



LFC-7000

Integrated Flow Control Module for Slurries and Chemicals

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)

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.

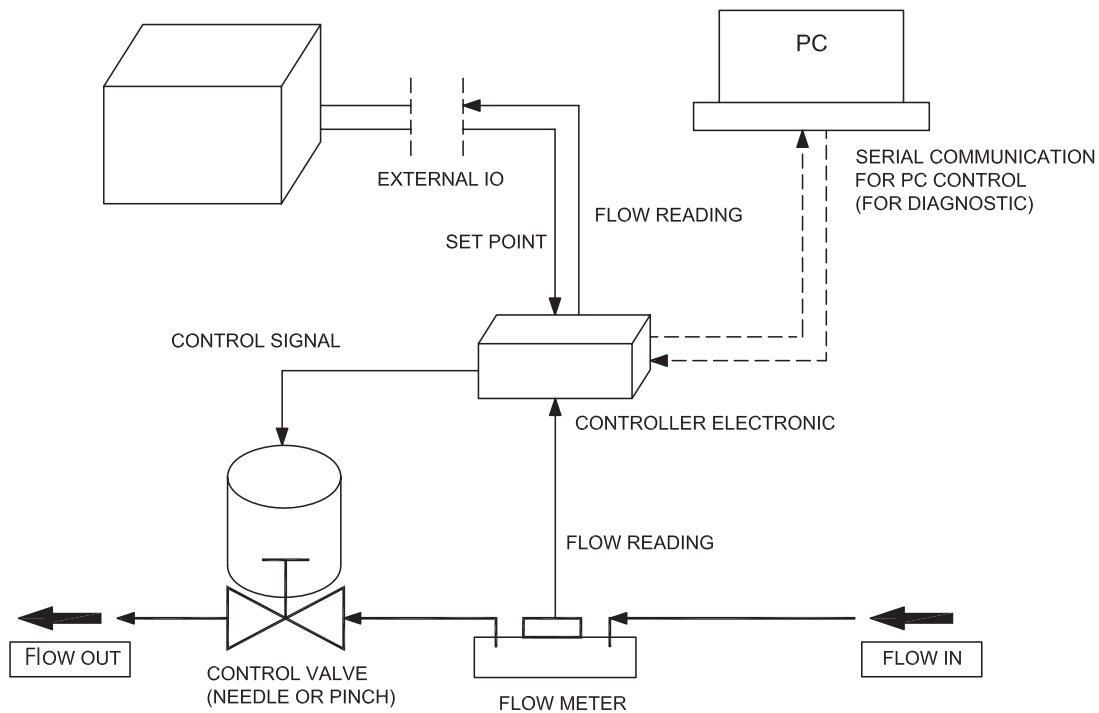
Description

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.

Typical Block Diagram



Performance Specification

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 with Malema for tighter accuracy/repeatability needs. Accuracy/repeatability is based on room temperature DIW calibration

*** Consult the factory for higher temperature application.

Corporate Headquarters

1060 S Rogers Circle
Boca Raton, FL 33487
P: (561) 995-0595 F: (561) 995-0622

West Coast Headquarters

2329 Zanker Road
San Jose, CA 95131
P: (408) 970-3419 F: (408) 970-3426

Asia Pacific Headquarters

35 Marsiling Industrial Estate Road 3 #02-06
Singapore 739257
P: (65) 6482-3533 F: (65) 6484-4231

India Headquarters

#1433, 3rd and 4th Floor, Pipeline Road,
Mahalakshmpuram, Bangalore 560086
P:(91) 80 2349-9362

Electrical Specification

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 250 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: 1/4" 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 250 Ω)	
4	Grey	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	Violet	No Connection		

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

Corporate Headquarters

1060 S Rogers Circle
Boca Raton, FL 33487
P: (561) 995-0595 F: (561) 995-0622

West Coast Headquarters

2329 Zanker Road
San Jose, CA 95131
P: (408) 970-3419 F: (408) 970-3426

Asia Pacific Headquarters

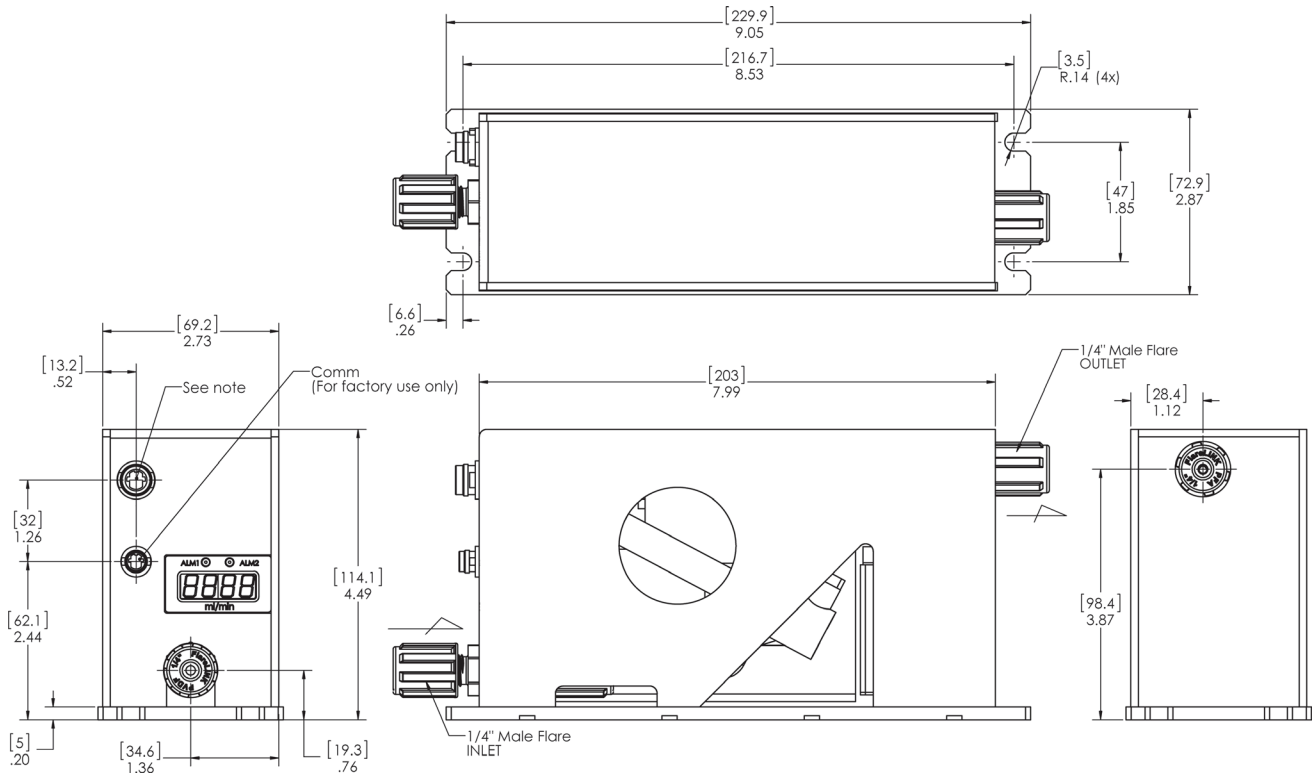
35 Marsiling Industrial Estate Road 3 #02-06
Singapore 739257
P: (65) 6482-3533 F: (65) 6484-4231

India Headquarters

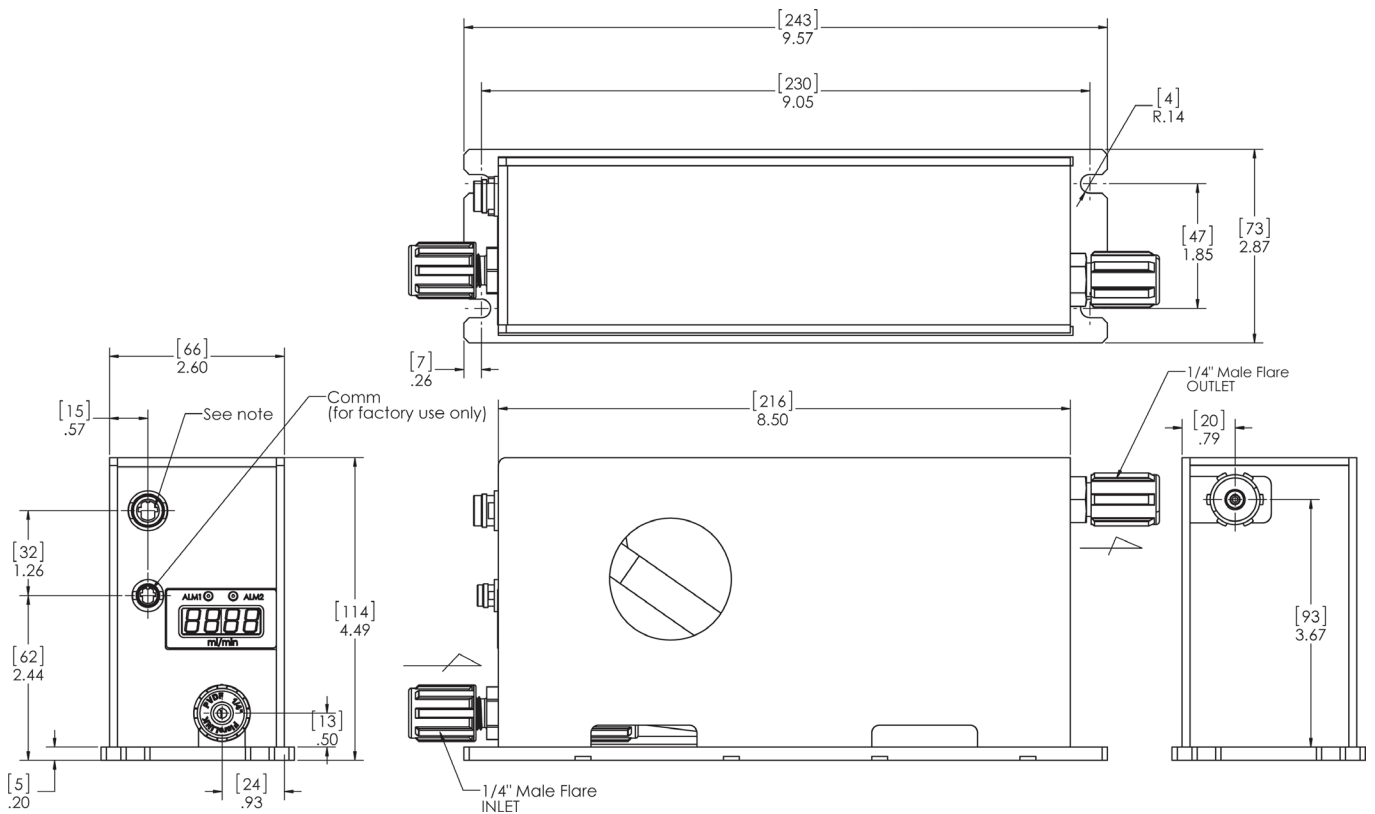
#1433, 3rd and 4th Floor, Pipeline Road,
Mahalakshimpuram, Bangalore 560086
P:(91) 80 2349-9362

Dimensional Drawings (Horizontal Modules)

Chemical Version



Slurry Version



Corporate Headquarters

1060 S Rogers Circle
Boca Raton, FL 33487
P: (561) 995-0595 F: (561) 995-0622

West Coast Headquarters

2329 Zanker Road
San Jose, CA 95131
P: (408) 970-3419 F: (408) 970-3426

Asia Pacific Headquarters

35 Marsiling Industrial Estate Road 3 #02-06
Singapore 739257
P: (65) 6482-3533 F: (65) 6484-4231

India Headquarters

#1433, 3rd and 4th Floor, Pipeline Road,
Mahalakshimpuram, Bangalore 560086
P:(91) 80 2349-9362

Ordering Information

Model Code													Description	
LFC-700	*	-	*	*	*	*	*	-	*	*	*	-	***	
Alarms	0													No Alarms or Display
	1													Alarms and Display on Top Panel
	2													Alarms 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													50 mL/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 mA / 4 to 20 mA
	3													0 to 10 Vdc / 4 to 20 mA
	4													Others
	-													
Valve Type	1													Diaphragm Valve
	2													Pinch Valve
Mounting Orientation	1													Horizontal
	2													Vertical
Accessories	0													Without plug connector
	1													With plug connector and cable
												XXX		Unique PN identifier

Note: Specifications are subject to change without notice.

© 2020 Malema Engineering Corporation. All rights reserved.

Malema, Malema Sensors, and Malema Engineering Corporation are service marks of Malema Engineering Corporation. All other trademarks are property of their respective owners. Malema supplies this publication for informational purposes only. While every effort has been made to ensure accuracy, this publication is not intended to make performance claims or process recommendations. Malema does not warrant, guarantee, or assume any legal liability for the accuracy, completeness, timeliness, reliability, or usefulness of any information, product, or process described herein. We reserve the right to modify or improve the designs or specifications of our products at any time without notice. For actual product information and recommendations, please contact your local Malema representative.

Corporate Headquarters

1060 S Rogers Circle
Boca Raton, FL 33487
P: (561) 995-0595 F: (561) 995-0622

West Coast Headquarters

2329 Zanker Road
San Jose, CA 95131
P: (408) 970-3419 F: (408) 970-3426

Asia Pacific Headquarters

35 Marsiling Industrial Estate Road 3 #02-06
Singapore 739257
P: (65) 6482-3533 F: (65) 6484-4231

India Headquarters

#1433, 3rd and 4th Floor, Pipeline Road,
Mahalakshimpuram, Bangalore 560086
P:(91) 80 2349-9362