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Find the *Malema M-10000-S3053-50-001* at our website: ***Click HERE***



M-10000 Series

Feature rich flow meter and switch with in-line flow

Features

- Wide flow rangeability
- Outstanding accuracy
- State-of-the-art electronics – high reliability
- 4-20 mA, 0-10 VDC, or pulse output
- Visual indication
- Adjustable flow switch – built in
- Small footprint
- All-Teflon® models available (except sapphire shaft)
- Flare Tube Connections Available

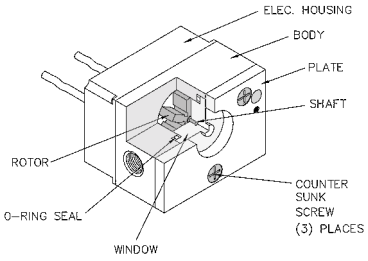
Applications

- Cooling systems
- Laser equipment
- Wet process systems
- CVD, CMP, and lithography tools
- Corrosive chemical distribution

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-10000, 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-10000 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. Malema also designs custom manifolds for customers with special requirements (see page i-viii of the catalog).

Calibration Range *

Water:
0.1 to 225 l/min
0.026 to 60 gpm

* These ranges are over different sizes.
Please see "Port/Range Table" on the next page.

Specifications

Accuracy:	±2% Full Scale
Repeatability:	0.5 %
Set Point Hysteresis:	6%

Material Versions *

- Teflon®
- Brass
- Celcon®
- 316 Stainless Steel

* Other materials available on request.

Port Sizes

- 1/4" FNPT
- 3/8" FNPT
- 1/2" FNPT
- 3/4" FNPT
- 1" FNPT
- Flare Tube Available

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Linearization of the M-10000

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-10000 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 or CV

Δ P 3 psi (0.2 bar) maximum
Low flow 1/4" versions: D P is 6 psi (0.4 bar) max

1/4" FNPT (03 flow range): Typical Cv = 0.5
3/8" FNPT (05 flow range): Typical Cv = 3.1
1/2" FNPT (08 flow range): Typical Cv = 6.3

General Specifications

M-10000 Operating Ranges	1/4" FNPT	0.1 - 1 l/min, 0.3 - 3 l/min, 0.5 - 5 l/min
	3/8" FNPT	1 - 10 l/min, 2 - 20 l/min, 3 - 30 l/min
	1/2" FNPT	4 - 40 l/min, 5 - 50 l/min
	3/4" FNPT	20 - 115 l/min
	1" FNPT	38 - 225 l/min
Repeatability	± 0.5%	
Pressure Drop	< 1 psi maximum; except 1/4" units, which are 3 psi maximum (0.2 bar)	
Materials Available	316 SS, 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 DPDT Relay: * 60 watts maximum * 2A at 30 VDC resistive	
Electrical Connections	2 Belden cables, 18" wire pigtails: * 2 wire cable for power and ground * 5 wire cable for NO, NC, relay common, signal output, and signal common Customer's wiring can be brought directly to terminal blocks on the PCB Custom connections available on 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 ohm	
	Pulse Train	

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Installation and Maintenance

The M-10000 Rotary Flow Meter may be installed horizontally or vertically, but axis of rotor should be parallel to the ground. No special field maintainence is required. 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	Brass	Celcon	316SS	Teflon® (PTFE)
Rotor	Composite PPS	Composite PPS	Composite PPS	Teflon®
Shaft	Zirconium Ceramic	Zirconium Ceramic	Zirconium Ceramic	Zirconium Ceramic
Window	Polycarbonate	Polycarbonate	Polycarbonate	Teflon®
Bushings	N/A	N/A	N/A	Rulon®
O-Ring	Viton®	Viton®	Viton®	Teflon® Encap. Viton®
Face Plate	PPS	PPS	PPS	PPS

* Special Material Notes:

- The M-10000 is available with special flare-fittings, please contact factory
- Rotor: Teflon can be ordered for any body
- 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

Housing		Brass	Celcon	Teflon	316SS
Maximum Operating Pressure (for standard units)*		200 psi	100 psi	100 psi	500 psi
Maximum Fluid Temperatures**		-40° to 180°F	-40° to 180°F	-40° to 180°F	-40° to 180°F
Weight	1/4" and 1/2" ports	~1.6 lbs	~0.8 lbs	~0.9 lbs	~1.5 lbs
	3/4" and 1" ports	~6.6 lbs	~1.5 lbs	~2.3 lbs	~ 6.4 lbs

* 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.

Dimensions	1/4"-1/2" ports	Width: 2.75"; Height: 1.97"; Depth: 2.165"
	3/4"-1" ports	Width: 4.50"; Heigth: 3.00"; Depth: 2.90"
Relay Life Time	Mechanical at 180 cycles per second = 10^8 cycles	
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)	
Pressure Drop	1 psi maximum; except 1/4" units, which are 3 psi maximum (0.2 bar)	

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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.

Electrical Specifications

Power Supply	Voltage Version	12 to 24 VDC + 10%	
	Current Version	24 VDC + 10%	
	Pulse Train	3.8 VDC to 24 VDC	
Current Draw	50 mA maximum		
Temperature Range	All electrical components are Extended Industrial Range Components rated from -40° to 85° C (-40° to 185° F)		
Electrical Connection	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 singal ground are **NOT** 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
SPDT Relay	* Contacts rated at 30 VDC, 2 amps (60 watts) non inductive load. (Optional DPDT available) * Nominal switching capacity (resistive): 2 A, 30 VDC * Maximum switching power (resistive): 60 W * Maximum switching voltage: 220 VDC * Maximum switching current: 2 A * UL/CSA rating (up to 24 V coil type): 2 A, 20 VDC; 0.3 A, 110 VDC; or 0.5 A, 125 VAC		
Relay Life Time (operations)	Electrical at 20 cycles per minute, 2 A, 30 VDC resistive = 10^8 cycles		

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Independent Test Results

Schutte and Koerting, an independent test house, was requested to calibrate and report on the linearity and repeatability of Malema's M-10000 flowmeters. These calibrations were performed with water and Stoddard Fluid; 6 vane configurations were tested in all cases. The results follow:

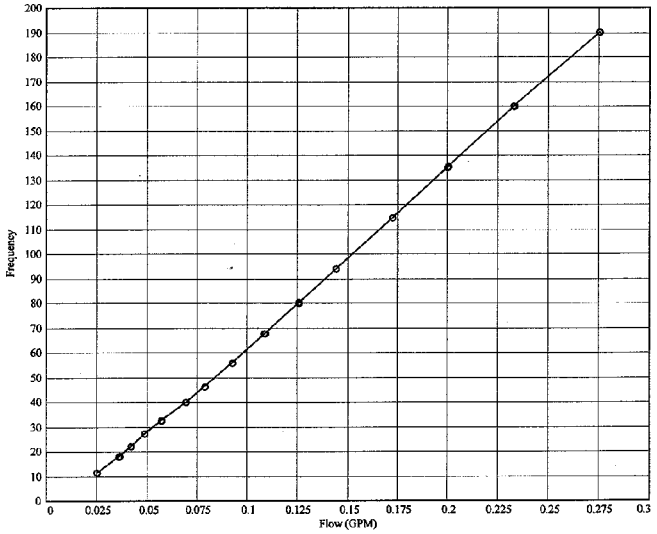
Part Number	Port Size	Linearity	Repeatability	Liquid Range (GPM)
M-10000-T2013-00	1/4"	+4/-4%*	±0.5%	0.036-0.27 Water
M-10000-T2023-00	1/4"	+3/-3%*	±0.5%	0.098-0.86 Water(Not Shown)
M-10000-C3053-00	3/8"	+5/-5%*	±0.5%	0.5-5.2 Water
M-10000-B4083-00	1/2"	+3/-3%	±0.5%	0-20 Water
M-10000-B4083-00	1/2"	+1/-1%**	±0.5%	4-20 Oil

* Over range specified in table above

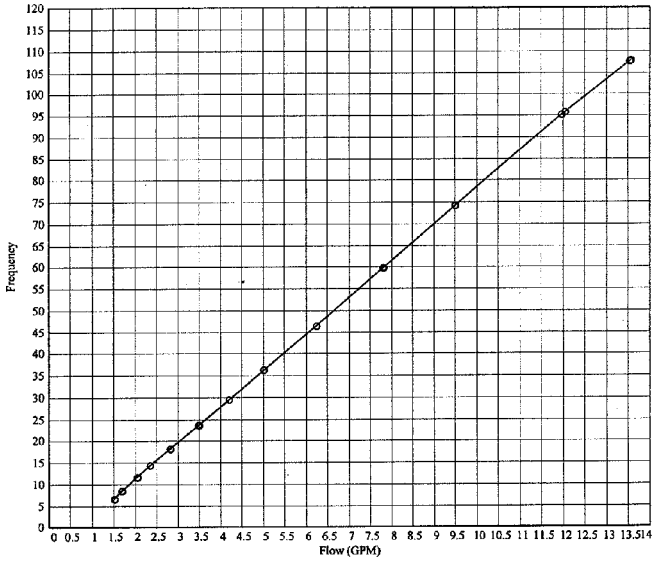
** Fluid Oil at 130°F Viscosity 2.5 cstk

Flow Characteristic Curves

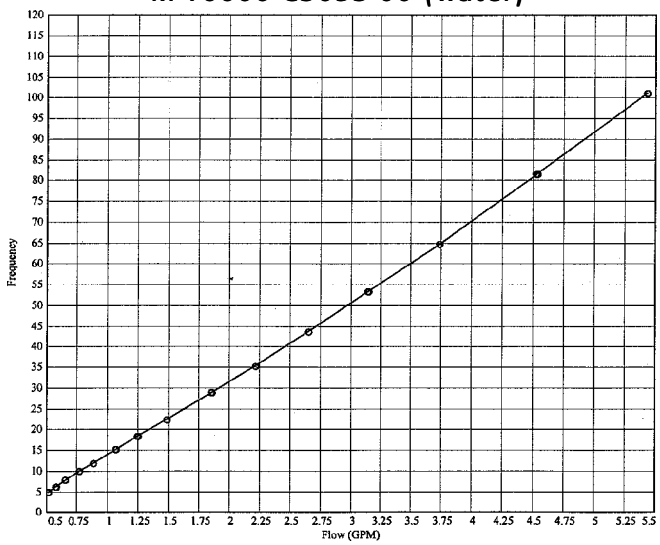
M-10000-T2013-00 (Water)



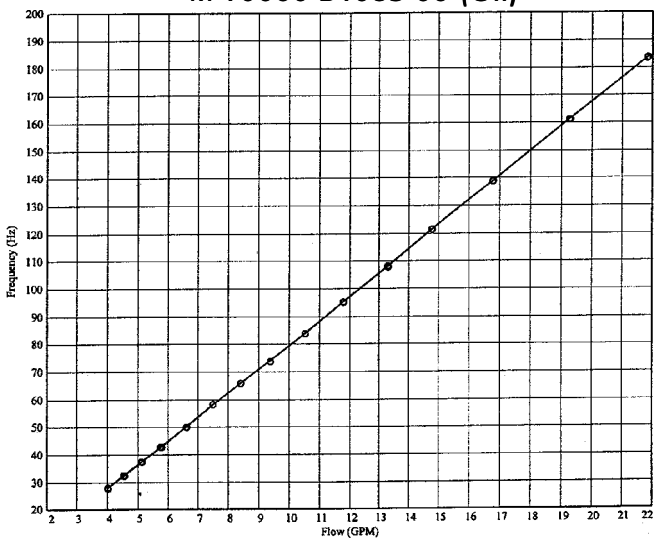
M-10000-B4083-00 (Water)



M-10000-C3053-00 (Water)



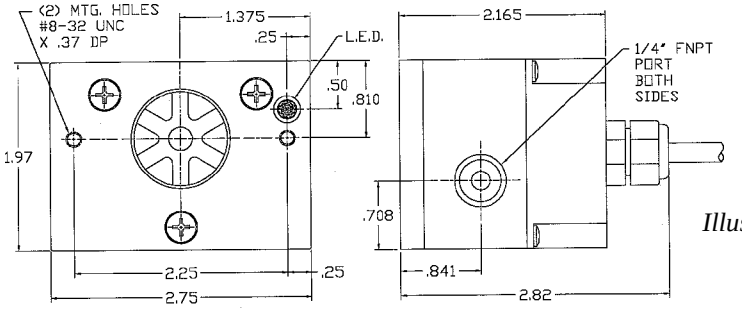
M-10000-B4083-00 (Oil)



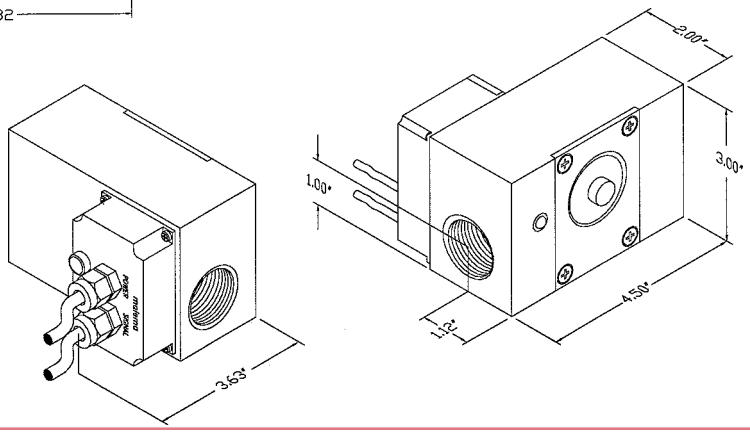
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Dimensional Drawings

Illustrated below is the M-10000 Model with 1/4" ports.



Illustrated below is the M-10000 Model with 1" ports.



Port / Range Combinations

Port Size	Range Code	Range GPM	Range LPM
1/4"	01	0.026 - 0.26	0.1 - 1.0
1/4"	02	0.08 - 0.8	0.3 - 3.0
1/4"	03	0.13 - 1.3	0.5 - 5.0
3/8"	04	0.26 - 2.6	1.0 - 10.0
3/8"	05	0.52 - 5.2	2.0 - 20.0
3/8"	06	0.8 - 8.0	3.0 - 30.0
1/2"	07	1.0 - 10.0	4.0 - 40.0
1/2"	08	1.3 - 13.0	5.0 - 50.0
3/4"	09	5.0 - 30.0	20.0 - 115.0
1"	10	10.0 - 60.0	38.0 - 225.0

Flare Tube / Range Combinations

Flare Tube	Range Code	Range (gpm)	Range (lpm)
1/4"	01	0.026 - 0.26	0.1 - 1.0
3/8"	02	0.8 - 8.0	0.3 - 3.0
3/8"	03	0.13 - 1.3	0.5 - 5.0
1/2"	04	0.26 - 2.6	1.0 - 10.0
1/2"	05	0.52 - 5.2	2.0 - 20.0
1/2"	06	0.8 - 8.0	3.0 - 30.0
3/4"	07	1.0 - 10.0	4.0 - 40.0
3/4"	08	1.3 - 13.0	5.0 - 50.0

Ordering Information

Standard Part Numbering								Options	
M	-	Model	_	Material	Port	Range*	Output	-	Window	Seals
M	-	10000	_	S	2	01	1	-	0	0
		10000		B -Brass C -Celcon S -316 Stainless T -Teflon®	2 -1/4" 3 -3/8" 4 -1/2" 6 -3/4" 8 -1"	01 -0.1 -1 l/m 02 -0.3 -3 l/m 03 -0.5 -5 l/m 04 -1 -10 l/m 05 -2 -20 l/m 06 -3 -30 l/m 07 -4 -40 l/m 08 -5 -50 l/m 09 -20 -115 l/m 10 -38 -225 l/m	0 -Visual only 1 -Voltage 2 -Current 3 -Pulse 4 -Relay		0 -Standard** 1 -316 Stainless 2 -Brass 3 -Polycarbonate 4 -Acrylic 5 -Polysulfone	0 -Standard** 1 -Kalrez® 2 -Viton® 3 -Teflon® encapsulated Viton® 4 -Silicone 5 -EPDM 6 -Butyl 7 -Nitrile

* See "Port/Range Combinations" table above.

**See "Standard Component materials" table on page 1-3

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