



M-60 Series

Fixed setting flow switch with in-line flow

Features

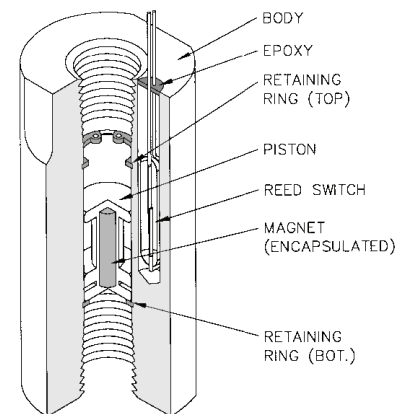
- For corrosive and non-corrosive liquids or gases
- Very accurate custom flow settings
- All-PTFE switch available
- Senses increasing or decreasing flow
- Hermetically sealed
- Universal mounting available

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 * | Model M-60: 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"> • Acrylic • Brass • PTFE • Aluminum (Anodized) • 316 Stainless Steel • PVC * 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.

Corporate Headquarters

1060 S Rogers Circle
 Boca Raton, FL 33487
 P: (561) 995-0595 F: (561) 995-0622

West Coast Headquarters

2329 Zanker Road
 San Jose, CA 95131
 P: (408) 970-3419 F: (408) 970-3426

Asia Pacific Headquarters

35 Marsiling Industrial Estate Road 3 #02-06
 Singapore 739257
 P: (65) 6482-3533 F: (65) 6484-4231

India Headquarters

#1433, 3rd and 4th Floor, Pipeline Road,
 Mahalakshimpuram, Bangalore 560086
 P:(91) 80 2349-9362

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 |

Corporate Headquarters

1060 S Rogers Circle
Boca Raton, FL 33487
P: (561) 995-0595 F: (561) 995-0622

West Coast Headquarters

2329 Zanker Road
San Jose, CA 95131
P: (408) 970-3419 F: (408) 970-3426

Asia Pacific Headquarters

35 Marsiling Industrial Estate Road 3 #02-06
Singapore 739257
P: (65) 6482-3533 F: (65) 6484-4231

India Headquarters

#1433, 3rd and 4th Floor, Pipeline Road,
Mahalakshimpuram, Bangalore 560086
P:(91) 80 2349-9362

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

UNAUTHORIZED USE, MANUFACTURE OR REPRODUCTION IN WHOLE OR IN PART IS PROHIBITED. DRAWINGS AND ALL OTHER DISCLOSURES ARE PROPERTY OF MALEMA ENGINEERING CORPORATION.

MALEMA FLOW SENSORS
CONFIDENTIAL

| | | | |
|-------------------------------------|----------------------|--|----------------------------|
| 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&18 Pattergarapalya main road, vijayanagar north Bangalore-560079</p> | |
| APPR DA | DATE | | |

Corporate Headquarters

1060 S Rogers Circle
 Boca Raton, FL 33487
 P: (561) 995-0595 F: (561) 995-0622

West Coast Headquarters

2329 Zanker Road
 San Jose, CA 95131
 P: (408) 970-3419 F: (408) 970-3426

Asia Pacific Headquarters

35 Marsiling Industrial Estate Road 3 #02-06
 Singapore 739257
 P: (65) 6482-3533 F: (65) 6484-4231

India Headquarters

#1433, 3rd and 4th Floor, Pipeline Road,
 Mahalakshmpuram, Bangalore 560086
 P:(91) 80 2349-9362

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 |
| M | - | 60 | - | S | 1 | 1 | - | 0 | 0 |
| | | 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.

© 2020 Malema Engineering Corporation. All rights reserved.

Malema, Malema Sensors, and Malema Engineering Corporation are service marks of Malema Engineering Corporation. All other trademarks are property of their respective owners. Malema supplies this publication for informational purposes only. While every effort has been made to ensure accuracy, this publication is not intended to make performance claims or process recommendations. Malema does not warrant, guarantee, or assume any legal liability for the accuracy, completeness, timeliness, reliability, or usefulness of any information, product, or process described herein. We reserve the right to modify or improve the designs or specifications of our products at any time without notice. For actual product information and recommendations, please contact your local Malema representative.

Corporate Headquarters

1060 S Rogers Circle
Boca Raton, FL 33487
P: (561) 995-0595 F: (561) 995-0622

West Coast Headquarters

2329 Zanker Road
San Jose, CA 95131
P: (408) 970-3419 F: (408) 970-3426

Asia Pacific Headquarters

35 Marsiling Industrial Estate Road 3 #02-06
Singapore 739257
P: (65) 6482-3533 F: (65) 6484-4231

India Headquarters

#1433, 3rd and 4th Floor, Pipeline Road,
Mahalakshimpuram, Bangalore 560086
P:(91) 80 2349-9362