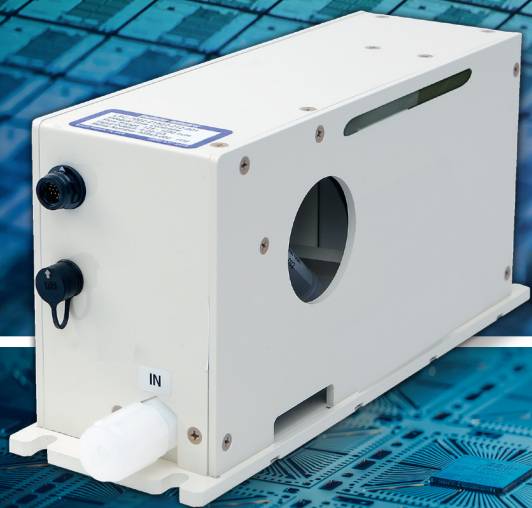


LFC-7650

Ultrasonic Integrated Flow Controller



Where Innovation Flows



Superior Accuracy - Regardless of Density, Viscosity, Gases, or Temperature

With +/- 1% metering accuracy, the LFC-7650 Series Ultrasonic Flow Controller with integrated pressure transducer, provides superior performance in all operating conditions. With a wide range of flow control from 50 to 4,000 mL/min, the LFC-7650 line of closed-loop flow control modules are designed for use in wet clean tools and post CMP cleaning applications.

Easy Install, Drop-in Upgrade - Replacement for Entegris NT6500

This ultrasonic technology is a drop-in upgrade for competing differential pressure flow controllers. The LFC-7650 fits seamlessly into your tools while providing consistent accurate flow, preventing costly and wasteful sensor drift.

Digital Signal Processing (DSP) technology ensures reliability and repeatability.

A typical module combines a Malema LFC-7650 Ultrasonic Flow Meter with a Malema Control Valve. It sets the standard for flow measurement in terms of accuracy, repeatability, turndown and purity. It's Digital Signal Processing (DSP) technology ensures reliable performance even with a certain degree of bubbles present in the process fluids, an area where

many other ultrasonic flow controllers struggle. Additionally, measurement drift is a non-issue due to ultrasonic technology that eliminates the issues that environmental conditions and temperature swings can cause with a competing differential pressure flow controller.

State of the art control algorithm achieves fast accurate and repeatable control.

In operation, the user inputs a flow rate set point via an analog signal. The flow control electronics module continuously compares this set point value with the flow rate reported by the flow meter and drives the motor actuated diaphragm valve to modulate to maintain the desired set point with minimal overshoot. State of the art control algorithm together with a high speed/precision flow meter and valve achieves fast, accurate, and repeatable control.

Improve yield throughput, quality wafers and increased profitability.

With the +/- 1% metering accuracy of the LFC-7650 Series Ultrasonic Flow Controller, your operation can ensure improved product yield by consistently manufacturing better quality wafers, while minimizing costly downtime and increasing overall operational profitability.

Key Features & Benefits

Product Features

- Drop-In upgrade replacement for current differential pressure flow meter
- Eliminates sensor drift that can occur with changes to environmental or temperature conditions, due to superior ultrasonic technology.
- With in-built pressure sensor analog output, providing the same required feature as the competing differential pressure flow controller.
- Fast Response 3 seconds (typically < 2 seconds for most applications)
- High flow turndown ratio (20:1)
- All Polytetrafluoroethylene (PTFE) / Perfluoroalkoxy (PFA) wetted part construction – ensures compatibility with UHP liquid chemicals, and DI water

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 for entire flow range
- Wide range of flow control capability - 50 ml/min - 4000 ml/min

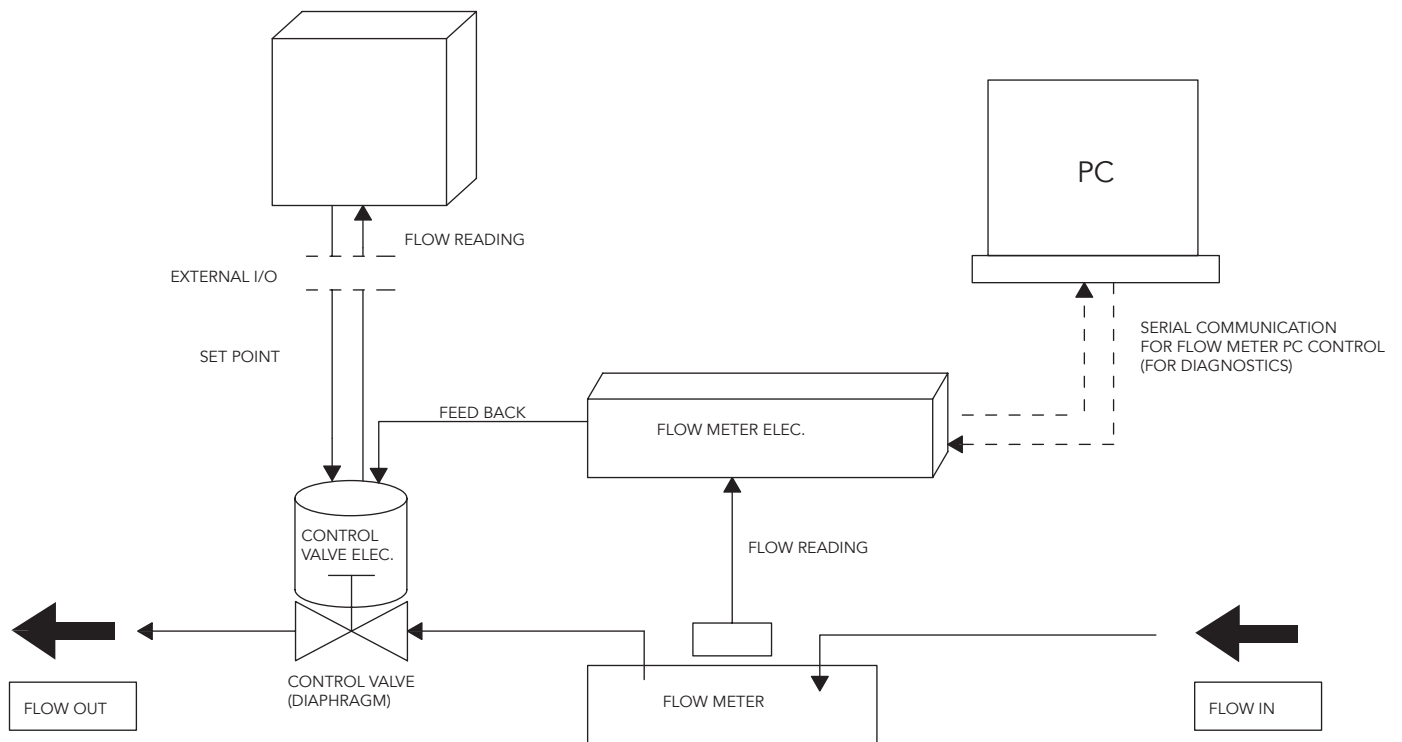
Low Maintenance, Increased Uptime

- Low maintenance – LFC-7650 Ultrasonic Flow Controllers contain NO moving parts, diminishing any wear component issues, leading to improved uptime
- Components of the LFC-7650 can be repaired, allowing you to recoup your initial investment.

Applications

- Designed for use in wet clean tools and post CMP cleaning applications.
- Ideal for fluid blending and/or dispense applications.

Typical Block Diagram



Applications

- Designed for use in wet clean tools and post CMP cleaning applications.
- Ideal for fluid blending and/or dispense applications.

Performance Specifications

Flow Controllability Range (Available in 8 standard ranges)	5 - 50 ml/min (1/4")
	10 - 100 ml/min (1/4")
	25 - 250 ml/min (1/4")
	50 - 500 ml/min (1/4")
	100 - 1000 ml/min (1/4" or 3/8")
	125 - 1250 ml/min (1/4" or 3/8")
	250 - 2500 ml/min (1/4" or 3/8")
	400 - 4000 ml/min (3/8")
	Custom
Pressure Measurement (Optional)	0 - 60 psi ***
Pressure Accuracy	±1% of Full Scale
Accuracy of Flow Control *	for 1/4": ±1% of set point or ±3 ml/min (whichever is larger) for 3/8": ±1% of set point or ±6 ml/min (whichever is larger)
Repeatability *	for 1/4": ±0.5% of set point or ± 1.5 ml/min (whichever is larger) for 3/8": ±0.5% of set point or ± 3 ml/min (whichever is larger)
Flow Control Time	< 3 sec
Fluid Temperature	Max 60 °C **
Maximum Expected Operating Pressure	0.4 MPa (60 psig)
Maximum Safe Internal Pressure	0.5 MPa (70 psig)
Ambient Temp/Humidity	0 – 40 °C (30 – 80% R.H., without DEW)
Minimum Differential Pressure	10 psid

* Please consult with Malema for tighter accuracy/repeatability needs.

** Contact the factory for higher fluid temperature requirements.

*** Contact factory for other pressure ranges

Electrical Specifications

Electrical Input	24 V DC ± 10%
Consumption	Max 0.5 A
Set Point Signal In*	0 - 5 V DC or 0 - 10 V DC or 4 - 20 mA (input resistance 250 Ω)
Flow Signal Out**	4 - 20 mA Passive
Pressure Signal Out	4 - 20 mA Passive

* Consult the factory for other options

** Configured as Passive output as default. Consult the factory for other options.

Material Specifications

Wetted parts for Modules	PFA, PTFE, Kalrez or equivalent
Non wetted parts, enclosure	ABS, PEEK, PVC*
Connectors	PPS

* Flame retardant (FMET4325)

Physical Specifications

Mounting Orientation	Horizontal
Fluid Connections	Inlet/Outlet: 1/4" or 3/8", Male Flare or Male Super Pillar 300
Flow Restrictions (orifice)	> 2 mm
Ingress Rating	IP64

* Consult the factory for other options

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 is given in the table below (See note below).

NOTE:

- User is required to order the standard mating cable or custom mating adapter cable with every controller (Please refer to the model code table).
- Refer to custom mating adapter cable options below. Please consult the factory for any other custom mating / adapter cable requirement.
- An optional communication cable with a 6 pin connector can be ordered separately to interface with the PC GUI program.

Ordering Information

Standard Hirose I/O Mating Cable 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 – 5 V DC or 0 – 10 V DC or 4 – 20 mA	Input resistance 250 Ω
4	Gray	Set Point (-)		
5	Blue	Flow, Output*	4 – 20 mA Out	Passive connection
6	White	Flow, Supply*	+24 V DC, loop	Passive connection
7	Red/Black	Pressure, Output (Optional)	4 – 20 mA Out	Passive connection
8	White/Black	Pressure, Supply (Optional)	+24 V DC, loop	Passive connection
9	Yellow	Sensor or Valve Alarm (+)**	Max. rating 30 V DC, 200 mA	Open Collector Output
10	Brown	Sensor or Valve Alarm (-) (0 V DC)**		
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		

* 4-20 mA (Passive) is the default output type. Please consult the factory for other options.

** Sensor alarm factory set as default. Field configurable for other options.

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

Custom Mating Adapter Cable Options

Hirose - Turck adapter cable P/N: CABLE-LFC-7650-001		
CONNECTOR PIN NO	CONNECTOR PIN NO	DESCRIPTION
TURCK	HIROSE	
M	1	Power 24VDC+
U	2	GROUND
R	3	SETPOINT +
G	4	SETPOINT COMMON
C	5	FLOW O/P 4 - 20 mA
E	6	+24 VDC LOOP POWER
P	7	PRESSURE OUT
O	8	PRESSURE +24VDC
A	9	NOT USED
L	10	NOT USED
N	11	ZEROING
J	12	N/C
S		N/C
T		N/C

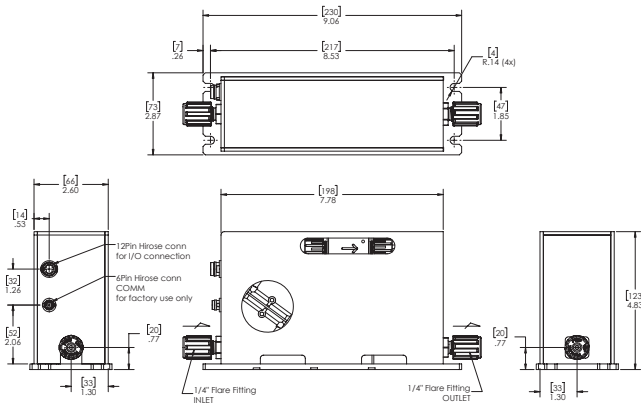
* 4-20 mA (Passive) is the default output type. Please consult the factory for other options.
*** Make sure the flow is completely stopped before zero adjust.

Hirose - Alden adapter cable P/N: CABLE-CMETER 041		
CONNECTOR PIN NO	CONNECTOR PIN NO	DESCRIPTION
ALDEN	HIROSE	
11	1	Power 24VDC+
12	2	GROUND
6	3	SETPOINT + (0 -5V DC)
7	4	SETPOINT COMMON
4	5	FLOW O/P 4 - 20 mA
2	6	FLOW (LOOP POWER)+24 VDC
1	7	PRESSURE 4 - 20 mA
3	8	PRESSURE +24VDC
8	9	N/C
9	10	N/C
5	11	ZEROING
10	12	N/C
13	13	N/C
14	14	N/C

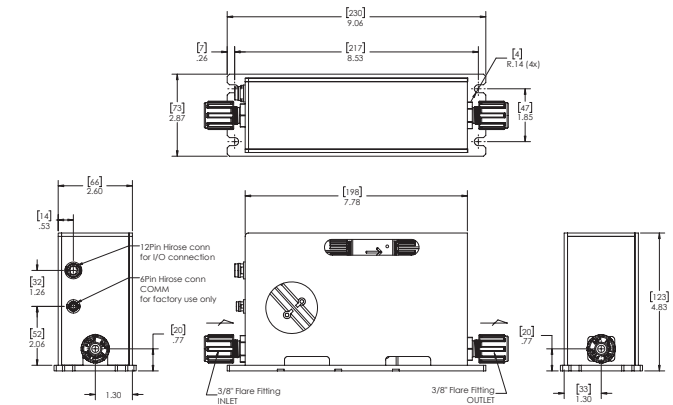
Dimensional Drawings

For reference only

Dimensions for 1/4" Flare end connections



Dimensions for 3/8" Flare end connections



Ordering Information

Model Code															Description		
LFC-7650	-	*	*	**	-	*	*	*	-	*	*	*	-	***			
Fluid Connection		1													1/4" Inlet & Outlet		
		2													3/8" Inlet & Outlet		
Connection Type			1												Flare (Male)		
			2													Super Pillar 300 (Male)	
Standard Full Scale Range				01											5 – 50 ml/min (1/4")		
				02													10 – 100 ml/min (1/4")
				03													25 – 250 ml/min (1/4")
				04													50 – 500 ml/min (1/4")
				05													100 – 1000 ml/min (1/4" or 3/8")
				06													125 – 1250 ml/min (1/4" or 3/8")
				07													250 – 2500 ml/min (1/4" or 3/8")
				08													400 – 4000 ml/min (3/8")
				09													
					-												
Sensor / Converter							1								M-2111 Mini (3mm) / DSP		
							2										
Set Point / Flow Output								1							0 – 5 V DC / 4 – 20 mA (passive)		
								2								0 – 10 V DC / 4 – 20 mA (passive)	
								3								4 – 20 mA / 4 – 20 mA (passive)	
								4								Custom	
Pressure Measurement (Optional)								1							Yes (4 – 20 mA passive output)		
								2								Not Required	
										-							
Valve Type											1					Diaphragm Valve	
Mounting Orientation											1					Horizontal	
Accessories												1				With standard Hirose I/O mating cable	
												2					Custom
														-			
															XXX	Unique PN identifier	



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