LFC-7000

Integrated Flow Control Module for Slurries and Chemicals

Features

- High Accuracy - Controls flowrate to within ± 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)

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.

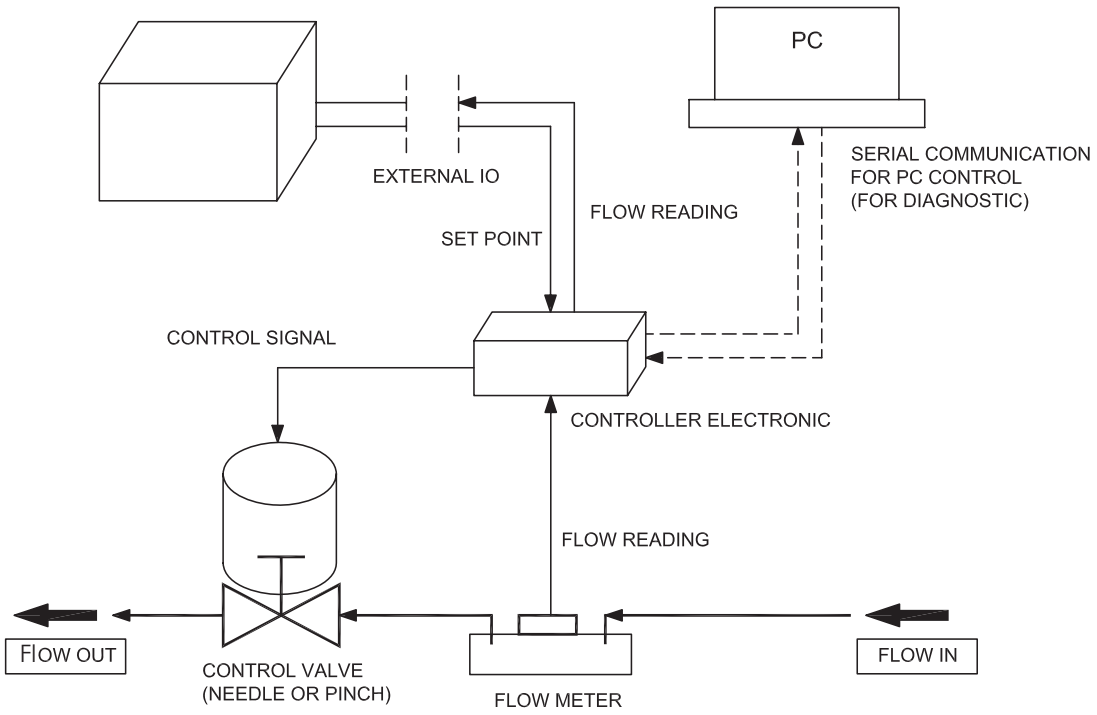
A typical module for high-accuracy control of ultrapure chemicals combines a Malema ultrasonic flowmeter, with accuracy rated at +/- 1% reading, with a Malema control valve. The ultrasonic flowmeter has an all PFA construction with no moving parts or seals. It sets a standard for flow measurement in 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.

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.

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Electrical Specification

Power Supply Input	24 Vdc ± 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 resistanace 500 Ω)
Flow Signal Out **	0 to 10 Vdc or 4 to 20 mA (input resistanace 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 (±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 ± 10%	
2	Black	Power (-) 0 Vdc		
3	Pink	Set Point (+)	0 - 10 Vdc or 4 - 20 mA (input resistanace 500 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.

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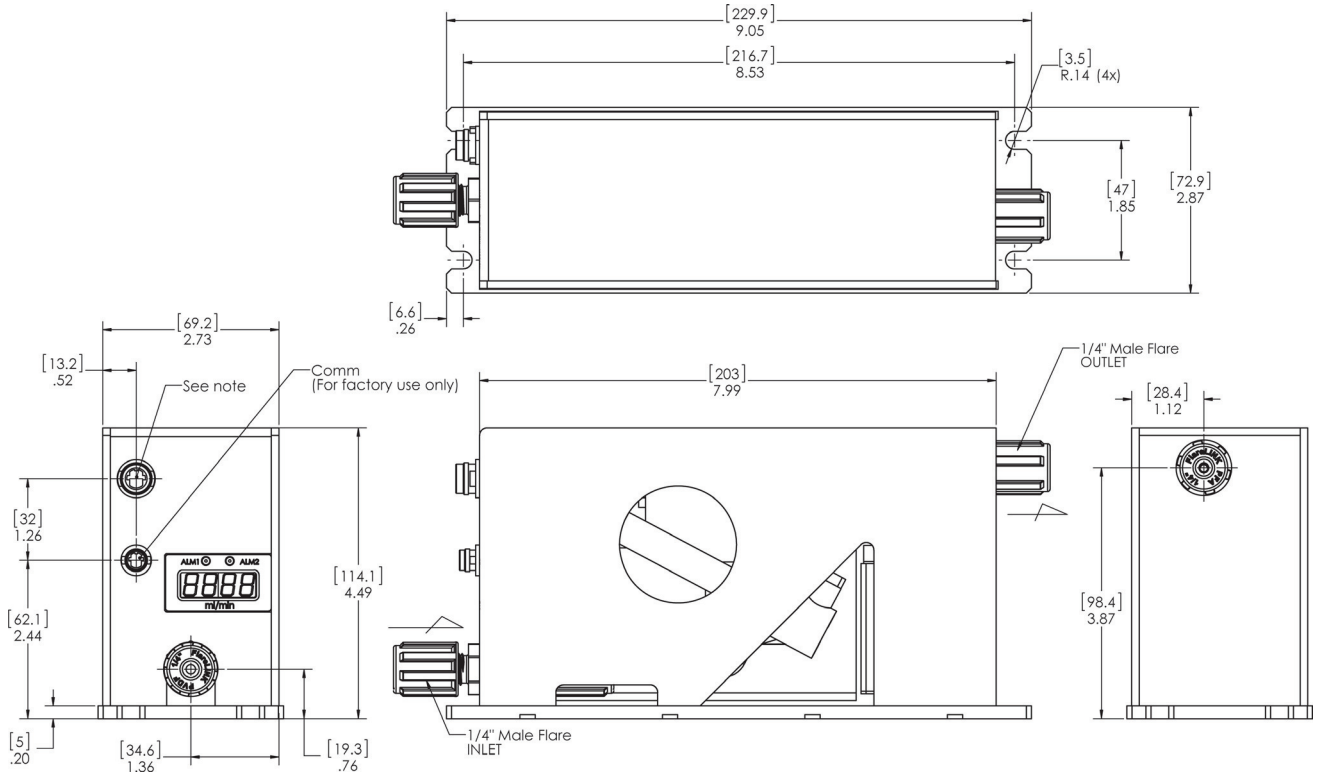
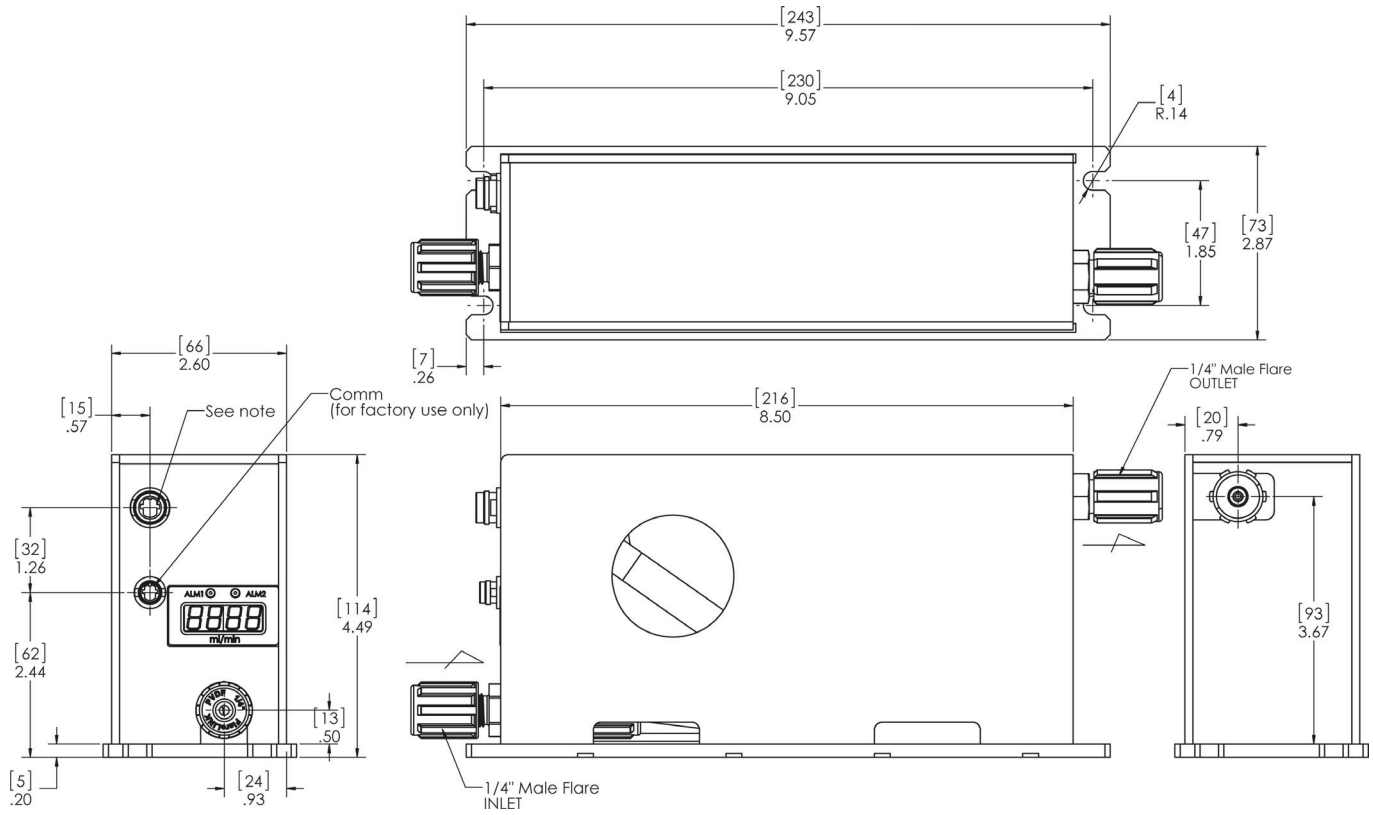
Dimensional Drawings

(Horizontal Modules)

Chemical Version



Slurry Version



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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											1			Without plug connector
											2			With plug connector and cable
													XXX	Unique PN identifier

Note: Specifications are subject to change without notice.

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