the type where both caps located at the upper and lower part of the body are manufactured in accordance with the weld specification.
2. In the case that the type is with needle valve, but with no sensor specification (See the list below) .

※ It is possible to disassemble the needle valve section and some kinds of plates such as scale plate, side plate and back plate, etc..

⚠ Caution

☆ **Specifications where the inside of the flowmeter cannot be disassembled.**

Types	PF200	PF300	PF400
Specifications (**Max flowrates**)	20mL/min 50mL/min 100mL/min 500mL/min	1.5L/min 2.0L/min	10L/min 15L/min

* It is usual to take out the float through the cap located at lower part of the meter body, if it is the specification with needle valve, but the specifications stated above has a structure which cannot take out the float due to the measurement of the meter body and the float.
* The flowrates shown above are ones that are water equivalent.

⚠ Caution

☆ The assembling and disassembling for maintaining the flowmeter should be done according to the following procedures.

1. Disassembling of the needle valve section (For specification with needle valve only)
   ① Turn the needle valve counterclockwise to fully open.
   ② Turn the gland counterclockwise to loosen.
   ③ Allow the needle valve to turn counterclockwise for the rest

2. Disassembling of the various kinds of plates
   Unscrew the screws tightened with the countersunk screws(M3) in four places of such plate as the front plate(for PF400 and PF500 types only), scale plate, side plate and back plate in sequential order.

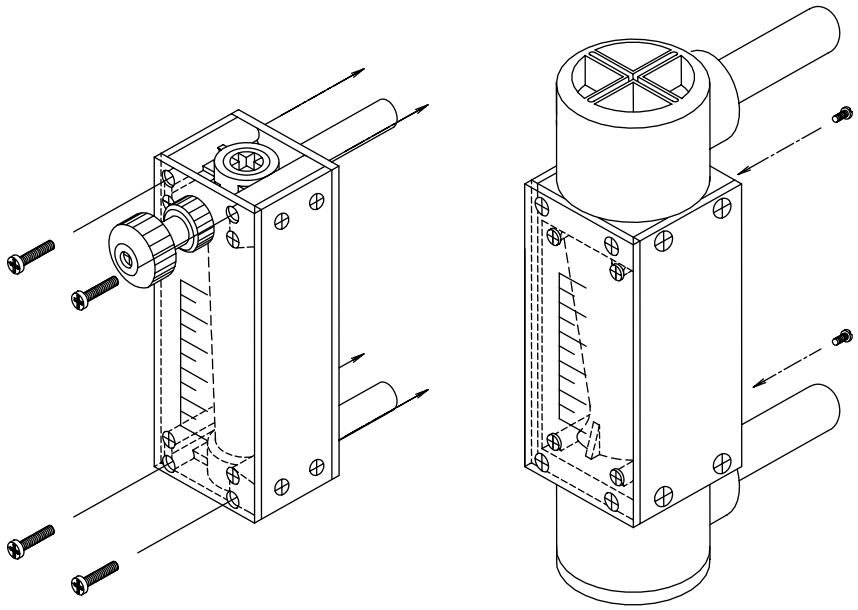
3. Assembling and disassembling of the main body
   ① Allow the cap located at the inlet side (lower part)to turn counterclockwise and remove it, and then take out an O-ring.
   ② Take out the float.
   ③ Allow the cap located at the outlet side (upper part) to turn counterclockwise and remove it, then take out an O-ring.

※ Assembling should be done in the reverse order from the disassembling. A great care should be taken for the excessive tightening for the tightening portions.

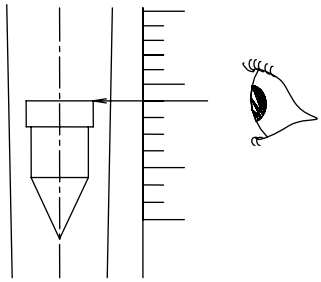
⚠ Caution

10. Installation procedures to the machinery and equipment

1. Handle with caution and unpack and install it in a place where is as clean as possible, because it has been packed in the clean room after cleaning.
2. Upon receipt of the product you put an order, check for any damage which may have occurred during shipment, prior to installing. Movement of float, contact forms and flow direction, etc..
3. For installing to the machinery and equipment, do it with reference to the Illustration 1.
   Be sure to use the given hole to mount the main body.
   PF200・・・・・・To use four holes(ϕ3.5) located at the corner viewing from front
   PF300・・・・・・To use four holes(ϕ4.5) located at the corner viewing from front
   PF400/500・・・ ① To use the two mounting taps located at the back (M5 and 5 long)
   ② For panel imbedded type, remove the front panel to use their same holes in four places.
4. As it is a floating type of flowmeter, it is important that the meter body be piped absolutely vertical so as smoothly to move the movable part and also not to apply stress due to the installation.
5. In making up pipe, do not enter the sealing or any other foreign materials into the inside of the meter.
   Dirt and foreign matters inside the flowmeter can cause it to indicate inaccurately.
6. Use the flowmeter in a place where is less mechanical vibration. If vibrated, it may cause disconnection of cable and particle occurrence(dirt, etc.).
7. After completed installing to the equipment, the valve should be opened as gradually as possible when starting operating the flowmeter. If the valve is so quickly opened, it may fail to operate properly due to the turbulent flow.
8. The tube fittings (joints) should be connected according to the instruction manual of their own.
9. Never use the flowmeter as immersed in fluid.



11. Confirmation of flowrate



☆ How to read the flowrate
Take reading at eye level so as to be horizontal to the top of the flat surface of the float

12. Standard specifications for the magnetic sensor

① Contact capacity: 0-24VDC Max 0.2A 4.8W (Compliant with UL standard)
※ As a non-standard specification
100VAC/DC 0.25A 20W $\cos\phi = 1$ and
200VAC/DC 0.1A 20W $\cos\phi = 1$
are also available upon request, but not compliant with UL standard.
② Contact resistance: For one minute at 500VDC
③ Withstand voltage: 1200V/AC /sec
④ Life span of contact switching: More than one million times, provided that it is at pure resistant load.
⑤ Contact forms: Contact A (To be turned on, when flowrate increases more than setting value)
Contact B(To be turned on, when flowrate decrease less than setting value)
* Setting value variable
* Contact is self-holding type.

⑥ Accuracy: Contact accuracy: Within ±10%

13. Standard specifications for photosensor

① Operating power supply: 12-24VDC within±10%
② Power consumption: Less than 15mA
③ Output mode: NPN open collector
Rating: Sink power supply: 80mA (30VDC) at max
④ Operation mode: Dark-on
* Variable setting value

⚠ Warnin

14. Other instructions

- If exceeded the rating of the electrical contact, it may cause damage.
- Wiring should be done after making sure that power have been turned off.
- If the connecting wires coming from the flowmeter are wired together with a strong power line such as power supply line, power line and high voltage cable, noises may transfer to the signal lines, and may result in malfunction.
- In no case shall the flowmeter be used in environment where explosive gas exists except it is constructed in accordance with the specifications for the intrinsic safety explosion-proof type photosensor.
- Do not remodel the flowmeter body.
- Do not put the flowmeter body in a place where is unstable. It may cause damage and injury resultantly.
- Although the flowmeter is light in weight, support the pipe so as not to kink and sag, and securely fix so as not to exert stress or forces upon the Teflon flowmeter.

⚠ **Caution**

15. Precautions when trouble happened

(Flowmeter body)

● If leakage from the flowmeter body or the connecting section(tube fitting, etc.) occurred, immediately stop operating the line to which the flowmeter is connected. The liquids drained should be wiped off after stopping the operation, and confirming the safety.

(Photosensor)

● If the photosensor has not been operated, make sure that the wiring has been done correctly and that the volume position has been kept a correct position. In case that it turned out to be failed to operate, it is necessary to consider changing the sensor. Stop the operation including the sensor connected systems. The same action should be taken, when adhering the fluid to the sensor.

16. Where to contact

TOFLO CORPORATION

Headquarters: 3-17 Minamidaira, 4-chome Hino City, Tokyo 191-0041
Tel: 81-42-593-8811 / Fax: 81-42-593-8812
Tokyo Sales Office: 3-17 Minamidaira, 4-chome Hino City, Tokyo 191-0041
Tel:81-42-592-6111 / Fax: 81-42-592-6112
Osaka Sales Office: Suite 915, East Exit Station Bldg.
20-14 Higashinakajima, 1-chome Higashiyodogawa ward, Osaka City Osaka-Fu 533-0033
Tel:81-6-4809-0411 / Fax:81-6-4809-0412
Fukuoka Sales Office: 2F K-2 bldg.
8-5 Hakataekiminami, 5-chome Hakata ward, Fukuoka City Fukuoka pref. 812-0016
Tel:81-92-482-2101 / Fax:81-92-482-2102
Sendai Sales Office: Suite 102, Izumi Kankoh bldg.
8-6 Shohgen, 1-chome Izumi ward, Sendai City Miyagi pref. 981-3132
Tel:81-22-218-2451 / Fax:81-22-218-2452

Warranty

All products we manufactured have been carefully inspected and passed through the intraoffice inspection before shipping, but contact us at the nearest sales offices upon confirmation of the symptom, when a trouble occurs by chance.

Warranty period

The warranty period shall be for one year after the date of delivery.

Scope of warranty

When trouble for which we are liable has occurred during the warranty period, we will repair or replace it free of charge. Provided that in case of the following items they shall not be covered by warranty.

① In case that it is improperly handled and used.
② In case that it emerges from the causes except we delivered,
③ In case that it is improperly remodeled and repaired,
④ In case that it is due to natural calamity, disaster and others.

In addition the warranty said above means the warranty of the single unit of the product we delivered. As to the damage triggered by the trouble of the delivery goods it cannot be warranted.

20090219