

CMFC-5000 Coriolis Mass Flow Controller for Slurries and Chemicals

DESCRIPTION

The CMFC-5000 Series is a line of high-performance closed-loop flow controllers designed for use in a wide variety of high-purity liquids including DI water, harsh chemicals, and CMP polishing slurries.

A typical flow control module consists of a high-accuracy, advanced Coriolis flow meter with a Malema control valve. The Coriolis flow meter has an all PFA construction with no moving parts or seals. It sets a standard for flow measurement in terms of accuracy and repeatability. The Coriolis flow measurement technology with its advanced digital signal processing ensures reliable performance even for process fluids with entrapped gases. The high speed/precision motor actuated pinch valve (for slurries) or diaphragm valve (for chemicals) helps provide a fast and precise response with minimal overshoot. Its all PTFE (Polytetrafluoroethylene) construction and minimal dead volume ensure maximum process purity and reliability (chemical control valve).

In operation, the user inputs a set point via an analog signal. The flow control module's electronics continuously compares this set point value with the flow rate reported by the flow meter and provides a continuous feedback signal to modulate the control valve to maintain the desired set point. The state of the art control algorithm together with high speed/precision flow meter and valve achieves fast, accurate, and repeatable control.



KEY FEATURES

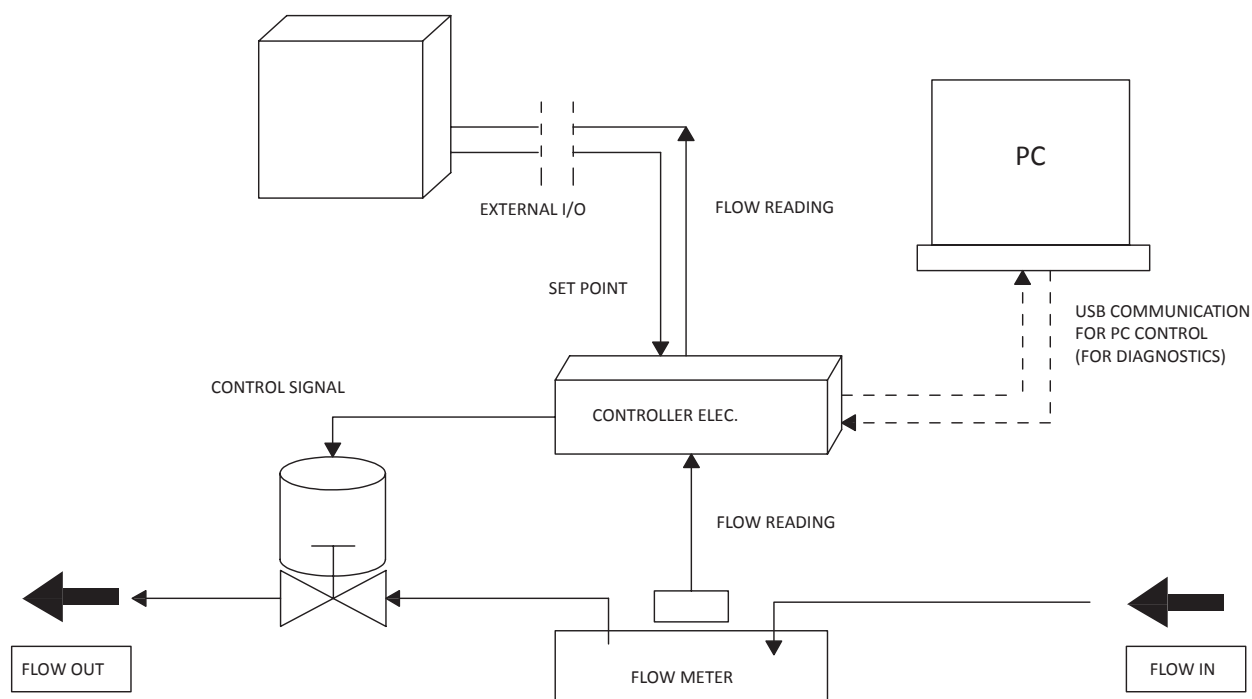
- High Accuracy - Controls flow rate to within $\pm 1.5\%$ of set point; ideal for fluid blending and/or dispense applications
- Fast Response 2 seconds (typically < 1 seconds for most applications)
- Broad application range with 2 types of control valves
- Wide range of flow control capability
- All PTFE/PFA wetted part construction - compatible with UHP liquid chemicals, DI water and CMP slurries (slurry module with Pt cured Silicone tubing)
- Mass flow measurement accuracy is independent of fluid density and viscosity

APPLICATIONS

- Semiconductor CMP tools - used to precisely control the flow of chemicals and polishing slurries dispensed to the polishing platen; an ideal replacement for peristaltic pump based delivery systems.
- Wet Cleaning tools - for accurate and reliable control of the blending and delivery of cleaning chemistries.
- Copper Plating tools - well suited to chemical mixing and dispensing applications.



TYPICAL BLOCK DIAGRAM



Performance Specifications

Flow Range	50 – 500 g/min
	100 – 1000 g/min
	150 – 1500 g/min
	200 – 2000 g/min
	250 – 2500 g/min
	300 – 3000 g/min
	400 – 4000 g/min (3/8" tubing only)
	500 – 5000 g/min (3/8" tubing only)
Accuracy (for room temperature DIW)	±1.5% of set point or ±3 g/min (whichever is larger)
Control Repeatability	± 0.5% of set point or ± 0.5 g/min (whichever is larger)
Flow Control Time	< 2 sec (< 1 sec for most applications)
Fluid Temperature	18 – 50 °C
Ambient: Temperature/Humidity	0 – 40 °C / 30 – 80% RH, without Dew
Maximum Expected Operating Pressure	50 psig
Maximum Safe Internal Pressure	70 psig

* Please consult with SPS-International for tighter accuracy needs

** Consult SPS-International for higher temperature applications

Electrical Specifications

Accuracy (for room temperature DIW)	±1.5% of set point or ±3 g/min (whichever is larger)
Control Repeatability	± 0.5% of set point or ± 0.5 g/min (whichever is larger)
Flow Control Time	< 2 sec (< 1 sec for most applications)
Fluid Temperature	18 – 50 °C

* Consult SPS-International for other options

Material Specifications

Wetted parts	PFA high purity, PTFE, Pt cured Silicone*
Non Wetted Parts, Enclosure	PPS, PEEK, Acrylic, Vinyl, PVC**, PC, PP, PVDF, Aluminum 6061 T6 (anodized), Stainless Steel (passivated)

*Only used in the Slurry Module

** Flame retardant (FMET4325)

Physical Specifications

Mounting Orientation	Horizontal or Vertical
Fluid Connections	Inlet/Outlet: 1/4" or 3/8", Flare or Pillar
Flow Restrictions (orifice)	> 2 mm
Ingress Rating	IP64

POWER AND SIGNAL CONNECTIONS (TYPICAL)

(Refer to drawing for custom parameters)

It is always recommended to use a dedicated power supply with 24 Vdc ($\pm 10\%$), 500mA.

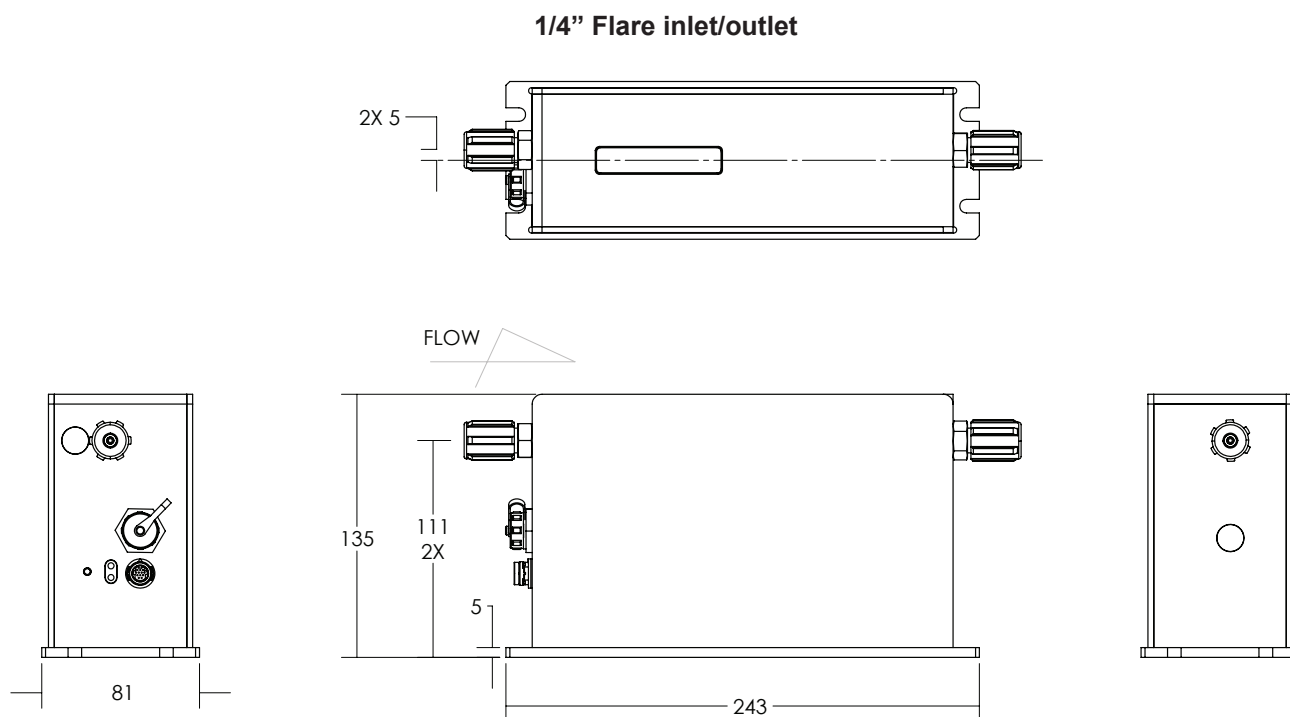
The configuration of the 12 pin-connector and its mating cable is given in the table below. A USB communication cable can be ordered separately to interface with the PC GUI program.

12 Pin Connector Configuration

Pin No.	Wire Color	Description	Specification	Remarks
1	Red	Power (+) 24 V DC	24 V DC $\pm 10\%$	
2	Black	Power (+) 24 V DC		
3	Pink	Set Point (+)	4-20 mA or 0-10 V DC	
4	Gray	Set Point (-)		
5	Blue	Flow Out (+)	4-20 mA (Max. load 900 ohm) or 0-10 V DC	
6	White	Flow Out (-)		
7	Red/Black	D Input/Output 2 (+)		Configurable
8	White/Black	DIO (-)		
9	Yellow	D Input/Output 1 (+)		Configurable
10	Brown	DIO (-)		
11	Green	Zero Adjust*		Pull up to power supply voltage starts the zero adjustment
12	Yellow	No Connection		

* Make sure the flow is completely stopped before zero adjust.

DIMENSIONAL DRAWING (TYPICAL HORIZONTAL MODULES)



Consult with SPS-International for other sizes and configurations, including vertical mount

Ordering Information

Model Code															Description
CMFC-5	***	-	F	*	*	**	-	*	*	-	*	*	-	***	
Sensor	031														3 mm serial
	032														3 mm parallel
	-														
Material		F													PFA
Tube Size		2													1/4"
		3													3/8"
Connection Type		1													Tube ends
		2													Flare
		3													Super Pillar 300
Flow Range		04													50-500 g/min*
		05													100-1000 g/min*
		06													150-1500 g/min*
		07													200-2000 g/min**
		08													250-1200 g/min**
		09													300-3000 g/min**
		10													400-4000 g/min***
		-													
Input (Set Point)		1													Current (4-20 mA)
		2													Voltage (0-10 V DC)
		3													Voltage (0-5 V DC)
Output (Flow Rate)		1													Current (4-20 mA)
		2													Voltage (0-10 V DC)
		3													Voltage (0-5 V DC)
		-													
Valve Type		N													Diaphragm Valve (clear chemistries)
		P													Pinch Valve (Colloidal suspensions)
Mounting Orientation		H													Horizontal
		-	XXX												Unique PN Identifier

* CMFC-5031 recommended, CMFC-5032 optional for high viscosity applications

** CMFC-5032 only

***CMFC-5032-F3 only