

**SAM**  
Speedy Accuracy Maintainability

**PS100 Series**  
Pressure-Based PI Mass Flow Controller



## PS100 Series

### Features

- ▶ Pressure-based flow measurement architecture
- ▶ Improved Pressure Insensitive function
- ▶ Valiant repeatability
- ▶ Self-diagnostic function



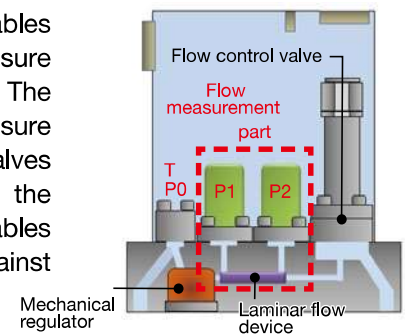
PS100 series is developed as a new approach of a Mass flow controller, it is one of the most critical devices in the semiconductor manufacturing tool, it controls the flow-rate measured by the pressure sensor. This model has non-heated flow measurement architecture, improved Pressure-Insensitive characteristic, valiant flow response, and it meets the needs of the times.

### Pressure-based flow measurement architecture

The non-heated flow measurement architecture results the lower reactive excrescence on the inner surface of the MFC against the thermally-degradable gas, the lower corrosion by the corrosive gas like  $Cl_2$  or  $BCl_3$  accelerated in case with small moisture and the heated condition to the high temperature, and the stable flow measurement and control for a long term.

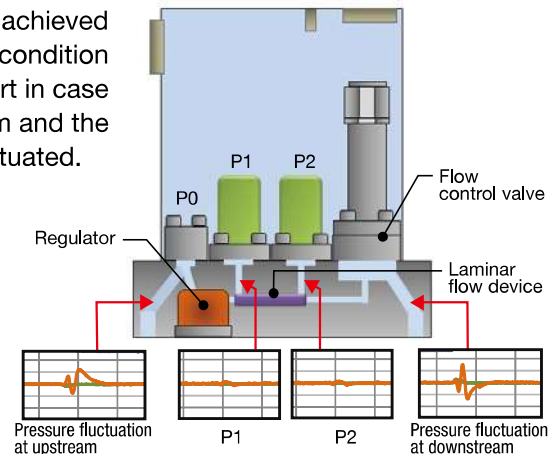
### Improved Pressure Insensitive function

The unique construction of this MFC enables stable flow control against the pressure fluctuation in the inlet and /or outlet. The mechanical regulator works for the pressure fluctuation in the upstream, the control valves works for the pressure fluctuation in the downstream, and this construction enables the high stability of the flow control against the pressure fluctuation.



### Valiant repeatability

The valiant repeatability is achieved owing to the stable pressure condition at the laminar flow device part in case that the pressure at upstream and the downstream of the MFC fluctuated.



The pressure around the flow measurement area, P1 and P2 is stable at any condition.

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## Self-diagnostic / response learning function

In case of the flow rising turn from zero, there may be a problem to have the various valve start position and the rising slope for each MFCs. The response learning function in this MFC enables the uniform and stable rising characteristics. The MFC self-diagnosis for the abnormal operation, display of the alarm and notification in the communication are in this unit.

## Other functions and features

- ▶ 11 BIN size MFCs enable to control from 5 SCCM to 5 SLM
- ▶ High accuracy,  $\pm 1\%$  S.P. @10 – 100 % (N<sub>2</sub>)
- ▶ Wide flow control range, 0.5 – 100 %F.S.
- ▶ High speed response 0.6 s (typical)
- ▶ High valve shut-off performance 0.1 % F.S.
- ▶ 10 million life cycle, robust diaphragm valve
- ▶ Analog, RS-485, DeviceNet™, EtherCAT® are applicable
- ▶ RoHS /CE compliant

### 11 BIN size MFCs enable to control from 5 SCCM to 5 SLM

11 BIN size MFCs enable to control flow-rate from 5 SCCM to 5 SLM in case of the Multi gas, Multi range model. The MFC with each BIN is applicable for wide flow range so that the possibility to convert the flow rate and/or gas name is high without replacing the MFC with other BIN, it means that these models are excellent in flexibility on-site.

### High accuracy, $\pm 1\%$ S.P. @10 – 100 % (N<sub>2</sub>)

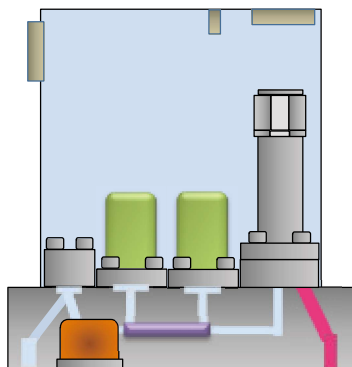
The flow range to guarantee the flow accuracy is  $\pm 1\%$  S.P. owing to the construction for high stability of the pressure sensing condition.

### Wide flow control range, 0.5 – 100 %F.S.

The flow range is 0.5 – 100 % F.S. in case that the MFC outlet pressure is less than 60 kPa (abs). The wide flow range has more possibility to control by the less MFC in the gas system instead of plural MFCs.

### High speed response 0.6 s (typical)

The fast rise and fall characteristic of the flow is important in case of the fast turn-around recipe in the process tool. PS100 series satisfy excellent response time, 0.6s (typical) by applying the improved algorithm. The gas flow stops quickly after setting zero.



The dead volume is small when the valve closes.

### High valve shut-off performance 0.1 % F.S.

The amount of gas between the down-stream side of the MFC valve and the pneumatic valve after the flow rate setting value is set to zero may have a problem. The MFC with 0.1 % F.S. as a valve shut-off performance in PS100 series (in case that the full-scale is set for each BIN) reduce its impact.

### 10 million life cycle, robust diaphragm valve

The open and close cycle results a big number in the process, such as ALD to repeat the open and close frequently. PS100 series applies 10 million life cycle design with the optimized drive circuit and PIEZO element in the valve, Co-Ni alloy diaphragm.

### Wide temperature range 15 – 50 °C

The small gas box in the process tool may results the high ambient temperature around the MFC against the anticipation. The design of this product applies precision, low power devices so that the temperature range of the usage is expanded to 50 °C.

### DeviceNet™, RS-485 / analog, EtherCAT® are applicable

This product applies analog interface, digital interface as DeviceNet™ and the high speed communication as EtherCAT®.

### RoHS /CE compliant

This product is EU-RoHS and CE marking compliant.

## Electrical Connection

### Analog model 9 Pin D-sub male type (M3 screw)

1	VALVE OPEN / CLOSE Connect to +15 V: OPEN Connect to -15 V: CLOSE
2	OUTPUT (0 – 5 VDC / 0 – 100 % F.S.)
3	INPUT POWER (+15 VDC)
4	POWER COMMON
5	INPUT POWER (-15 VDC)
6	SET POINT INPUT (0 – 5 VDC / 0 – 100 % F.S.)
7	SIGNAL COMMON
8	SIGNAL COMMON
9	VALVE VOLTAGE OUTPUT (0 – 4V / 0 – 100 %)

### DeviceNet™ model CM02-8DR5P-CF (D5) DDK

1	SHIELD
2	INPUT POWER (+11 – 25 VDC)
3	GND(-)
4	CAN(H)
5	CAN(L)

### RS-485 model 9 Pin D-sub male type (M3 screw)

1	NA
2	NA
3	INPUT POWER (+15 VDC)
4	POWER COMMON
5	INPUT POWER (-15 VDC)
6	NA
7	SIGNAL COMMON
8	RS-485+
9	RS-485-

### EtherCAT® model (Power connector) XS3M-M524-201 OMRON

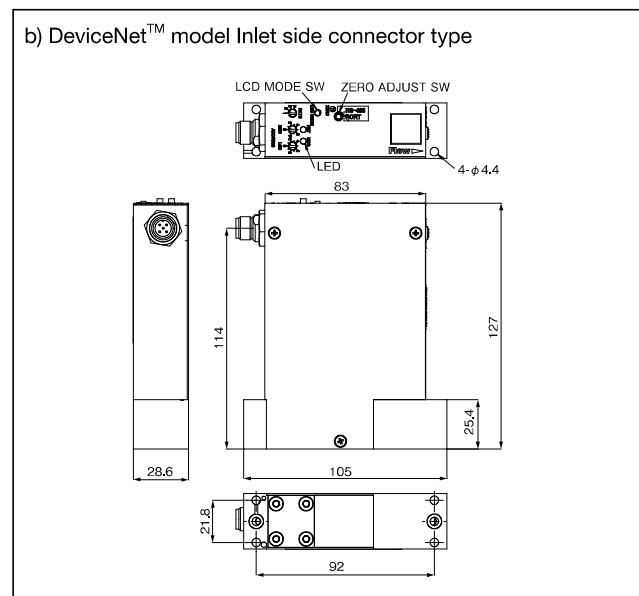
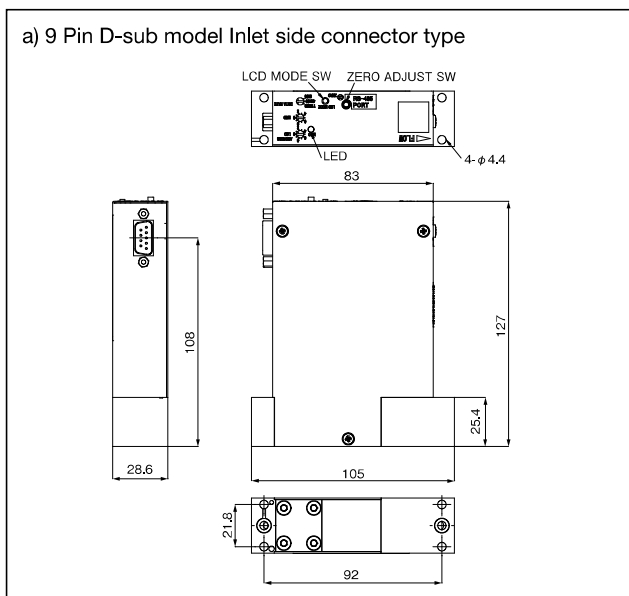
1	+24VDC
2	FG
3	POWER COMMON (0V)

### EtherCAT® model (Communication connector) Cat.5 RJ45 Ethernet connector

Category 5 networking Ethernet cable is used.

## Dimensions

### 1.125" IGS® fitting



# Specifications ※ 1

Items	Normal pressure type	Low vapor pressure type (C <sub>4</sub> F <sub>6</sub> , C <sub>4</sub> F <sub>8</sub> or similar gas)
Full-Scale Range (N <sub>2</sub> equivalent flow)	From 5 SCCM to 5 SLM (Multi-0~10)	
Flow Sensing	Measurement of the differential pressure	
Flow Calibration	Multi Gas, Multi Range (11 BINs)	
Settling Time (SEMI™ E17-91)※2	< 0.8s (< 0.6s (typical))	
Accuracy (N <sub>2</sub> )※3	< ±1% S.P. (10–100%), < ±0.1% F.S. (0.5–10%)	
Linearity	< ±0.5% F.S.	
Repeatability	< ±0.25% F.S.	
Leak Integrity	< 1 × 10 <sup>-11</sup> Pa·m <sup>3</sup> /s (He)	
Flow control range※4	0.5–100% F.S.	
Operating Pressure Range (Inlet)	230–600kPa (abs)	140–250kPa (abs)
Operating Pressure Range (Outlet)	Vacuum-60kPa (abs)	
Leak Across Valve	<0.5% F.S., <0.1% F.S. (in case that the full-scale is set for each BIN)	
Proof pressure	0.6MPaG	
Ambient Temp. Range	15-50 °C [Gas temperature needs to be equal to ambient temperature.]	
Accuracy of the internal pressure sensor	< ±5kPa [0-500kPa (abs)]	
Accuracy of the internal temperature sensor	< ±1 °C [15–50 °C]	
Control Valve Type	Normally-Closed Piezo Actuator	
Materials for external seals	316L S.S.	
Materials for gas wetted	316L S.S., PCTFE, Ni-Co alloy	
Fittings	92mm 1.125" Cseal, 92mm 1.125" Wseal®	
Surface Finish	Electro-polished (fitting, sensor, base) Ra=0.2µm, machine finish Ra=0.8µm	
Orientation	Any position	
Mass	1.1kg	
Special function	Pressure Insensitive function microSD™ card, LCD Display to monitor the various parameter	
Signal interface	Analog, Digital (RS485, DeviceNet™, EtherCAT®)	
Connector type	Analog : 9Pin D-sub Digital : RS485, DeviceNet™, EtherCAT® Maintenance : RS485/Φ2.5 3-pole round connector (for all model)	
Input power	Analog : +15VDC ±4% 90mA, -15VDC ±4% 60mA DeviceNet™ : +11VDC 500mA - +25VDC 230mA EtherCAT® : +24VDC ±10% 120mA	
Flow set signal (Analog model only)	0–5VDC / 0–100%F.S. input impedance > 1MΩ	
Flow out signal (Analog model only)	0–5VDC / 0–100%F.S. load impedance > 2kΩ (required)	

※1. This specification is defined based on our standard test condition with single MFC. The performance with the different condition may not satisfy this specification, and we do not guarantee this specification under the condition with all combination of the configuration.

※2. From 0% to 5%S.P. or greater, ambient temperature is 22°C±10°C

※3. Digital mode, ambient temperature is 22°C±3°C

※4. Valve closes if the set point applies less than 0.5%F.S.

SCCM, SLM are the unit indicates the gas flow-rate as mL/min, L/min at 0°C, 101.3kPa (abs) condition.

F.S. = full scale, S.P. = set point

# PS100 series model and the suffix codes

Description	Description	Suffix code									
Model	Measurement of the differential pressure	PS100									
Interface	Analog (9Pin D-sub)		A								
	DeviceNet™		D								
	L Protocol RS-485 (9 Pin D-sub)		L								
	EtherCAT®		E								
Connector location	Top L Protocol (RS-485) model is excluded.		T								
	Inlet side		U								
External seals	Metal seal			M							
Valve type	Normally closed				C						
Fitting	92mm 1.125" Wseal®							BW1			
	92mm 1.125" Cseal							BA1			
Fixed code									0		
Optional code										NNN	
Full scale range	5 to 12 SCCM										Multi-0
	13 to 20 SCCM										Multi-1
	21 to 40 SCCM										Multi-2
	41 to 60 SCCM										Multi-3
	61 to 100 SCCM										Multi-4
	101 to 200 SCCM										Multi-5
	201 to 300 SCCM										Multi-6
	301 to 500 SCCM										Multi-7
	501 to 1000 SCCM										Multi-8
	1001 to 2500 SCCM										Multi-9
	2501 to 5000 SCCM										Multi-10
Example	PS100ATMCBA10NNN Multi-5										
	Pressure-based MFC, Analog control, Top connector, 9Pin D-sub connector, metal seal, Normally closed piezo valve, 1.125" 92mm Cseal, no option, Full scale 200SCCM										

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