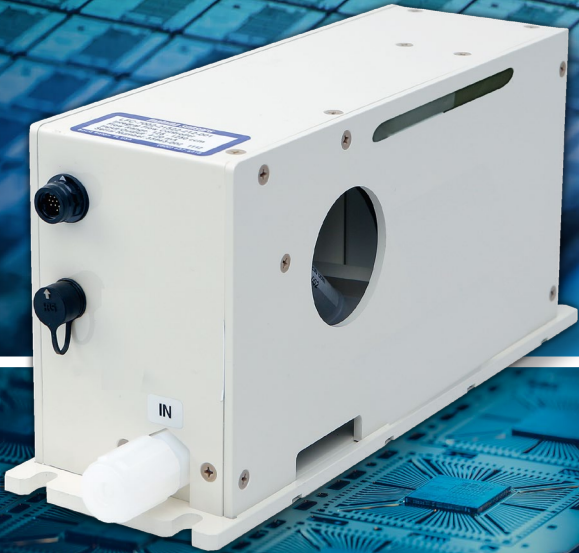


LFC-7000

Ultrasonic Integrated Flow Controller



Where Innovation Flows



Superior Accuracy $\pm 1\%$ of Set Point

Malema LFC-7000 Series Ultrasonic Integrated Flow Controller

The LFC-7000 Ultrasonic Flow Controller sets the standard for combining flow meter technology with a control valve in a closed loop system which ensures precision $\pm 1\%$ of dispensing of high-purity liquids including DI water, harsh chemicals, and CMP polishing slurries. Combined into one compact unit, the LFC-7000 Ultrasonic Flow Controller features a flow meter constructed of PFA with no moving parts or seals and a control valve - either a motor actuated pinch valve (for slurries) or a diaphragm valve (for chemistries). The integral display provides operators with immediate dispensing information, enabling the operator to identify and respond to process variations and failures quicker with less wasted time and materials. The LFC-7000 can be easily integrated into your current slurry or chemistry dispensing application with choice of 1/4" or 3/8" port sizes and flare or pillar connections with a flow rate from 5 to 8,000 ml/min. All these features make the LFC-7000 the standard in flow measurement and control in terms of accuracy and repeatability.

Reliable, Repeatable Results

Measurement in terms of accuracy, repeatability, turndown and purity. It's Digital Signal Processing (DSP) technology ensures reliable performance even when a certain degree of bubbles are present in the process fluids. This is an area where many other ultrasonic flow controllers struggle. Malema ultrasonic technology eliminates measurement drift caused by various environmental conditions like temperature and humidity fluctuations.

Achieve Accurate and Repeatable Control

The LFC-7000 integrated P&ID algorithm ensures fast, precise control for your process requirements. Flow rates are preset via an analog signal, during operation the flow control electronics module continuously compares the set point value with the actual flow rate. The flow controller adjusts the flow rate instantaneously by actuating the diaphragm valve or pinch valve to maintain the desired set point with minimal overshoot.

Improve Yield Throughput, Quality Wafers and Increased Profitability

The LFC-7000 Series Ultrasonic Flow Controller sets manufacturing standards with $\pm 1\%$ metering accuracy. Due to its precision control the LFC-7000 minimizes production costs by reducing liquid/slurry usage. Furthermore, there is improved batch production with tighter control yielding more high quality wafers. This quality control helps minimize costly downtime and increases overall operational profitability.

Features and Benefits

Product Features

- Integral display feature to provide immediate dispensing information
- Equipped with either a motor actuated pinch valve (for slurries) or diaphragm valve (for chemistries), for fast and precise response with minimal “overshoot”
- Eliminates sensor drift that can occur with changes to environmental or temperature conditions, due to superior ultrasonic technology
- Available in 1/4” or 3/8” inch port sizes with flare or pillar connections
- Fast response 3 seconds (typically < 2 seconds for most applications)
- High flow turndown ratio (20:1)
- All wetted part construction for chemical applications with diaphragm valve features PTFE/PFA
- For slurry applications with pinch valve wetted part construction features PFA/Platinum cured silicon
- Ideal for slurry or chemistry dispensing applications

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 – Accurate and reliable control of the blending and delivery of cleaning chemistries.
- Copper Plating tools – Well suited to chemical mixing and dispensing applications.

Operational Benefit

- Improved process, product quality and yield throughput
- Decreased downtime, increased uptime, less waste
- Increased product/batch profitability

Superior Metering Performance

- High accuracy - controls flow rate to within $\pm 1\%$ of set point
- Wide range of flow control capability:
5 ml/min – 8,000 ml/min

Low Maintenance, Increased Uptime

- Low maintenance – LFC-7000 Ultrasonic Flow Controllers contain no moving parts, diminishing any wear component issues, leading to improved uptime
- Components of the LFC-7000 can be repaired, allowing you to recoup your initial investment
- Designed for use in wet clean tools and post CMP cleaning applications

Performance Specifications

Flow Controllability Range (Available in 9 standard ranges)	5 - 50 ml/min (1/4" size)
	10 - 100 ml/min (1/4" size)
	25 - 250 ml/min (1/4" size)
	50 - 500 ml/min (1/4" size)
	100 - 1,000 ml/min (1/4" or 3/8" size)
	150 - 1,500 ml/min (3/8" size)
	250 - 2,500 ml/min (3/8" size)
	400 - 4,000 ml/min (3/8" size)
	800 - 8,000 ml/min (3/8" size)*
Flow Control Accuracy**	for size 1/4": $\pm 1\%$ of set point or ± 3 ml/min (whichever is larger)
	for size 3/8": $\pm 1\%$ of set point or ± 6 ml/min (whichever is larger)
	for size 3/8" and 8000 ml/min range: $\pm 1\%$ of set point or ± 16 ml/min (whichever is larger)
Control Repeatability**	for size 1/4": $\pm 0.5\%$ of set point or ± 1.5 ml/min (whichever is larger)
	for size 3/8": $\pm 0.5\%$ of set point or ± 3 ml/min (whichever is larger)
	for size 3/8" and 8000 ml/min range: $\pm 0.5\%$ of set point or ± 8 ml/min (whichever is larger)
Flow Control Time	< 3 sec
Fluid Temperature	10 - 60°C ***
Ambient Temperature/Humidity	0 – 40°C (30 – 80% R.H. without dew)
Maximum Expected Operating Pressure	Pinch Valve: 0.34 MPa (50 psig)
	Diaphragm Valve: 0.4 MPa (60 psig)
Maximum Safe Internal Pressure	Pinch Valve: 0.4 MPa (60 psig)
	Diaphragm Valve: 0.5 MPa (70 psig)
Minimum Differential Pressure	7 to 30 psid (depending on flow range)***

* 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.

Electrical Specifications

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

* Other options available

** Both active and passive current available

Material Specifications

Wetted Parts for Modules	LFC-7000 with Pinch Valve - PFA/PT Cured Silicone
	LFC-7000 with Diaphragm Valve - PTFE/PFA
Non Wetted Parts Enclosure	PPS, PEEK, Acrylic, Vinyl, PVC*

* Flame retardant (FMET4325)

Physical Specifications

Mounting Orientation	Horizontal or Vertical
Fluid Connections	Inlet/Outlet: 1/4" or 3/8" Flare or Pillar
Ingress Rating	IP65

Power and Signal Connections

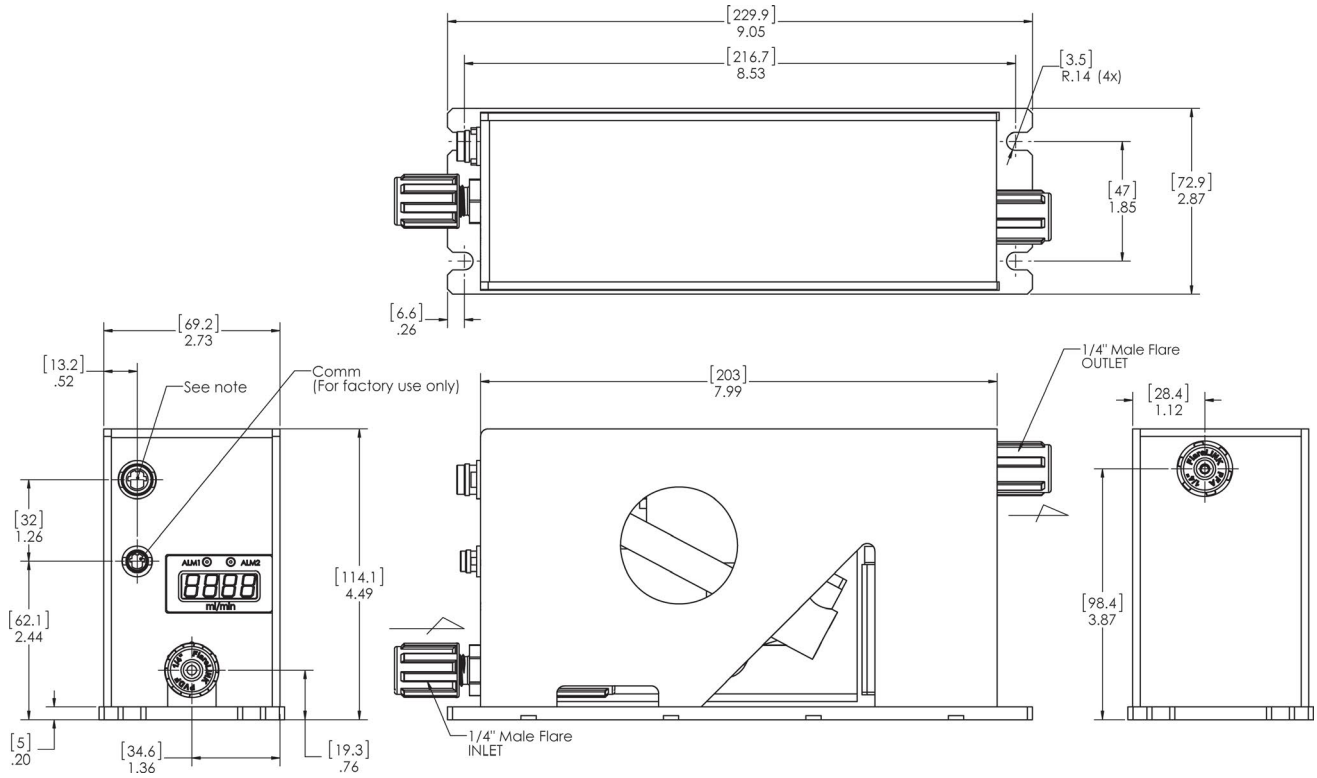
It is always recommended to use a dedicated power supply with 24 V DC ($\pm 10\%$), 500 mA. The configuration of the 12 pin I/O connector and its mating cable is given in the table below. A communication cable with a 6 pin connector can be ordered separately to interface with the PC GUI program.

12 Pin-Connector Configuration				
Pin No.	Wire Color	Description	Specification	Remarks
1	Red	Power (+) 24 V DC	24 V DC \pm 10%	
2	Black	Power (-) 0 V DC		
3	Pink	Set Point (+)	0 - 10 V DC or 4 - 20 mA (input resistance 500 Ω)	
4	Gray	Set Point (-)		
5	Blue	Flow Out (+)	0 - 10 V DC or 4 - 20 mA (load resistance 900 Ω max)	
6	White	Flow Out (-)		
7	Red/Black	Valve Alarm (+)	Max. rating 30 V DC, 200 mA	Open Collector Output
8	White/Black	Valve Alarm (-) (0V)		
9	Yellow	Sensor Alarm (+)	Max. rating 30 V DC, 200 mA	Open Collector Output
10	Brown	Sensor Alarm (-) (0V)		
11	Green	Zero Adjust*	0 V DC: Normal operation 24 V DC: Zero Adjust	Pull up to power supply voltage starts the zero adjustment
12	Violet	No Connection		

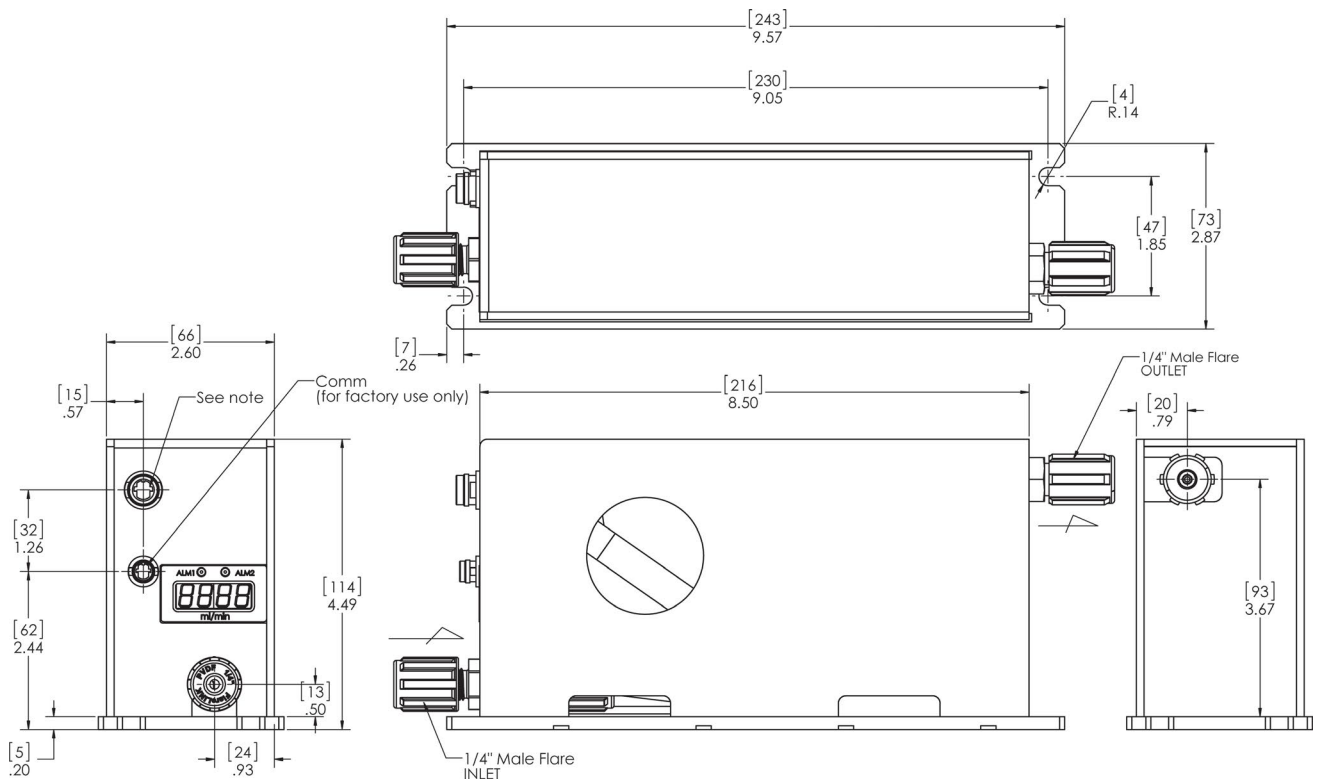
* Make sure the flow is completely stopped before zero adjust.

Dimensional Drawings

LFC-7000 with Diaphragm Valve for Chemistries



LFC-7000 with Pinch Valve for Slurries



For reference only, consult factory for specific dimensional drawings.

Ordering Information

Model Code													Description
LFC-700	*	-	*	*	*	*	*	-	*	*	*	***	
Alarms	0												No Alarm LEDs or Flow Rate Display
	1												Alarm LEDs and Flow Rate Display on Top Panel
	2												Alarm LEDs and Flow Rate Display on Front Panel
	-												
Connection Size	2												Fluid Connection 1/4"
	3												Fluid Connection 3/8"
Connection Type	1												Flare Ends (Male)
	2												Super Pillar 300 (Male)
Flow Control Range	0												5 – 50 ml/min (1/4" size)
	1												10 – 100 ml/min (1/4" size)
	2												25 – 250 ml/min (1/4" size)
	3												50 – 500 ml/min (1/4" size)
	4												100 – 1000 ml/min (1/4" or 3/8" sizes)
	5												150 – 1500 ml/min (3/8" size)
	6												250 – 2500 ml/min (3/8" size)
	7												400 – 4000 ml/min (3/8" size)
	8												800 – 8000 ml/min (3/8" size)
Sensor Size	1												For flow control range code 8 only
	2												For flow control range codes 0 to 7
Signal Input / Output	1												Set point 0 to 10 V DC / Flow output 0 to 10 V DC, (Note: 0 V DC = 0 ml/min, 10 V DC = Max flow for corresponding range)
	2												Set point 4 to 20 mA / Flow output 4 to 20 mA Active (Note: 4 mA = 0 ml/min, 20 mA = Max flow for corresponding range)
	3												Set point 0 to 10 V DC / Flow output 4 to 20 mA Active, (Note: 0 V DC = 0 ml/min, 10 V DC = Max flow for corresponding range),(Note: 4 mA = 0 ml/min, 20 mA = Max flow for corresponding range)
	-												
Valve Type	1												Diaphragm Valve
	2												Pinch Valve
Mounting Orientation	1												Horizontal
	2												Vertical
Accessories	1												Supplied without I/O cable
	2												Supplied with 5 meter I/O cable
	-	S01											Standard Version
												XXX	Custom Version (Note: XXX number is Factory assigned)



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