MALEMA

# M-100X
## Explosion Proof Adjustable Flow Switch with Right Angle Flow

## Key Features

- Field adjustable
- Infinite flow range
- Extremely accurate and sensitive
- Low pressure drop
- UL recognized for hazardous location
- ATEX and IECEX certified for intrinsic safety and encapsulation and dust environments
- Community Europe compliant
- Universal Mounting available

Illustrated is the M-100X model with 1/4" ports.

## Description

The M-100X Series is an extremely sensitive flow switch. It has been engineered to monitor vital sample flow parameters for instrumentation in process control and inert blanket gases. It is used as an auxiliary alarm monitor for flow meters and is ideally suited for applications when installed on a bypass for determination of filter plugging. Infinite adjustment permits detection and signaling of very low fluid flows with the added capability of detection in high flows.

## Operating Principle

When there is no flow the free magnetic piston rests on the bottom of the bore. Process changes in the flow, relative to the variable orifice adjustment initiates the movement of the piston which is restored to its original position when there is a loss of flow. The movement of the piston actuates a sensitive reed switch which can be positioned to indicate a normally open or closed circuit, depending on the specific requirement. A counter-clockwise adjustment of the adjusting screw allows more flow through the bypass, effectively rendering a less sensitive flow switch. A clockwise adjustment of the adjusting screw reduces the bypass flow, redirecting the flow path to the main bore for a more sensitive flow switch.

## Applications

- Gas and liquid analyzers
- Biomedical instruments
- Atmosphere furnaces
- Gas chromatographs
- Vacuum systems
- Industrial fluid lines

## Material Specifications

| | | |
|---|---|---|
| **Housing** | Hasteloy | 316 SS |
| **Endplug** | Hasteloy | 316 SS |
| **Piston** | Hasteloy | 316 SS |
| **Spring (only in universal mounting version)** | Hasteloy | Stainless Steel |
| **Adjustment Screw (wetted area)** | PTFE | |
| **O-rings** | Viton* | |
| **Retaining ring** | N/A | Stainless Steel (PH 15-7 MO, AMS 5520, AISI-632) (Passivated) |

*** Please consult with the factory for any special requirements.**

## Operating Specifications

| | | | |
|---|---|---|---|
| **Pressure & Temperature** | Maximum Operating Pressure | 1,500 psig | 3,000 psig |
| | Burst Pressure | 3,000 psig | 5,000 psig |
| | Maximum Operating Temperature | 150°C (302°F) | |
| **Flow Calibration** | Set Point Accuracy | ± 10% maximum | |
| | Hysteresis | 15% - 30% | |
| | Repeatability | ± 5% maximum | |

**See "Design Consideration/Construction" section**

## Calibration range

| Flow Range | Flow Range Air (sccm) | Flow Range Water (ccm) | Port Sizes |
|---|---|---|---|
| **0 - Low** | 20 - 10,000 | 1 - 200 | 1/8" FNPT |
| **1 - Standard** | 50 - 40,000 | 3 - 650 | 1/8" FNPT |
| **2 - High** | 200 - 60,000 | 5 - 950 | 1/4" FNPT |

**NOTE: The above mentioned ranges could vary if used with a spring for universal mounting.**
**Please contact the factory for higher settings. Please consult with us for alternate port connections.**

## Electrical Specifications

| **Reed Switch data** (Electical Ratings) | 10 Watts SPST or 3 Watts SPDT (Hermetically Sealed) UL Recognized. File E47258 |
|---|---|
| Operating temperature | -40°C to 150°C |
| Switch voltage | 200 Vdc (170 Vdc for SPDT) |
| Breakdown voltage | 250 Vdc (200 Vdc for SPDT) |
| DC Resistive | 10 VA (3 VA for SPDT) |
| AC Resistive | 10 Watts (3 Watts for SPDT) |
| Switching current | 0.5 A (0.25 A for SPDT) |
| Carrying current | 1.2 A (0.5 A 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<br>SPDT: Green - Common, Yellow - Normally Closed, Orange - Normally Open |

## Reed Switch Ratings as Recognized by UL

| | | |
|---|---|---|
| **SPST** | 120 Vac<br>24 Vdc<br>50 Vdc | 0.1 A general purpose<br>0.25 A resistive<br>0.25 A resistive |
| **SPDT** | 120 Vac<br>10 Vdc<br>24 Vdc | 0.1 A general purpose<br>0.25 A resistive<br>0.1 A resistive |

## Installation and Maintenance

The standard switch has to be mounted vertically in the position shown above (first page). Models suitable for universal mounting positions are available upon request. Adequate filtration and sealing procedures should be used when mounting in flow lines. For detailed directions, please refer to our “Installation and Maintenance” sheet.

## Design Considerations / Construction

The M-100X Series comprises a body, piston, and Retaining rings. Selecting a flowswitch begins with selecting the body; this series is available in 316 Stainless Steel or Hasteloy. The M-100X 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 PTFE Encapsulated. This piston is a magnet that has PTFE molded around it and is then machined to the appropriate configuration. These pistons are primarily used in applications when a customer prefers a piston that does not have epoxy in the fluid path; or a piston that is impervious to aggressive fluids and gases. This piston is highly recommended for medical applications. Hysteresis on these pistons tends to be slightly higher (10 to 15%) than a metal piston due to frictional effects, weight, and surface adhesion considerations. Fluid temperatures and fluid compatibility with PTFE must be taken into account prior to selecting this piston. Certain aggressive chemicals at specific temperatures cause the PTFE to swell thus 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 applications in which the piston can 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. An orifice disc (See Universal Mounting Diagram) is recommended for high pressure (125 psi) applications.

## Adjustable Flow Setting Information

This model is an adjustable flow switch. The flow set point can be set at the factory, upon request. When purchasing a flow switch, use the “Flow Switch Application Sheet” or provide additional information on the purchase order to facilitate factory calibration of the set point.

- 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)
- Mounting orientation (i.e. horizontal or vertical)

## 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.

## Certifications

• UL and Canadian UL Recognized for use in USR, CNR - Class I, Groups A, B, C and D; Class II, Groups E, F and G, all divisions (applicable to M-100X, M-50X and M-60X), under UL File # E153446

• UL and Canadian UL Recognized for use in USR, CNR - Class I, Groups C and D; Class II, Groups E, F and G, all divisions – (applicable to M-200X), under UL File # E153446

• ATEX Certification for Intrinsic Safety and Encapsulation (under DEMKO 19 ATEX 2278X and DEMKO 19 ATEX 2270X) (Refer to control drawing for additional details)

- II 1 G Ex ia IIC T6...T3 Ga
- II 1 D Ex ia IIIC T80°C ... T150°C Da

- II 2 G Ex mb IIC T3 Gb
- II 2 D Ex mb IIIC T150°C Db

• IECEX Certification for Encapsulation and Intrinsic Safety (under IECEx UL 13.0067X and IECEx UL 13.0065X) (Refer to control drawing for additional details)

- ia IIC T6...T3
- ia III C T80...T150°C Da

- mb IIC T3 Gb
- mb IIIC T150°C Db ( -40°C to +145°C)

| Electrical Parameters |
|---|
| Ui ≤ 30 V |
| Pi ≤ 0,7 W |
| Ci = 40pf |
| Li = 4 µH |

| Electrical Parameters |
|---|
| Um = 250 V and Im = 1 A |

| Ambient temperature range | Temperature class for Gas | Temperature class for Dust |
|---|---|---|
| - 40 °C to + 60 °C | T6 | T95°C |
| - 40 °C to + 75 °C | T5 | T95°C |
| - 40 °C to + 117 °C | T3 | T140°C |
| - 40°C to + 149 °C | T3 | T175°C |

• **CE Mark**: All EX flow switches are CE certified per ATEX Directive 2014/34/EU

## Cut Dimensional Drawings

Illustrated are the M-100X model with 1/8” ports and SPDT switch (above) and the M-100X model with 1/4” ports and SPDT switch (below). For Reference Only

## Ordering Information

| Model Ordering Code | | | | | | | | | | | | Option |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M-100X | - | * | * | * | * | - | * | * | * | - | *** | |
| | - | | | | | | | | | | | |
| Material | | H | | | | | | | | | | Hasteloy |
| | | S | | | | | | | | | | 316SS |
| Fluid Connection | | | 1 | | | | | | | | | 1/8” FNPT |
| | | | 2 | | | | | | | | | 1/4” FNPT |
| Switch | | | | 1 | | | | | | | | SPST N.O. |
| | | | | 2 | | | | | | | | SPST N.C. |
| | | | | 3 | | | | | | | | SPDT |
| Flow Range | | | | | 0 | Applicable for 1/8” needle valve body | | | | | | Low (needle valve body) |
| | | | | | 1 | Applicable for 1/8” standard valve body | | | | | | Standard |
| | | | | | 2 | Applicable for 1/4” standard valve body | | | | | | High |
| | | | | | | - | | | | | | |
| Mounting | | | | | | | 0 | | | | | Standard (Vertical) |
| | | | | | | | 1 | | | | | Universal Mounting (with disc and spring) |
| Piston | | | | | | | | 0 | | | | 316SS with epoxy |
| | | | | | | | | 1 | | | | PTFE encapsulated |
| | | | | | | | | 2 | | | | All-316SS (no epoxy) |
| Seals | | | | | | | | | 0 | | | Standard (Viton) |
| | | | | | | | | | 1 | | | Kalrez |
| | | | | | | | | | 6 | | | Butyl |
| | | | | | | | | | 7 | | | Buna-N (Nitrile) |
| | | | | | | | | | | - | XXX | Unique PN Identifier |

NOTE: Specifications are subject to change without notice.

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**Corporate Headquarters**
1060 S Rogers Circle
Boca Roton, 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

**South East Asia 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,
Mahalakshmipuram, Bangalore 560086
P:(91) 80 2349-9362