FLOW METER

<Panel Mounting Type Purge Meter>
for minimum flow

INSTRUCTION MANUAL
for
FM-PX20/25 Series

Caution

Before use, please read this Instruction Manual thoroughly for your safe operation.
Please always keep this Instruction Manual at hand for quick reference when necessary.

TOFLO CORPORATION

3-R06

Safety precaution

We highly appreciate your purchasing our products of the model "FM-PX20/25 Series".

Please read through this Instruction Manual thoroughly in order to use properly and safely and also for the purpose of prevention from disaster that might be caused upon making sure the following descriptions.

The **"Safety precaution"** intends to prevent the user 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.

■ Features

FM-PX20 and 25 Series are particularly used for the semiconductor manufacturing process in addition to the machinery and equipments for general industrial use as a general purpose or for purging of liquids and gases in the extensive areas.

☆ Compactly designed and simple in construction and space saving type.
☆ The flowing state of fluid can be viewed because it is made of glass tapered tube.
☆ Due to panel mounting type it can be installed inside out of the panel.
☆ Needle valve can be installed at the upper part of the meter body.
☆ Switch can be installed to PX25 type.
☆ Simple construction and can be offered at low cost.

■ Specifications

Flow accuracy	**Standard type**	FS±5%
	Short type	
	Long type	FS±2%
Max operating pressure		0.5MPa(G)
Operating fluid temperature		Max 60℃
Ambient temperature		0 – 50℃(Non condensing)

■ Specifications on proximity sensor

Power source	12 – 24VDC
Controlling output	200mA at Max. Make-and-break type on direct current NPN type, Normally closed
Cord length	2 m

■ Specifications on photosensor

Power supply	24VDC ±10%
Control output	NPN open collector (Sink current 80mA(30VDC) at max. with Dark-On type
Cord length	2 m

■ Specifications on magnetic switch

Contact systems	Contact A
	Contact B
Contact capacity	0 – 24VDC Max 0.2A
Cord length	50 cm

☆ Although they are non-standard specifications that are stated below, it is available upon your requesting : Contact capacity: 100VAC/DC 0.25A 20W at cosϕ=1
200VAC/DC 0.1A 20W at cosϕ=1

☆ Switch is a self-holding type and the setting value is variable on site.

■ Type selection for use in gas on PX20 type

FM-PX	Std	Gases	Shapes	Fluids	Units	Max flowrate	Designed pres. / temp.	Opt.	Specif. item
FM-PX	20	G	-0	1	-B	20	- 1 atm/20℃	FPM	For instance of entry / Description
								FPM	Viton Packing
							1 atm/20℃		It shows designed pres. / temp.. ✱3
						20	It shows max flowrate. ✱2		
					A	NmL/min			
					B	NL/min			
					D	SmL/min			
					E	SL/min			
					Z	For specif. unit ✱1			
				1	Air				
				2	N2				
				3	O2				
				4	CO2				
				5	Ar				
				6	He				
				7	C3H8(Propane)				
				9	For specif. fluid ✱1				
			0	With no needle valve					
			1	With needle valve at lower part					
			2	With needle valve at upper part					
			9	For specif. shape ✱1					
		G	It shows for use in gas.						

Std	Flow ranges	Pipe size	Material
20	- 20 NL/min	Rc1/8	BSBM((Plating)

✱1: For specif. items, specify them at end of this Type selection in order.
✱2: Refer to a table of flow ranges as follows.
✱3: Refer to procedures for Type selection at beginning of the catalog, if pressure and temperature are other than at 1 atm/20℃.

■ Type selection for use in water on PX20 type

FM-PX	Std	Liquid	Shape	Fluid	Unit	Max flowrate	Option	Specif. item
FM-PX	20	W	-0	1	-A	500	-FPM	For instance of entry / Description
							FPM	Viton packing
						500	It shows max flowrate. ✱2	
					A	mL/min		
					Z	For specif. unit ✱1		
				1	Water			
				9	For specif. fluid ✱1			
			0	With no needle valve				
			1	With needle valve at lower part				
			2	With needle valve at upper part				
			9	For specif. shape ✱1				
		W	It shows for use in water.					

Std	Max flowrate	Material	Pipe size
20	- 500 mL/min	BSBM(Plating)	Rc 1/8

✱1: For specif. items, specify them at end of Type selection in order.
✱2: Refer to a table of flow ranges as follows.

■ Type selection for use in gas on PX25 type

FM-PX	Std	Gas	Shape 1	Shape 2	Fluids	Units	Max flow	Designed pres./temp.	Opt.	For specif. items
FM-PX	25	G	-0	1	1	-B	50	-1 atm/20℃	-SW	For instance /Description
									T1	Short type
									L	Long type with accuracy at FS±2% ✱5
									B	With stand(Self-maintaining type)
									SW	With a joint of Swagelok type
									V	With a joint of VCR type
									FMP	Viton packing
								1 atm/20℃		It shows designed pres. and temp.. ✱4
							50	It shows max flowrate. ✱3		
						A	NmL/min			
						B	NL/min			
						D	SmL/min			
						E	SL/min			
						Z	For specif.unit ✱1			
					1	Air				
					2	N_2				
					3	O_2				
					4	CO_2				
					5	Ar				
					6	He				
					7	C_3H_8(Propane)				
					9	For specif. fluid ✱1				

✱1: For specif. items, specify them at end of Type selection in order.
✱2: Select it from contact systems in a table of flow ranges below.
✱3: Refer to a table of flowrates below.
✱4: Refer to procedures for Type selection described at beginning of the catalog, if pressure and temperature are other than at 1 atm/20℃.
✱5: No switch installation to long type.

Shape 1		Shape 2	
0	With no needle valve	0	With no switch
1	With needle valve at lower part	1	With switch of contact A at rear
2	With needle valve at upper part	2	With switch of contact B at rear
9	For specif. shape ✱1	3	With proximity sensor ✱2
		5	With photosensor formed Dark On at 24VDC±10% ✱3
		9	For specif. shape ✱1

G	It shows for use in gas.		
Std	Max flowrate	Pipe size	material
25	- 100 NL/min	Rc1/4	SUS316

■ Type selection for use in water on PX25 type

FM-PX	Std	Liguid	Shape 1	Shape 2	Fluids	Units	Max flowrate	Option	For specif. item
FM-PX	25	W	-0	2	1	-B	3	-SW	For instance/ Description
								T1	Short type
								L	Long type with accuracy at 2% ✱4
								B	With stand (Self-maintaining type)
								SW	With a joint of Swagelok type
								FPM	Viton packing
							3		It shows max flowrate. ✱3
						A	ML/min		
						B	L/min		
						Z	For specif. unit ✱1		
					1	Water			
					9	For specif. fluid ✱1			

Shape 1		Shape 2	
0	With no needle valve	0	With no switch
1	With needle valve at lower part	1	With switch of contact A at rear
2	With needle valve at upper part	2	With switch of contact B at rear
9	For specif. shape ✱1	3	With proximity sensor ✱2
		9	For specif. shape ✱1

W	It shows for use in water.		
Std	Max flowrate	Pipe size	Material
25	- 5 L/min	Rc1/4	SUS316

✱1: For specif. items, specify them at end of this Type selection in order.
✱2: Select it from contact systems in a table of flow ranges as follows.
✱3: Refer to a table of flow ranges as follows.
✱4: No switch installation for the long type.

■ Tables of flowrates for PX20 types

For gas

Std	Flow ranges NL/miln
20	40 – 500 NmL/min
	0.1 – 1 NL/min
	0.2 – 2
	0.4 – 5
	1 – 10
	2 – 20

For water

Std	Flow ranges
20	mL/min
	10 – 100
	20 - 200
	40 – 500

■ Tables of flowrates for PX25 types

For gas

Std	Flow ranges	Contact systems
25	10 – 100 NmL/min	Proximity switch
	20 – 200	
	40 – 500 (50 – 500) ✳4	
	0.1 – 1 NL/min	
	0.2 – 2	
	0.4 – 5 (0.5 – 5) ✳4	Photosensor
	1 – 10	Magnetic switch
	2 – 20	
	3 – 30	
	4 – 50 (5 – 50) ✳4	
	5 – 70 ✳	
	10 – 100 ✳	

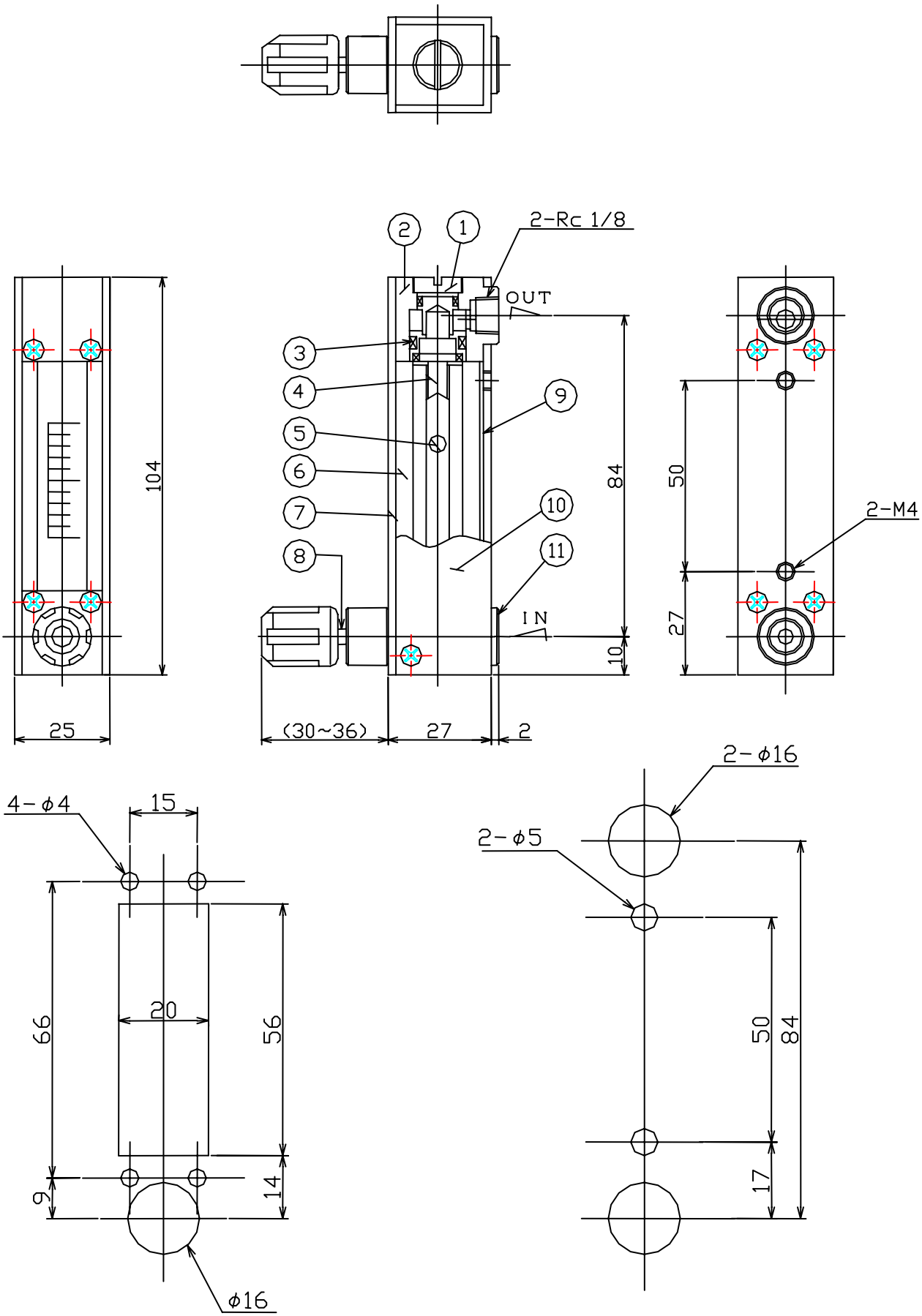
For water

Std	Flow ranges	Contact systems
25	1 – 10 mL/min ✳2	Proximity sensor ✳3
	2 – 20 ✳2	
	4 – 50 (5 – 50) ✳4	
	10 – 100	
	20 – 200	
	40 – 500 (50 – 500)	Magnetic switch ✳3
	0.1 – 1 L/min	
	0.2 – 2 ✳4	
	0.3 – 3 ✳2	
	1 – 5 ✳1 ✳2	

✳1: For max 5L/min it is required to supply pressure at 0.08Mpa(G) or more.
✳2: This range of flowrate cannot be manufactured in a long type.
✳3: The long types with a switch of these flowrates cannot be manufactured.
✳4: The parenthetic flowrates as shown with asterisk 4 are applied to the flow range in the case of the long type.

✳For the information about flowrates described above, in case of gas, the flowrates are ones equivalent to air at 1atm and 20℃, and in case of water, they are ones equivalent to water at 20℃.
✳The setting range of the contact shall be set within 20% to 80% at full scale, but it varies depending on a scale, size and contact systems of the flowmeter.

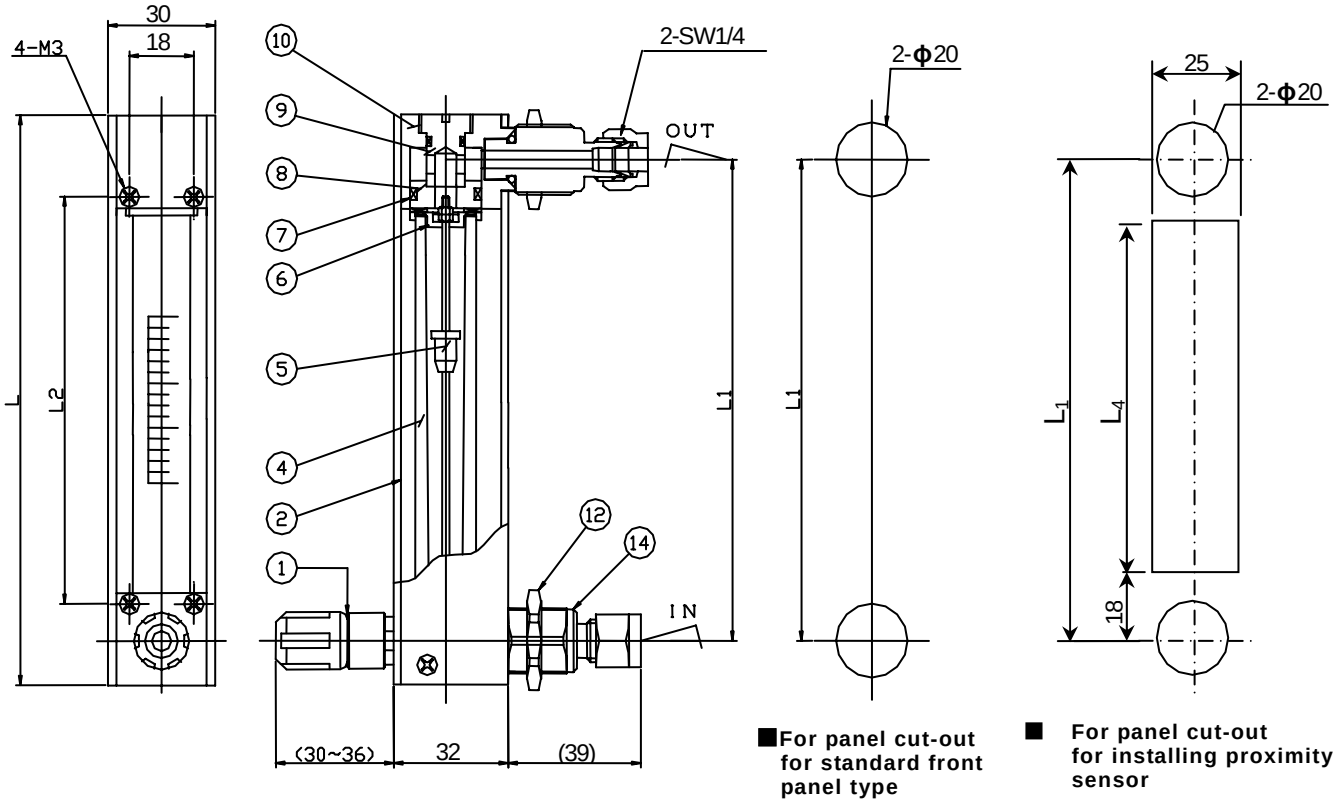
■ Structural drawing for PX20 types



◆For panel cut-out for panel imbedded type

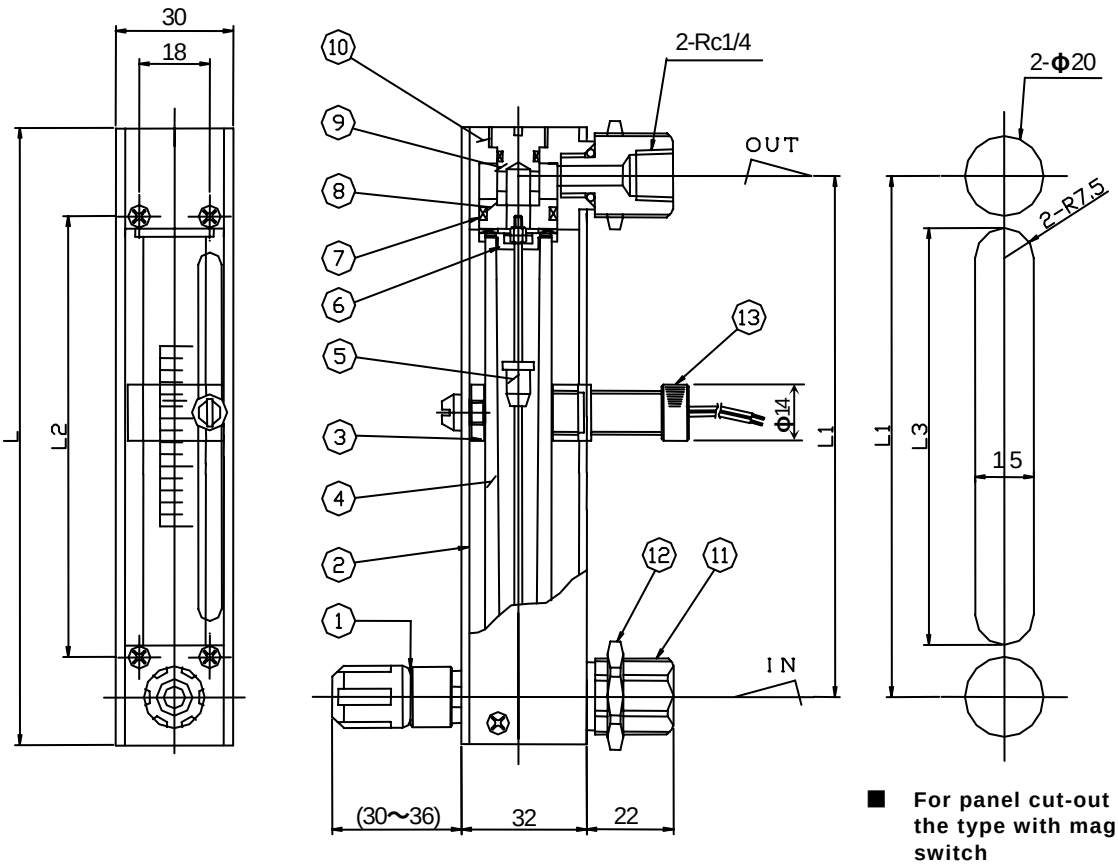
◆For panel cut-out for standard front panel type

■ Structural drawing for PX25 type with a joint of Swagelok type, but with no switch



■ For panel cut-out for standard front panel type

■ For panel cut-out for installing proximity sensor



■ For panel cut-out for the type with magnetic switch

■ Materials for PX20 type

Item No.	Names of parts	Materials	Remarks
①	Cap	BSBM	Plating
②	Fittings	BSBM	Plating
③	Packings	NBR	
④	Stoppers	SUS316/PE/PTFE	
⑤	Float	SUS304	
⑥	Tapered tube	Pyrex	
⑦	Front plate	PMMA	Clear
⑧	Needle valve	SUS316	Orifice:PEEK
⑨	Reflecting seal	PET	Yellow
⑩	Cover	Al	Black
⑪	Countersink screw	SUS316	M3

■ Materials for PX25 type

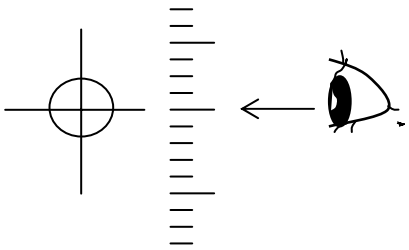
Item No.	Names of parts	Materials	Remarks
①	Needle valve	SUS316	Orifice: PEEK
②	Front plate	PMMA	
③	Sensor bracket	PMMA	No need for proximity sensor
④	Tapered tube	Pyrex	
⑤	Float	Glass/Ruby/SUS316	
⑥	Stoppers	PTFE/SUS316/FPM	
⑦	O-rings	NBR	
⑧	Retainer	SUS316	
⑨	Cap	SUS316	
⑩	Fittings	SUS316	
⑪	Adapters	SUS316	
⑫	Lock nuts	BSBM	Plating
⑬	Magnetic switch	SUS303 and others	
⑭	Swagelok type adapters	SUS316	Bylok

■ Standard dimensions

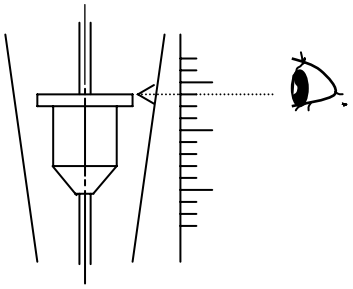
	L	L1	L2	L3	L4
Standard type	154	130	110	104	94
Short type	139	115	95	89	79
Long type	244	220	200	194	—

■ How to confirm flowrates and switching contact

☆ How to read flowrates
In case that the float is a type of ball,
take a reading at eye level so as to overlap
the center of ball with the scale mark horizontally.

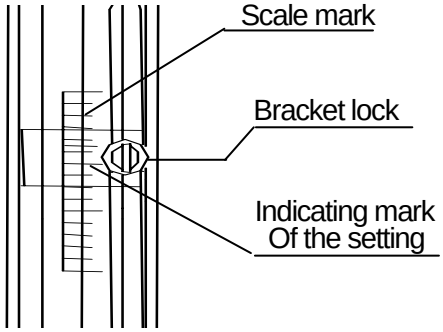


In case that the float is a standard type, take
a reading at eye level so as to overlap the top of
float with the scale mark horizontally.



☆ How to set the switching contact

Leave the bracket lock loosened to slide it up to the desired flowrate,
then agree the indicating mark of the setting which has been
graduated on the sensor bracket with the desired scale mark
to be set.



! Caution

■ Installation precaution to the machinery and equipment

1. Firstly confirm the product you received before installing.
   Flow direction, Pipe connection, Flow ranges, Contact systems and the specifications on electricity(Voltage and current), Movement of the moving parts, etc..
2. FM-PX 20 and 25 Series are floating type so that the meter body be piped absolutely vertical, as deviation may cause errors in flow indication.
3. 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 read inaccurately and/or malfunction.
4. Start operating, if completed assembling, but the valve should be opened as gradually as possible.
   If the valve is so quickly opened, it may fail to operate properly due to the turbulent flow.
5. If the flowmeter is so heavy in weight, support the piping not to bend, and securely fix so as not to exert the forces or stress against the pipe. If the excessive forces or stress are exerted upon a metering body, the damage may be resulted.

! Warning

※ The glass tapered tube may cause damage, if the rated pressure and temperature are exceeded.
※ The sensor may be malfunctioned, if the excessive current runs, and also it may be failed to function resultantly, if it is used in the strong magnetic field.

⚠ Caution

■ Structural drawing and the assembling and disassembling procedures

☆ **For structural drawing**

See the structural drawing

☆ **Assembling and disassembling**

1. In assembling and disassembling the flowmeter body, do it in such a stable place as on a working bench. Since the PX20 type and PX25 type are constructed similar in the structure, do the work of assembling and disassembling in the same manner.
2. Remove the both front plates ⑦/② on the types of FM-PX20 and PX25. Loosen the screws located in four places counterclockwise, and remove them. ***In the case that it is the type with the sensor of PX25 type***, the sensor ⑬ should be removed at first. As the sensor is screwed to the sensor bracket③, it can be removed if loosening the screws. Next to that, remove the front bracket lock.
3. Remove the cap①/⑨ in the next. The cap which is screwed in the upper fitting can be removed, if turning it counterclockwise by using a slotted screwdriver. Pull it out, while turning it along the thread so as not to damage O-ring, because the O-ring as the sealing material has been set in the groove.
4. Since the retainer has been fitted into the fitting ②/⑩ in which the cap is screwed in, push the tapered tube ⑥/④upwards and pull it to the front, and it will come off from the fitting ②/⑩. ***In the case that the float is a ball***, take it out by loosening the screws located in the fitting ②/⑩.
5. ***In the case that the sensor is installed to the PX25 types***, remove the sensor bracket which has been fitted into the tapered tube.
6. Do it carefully when taking out the tapered tube ⑥/④. It may be broken by striking to the fitting ②/⑩ if pulled abruptly and strongly. Also in the case that the float is a type of the ball, take care not to lose such parts, because the parts put together such as float ⑤ and stoppers ④/⑥ have been come pieces.
7. ***In the case that the float is guided by guide pole***, handle it as a " **tapered tube unit**". The "tapered tube unit" means that the tapered tube is integrated with the float⑤ and stoppers④/⑥.
8. Disassemble the "tapered tube unit". Remove the nuts tightened doubly by using a box driver, while putting one more driver on the opposite nut of the inlet(Inflow).
9. After removed the nuts, take out the stoppers④/⑥ by using a radio cutting pliers in the next. As the sheet packing has been put between the tapered tube⑤ and the stoppers④/⑥, take care, at this time, not to lose or damage it.
10. If the guide pole is to be taken out, only the float⑤ remains. The disassembling will be completed, if taking out the float.
11. Reassembling should be done in the reverse order from their disassembling procedures. The tapered tube unit should be, therefore, done first.
12. Following completing the work of reassembling, after carrying out the leakage test and checking the moving part of the meter(if the float is in good shape), install the meter body to the machinery and equipment. Install the flowmeter vertically so as to make the IN side(Inflow) lower and the OUT side(Outflow) upward.

Warning

■ Inspection and maintenance

☆ If the tapered tube is extremely contaminated and obscured from reading, disassemble and clean it with light clean cloth if necessary.

☆ Remove water from the flowmeter, when it is not used in the winter season.

☆ Since the tapered tube has been made of glass, be full careful of the impact and shock.

☆ 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 read inaccurately and/or malfunction.

☆ In case where the switch is installed to the flowmeter, do not use it at more than the ratings. It may cause malfunction, and must be replaced the switch with a new one. However we have not supplied any “switch unit”.

※ We, however, cannot warrant, if the flowmeter has been disassembled in your company.

Warning

※ Do not remodel the meter body.

※ Do not put the meter itself on the unstable place and also do not assemble and disassemble on such places. The flowmeter falls down, and it may cause damage and injury.

※ Do not use with any power voltage other than the indicated voltage.

■ Where to call

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Warranty

All products we made 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.

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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 product we delivered. As to the damage triggered by the trouble of the delivery goods it cannot be warranted.

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