INFORMATION

ð IO-Link"

1 For the PF2M7-L

Low Particle Generation 2-Color Display Digital Flow Switch



1 to 100 L/min **PF2M711-X300** 2 to 200 L/min **PF2M721-X300**



0.1 to 10 L/min PF2M710-X300 0.3 to 25 L/min PF2M725-X300 0.5 to 50 L/min PF2M750-X300

Particle Generation Characteristics (Reference Data)



Specifications

Ultrasonic cleaning	Metal parts in contact with fluid: Fitting, Mesh
Degreasing treatment	Body, O-ring
Air blow	Air blow of the fluid passage*1
Clean packaging	Antistatic bag (Double packaged)

*1 With Class 100 air in a Class 10000 clean room

Metal Material of Parts in Contact with Fluid: Stainless Steel 304

<Application Example>

0.01 to 1 L/min PF2M701-X300

0.02 to 2 L/min PF2M702-X300

0.05 to 5 L/min PF2M705-X300

Flow control of a clean air blow in clean room environments



* When the product is used for blowing, use caution to prevent the workpiece from being damaged by air entrained from the surrounding area.

IO-Link Compatible

The flow rate value and the device status can be figured out easily via the process data.

Diagnosis Ove

Over current error, Outside of rated flow range, Accumulated flow error, Internal product malfunction







PF2M7-X300 Particle Generation Characteristics

Measuring Method



[Test Method]

Place a sampling tube at the latter stage of the test sample and measure the number of generated particles with a laser dust monitor.

[Measuring Conditions]

	Description	Automatic particle counter using the light scattering method		
instrument	Minimum measurable particle diameter	0.1 μm		
monument	Suction flow rate	28 L/min		
o:	Sampling time	1 min		
Setting	Interval time	4 min		
contaitions	Sampling air flow	28 L		

* The flow rate used during measuring is the max. rated flow of the test sample.

Particle Generation Characteristics (Reference Data)







Low Particle Generation 2-Color Display C E c Tus **Digital Flow Switch** RoHS PF2M7-X300

Rated flow range

01 02 05 10 25 50 11 21

Nil

Lead wire with connector (2 m)

4 Option 1

10-ZS-33-D

How to Order



Rated flow range

Z)	Port	Siz

01

02

Symbol Port size

Rc1/8

Rc1/4

01	0.01 to 1 L/min	25	0.3 to 25 L/min	
02	0.02 to 2 L/min	50	0.5 to 50 L/min	
05	0.05 to 5 L/min	11	1 to 100 L/min	
10	0.1 to 10 L/min	21	2 to 200 L/min	

Output specification

	<u> </u>				
Symbol	OUT1	OUT2			
Α	NPN	NPN			
В	PNP	PNP			
С	NPN	Analog 1 to 5 V \Leftrightarrow Analog 0 to 10 V ^{*1}			
D	NPN	Analog 4 to 20 mA			
E	PNP	Analog 1 to 5 V \Leftrightarrow Analog 0 to 10 V ^{*1}			
F	PNP	Analog 4 to 20 mA			
L	IO-Link/NPN/PNP	—			
L2	IO-Link/NPN/PNP	NPN/PNP/External input			
L3	IO-Link/NPN/PNP	Analog 1 to 5 V \Leftrightarrow Analog 0 to 10 V ^{*1}			
L4	IO-Link/NPN/PNP	Analog 4 to 20 mA			

*1 1 to 5 V or 0 to 10 V can be selected by pressing the button. The default setting is 1 to 5 V.

5 Unit specification

М SI unit only*2 Nil Unit selection function*3

- *2 Fixed unit: Instantaneous flow: L/min Accumulated flow: L
- *3 This product is for overseas use only. (The SI unit type is provided for use in Japan in accordance with the New Measurement Act.) The unit can be changed. Instantaneous flow: L/min ⇔ cfm Accumulated flow: L ⇔ ft³

Calibration certificate*4

Nil	None
Α	Yes

*4 Made to order

The certificate is in both English and Japanese.

6 Option 2



Options are shipped together with the product but do not come assembled.

DIN Rail Mounting Bracket (Ordered Separately)





10-ZS-33-F

W

Lead wire with connector (2 m) Connector cover (Silicone rubber)

Without lead wire with connector M12 conversion lead wire (0.1 m)

PF2M7-X300

Specifications/PF2M7-X300

Refer to the **Web Catalog** for flow switch precautions. For details on the specific product precautions, refer to the "Operation Manual" on the SMC website.

	Mod	lel	PF2M701-X300	PF2M702-X300	PF2M705-X300	PF2M710-X300	PF2M725-X300	PF2M750-X300	PF2M711-X300	PF2M721-X300		
p	Applicable fluid*1											
iui	Applicable Iulu		(JIS B 8392–1 1.1.2 to 1.6.2, ISO 8573–1 1.1.2 to 1.6.2)									
-	Fluid temperature	range				0 to 5	50°C					
	Detection method		Thermal type (N	fain flow type)		Tł	nermal type (B	ypass flow typ	e)			
	Rated flow range	Dry air, N ₂ , Ar	0.01 to 1	0.02 to 2	0.05 to 5	0.1 to 10	0.3 to 25	0.5 to 50	1 to 100	2 to 200		
	[L/min]	CO2	0.01 to 0.5	0.02 to 1	0.05 to 2.5	0.1 to 5	0.3 to 12.5	0.5 to 25	1 to 50	2 to 100		
ş	Set point range	Instantaneous flow [L/min]	-0.05 to 1.05	-0.1 to 2.1	-0.25 to 5.25	-0.5 to 10.5	-1.3 to 26.3	-2.5 to 52.5	-5 to 105	-10 to 210		
Η	0	Accumulated flow [L]	0.00 to 99	99999.99		999999.9		0 to 999	999999			
	Smallest settable	Accumulated flow [1]	0.001									
	Accumulated volu	me per pulse [] /pulse]										
	Accumulated valu	e hold function*2	U.U. U.I Intervals of 2 or 5 minutes can be selected									
	Operating pressu	re range	-0.1 to 0.75 MPa									
e	Rated pressure ra	nae ^{*3}	-0.07 to 0.75 MPa									
ssu	Proof pressure		1.0 MPa									
Pre	Pressure loss				Ret	fer to the "Pres	sure Loss" gra	ph.				
	Pressure characte	eristics			±5%	F.S. ±1 digit (0	.35 MPa stand	lard)				
a	Power supply For	the switch output device				12 to 24 V	DC ±10%					
tric	voltage*4 For	r the IO-Link device				18 to 30 V	DC ±10%					
ec	Current consumpt	tion				35 mA	or less					
ш	Protection					Polarity p	rotection					
\$2	Display accuracy					±3% F.S.	±1 digit					
acy	Analog output acc	curacy				±3%	F.S.		0.05 \			
nc	Repeatability			±1% F.	S. ±1 digit (±2%	6 F.S. ±1 digit v	when the digita	I filter is set to	0.05 s)			
Acc	Temperature chara	acteristics			±3% F.S	± 1 digit (15 to	35°C: 25°C st	tandard)				
					±3 % F.C		on collector					
	Output type		Solo	oct from Hyste	vesis Window	comparator A			ated pulse out	out		
	Output mode		Sele	ct nom nyste	Error o	utput. or Switc	h output OFF r	nodes.	aleu puise oul	Jui,		
	Switch operation				Selec	t from Normal	or Reversed o	utput.				
t	Max. load current		80 mA									
tpu	Max, applied	Standard	28 VDC (NPN only)									
on	voltage	IO-Link compatible	30 VDC (NPN only)									
ch	Internal voltage	Standard	NPN: 1 V or less (Load current: 80 mA) PNP: 1.5 V or less (Load current: 80 mA)									
wit	drop	IO-Link compatible	1.5 V or less (Load current: 80 mA)									
0	Response time ^{*6}											
	Delay time*7	Select from 0 to 0.10 s (increment of 0.01 s), 0.1 to 1.0 s (increment of 0.1 s), 1 to 10 s (increment of 1 s),										
	Husteresis*8		20 S, 30 S, 40 S, 50 S, 00 S. Variable from 0									
	Protection		Variable from U Short circuit protection									
6			Short circuit protection									
og	output type	Voltage output	Output impedance: Approx 1 kO									
utp	Impedance	Current output	Maximum load impedance: 600 Ω at power supply voltage of 24 V, 300 Ω at power supply voltage of 12 V									
4 ٥	Response time*6	· ·	50 ms ±40%									
	Reference condition	on* ¹¹	Select from Standard condition (STD) or Normal condition (NOR).									
	Display mode				Select from	Instantaneous	flow or Accum	nulated flow.				
	IInit*12	Instantaneous flow	L/min, cfm									
lay		Accumulated flow				L,	ft ³					
isp		Instantaneous flow [L/min]	-0.05 to 1.05	-0.1 to 2.1	-0.25 to 5.25	-0.5 to 10.5	-1.3 to 26.3	-2.5 to 52.5	-5 to 105	-10 to 210		
Δ	Display range	Zero cut-off range	0.00 +- 0.00	0 to <u>-</u>	10% F.S. (Sele	ect per 1% F.S.	for the maxim	um rated flow	rate.)			
	Diaplay	Accumulated now [L]	0.00 10 99	99999.99		Jar: Bod/Croo	A digita 7 ag	0 10 999	999999			
	Indicator I FD					en switch output	r_{1} + urgits, 7 Se it is ON (OF IT)	1/2· Orange)				
Diaita	al filter ^{*14}				Select fro	0.05 ± 0.1	s 0.5 s 1 s 2	s or 5 s				
a	Enclosure					IP4	40					
len 1ce	Withstand voltage)			1000 VAC for	r 1 minute betw	een terminals	and housing				
stal	Insulation resistar	nce	5	0 M Ω or more	(500 VDC me	asured via me	gohmmeter) be	etween termina	als and housing	9		
wird	Operating temperating	ature range		Operati	ing: 0 to 50°C,	Stored: -10 to	60°C (No con	densation or fro	eezing)			
ш	Operating humidit	ty range		Op	perating/Stored	: 35 to 85% RH	I (No condens	ation or freezir	ng)			
Stand	lards			CE marking (I	EMC Directive,	RoHS Directiv	/e), UL (CSA)					
ing*!	Piping specification			01 (R	c1/8)			02 (F	lc1/4)			
문	Piping entry direc				Stra	ight						
wain	materials of parts	m contact with fluid			PPS, FK	uvi, Stainiess s	ieei 304, Si, Ai	u, GE4F				
÷	Lead wire				60	<u>, a</u>	50		12	y		
igh	Bracket					+3) u · A					
We	Panel mount adan	ter	-			+1!	2 a					
-	DIN rail mounting	bracket				+65	5 g					
Clear	liness class (ISO c	+op g Class 4										

- *1 Refer to the "Recommended pneumatic circuit examples" on page 4.
- *2 When using the accumulated value hold function, use the operating conditions to calculate the product life, and do not exceed it. The maximum access limit of the memory device is 3.7 million times. If the product is operated 24 hours per day, the product life will be as follows:
 - 5 min interval: life is calculated as 5 min x 3.7 million = 18.5 million min = 35 years
 - 2 min interval: life is calculated as 2 min x 3.7 million = 7.4 million min = 14 years
- *3 Negative pressure indicates the pressure value on the IN side (inlet side).
- *4 When multiple products are installed closely, the upper limit of the power supply voltage is 24 VDC.
- *5 The accuracy value is based on dry air as a fluid. For other fluids, it is a reference value.
- *6 Value when the digital filter is set at 0.05 s
- *7 The time from when the instantaneous flow reaches the set value to when the switch output operates can be set.
- *8 If the flow fluctuates around the set value, the hysteresis must be set to a value more than the fluctuating width. Otherwise, chattering will occur.

- *9 When using a product with an analog output
- *10 When selecting 0 to 10 V, refer to the analog output graph for the allowable load current.
- *11 Standard condition (STD): 20 [°C], 101.3 [kPa] (Absolute pressure), 65 [% RH] (The flow rate given in the specifications is the value under standard conditions.) Normal condition (NOR): 0 [°C], 101.3 [kPa] (Absolute pressure), 0 [% RH]
- *12 Setting is only possible for models with the unit selection function.
- *13 Power value is displayed for accumulated flow. The first 4 digits of the measurement value are always displayed.
- *14 The time for the digital filter can be set to the sensor input. The response time indicates when the set value is 90% in relation to the step input.
- *15 Some piping conditions may have negative effects on the flow accuracy.
- Products with tiny scratches, marks, or display color or brightness variations which do not affect the performance of the product are verified as conforming products.

Communication Specifications (IO-Link mode)

IO-Link type	Device										
IO-Link version	V1.1										
Communication speed	COM2 (38.4 kbps)										
Minimum cycle time	3.4 ms										
Process data length	Input data: 4 bytes	, Output data: 0 byte									
On request data communication	, N	/es									
Data storage function	, N	/es									
Event function	N N	/es									
Vendor ID	131 (0	x 0083)									
Device ID	PF2M701L	PF2M725L -X300 : 0 × 00017D (381) PF2M725L2 -X300: 0 × 00017E (382) PF2M725L3 -X300: 0 × 00017F (383) PF2M725L4 -X300: 0 × 000180 (384) PF2M750L2 -X300: 0 × 000181 (385) PF2M750L2 -X300: 0 × 000182 (386) PF2M750L4 -X300: 0 × 000183 (387) PF2M750L4 -X300: 0 × 000183 (387) PF2M750L4 -X300: 0 × 000184 (388) PF2M750L4 -X300: 0 × 000184 (388) PF2M711L2 -X300: 0 × 000185 (389) PF2M711L2 -X300: 0 × 000186 (390) PF2M711L4 -X300: 0 × 000187 (391) PF2M711L4 -X300: 0 × 000188 (392) PF2M721L4 -X300: 0 × 00023B (571) PF2M721L4 -X300: 0 × 00023B (571) PF2M721L4 -X300: 0 × 00023D (573) PF2M721L4 -X300: 0 × 00023D (573) PF2M721L4 -X300: 0 × 00023E (574)									

Process Data

Diagnosis Output

Bit offset		Item		Note							[Diagno	osis ite	ms	
0	OU.	T1 out	put	0: OF	F 1:	ON				ר ר	0				
1	OU.	T2 out	put	0: OF	F 1:	ON					- Ove	side o	ent en f ratec	for I flow	
8	Diagno	osis (flow	rate)	0: With	nin rang	ge 1: O	ut of ra	nge (Hl	HH/LLL	.)	ran	ge	Tutoc		
14	Fixe	ed outp	out	0: No	rmal c	output	1: Fixe	ed outp	put		· Acc	umula	ated flo	ow erre	or
15	Diagr	nosis (e	error)	0: Error not generated 1: Error generated Internal product											
16 to 31	Measure	ed flow rate	e value	Signe	ed 16 l	oit					ma	Tuncuo	n		
Bit offset	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
Item					Measured flow rate value (PD)										
Bit offset	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
ltom	Error	Fived		R۵	corvat	ion		Flow rate			Roso	vation			

Diagnosis

16

0 OUT1

Switch output



Recommended Pneumatic Circuit Examples



* Recommended air quality class: JIS B 8392-1 1.1.2 to 1.6.2 (ISO 8753-1 1.1.2 to 1.6.2)

Set Point Range and Rated Flow Range

Set the flow rate within the rated flow range.

The set point range is the range of flow rate that can be set in the switch.

The rated flow range is the range that satisfies the switch specifications (accuracy, linearity, etc.).

It is possible to set a value outside of the rated flow range if it is within the set point range, however, the satisfaction of specifications can not be guaranteed. The flow range if using CO₂ is given in brackets.

PF2M7-X30	00				Rated f	low range Set	point range Dis	splay range
Model				Flo	w range [L/min]			
model	-10 -	-5 0 1	2 5 1	0 2	25	50 1	00 2	00
PF2M701	-4	0.01 L/min 1 0.05 L/min 0.05 L/min	.0 L/min (0.5 L/m 1.05 L/min (0.525 1.05 L/min (0.525	in) L/min) L/min)				
PF2M702	-	0.02 L/min -0.1 L/min -0.1 L/min	2.0 L/min (1 L/ 2.1 L/min (1.05 2.1 L/min (1.05	min) 5 L/min) 5 L/min)				1 1 1 1 1 1 1 1 1
PF2M705	-(0.05 L/min 0.25 L/min 0.25 L/min	5.0 L/min 5.25 L/m 5.25 L/m	(2.5 L/min) in (2.63 L/min) in (2.63 L/min)				
PF2M710	-	0.1 L/min 0.5 L/min 0.5 L/min		10.0 L/min (5 L/r 10.5 L/min (5.2 10.5 L/min (5.2	nin) 5 L/min) 5 L/min)			
PF2M725	-1. -1.	0.3 L/min 3 L/min 3 L/min			25.0 L/min (12.5 L/ 26.3 L/min (13.1 26.3 L/min (13.1	i min) i /min) L/min)		
PF2M750	–2.5 l –2.5 l	0.5 L/min				50.0 L/min (25 L/min) 52.5 L/min (26.3 L/m 52.5 L/min (26.3 L/m	n)	
PF2M711	–5.0 L/min –5.0 L/min	1.0 L/min					100.0 L/min (50 L/min) 105.0 L/min (52.5 L/m 105.0 L/min (52.5 L/m	in) in)
PF2M721	–10 L/min –10 L/min	2 L/min						200 L/min (100 L/min) 210 L/min (105 L/min) 210 L/min (105 L/min)

Flow/Analog Output



*1 The analog output current from the connected equipment should be 20 μ A or less when selecting 0 to 10 V.

When $20 \ \mu A$ or more current flows, it is possible that the accuracy is not satisfied at less than or equal to 0.5 V.

 D or H fluctuates depending on the setting of the zero cut-off function.

When the zero cut-off function is set to "0," the flow rate display value starts from 0 L/min., but in conditions other than horizontal installation and supply pressure of 0.35 MPa, the output may not be 0 L/min.



Internal Circuits and Wiring Examples



PF2M700-0-B0-000

PF2M7□□-□-B□-□□□-X300	Ĭ					
PNP + Analog output type PF2M7□□-□-E□-□□-X300 PF2M7□□-□-F□-□□-X300	Black OUT1	Load Load	Max. 80 mA	ον	or	
		-		─ → │		→ • 50 ms

-

Internal Circuits and Wiring Examples



Max. applied voltage: 30 V, Max. load current: 80 mA, Internal voltage drop: 1.5 V or less



Max. applied voltage: 30 V, Max. load current: 80 mA, Internal voltage drop: 1.5 V or less

NPN + External input type



Max. applied voltage: 30 V, Max. load current: 80 mA, Internal voltage drop: 1.5 V or less

PF2M7 ---L3/4 ----X300 L3: NPN + Analog voltage output type L4: NPN + Analog current output type



Max. applied voltage: 30 V, Max. load current: 80 mA, Internal voltage drop: 1.5 V or less

L3: Analog output: 1 to 5 V or 0 to 10 V can be selected. Output impedance: 1 $k\Omega$

- L4: Analog output: 4 to 20 mA
 - Load impedance: 50 to 600 Ω

When used as an IO-Link device

	l ,	Brown L+	[
			L+
rcuit		Black C/Q	C/Q
ain cii		White Other	IO-Link
ž		Dhua h	Indstei
			L-

PNP output type



Max. load current: 80 mA, Internal voltage drop: 1.5 V or less

PNP 2 output type



Max. load current: 80 mA, Internal voltage drop: 1.5 V or less

PNP + External input type



Max. load current: 80 mA, Internal voltage drop: 1.5 V or less

L3: PNP + Analog voltage output type L4: PNP + Analog current output type



Max. load current: 80 mA, Internal voltage drop: 1.5 V or less L3: Analog output: 1 to 5 V or 0 to 10 V can be selected.

Output impedance: 1 k $\!\Omega$

L4: Analog output: 4 to 20 mA Load impedance: 50 to 600 Ω



SMC

Construction: Parts in Contact with Fluid



PF2M705/710/725/750-01-X300



PF2M701/702-01-X300

 $\ast\,$ There is no bypass construction for the 1 and 2 L ranges.



PF2M711/721-02-X300

Component Parts

No.	Description	Material	Note
1	Body	PPS	
2	Fitting for piping	Stainless steel 304	
3	O-ring	FKM	
4	Flow rectifier	Stainless steel 304	
5	Seal	FKM	
6	Flow rectifier	Stainless steel 304	
7	Sensor chip	Silicon	
8	Body B	PPS	
9	Printed circuit board	GE4F	

Dimensions

PF2M□-01/02-X300



			[mm]
Model	Α	В	Р
PF2M701/702/705/710/ 725/750-01-X300	66	14	ø2.8 depth 8.4
PF2M711/721-02-X300	70	17	ø2.8 depth 6.2



A Precautions

Flush the piping line before when the product for the first time and after it has been replaced. Also, if piping, etc., is to be connected, flush (air blow) using this product for the first time in order to reduce the effects of the dust generated from the connection, etc. Flushing the line is also required to eliminate contamination resulting from the installation of piping lines. Therefore, be sure to flush the line before running the system. Make sure all mounting parts are secure before use.

Safety Instructions Be sure to read the "Handling Precautions for SMC Products" (M-E03-3) and "Operation Manual" before use.

SMC Corporation

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