

LFC-7000 Integrated Flow Control Module for slurries and Chemicals

DESCRIPTION

The LFC-7000 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 module for high-accuracy control of ultrapure chemicals combines a Malema ultrasonic flowmeter, with accuracy rated at $\pm 1\%$ reading, with a Malema control valve. The ultrasonic flowmeter has an all PFA construction with no moving parts or seals. It sets a standard for flow measurement in terms of accuracy, repeatability, and purity. Its digital signal processing technology ensures reliable performance even with a certain degree of bubbles present in the process fluids. 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 module).

In operation, the user inputs a "setpoint" via an analog signal. The flow control module's electronics continuously compares this set point value with the flowrate reported by the flowmeter 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/repeatable control.

APPLICATIONS

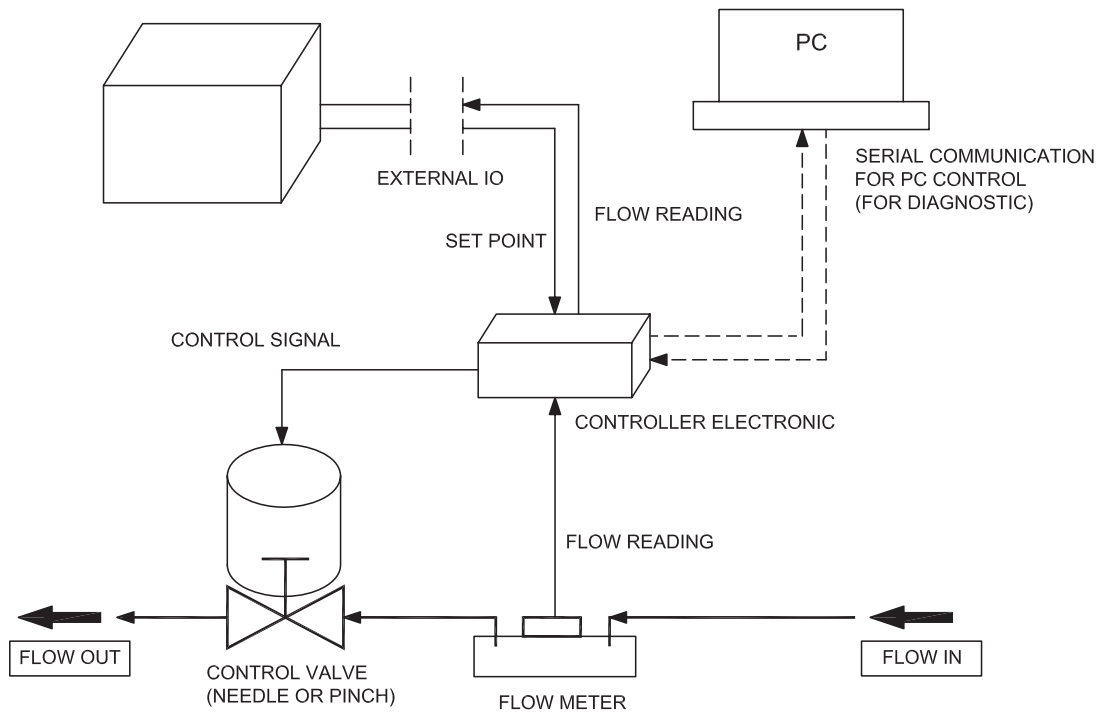
- Semiconductor CMP tools - used to precisely control the flow of chemicals and polishing slurries dispensed to the polishing platen; an ideal replacement for peristaltic pump based delivery systems.
- Wet Cleaning tools - for accurate and reliable control of the blending and delivery of cleaning chemistries.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



KEY FEATURES

- High Accuracy - Controls flowrate to within $\pm 1\%$ of setpoint; ideal for fluid blending and/or dispense applications
- Fast Control Response 3 seconds (typically < 2 seconds for most applications)
- Broad application range with 2 types of control valves
- Wide range of flow control capability: 5 mL/min - 12000 mL/min (turndown can be as high as 100:1)
- All PTFE/PFA wetted part construction: insures compatibility with UHP liquid chemicals, DI water and CMP slurries (slurry module with Pt cured Silicone tubing)
- Low Maintenance: modules featuring ultrasonic flow meters with NO moving parts provide the ultimate in "uptime" (slurry module with pinch tube replacement cycle of 3 years or longer)

TYPICAL BLOCK DIAGRAM



Performance Specifications

Standard Full Scale Range	50 mL/min
	100 mL/min
	250 mL/min
	500 mL/min
	1000 mL/min
	1500 mL/min
	2500 mL/min*
	4000 mL/min*
	5000 mL/min*
Accuracy ** (for room temperature DIW)	±1% of set point or ±3mL/min (whichever is larger)
Repeatability **	± 1% of set point or ± 1 mL/min (whichever is larger)
Control Repeatability	± 0.5% of set point or ± 0.5 mL/min (whichever is larger)
Flow Control Time	< 3 sec
Fluid Temperature	10 - 60 C ***
Ambient: Temperature/Humidity	0= - 40= C / 30 - 80% RH, without Dew
Maximum Expected Operating Pressure	50 psig
Maximum Safe Internal Pressure	70 psig
Differential Pressure Range	7 to 30 psid

* The enclosure footprint may be larger for these flow ranges to meet the pressure drop specification.

The minimum differential pressure requirements can be higher for these ranges

** Please consult SPS-International with for tighter accuracy/repeatability needs. Accuracy/repeatability is based on room temperature DIW calibration

*** Consult SPS-International for higher temperature application

Electrical Specifications

Power Supply Input	24 Vdc $\pm$ 10%
Current Consumption	Max 0.5 A
Alarm Signals	Max 30 Vdc, 200 mA NPN open collector
Control Signal In *	0 to 10 Vdc or 4 to 20 mA (input resistance 500 Ω)
Flow Signal Out **	0 to 10 Vdc or 4 to 20 mA (input resistance 900 Ω)

* Other options available

** Both Active and Passive current options available

CE Certification: Complies to EMC Directive 2014/30/EU

Material Specifications

Wetted parts	PFA,PTFE, Pt cured Silicone*
Non Wetted Parts, Enclosure	PPS, PEEK, Acrylic, Vinyl, PVC**

* Only used in the Slurry Module

** Flame retardant (FMET4325)

Physical Specifications

Mounting Orientation	Horizontal or Vertical
Fluid Connections	Inlet/Outlet: ¼" or 3/8", Flare or Pillar
Flow Restrictions (orifice)	> 2 mm
Ingress Rating	IP65

POWER AND SIGNAL CONNECTIONS

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 communication cable with a 6 pin connector can be ordered separately to interface with the PC GUI program.

12 Pin Connector Configuration

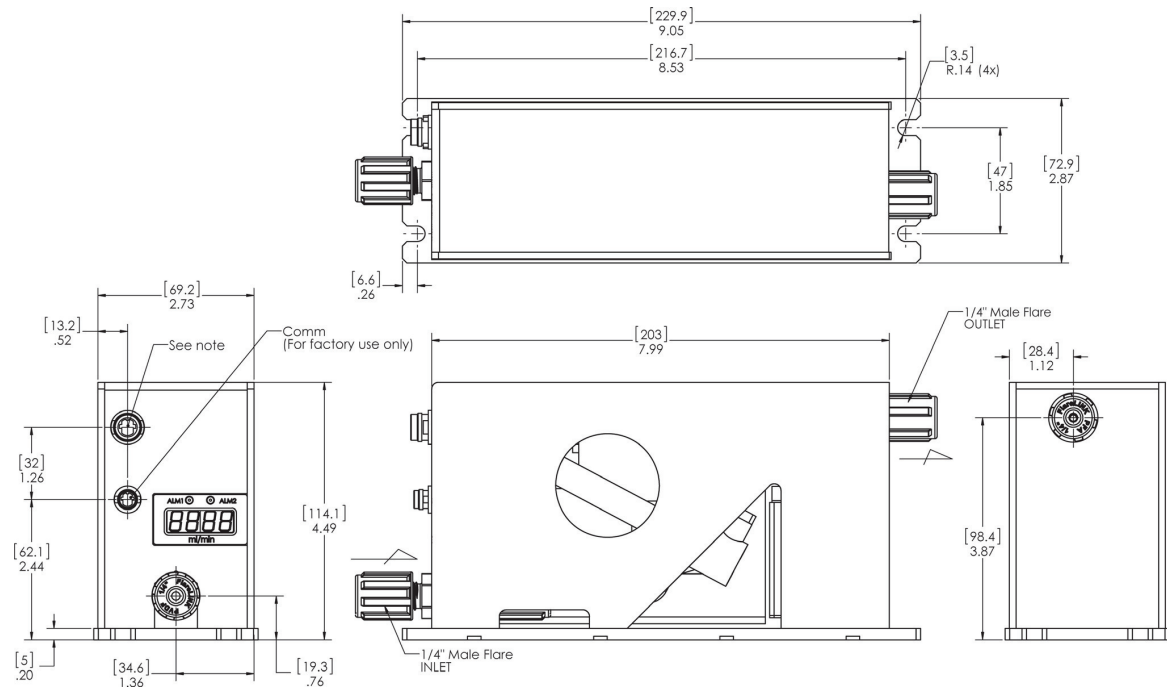
Pin No.	Wire Color	Description	Specification	Remarks
1	Red	Power (+) 24 Vdc	24 Vdc $\pm 10\%$	
2	Black	Power (-) 0 Vdc		
3	Pink	Set Point (+)	0 - 10 Vdc or 4 - 20 mA (input resistance 500 Ω)	
4	Gray	Set Point (-)		
5	Blue	Flow Out (+)	0 - 10 Vdc or 4 - 20 mA (upto 900 Ω)	
6	White	Flow Out (-)		
7	Red/Black	Valve Alarm (+)	Max. rating 30 Vdc, 200 mA	Open Collector Output
8	White/Black	Valve Alarm (-) (0V)		
9	Yellow	Sensor Alarm (+)	Max. rating 30 Vdc, 200 mA	Open Collector Output
10	Brown	Sensor Alarm (-) (0V)		
11	Green	Zero Adjust*	0 Vdc: Normal operation 24 Vdc : 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.

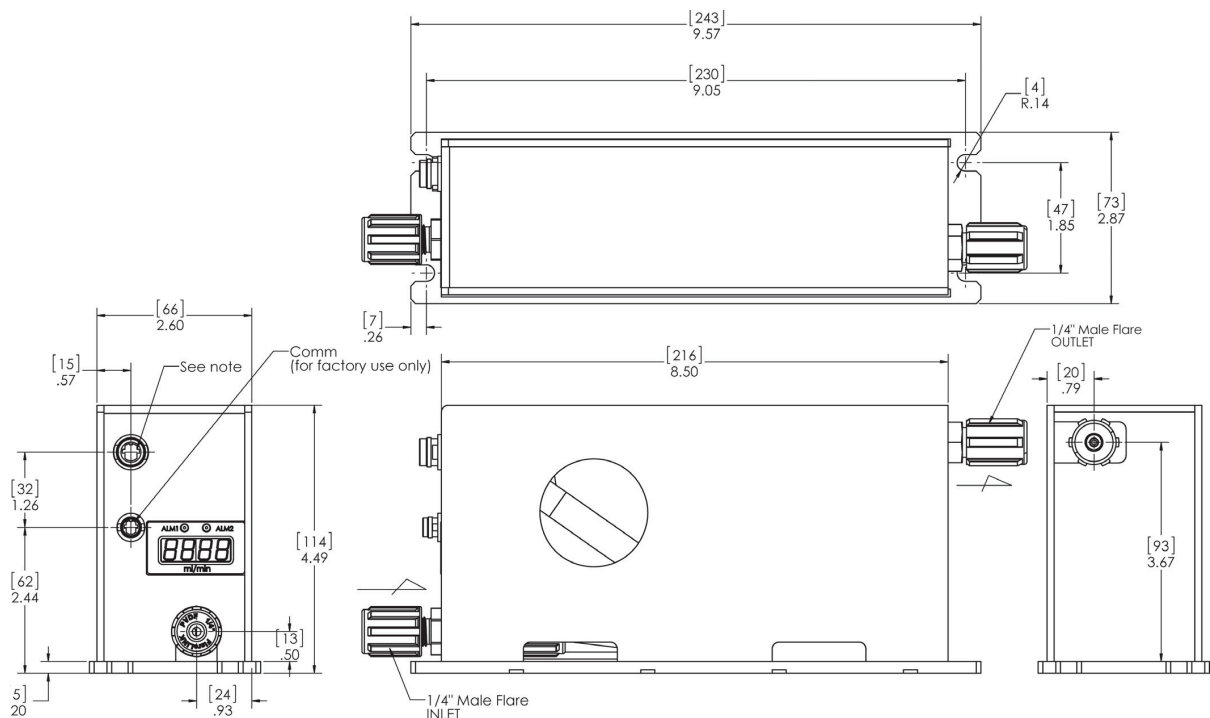
DIMENSIONAL DRAWINGS

(Horizontal Modules)

Chemical Version



Slurry Version



Ordering Information

Model Code														Description
LFC-7000	*	-	*	*	*	*	*	-	*	*	*	-	***	
Alarms	0													No Alarms or Display
	1													Alarms and Display on Top Panel
	2													Alarm and Display on Front Panel
	-													
Tube Size	2													1/4"
	3													3/8"
	4													1/2"
Connection	1													Flare Ends
	2													Super Pillar 300
Standard Full Scale Range	0													50mL/min
	1													100 mL/min
	2													250 mL/min
	3													500 mL/min
	4													1000 mL/min
	5													1500 mL/min
	6													2500 mL/min
	7													4000 mL/min
	8													8000 mL/min
	9													12000 mL/min
Sensor Converter	1													M-2111 (6 mm) / DSP
	2													M-2111 (4 mm) / DSP
	3													M-2111 (10 mm) / DSP
Input / Output	1													0 to 10 Vdc / 0 to 10 Vdc
	2													4 to 20 Vdc / 4 to 20 Vdc
	3													0 to 10 Vdc / 4 to 20 Vdc
	4													Others
	-													
Valve Type	1													Diaphragm Valve
	2													Pinch Valve
Mounting Orientation	1													Horizontal
	2													Vertical
Accessories	1													Without plug connector
	2													With plug connector and cable
	XXX													Unique PN identifier