

Aera

Aera® HC100/HM100 Series

Digital Mass Flow Controller, Mass Flow Meter



Features

- ▶ Quick flow-response, 0.5s (HC100 series)
- ▶ 10 millions life cycle, robust diaphragm valve
- ▶ DeviceNet™, RS-485/analog, EtherCAT® are applicable

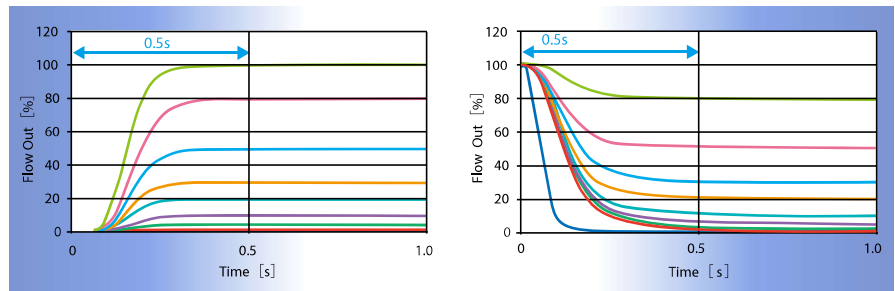


Mass flow controller is one of the most critical devices in the semiconductor manufacturing tools, it is progressing with changes in the cutting-edge process. HC100/HM100 series is a digital MFC/MFM model with the proven thermal sensor.

HC100/HM100 series have the improved essential performance like the response, robustness for ALD process, valve shut-off capability, control range, flow accuracy with the times.

High speed flow-response 0.5s (HC100 series)

The quick rise and fall characteristic of the flow is important in case of the quick turn-around recipe in the process tool. HC100 series satisfy excellent response time, 0.5s (from Multi-1 to Multi-5) by applying the improved algorithm.



The example of the rising edge in the wave form (Multi-4)

The example of the falling edge in the wave form (Multi-4)

10 millions 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. HC100 series applies 10 millions life cycle design with the optimized drive circuit and PIEZO element in the valve, Co-Ni alloy diaphragm.

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

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

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 Features

- ▶ Multi-gas, Multi-range selection
- ▶ 9 BIN size MFCs enable to control from 10SCCM to 50SLM
- ▶ High accuracy, $\pm 1\%$ S.P. @10-100% (N_2)
- ▶ Wide flow control range, 0.5-100% F.S. (NC type with PCTFE poppet model)
- ▶ High valve shut-off performance, 0.1% F.S. (NC type with PCTFE poppet model)
- ▶ Wide temperature range 15-50°C
- ▶ RoHS / CE compliant

9 BIN size MFCs enable to control from 10SCCM to 50SLM

9 BIN size MFCs enable to control flow-rate from 10SCCM to 50SLM 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_2)

The flow range to guarantee the flow accuracy as $\pm 1\%$ S.P. is expanded to 10 – 100% F.S. from the spec in the legacy model, 25 – 100% F.S.

Wide flow control range, 0.5 - 100% F.S.

The flow range is expanded to 0.5 – 100% F.S. (NC type with PCTFE poppet model) from the spec in the legacy model, 2 – 100% F.S. The wide flow range has more possibility to control by a single MFC in the gas system instead of 2 MFCs.

Electrical Connection

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

1	VALVE OPEN / CLOSE (except HM100 / HM101) Connect to +15V : OPEN Connect to -15V : CLOSE
2	OUTPUT (0 - 5VDC / 0 - 100%F.S.)
3	INPUT POWER (+15VDC)
4	POWER COMMON
5	INPUT POWER (-15VDC)
6	SET POINT INPUT (except HM100 / HM101) (0 - 5VDC / 0 - 100%F.S.)
7	SIGNAL COMMON
8	SIGNAL COMMON
9	VALVE voltage output (0 - 4V / 0 - 100%) (except HM100 / HM101)

RS485 model 9Pin D-sub male type (M3 screw)

1	NA
2	NA
3	INPUT POWER (+15VDC)
4	POWER COMMON
5	INPUT POWER (-15VDC)
6	NA
7	SIGNAL COMMON
8	RS485+
9	RS485-

Leak across the valve 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 HC100 series (NC type / PCTFE poppet model) reduce its impact.

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 supposition. This product equipped high quality devices and low power design so that the ambient temperature range is applicable up to 50°C.

RoHS / CE compliant

This product is EU-RoHS and CE marking compliant.

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

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

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.

Aera[®] HC100/HM100 Series

Specification

Items	HC100 / HM100		HC101 / HM101	
Full-Scale Range (N ₂ equivalent flow)	10-5,000SCCM (Multi-1-6)		5,001-10,000SCCM (Multi-7)	10,001-50,000SCCM (Multi-8, 9)
Flow Sensing	Thermal Sensor Type			
Flow Calibration	Multi Gas, Multi Range (9 BINs)			
Settling Time (SEMI TM E17-91) ^{*2}	< 0.5s (Multi-1-7)			< 0.7s (Multi-8, 9)
Accuracy (N ₂) ^{*3}	< ±1%S.P. (10 - 100%), < ±0.1%F.S. (2 - 10%)			
Linearity	< ±0.5%F.S.			
Repeatability	< ±0.2%F.S.			
Zero Stability	< ±0.3%F.S. / year			
Leak Integrity	< 1x10 ⁻¹¹ Pa·m ³ /s (He)			
Flow control range ^{*4} (except HM100 / HM101)	0.5 - 100%F.S. (PCTFE poppet model), 2 - 100%F.S. (Metal poppet, NO model)			
Operating Pressure Range ^{*5}	50 - 400kPaD (Multi-1-6)	70 - 400kPaD (Multi-7)	250 - 400kPaD (Multi-8, 9)	
Operating Pressure Range	20kPaD			
Maximum Operating Upstream Pressure	400kPaG			
Operating Downstream Pressure Range	Vacuum to atmospheric pressure [Contact sales if the downstream pressure more than atmospheric pressure is required]			
Leak Across Valve (except HM100 / HM101)	< 0.1% F.S. (PCTFE poppet), < 1.0% F.S. (Metal poppet, NO model) [N ₂ P1=50kPaG (Multi-1-6), 70kPaG (Multi-7), 250kPaG (Multi-8, 9), P2=atmospheric pressure]			
Proof pressure	HC100 / HC101/ HM100 / HM101: 1MPaG			
Ambient Temp. Range	15 - 50°C [Gas temperature needs to be equal to ambient temperature]			
Internal pressure sensor	< ±5kPa [0 - 500kPa (abs)]			
Internal temp. sensor	< ±1°C [15 - 50°C]			
Control Valve Type (except HM100 / HM101)	Normally-Closed (NC) and Normally-Open (NO) Piezo Valve			
Materials for external seals	316L S.S.			
Materials for gas wetted	316L S.S., PCTFE, Co-Ni alloy			
Fittings	92mm 1.125" Cseal, 92mm 1.125" Wseal [®] , 124mm 1/4" VCR [®] type			
Surface Finish	Electro-polished (fitting, sensor, base) Ra=0.2μm, machine finish Ra=0.8μm			
Orientation	Any position			
Mass	1.1kg			
Special function	microSD TM card, LCD Display to monitor the various parameter			
Signal interface	Analog, Digital (RS485, DeviceNet TM , EtherCAT [®])			
Connector type	Analog : 9Pin D-sub Digital : RS485, DeviceNet TM , EtherCAT [®] Maintenance : RS485/Φ 2.5 3-pole round connector (for all model)			
Input power ^{*1}	Analog : +15VDC ±4% 90mA, -15VDC ±4% 60mA DeviceNet TM : +11VDC 500mA - +25VDC 230mA EtherCAT [®] : +24VDC ±10% 120mA			
Flow set signal (Analog model, except HM100 / HM101)	0 - 5VDC / 0 - 100% F.S. input impedance > 1MΩ			
Flow out signal (Analog model)	0 - 5VDC / 0 - 100% F.S. load impedance > 2kΩ			

*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.

*5. For N₂ full-scale flow in case of outlet pressure less than half of the inlet pressure minus 13.8kPaA.

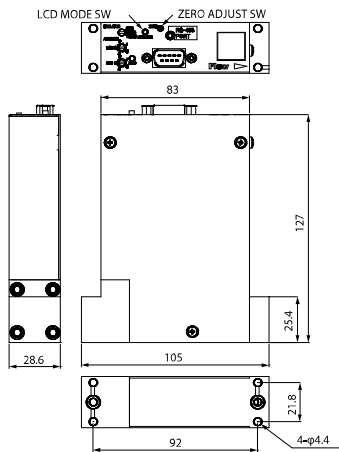
SCCM, SLM are the unit to indicates the gas flow-rate as mL/min, L/min at 0°C, 101.3kPa(abs) condition.

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

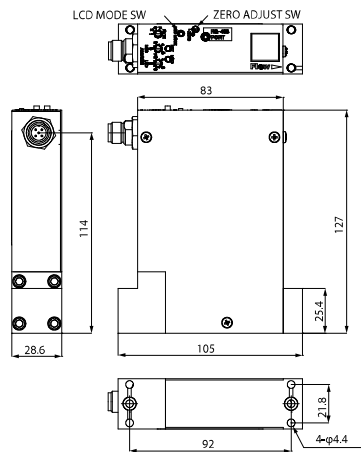
Dimensions

1.125" IGS® fitting

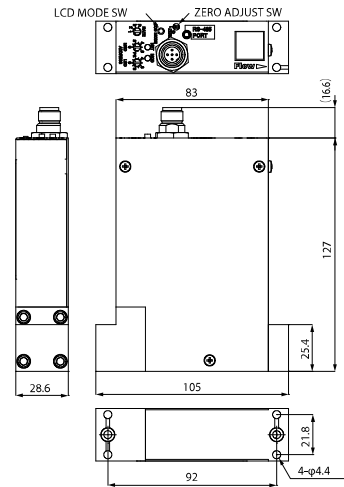
- 9Pin D-sub model
Top connector type



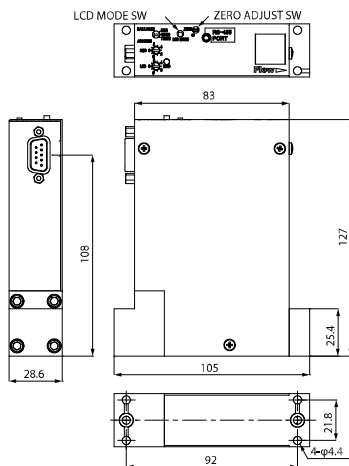
- DeviceNet™ model
Inlet side connector type



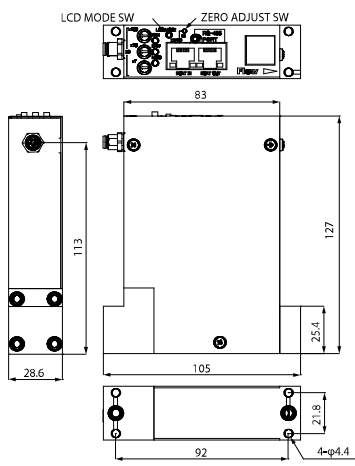
- DeviceNet™ model
Top connector type



- 9Pin D-sub model
Inlet side connector type

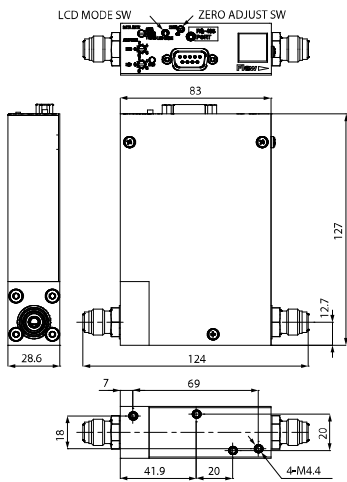


- EtherCAT® model

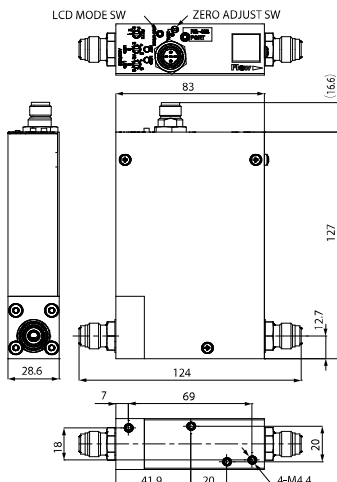


124mm 1/4" VCR® type fitting

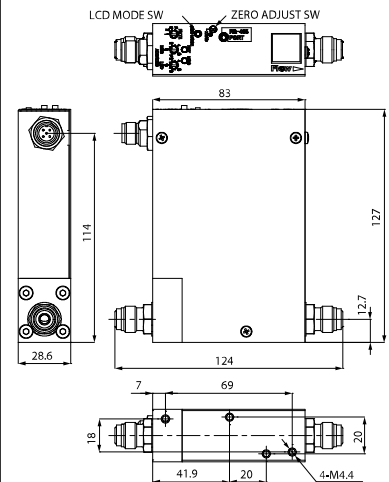
- 9Pin D-sub model
Top connector type



- DeviceNet™ model
Top connector type



- DeviceNet™ model
Inlet side connector type



HC100 / 101, HM100 / 101 series model and suffix codes

Category	Description	Suffix codes									
Model	Thermal sensor type	MFC	HC100								
			HC101								
		MFM	HM100								
			HM101								
Interface	Analog (9Pin D-sub)		A								
	DeviceNet™		D								
	L Protocol RS485 (9Pin D-sub)		L								
	EtherCAT®		E								
Connector location	Top (except L Protocol RS485 model)			T							
	Inlet side (except analog and EtherCAT® model)			U							
External seals	Metal seal				M						
Valve type	Normally closed					C					
	Normally opened					O					
Fitting	92mm 1.125" Wseal®						BW1				
	92mm 1.125" Cseal						BA1				
	124mm 1/4" VCR® type						4V2				
Fixed code								1			
Optional code									NNN		
Full scale range	10 to 30 SCCM										Multi -1
	31 to 100 SCCM										Multi -2
	101 to 300 SCCM										Multi -3
	301 to 1,000 SCCM										Multi -4
	1,001 to 3,000 SCCM										Multi -5
	3,001 to 5,000 SCCM										Multi -6
	5,001 to 10,000 SCCM										Multi -7
	10,001 to 30,000 SCCM										Multi -8
	30,001 to 50,000 SCCM										Multi -9
Example	HC100DTMCBA11NNN Multi-5										
	Thermal type PI-MFC, DeviceNet™, Top connector, Metal seals, Normally closed Piezo valve, 1.125" 92mm Cseal fitting, No option, full-scale 3000SCCM										



<http://www.hitachi-metals.co.jp/e/>

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