



## Malema Paddle Wheel Flow Meter

M-10000



### Operating and Instructions Manual

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## Introduction

The Malema M-10000 is an accurate, feature-rich, cost effective flow meter designed for maximum flexibility in an industrial and semiconductor environments.

The M-10000 not only can provide pulse output, analog voltage output, or current output but also includes a relay output (form C SPDT relay) that can be utilized as a flow alarm. The analog voltage output/current output/relay output are all field settable thereby giving flexibility for field scaling/calibration.

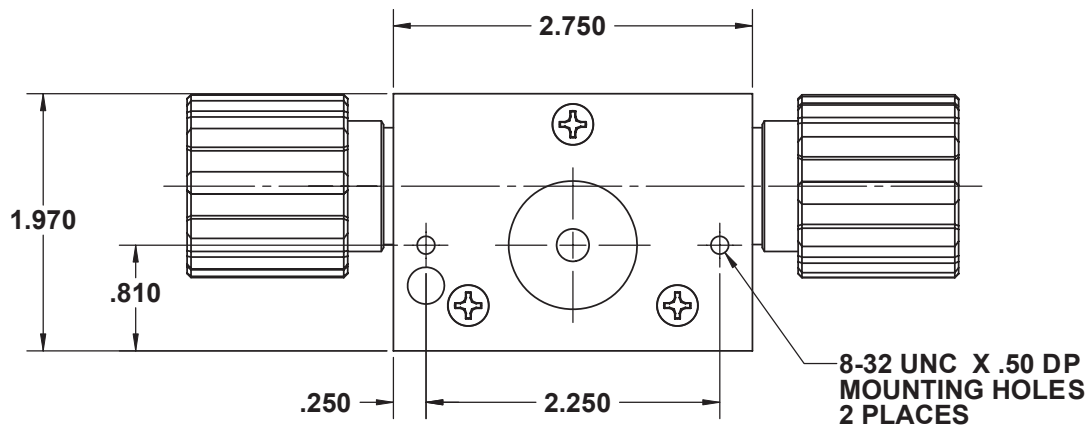
## Operating Principle

The rotary flow meter translates the mechanical action of the rotating wheel in the liquid flow around an axis into a user-readable flow rates. The rotating wheel is set in the path of a fluid stream. The flowing fluid impinges on the wheel blades, imparting a force to the blade surface and setting the rotor in motion. The rotational speed of the wheel is proportional to fluid velocity.

The rotating wheel blades are encapsulated with permanent magnets. M-10000 utilizes a Hall sensor to detect the rotational speed of the wheel blades. Depending on the analog output type, the signal can be scaled to Analog:

- Voltage O/p (0 to 10Vdc) or
- Current O/p (4 to 20mA) or
- Pulse O/p (Hz) output.

## Dimensional Drawing



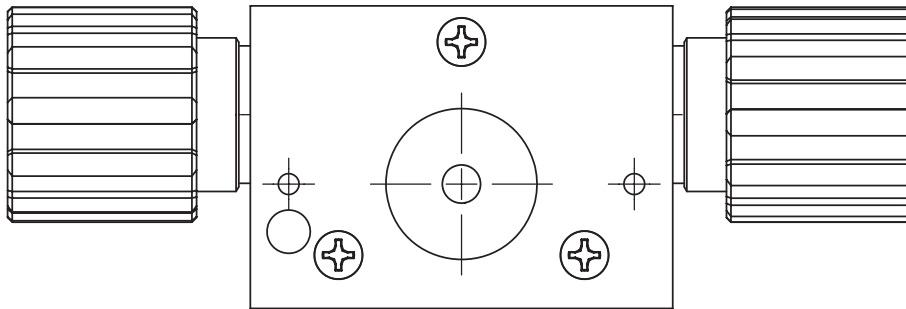
**MOUNTING DETAILS**

**NOTE:** The above drawing shows M-10000-T6062-01-001-FLR. The body dimension and mounting details remain the same with other choices of fluid connection ports.

## INSTALLATION INSTRUCTIONS

### Mechanical Installation

1. Unpack the unit, remove the endplugs from the fluid ports and the M-10000 flow meter is ready for installation.
2. Fluid flow through the M-10000 flow meter is bidirectional.
3. The unit mounting is position dependent. The unit must be installed with the shaft, upon which the rotor wheel spins, parallel to the ground and the internal flow path cavity facing downwards as shown per the following drawing:



4. Wherever applicable, sealing of the connection threads should be accomplished by using Teflon tape or similar material. Do not allow excess tape to break off into the flow meter's fluid ports and entangle around the shaft and rotor.
5. Ensure that the maximum permitted pressure and temperature limits are not exceeded.
6. The mechanical installation is complete after checking for leaks in the piping.

### Mechanical Specification

Housing		316SS	Celcon	PTFE
Maximum Operating Pressure ( for standard units)		200 psi	100 psi	100 psi
Maximum Fluid Temperatures		-40°F to 340°F	-40°F to 180°F	-40°F to 180°F
Weight	1/4" and 1/2" ports	~ 1.5 lbs	~ 0.8 lbs	~ 0.9 lbs
	3/4" and 1" ports	~ 6.4 lbs	~ 1.5 lbs	~ 2.3 lbs
Dimensions	1/4" and 1/2" ports	Width: 2.75", Height: 1.97", Depth: 2.165"		
	3/4" and 1" ports	Width: 4.50", Height: 3.00", Depth: 2.90"		
Mounting Holes	On units up to 1/2"	2# 8 - 32 female holes allow for panel mounting		
	Larger units	Mounted in-line		
Viscosity	Up to 120 centistokes ( ~ 30 weight oil )			

\* Please consult the factory for any custom fluid connection requirements.

## Electrical Installation

1. Ensure that the power supply voltage is within the specified limits.
2. Ensure that the electrical connections are made as per the specified wiring details on the supplied electrical cable.

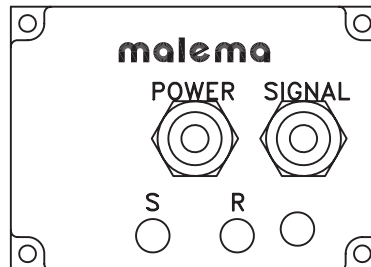
## Electrical Specification

Power supply	Voltage Version & Relay Version	12 to 24 VDC +10%	
	Current Version	24 VDC + 10 %	
	Pulse Train	3.8 VDC to 24 VDC	
Current Draw	50 mA maximum		
Signal Outputs	Voltage Version	0 - 10 VDC analog output , span adjustable output	
	Current Version	4 - 20 mA span adjustable output maximum external load 1 K ohm	
	Pulse train	Hz	
	Relay Output	SPDT Relay, contacts rated at 30 VDC, 2 amps (60 watts) non inductive load.	
Relay Lifetime (operations)	Electrical at 20 cycles per minute, 2A, 30 VDC resistive = $10^8$ cycles		
Electrical Connection	Voltage Version & Current Version	2 wire cable	Red: Input cable Black: ground
		5 wire cable	Green: NO Brown: NC White: relay common Red: Analog signal output Black: signal ground (power and signal ground are common)
	Relay Version	5 wire cable	Green: NO Brown: NC White: relay common Red: Input voltage Black: ground
	Pulse train	3 wire cable	Red: 3.8 VDC to 24 VDC Black: ground (power and signal ground are common) Green: signal

\* Please consult the factory for any custom cable requirements.

## Calibration Procedure

The voltage, current and relay outputs can be field calibrated by accessing three potentiometers located on the black cover plastic. The three adjustment potentiometers are signal span adjustment, signal linearization adjustment and relay set point adjustment. The pulse signal output unit has NO points of adjustment.



### Zero adjustments

All models

The M-10000 flow meter is factory zeroed and does not require adjustment. If a zero calibration needs to be performed, it is recommended that the unit be returned to the factory. If the unit cannot be returned, contact the factory for detailed instructions on how to perform a zero calibration of the unit.

### Signal span adjustments

0-10 Vdc and 4-20 mA output models

1. The signal span is adjusted by a potentiometer accessible through a hole from the black plastic cover of M-10000 flow meter next to where the cables exit the meter housing. The proper port is clearly marked on the rear housing of the meter with an S for span adjust.
2. Establish the desired maximum flow through the unit. For example, if the unit is 1-10 LPM model establish a flow rate of 10 LPM.
3. Monitor the output signal with a multimeter or an equivalent device.
4. Adjust the output signal by turning the potentiometer in the appropriate direction.

### Signal Linearization adjustments

0-10 Vdc and 4-20 mA output models

1. The linearity adjustment and the span adjustment are inter-dependent. Adjusting one potentiometer will affect the other. It is located in the right most position on the black plastic cover and does not have any markings.
2. Establish 20% of the desired full scale flow rate through the unit. For example, if the unit is 1-10 LPM unit establish a flow rate of 2 LPM. Adjust the Linearization Adjustment Potentiometer to read 2 LPM. Repeat signal span adjustment procedure to adjust the full scale span which is 10 LPM in this case. As the two adjustment potentiometers are inter-dependent, signal span adjustment and signal linearization procedures should be repeated 2 or 3 times. In this example, readjust the span to read 10 VDC at 10 LPM and then readjust the linearity to read 2.0 VDC at 2.0 LPM as necessary.

**Relay Set point adjustments**

0-10 Vdc and 4-20 mA output models

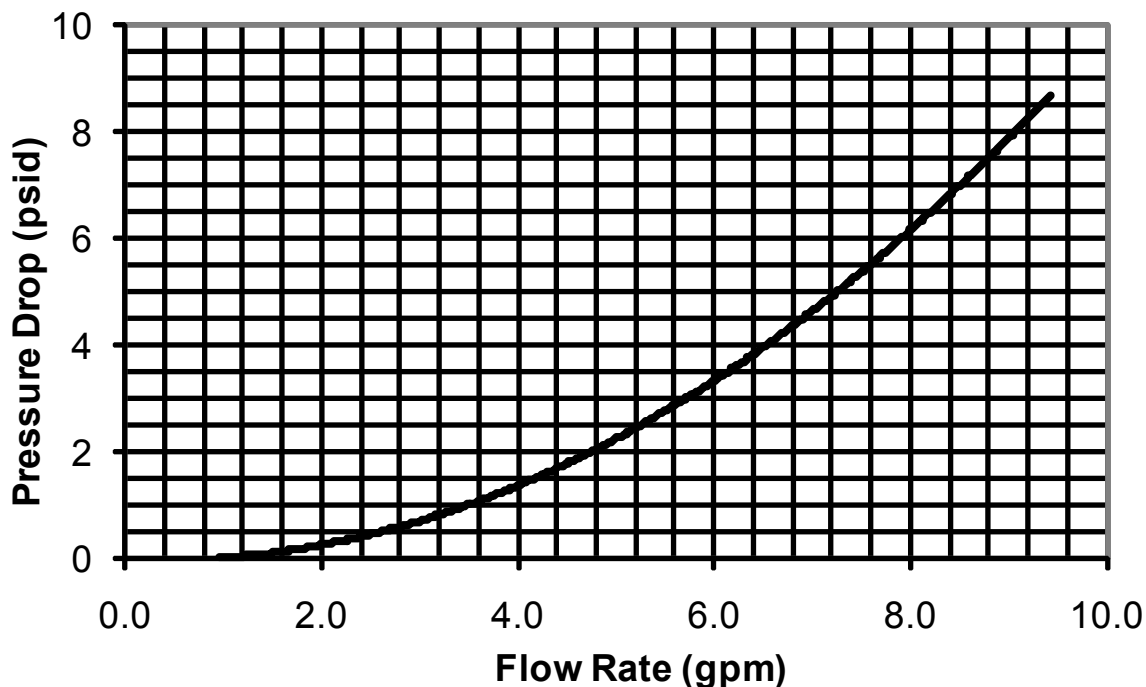
1. The Relay Set Point is adjusted by a potentiometer accessible through a hole from the black cover plastic. The proper port is clearly marked as R for Relay Adjustment.
2. The Relay Set Point is monitored during adjustment via the LED indicating light. In the standard configuration the LED indicating light is RED when the fluid flow is below the Relay Set Point and is GREEN when the fluid flow is above the Relay Set Point.
3. Adjust fluid flow through the M-10000 flow meter to the desired set point flow rate.
4. If the LED indicating light is already GREEN, turn the Relay Set Point Potentiometer counterclockwise until the LED indicating light turns RED. Turn the Relay Set Point Potentiometer clockwise until the LED indicating light turns GREEN.

**NOTE 1:** The Relay Set Point circuitry has a fixed set point hysteresis of 5% to prevent chattering of the relay at the set point.

**NOTE 2:** The relay set point adjustment is independent of the span adjustment. Changing the span does not affect the relay set point.

**Pressure Loss Curve**

Typical Pressure loss curve for M-10000-T6062-01-001-FLR

**Custom Version Available**

Malema welcomes the opportunity to apply its flow sensor experience to work for its customers. Please contact us for any special requirements including ports, extreme temperature capabilities, extreme pressure capabilities, etc.

**CE Declaration**

**DECLARATION OF CONFORMITY**

(In accordance with EN 45014)

We,

Malema Engineering, Corp.  
1060 South Rogers Circle  
Boca Raton, Florida 33487

declare under our sole responsibility that the product,

Type of Equipment: Flow Meter  
Model Number: M-10000 & M-10001

to which this declaration relates conforms to the following standards or other normative documents:

- EMC
- EN 61000-6-4:2001
- EN 61000-6-2:2005
- EN61000-4-2
- EN61000-4-3
- EN61000-4-6
- EN61000-4-4

- Safety
- EN 61010-1:2001



## Safety

- Inspect the unit for damage upon arrival.
- Under no circumstances must the maximum specification for pressure, temperature, supply voltage and current be exceeded.
- Check chemical compatibility of the wetted parts for applications using corrosive fluids.
- Check the filter requirements with the factory to ensure proper operation of the product.

Malema Sensors cannot accept responsibility for failure and consequences resulting from improper usage of the product beyond the specified parameter limits.

## Warranty

Malema Sensors warrants to the buyer that its products are free from defects in materials and workmanship at the time of shipment and during the WARRANTY PERIOD. Malema Sensors obligation under this warranty is limited to the replacement of the product(s) by same product(s) manufactured by Malema Sensors or repair of the product(s) at the Malema Sensors facility.

Malema Sensors products are sold with the understanding that the buyer has determined the applicability of the product(s) to its intended use. It is the responsibility of the buyer to verify acceptability of performance to the actual conditions of use. Performance may vary depending upon these actual conditions.

### Warranty Period

This warranty is in effect for twelve (12) months from the date of shipment from Malema Sensors place of business.

### Warranty Claim

If Malema Sensors products are found to be defective in materials or workmanship within twelve (12) months of the date of shipment, they will be repaired or replaced with same product at the discretion of Malema Sensors at its place of business at no charge to the buyer.

## Return

To return the products, please obtain an RMA number for the product by contacting Malema Sensors (Corporate Office), Boca Raton at (800) 637-6418 or (561)995-0595.

All returns of equipment must go to the following address:

Malema Sensors,  
1060 S Rogers Circle  
Boca Raton, FL 33487, USA

**NOTE: Specifications are subject to change without notice.**