



# M-60 Series

## Fixed setting flow switch with in-line flow

### Features

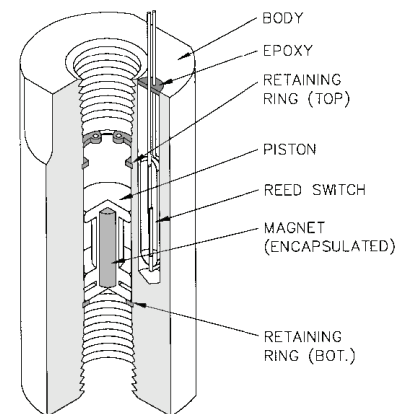
- For corrosive and non-corrosive liquids or gases
- Very accurate custom flow settings
- All-PTFE switch available
- Senses increasing or decreasing flow
- Hermetically sealed
- Universal mounting available

### Description

The M-60 flow switches monitor increasing and decreasing flow. They utilize a single moving part which responds to fluid (liquid or gas) flowing within a system. These switches are suitable for a wide range of applications used in semiconductor, industrial, biomedical, and OEM products. The flow monitors operate only when fluid flow is positively established. The M-60 is available standard with 1/4" FNPT connections.

### Operation

The operating principle is based on a free floating magnetic piston which responds only to the motion of fluids within the line, not to static or system pressures. In the presence of fluid flow, controlled movement of the piston actuates an external hermetically sealed reed switch thus producing the required signal. This signal can be used to actuate audible or visual alarms as well as relays, or other control. Piston travel is short which insures low hysteresis. Pressure drop across flow switch varies from 0.035 to 2 psi (at maximum flow rates for air and for liquid). Universal mounted units are outfitted with a spring which resets the piston. The spring is held in place using an orifice disc.



### Applications

- Sample flow monitoring
- Purge flows
- Semiconductor etch tools
- Alarm actuation
- Loss of flow protection
- Laser cooling equipment

## Measurement Specifications

Calibration Range *	<b>Model M-60:</b> Air: 300 - 55,000 scc/min Water: 10 - 1,600 cc/min * For lower and higher trip points contact factory. Maximum flows through switch are higher.
Set Point Accuracy	±10% maximum
Repeatability	± 5% maximum
Hysteresis	15% - 30%
Material Versions *	<ul style="list-style-type: none"> <li>• Acrylic</li> <li>• Brass</li> <li>• PTFE</li> <li>• Aluminum (Anodized)</li> <li>• 316 Stainless Steel</li> <li>• PVC</li> </ul> * Other materials available on request.
Port Sizes	1/4" FNPT

## 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.

## Design Considerations/Construction

The M-60 Series comprises a Body, Piston, and Retaining Rings. Selecting a Flow Switch begins with selecting the body. This series contains one moving part (i.e. the piston) and two retaining rings that are in the fluid path. Construction of the piston is important from a design perspective. We manufacture three types of pistons (it is critical to select the correct piston for your application): 316 Stainless Steel, PTFE Encapsulated, and Special All-Metal piston.

(1) The standard piston is a 316 Stainless Steel piston with **epoxy** to hold the magnet in place. This piston is recommended for non-aggressive fluids and inert gases. Stainless Steel retaining rings are typically used with this piston type.

(2) The second piston that is available is a PTFE Encapsulated one. This piston is a magnet that has PTFE molded around it and then machined to the appropriate configuration. These pistons are primarily used in PTFE flow switches and also in other flow switch bodies (typically 316SS and Acrylic bodies) where customers prefer a piston that does not have epoxy in the fluid path; as well as a piston that is impervious to aggressive fluids and gases. This piston is highly recommended for medical applications. Hysteresis on these pistons does tend to be slightly higher (10 to 15%) than metal pistons due to frictional effects, weight, and surface adhesion considerations. Prior to selecting this piston, fluid temperatures and fluid compatibility with PTFE must be taken into account because certain aggressive chemicals at specific temperatures tend to swell PTFE causing the piston to change shape resulting in failure of the product. Stainless or PTFE retaining rings can be used with this piston.

(3) The third piston that is available is a Special All-Metal piston with **no epoxy** (only available in 316SS). This piston is fabricated in a proprietary process with only one weld seam (leak tested) which presents an all 316SS surface to the fluid path. This piston is recommended for those applications where the piston could experience a lot of cycling wear. This piston has been tested to 250,000 cycles at 125 psi. Stainless Steel retaining rings are recommended for this piston type for low pressure applications and an orifice disc (see Universal Mounting diagram on page 2-4) is recommended for high pressure (125 psi) applications.

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## Standard Specifications by Materials

Housing	Acrylic	Aluminum	Brass	316SS	PTFE	PVC
Piston*	316SS	316SS	316SS	316SS	PTFE	PVC
Orifice Plate or Disc	Stainless Steel				PTFE	PVC
Spring	Stainless Steel				N/A	Stainless Steel
Retaining Rings*	Stainless Steel (PH 15-7 MO, AMS 5520, AISI-632) (Passivated)				PTFE	Stainless Steel
Pressure & Temperature Maximum Operating (psig) Burst (psig) Maximum Operating Temperature	200 400 77 C (170°F)	1,000 2,000 149 C (300°F)	1,500 3,000 149 C (300°F)	3,000 5,000 149 C (300°F)	80 160 104 C (220°F)	100 200 49 C (120°F)
Reed Switch Data (Electrical Ratings) Reed Switch  Switching Voltage Breakdown Voltage DC Resistive AC Resistive Switching Current	10 Watts SPST or 3 Watts SPDT (Hermetically Sealed) UL Recognized. File E47258. Operating Temperature -40°C to 125°C 200 VDC (170 VDC for SPDT) 250 VDC (200 VDC for SPDT) 10 Watts (3 Watts for SPDT) 10 VA (3VA for SPDT) 0.5 A (0.25 A for SPDT) 1.2 A (0.5A for SPDT)					
Lead Wires	No 24 to 18 AWG. 18" Length, Polymeric UL Recognized (Belden cable or special shielded cable is available)					
Lead Wires Color	SPST: 2 Blue wires; SPDT: Green - Common, Yellow - Normally Closed, Orange - Normally Open					
Flow Calibration Set Point Accuracy Hysteresis (Deadband) Repeatability	(Higher accuracy units available) ± 10% maximum 15% - 30%  ± 5% maximum					

\* See "Design Considerations/Construction" above

## Reed Switch Ratings as Recognized by UL

SPST	120 V ac 24 V dc 50 V dc	0.1 A general purpose 0.25 A resistive 0.25 A resistive
SPDT	120 V ac 10 V dc 24 V dc	0.1 A general purpose 0.25 A resistive 0.1 A resistive

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# Installation & Maintenance

The standard switch has to be mounted vertically in the position shown above for normally open conditions and inverted position for normally closed conditions. When inverted, the switch set-point will change by  $\pm 5\%$ ; please use the product in the orientation it was calibrated (as indicated by reading the label). Universal units can be mounted horizontally or vertically. Please advise mounting orientation while ordering, so that the factory can calibrate in the required orientation as calibration does change slightly when changing orientation. Adequate filtration and sealing procedures should be used when mounting in flow lines. For detailed directions, please refer to our "Installation and Maintenance" sheet.

## Certifications

### UL and Canadian UL

UL and Canadian UL Recognized for ordinary locations. File E138467

### CE Compliance

As per LVD directive

### ROHS Compliance

Our products are manufactured in compliance with RoHS

## Cv at typical set points

	Water cc/m	Air scc/m	Cv
M-60	850	30,000	0.43
	1595	55,000	0.54

## Dimensional and Cut-Away Drawings

Illustrated is the M-60 Model with 1/4" ports.

TABLE-1		Material	
BODY	Aluminum	PISTON	SS316
RETAINER RING	SS	REED SWITCH	SPST**
WIRE LENGTH	36"*		

M-60 Fixed Set Point Flow Switch  
 Service: Oxygen SG: 1.1044 (Pls Confirm)  
 Operating Pressure: 15 PSIA  
 Operating Temperature: 60 degC  
 Part #: M-60-A22-02-001  
 Aluminum Body  
 1/4" FNPT Connection  
 SPST Normally Closed Switch  
 Standard (Vertical) Mounting  
 All SS 316 no Epoxy Piston

Note: Does not include oxygen cleaning  
 \* Leadwires data: No 24 to 18 AWG. 18" Length, Polymeric UL Recognized (Belden cable or special shielded cable is available)  
 \*\* Reed switch data: 10 Watts SPST or 3 Watts SPDT (hermetically Sealed) UL Recognized. File E47258.

Set Point Accuracy : 10 % maximum  
 Set Point Differential : 15 %  
 (Deadband)  
 Repeatability :  $\pm 2\%$  maximum

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Labels in cut-away drawing: BODY (BLACK ANODIZED ALUMINUM) EPOXY, RETAINER RING (TOP) SS, PISTON (SS316), REED SWITCH (SPST), MAGNET (ENCAPSULATED), RETAINER RING (BOT) SS.

Dimensions: 1.25 ± .01, 1.125, 2.25 ± .01.

Ports: 1/4" FNPT PORT.

Leadwires: (2) BLUE.

PART NAME: M-60-A22-02-001		SCALE: --	SHEET: 1 OF 1
PART NO. & REV. NO.: M-60-A22-02-001		REV: 1	DESCRIPTION AS PER TABLE 1
ISS. DATE: 22/02/2017	CHKD. DATE: 22/02/2017	<p>MALEMA SENSORS INDIA PVT. LTD.                  3rd Floor, Hanumanthra Arcade, No.17&amp;18                  Pattergarapalya main road, vijayanagar north                  Bangalore-560079</p>	
APPR. DA	DATE		

MALEMA FLOW SENSORS  
CONFIDENTIAL

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## Fixed Flow Setting Information

This model is a FIXED flow switch. The flow set point is fixed at the factory and is NOT field adjustable. Proper calibration of the set point requires the following information. When purchasing a flow switch, use the "Set Point Calibration" form on page i-vi or provide this information on the purchase order.

- Calibration set point,
- Increasing or decreasing flow,
- Fluid type (i.e. liquid or gas),
- Density or specific gravity,
- Viscosity,
- System pressure and temperature,
- Flow direction (i.e. upward or downward), and
- Mounting orientation (i.e. horizontal or vertical).

## Ordering Information

Standard Part Numbering						Options			
M	-	Model	-	Material	Port	Switch	-	Mounting	Piston
<b>M</b>	<b>-</b>	<b>60</b>	<b>-</b>	<b>S</b>	<b>1</b>	<b>1</b>	<b>-</b>	<b>0</b>	<b>0</b>
		60		A - Aluminum B - Brass P - Acrylic S - 316 Stainless T - PTFE V - PVC	2 - 1/4"	1 - SPST N.O. 2 - SPST N.C. 3 - SPDT 4 - DS (Two SPST)		0 - Standard (Vertical) 1 - Universal Mounting (with disc and spring)	0 - Standard* (316SS with epoxy) 1 - PTFE encapsulated 2 - All-316 SS (no epoxy)

NOTE: Specifications are subject to change without notice.

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