

# Rotary Flow Meter

## M-10001 Series

Low flow,  
flow meter and switch with  
right-angle flow

### Features

- Very low flow sensitivity
- State-of-the-art electronics – high reliability
- 4-20 mA, 0-10 VDC, or pulse output
- Adjustable flow switch – built in
- Small foot print
- All-PTFE models available (except sapphire shaft)
- For liquids only

### Applications

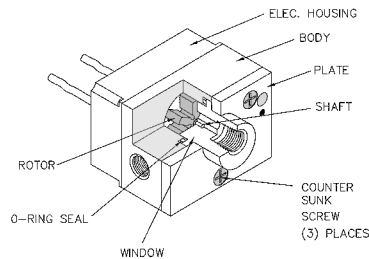
- Sample lines
- Chemical injection
- Semiconductor tools
- Wet process systems



Tangential turbine flow meters continue to be the most common way to measure flow electronically in a wide range of industries. Enhancements to tangential turbine flow meter systems are producing a flow-sensing device that is smaller, easier to install, and more accurate than ever before. Malema manufactures a line of Tangential Turbine (also called Paddle Wheel) Flow meters that utilize sophisticated circuitry to foster signal conditioning.

### Operation

The rotational velocity of the rotary wheel varies linearly with the average velocity of the fluid flowing through the flow meter. A square wave pulse is generated by a Hall Effect from magnets embedded in the vanes of the rotor wheel. Depending on the output version of the M-10001, the pulse signal is relayed directly, converted to a 0-10 VDC (voltage) output or a 4-20 mA (current) output. The voltage and current models are span-adjustable over the flow range of the unit.



*Illustrated is the M-10001 Model with 1/4" ports.*

### Custom Versions Available

Malema welcomes the opportunity to apply its flow sensor experience to work for its customers. Please contact the factory for any special requirements; such as ports, extreme temperature and pressure capabilities, etc.

### Calibration Range

Water:  
0.022 - 0.200 l/min, or  
0.03 - 0.30 l/min

### Specifications

Accuracy: 5% Full Scale  
Repeatability: 1%  
Set Point Hysteresis: 6%

### Material Versions \*

- PTFE
  - 316 Stainless Steel
- \* Other materials available on request.

### Port Sizes

- 1/4" FNPT

## Linearization of the M-10001

Linearizers are electronic devices that improve the linearity of the output signal of turbine flow meters. The output frequency is essentially a straight-line frequency as a function of flow rate which does not pass through zero. Left uncorrected, this will result in a K-factor which varies with the flow rate.

Simple, low-cost linearizers will compensate and correct for the frequency offset characteristics. These linearizers use a method of offset frequency injection to compensate the frequency characteristics. Offset frequency injection is implemented electronically by adding a signal equal to the offset frequency required to linearize the output of the flow meters. This effectively shifts the output characteristic to that of the desired ideal. A low-flow cutout feature is provided where the offset signal is inhibited during no flow to prevent false outputs from being generated.

The linearizer circuit is standard only on units with voltage output.

## Certifications

**CE Compliance:** Only the M-10001 with Voltage and Pulse outputs meet the intent of Directive 89/336/EEC for Immunity and Low Voltage Directive 73/23/EEC for Product Safety.

## Pressure Drop

Contact factory for individual pressure drop curves.

## General Specifications

M-10001 Operating Ranges	1/4" FNPT	0.022 - 0.2 l/min, 0.030 - 0.3 l/min
Repeatability		+0.5%
Pressure Drop		<1 psi maximum; except 1/4" units, which are 3 psi maximum (0.2 bar)
Materials Available		316Stainless Steel, Teflon, Brass, Celcon, PVDF
Mounting		Horizontal or vertical mounting; axis of rotor should be parallel to the ground
Power Supply	Voltage Output Model	12 - 24 VDC +10%, 50 mA
	4 - 20 mA Output Model	24 VDC +10%
		2 Form C SPDT Relay <ul style="list-style-type: none"> <li>• 60 watts maximum</li> <li>• 2A at 30 VDC resistive</li> </ul>
Electrical Connection		2 Belden cables, 18" wire pigtails: <ul style="list-style-type: none"> <li>• 2 wire cable for power and ground</li> <li>• 5 wire cable for NO, NC, relay common, signal output, and signal common.</li> </ul> Customer's wiring can be brought directly to terminal blocks on the PCB Custom connections available upon request
Signal Outputs		Voltage: 0 - 10 VDC analog output (span - adjustable to 0 - 5 VDC)
		Current: 4- 20 mA span adjustable output; maximum external load: 1K
		Pulse Train

## Signal Outputs

Voltage Version: 0 - 10 VDC analog output (span adjustable to 0 - 5 VDC).

Current Version: 4 - 20 mA span adjustable output; maximum external load: 1K ohm.

Pulse Version: 0 - 120 Hz square wave pulse train. Signal amplitude is equal to supply voltage.

## Power Supply

Power Supply: 12 - 24 VDC, voltage version; 24 VDC, current (4-20 mA) version.

Relay Capacity: 60 Watts max; 2 A, 30 VDC; 0.3 A, 110 VDC; 0.5 A, 125 VAC.

# Rotary Flow Meter

## Installation and Maintenance

The standard M-10001 unit must be installed horizontally with the axis of the rotor perpendicular to the ground (axis facing the sky).. If necessary, the flow meter is easily disassembled and cleaned. For detailed directions, please refer to our "Installation and Maintenance" sheet.

## Standard Component Materials

Body	316SS	PTFE
Rotor	Composite PPS	PTFE
Shaft	Zirconium Ceramic	Zirconium Ceramic
Window	Polycarbonate	PTFE
Bushings	N/A	Rulon®
O-ring	Viton®	PTFE Encap. Viton®
Face Plate	PPS	PPS

### \* Special Material Notes:

- The M-10001 is available with special flare-fittings, please contact factory
- Shaft: Sapphire shaft is available for acid applications
- Window: Any of the materials are available
- O-Ring: Polyimide, Buna, and other elastomers are available
- Face Plate: Molded PPS is the standard for all body materials (316SS is available for high pressure applications)
- Thermal Barrier is available for extreme temperatures

Note: Any changes from the basic configuration may add additional cost and must be specified

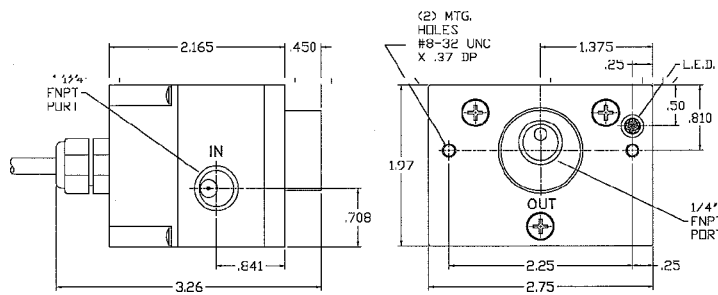
## Physical Specifications

<b>Housing</b>	Teflon	316SS
<b>Maximum Operating Pressure</b> (for standard units)*	100 psi	500 psi
<b>Maximum Fluid Temperatures **</b>	-40° to 180° F	-40° to 180° F
<b>Weight</b>	-0.91b	-1.71b

\* A special high pressure version for 316SS is available (2000 psi)

\*\* Call factory concerning extended temperature ranges. For example, a special 316SS version has a min/max fluid temperature range of -40° to 300° F with an ambient air temperature of 75° F.

## Dimensional Drawing



Illustrated is the M-10001 Model with 1/4" ports.

## Electrical Specifications

<b>Power Supply</b>	Voltage Version	12 to 24 VDC + 10%	
	Current Version	24 VDC + 10%	
	Pulse Train	3.8 VDC to 24 VDC	
<b>Current Draw</b>	50 mA maximum		
<b>Temperature Range</b>	All electrical components are Extended Industrial Range Components rated from -40° to 85° C (-40° to 185° F)		
<b>Electrical Connection</b>	2 Belden Cables (2-wire and 5-wire cables)		
	Voltage Version	2-wire cable	Red: 12 to 24 VDC Black: ground
		5-wire cable	Green: normally open Brown: normally closed White: relay common Red: analog signal output Black: signal ground (power and signal ground are common)
	Current Version	2-wire cable	Red: 24 VDC + 10% Black: ground
		5-wire cable	Green: normally open Brown: normally closed White: relay common Red: 4 - 20 mA analog output signal Black: 4 - 20 mA signal ground (power and signal ground are <b>NOT</b> common)
	1 Belden Cable (3 - wire cables)		
Pulse Train	3 - wire cable	Red: 3.8 VDC to 24 VDC Black: ground (power and signal ground are common) Green: signal	
<b>SPDT Relay</b>	<ul style="list-style-type: none"> <li>* Contacts rated at 30 VDC, 2 amps (60 watts) non inductive load. (Optional DPDT available)</li> <li>* Nominal switching capacity (resistive): 2 A, 30 VDC</li> <li>* Maximum switching power (resistive): 60 W</li> <li>* Maximum switching voltage: 220 VDC</li> <li>* Maximum switching current: 2 A</li> <li>* UL/CSA rating (up to 24 V coil type): 2 A, 20 VDC; 0.3 A, 110 VDC; or 0.5 A, 125 VAC</li> </ul>		
<b>Relay Life Time (operations)</b>	Electrical at 20 cycles per minute, 2 A, 30 VDC resistive = 10 <sup>8</sup> cycles		

## Ordering Information

Standard Part Numbering								Options		
M	-	Model	-	Material	Port	Range*	Output	-	Window	Seals
M	-	10001	-	S	2	01	1	-	0	0
		10001		S - 316 Stainless T - PTFE	2 - 1/4"	0.022 - 0.2 l/min 0.030 - 0.3 l/min	0 - Visual only 1 - Voltage 2 - Current 3 - Pulse 4 - Relay		0 - Standard 1 - 316 Stainless 2 - Brass 3 - Polycarbonate 4 - Acrylic	0 - Standard 1 - Kalrez® 2 - Viton® 3 - PTFE encapsulated Viton® 4 - Silicone 5 - EPDM

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