Bimba Position Sensing Switches

Switches

Bimba offers Solid State, Magnetic Reed and Magnetic Reed/Triac-type switches to meet a wide variety of customer needs. Bimba actuators and switches provide a reliable, cost-effective interface between the pneumatically-powered functions of applications and the electrical controls. They eliminate costly, time-consuming design and fabrication of independent electrical limit switch arrangements, and provide an aesthetically pleasing installation.

The switches perform the same function as conventional limit switches. They can be used as position indicators, cycle counters, or to confirm operation. They may also be used as safety devices by allowing for operation of secondary devices only when the actuator is properly positioned.

The Switch Application Selection Guide provides information on which type of switch is suitable for a particular application.

All Bimba switches are designed to sense the magnet that is used in the MRS cylinder and in other Bimba actuators that are ordered with the -M option. All are normally open switches that close when sensing the magnet. We also offer a variety of lead lengths and optional quick connect models.

Benefits of the Solid State Switch

- Compact
- Solid state reliability — no moving parts means longer life, no contact bounce
- Easy to mount on a variety of Bimba actuators
- Able to mount several switches on one actuator
- LED for ease of positioning and troubleshooting
- Available with pigtail leads (in 2 lengths) or quick connect (with two cable length options)
- Faster signal speeds

Benefits of the Magnetic Reed Switch

- Compact
- Lower cost
- Easy to mount on a variety of Bimba actuators
- Able to mount several switches on one actuator
- LED available in many models for ease of positioning and troubleshooting
- Many models:
  - Low, medium and high current models, AC or DC, and triac-type switches for inductive kickback or inrush current.
  - Track- and band-mounted models
  - Choice of pigtail leads in 2 lengths or quick connect with two cable length options

Switch Application Selection Guide

<table>
<thead>
<tr>
<th></th>
<th>Programmable Controllers</th>
<th>Relays</th>
<th>Solenoids</th>
<th>Indicator Lights</th>
<th>Motors</th>
<th>Time Counters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reed Switch</td>
<td>Yes</td>
<td>&lt;5VA*</td>
<td>&lt;5VA*</td>
<td>&lt;5VA*</td>
<td>Yes</td>
<td>&lt;5VA*</td>
</tr>
<tr>
<td>Triac Reed Switch*</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Solid State Switch</td>
<td>Yes</td>
<td>&lt;300mA</td>
<td>No</td>
<td>&lt;300mA</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

* Use resistor-capacitor protection  **Minimum current = 100mA
**Bimba Solid State Switch**

This is a three-wire, solid state device recommended for low current DC loads such as interfacing with a programmable controller. It provides compact, reliable sensing for virtually infinite life. An LED indicator light illuminates when switching occurs. Models are available in current sinking (NPN) and current sourcing (PNP) models. Either can be used for loads such as counters and solid state relays. Selection of sinking or sourcing models depends on the requirements of the programmable controller.

**How it works:**
The Bimba GMR Switch is based on giant magnetoresistive (GMR) technology, which was first developed in 1988. It includes 4 GMR resistors (2 active, 2 shielded), each of which has many thin layers of magnetoresistive material. In each layer, the electrons are oriented opposite the adjacent layer, providing a great deal of resistance to electrical flow. The presence of a magnetic field overcomes the magnetic coupling between the adjacent layers, causing parallel alignment of magnetic moments between layers, and resistance drops significantly. By connecting the 4 resistors in a classic Wheatstone bridge configuration, the voltage across a single resistor is doubled, providing a linear output. This voltage is then amplified, and sent to a comparator that switches the sensor output when it detects that a minimum magnetic field strength is present. High voltage transistors provide TTL-compatible output rated at 25 milliamps. The switch includes reverse polarity, overvoltage and transient protection.

**Sinking vs. Sourcing**

*Bimba offers both sinking and sourcing Solid State Switch models.*

**Sinking switches** are applied to the negative side of a load. When the switch is activated, the negative (ground) is connected, completing the circuit.

**Sourcing switches** are applied to the positive side of a load. When the switch is activated, power is connected, completing the circuit.

The model needed will be determined by a number of factors, including:

- Company standards.
- PLC input cards. (You may have sinking input cards available or your PLC only has a sinking type. Be aware that for some PLC manufacturers, sourcing input cards require a sinking switch or sinking input cards require a sourcing switch; check the specifications to clarify.)
- Type of circuit. PLC manufacturers typically filter input modules that use sourcing field devices and use unfiltered input modules with sinking field devices.

---

**Typical Solid State Sinking Configuration (NPN)**

![Typical Solid State Sinking Configuration (NPN)](image)

**Typical Solid State Sourcing Configuration (PNP)**

![Typical Solid State Sourcing Configuration (PNP)](image)
How to Order

HSK

QCX - 04

To Order Cable Connectors Separately

**Base Model** | **Description**
--- | ---
C4 | 2m - straight
C4X | 5m - straight

**Specifying Band Size**

Many of the Bimba Solid State switches are band-mounted to the actuator. For all band-style switches, a pre-sized band is ordered by adding a bore size designation as the last two or three digits of the basic switch model number. For example, the current sourcing Solid State Switch model for a 1-1/16” bore MRS cylinder would be HSC-09.

<table>
<thead>
<tr>
<th>Bore Size</th>
<th>9/16”</th>
<th>3/4”</th>
<th>7/8”</th>
<th>1-1/16”</th>
<th>1-1/4”</th>
<th>1-1/2”</th>
<th>1-3/4”</th>
<th>2”</th>
<th>2-1/2”</th>
<th>3”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bore Model Number</td>
<td>02</td>
<td>04</td>
<td>06</td>
<td>09</td>
<td>12</td>
<td>17</td>
<td>24</td>
<td>31</td>
<td>50</td>
<td>70</td>
</tr>
</tbody>
</table>
Bimba Solid State Switches

Electrical Specifications

Solid State Switches (3 wire switches)

- **Input Voltage**: 4.5 to 30 VDC
- **Load Current**: 150 mA, maximum
- **Sensor Element**: Solid-State
- **Off-State Leakage**: 10 microamperes, maximum
- **Reverse Battery**: 40 VDC, minimum
- **Transient Protection**: 500 Watts of peak power, minimum
- **Overvoltage Protection**: 37 VDC maximum with up to 12 amperes
- **Sensor Operation Indicator**: Red LED for Sinking, Yellow LED for Sourcing
- **Turn-on Time**: 1 microsecond, maximum
- **Turn-off Time**: 1 microsecond, maximum
- **“On” Voltage Drop**: 0.4 VDC, maximum, for a Sinking Circuit
- **Operational Temperature Range**: -20°F to +185°F, minimum
- **Insulation Resistance**: 100 megohms, lead to case with a 500 volt AC and or DC source
- **Flammability Rating**: UL 94 VO
- **Packaging**: IEC 529-1989, Category IP 67 Tests
- **Vibration**: Mil-Std-810E, Method 514.1, Category 10
- **Welding Field Immunity**: Immune to welding fields to 4000 amperes, minimum at a minimum distance of 0.25’
- **CE Mark**: CE Compliance per engineering evaluation to certified circuits
- **Cable**: 3 conductor, 24 to 26 AWG, Gray PVC outer jacket
- **Repeatability**: +/-0.005”

**See page 135 for signal repeatability and hysteresis**

Electrical Circuit Diagrams

**HSC**

**Typical Solid State Sourcing Configuration for HSC Models (PNP)**

Basic Circuit Layout for Programmable Logic Controllers (PLC) and Normally Off Relays and Solenoids

**CAUTION**: Shorting white wire to ground will damage switch

**HSK**

**Typical Solid State Sinking Configuration for HSK Models (NPN)**

Basic Circuit Layout for Programmable Logic Controllers (PLC) and Normally Off Relays and Solenoids

**CAUTION**: Shorting white wire to supply voltage will damage switch
**Bimba Solid State Switches**

**Pin and Wire Assignments for Quick Connect**

8mm Female Connector

- **BROWN - POSITIVE**
- **BLUE - GROUND**
- **BLACK - OUTPUT**

Face View of Male Connector

1. POSITIVE
2. GROUND
3. OUTPUT

**Dimensions**

**HSC, HSK Solid State Switches**

(inches shown, mm in parentheses)

**Mounting**

**HSC, HSCQ, HSK, HSKQ**

The switch can be mounted anywhere along the length and circumference of the actuator body. Mounting hardware includes the switch, a presized stainless steel band, a chrome-plated zinc die cast housing and a ball head screw. 2-3 in.-lbs. of torque recommended for mounting.

**Note:** Mount with LED face up.
Hysteresis and Operating Windows

Hysteresis
Bimba Solid State switches are subject to hysteresis. Hysteresis is the difference in magnetic field strength needed to initiate switch operation versus the field strength needed to sustain switch operation. The effect is that the switch break point will be different from the switch make point in the piston travel.

Operating Window
The operating window is the distance the piston travels while the switch is in the “ON” state, and includes the hysteresis action. For the Solid State Switch, hysteresis is greater on one side of the operating window because this switch is sensitive to only one side of the magnet.

For high speed equipment, the time duration of the switch signal may be critical. The time duration is a function of the operating window length and the speed of operation of the actuator. It is calculated by dividing the minimum travel in the operating window by the piston speed, taking into account the hysteresis effect. The illustrations and chart below show the operating windows for the Solid State Switch.

---

Operating Windows and Hysteresis

<table>
<thead>
<tr>
<th>Bore</th>
<th>Operating Window</th>
<th>Maximum Hysteresis</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/16&quot;</td>
<td>.290&quot;</td>
<td>.040&quot;</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>.310&quot;</td>
<td>.040&quot;</td>
</tr>
<tr>
<td>7/8&quot;</td>
<td>.320&quot;</td>
<td>.040&quot;</td>
</tr>
<tr>
<td>1-1/16&quot;</td>
<td>.330&quot;</td>
<td>.040&quot;</td>
</tr>
<tr>
<td>1-1/4&quot;</td>
<td>.340&quot;</td>
<td>.040&quot;</td>
</tr>
<tr>
<td>1-1/2&quot;</td>
<td>.350&quot;</td>
<td>.040&quot;</td>
</tr>
<tr>
<td>1-3/4&quot;</td>
<td>.350&quot;</td>
<td>.040&quot;</td>
</tr>
<tr>
<td>2&quot;</td>
<td>.360&quot;</td>
<td>.040&quot;</td>
</tr>
<tr>
<td>2-1/2&quot;</td>
<td>.370&quot;</td>
<td>.040&quot;</td>
</tr>
<tr>
<td>3&quot;</td>
<td>.380&quot;</td>
<td>.040&quot;</td>
</tr>
<tr>
<td>4&quot;</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>
**Bimba Magnetic Reed Switch**

This is a two-wire device with wires directly connected to a reed switch. Specifications are valid for purely resistive loads only. Choosing a switch is governed by our published load current derating curves. These are derived from the switch contact rating, expressed in wattage. Bimba offers magnetic reed switches that can handle the current requirements of a wide variety of applications. In addition, models are available for track- or band-mounting, and many include an LED indicator light to show when switching occurs. A third wire is added for switches with LED indicator lights to power the LED.

**Magnetic Reed/Triac-type Switch**

This is a two-wire device recommended for high current AC loads. The reed switch senses the magnet and triggers the solid state triac that performs the actual current switching. The switch can handle up to 25A one-cycle surge to accommodate inductive kickback (current surge when an electrical device such as a solenoid coil is turned off) and inrush (current surge when a device is first turned on). Its operation is unreliable below 100mA load current. Maximum current is subject to ambient temperature. Models are available for track or band mounting.

**How it works:**

Reed switches contain hermetically-sealed reeds, or contacts. When the magnet on the piston moves close to the switch, the reeds become magnetized and the normally open contacts will close or pull in. The resulting signal can be used to signal or control other operations in the system. When the magnet moves away from the piston, the contacts will open or drop out.

**How to Order/List Prices**

**MRS - .087 -P □ B L QCX - 04**

<table>
<thead>
<tr>
<th>SWITCH TYPE</th>
<th>BAND MOUNT</th>
<th>LED</th>
<th>OPTIONAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>24” (0.6m) pigtail lead</td>
<td>□</td>
<td>L = LED</td>
<td>X = Include if 144” (3.66m) pigtail lead needed (Not applicable with Quick Connect)</td>
</tr>
<tr>
<td>□</td>
<td>Omit = No LED</td>
<td>□</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BAND SIZE</th>
<th>(See page 137)</th>
</tr>
</thead>
</table>

**OPTIONAL**

- Q = Include if Quick Connect style needed
- QC = 2 meter mating cable accompanies switch
- QCX = 5 meter mating cable accompanies switch

**To Order Cable Connectors Separately**

<table>
<thead>
<tr>
<th>Base Model</th>
<th>Description</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>C4</td>
<td>2m - straight</td>
<td>$20.00</td>
</tr>
<tr>
<td>C4X</td>
<td>5m - straight</td>
<td>30.00</td>
</tr>
</tbody>
</table>
## Bimba Magnetic Reed Switches

**Electrical Specifications for Magnetic Reed Switches**

<table>
<thead>
<tr>
<th>Base Model</th>
<th>Base Model 24&quot; (0.6m) pigtail lead</th>
<th>OPTIONS</th>
<th>Quick Connect</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>24&quot; (0.6m) pigtail lead</td>
<td>X 144&quot; (3.66m) pigtail lead</td>
<td></td>
</tr>
<tr>
<td>MRS-.027</td>
<td>$12.25</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>MRS-.087</td>
<td>12.25</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>MRS-.087-B</td>
<td>17.85</td>
<td>23.55</td>
<td>33.70</td>
</tr>
<tr>
<td>MRS-.087-BL</td>
<td>21.50</td>
<td>28.35</td>
<td>40.25</td>
</tr>
<tr>
<td>MRS-.087-PBL</td>
<td>21.50</td>
<td>28.35</td>
<td>40.25</td>
</tr>
<tr>
<td>MRS-.1.5</td>
<td>22.50</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>MRS-.1.5-S</td>
<td>22.50</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>MRS-.1.5-B</td>
<td>25.10</td>
<td>30.60</td>
<td>N/A</td>
</tr>
</tbody>
</table>

1. Track mount switches – Must specify -Z in cylinder part number for track mounting; valid for MRS cylinders only.
2. Switches come with 24" pigtail leads. Consult distributor for longer leads.

**Specifying Band Size**

Many of the Bimba Magnetic Reed switches are band-mounted to the actuator. For all band-style switches, a pre-sized band is ordered by adding a bore size designation as the last two digits of the basic switch model number. For example, the Magnetic Reed Switch model MRS-.087-B for a 2" would be MRS-.087-B-31.

<table>
<thead>
<tr>
<th>Bore Size</th>
<th>9/16&quot;</th>
<th>3/4&quot;</th>
<th>7/8&quot;</th>
<th>1-1/16&quot;</th>
<th>1-1/4&quot;</th>
<th>1-1/2&quot;</th>
<th>1-3/4&quot;</th>
<th>2&quot;</th>
<th>2-1/2&quot;</th>
<th>3&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bore Model Number</td>
<td>02</td>
<td>04</td>
<td>06</td>
<td>09</td>
<td>12</td>
<td>17</td>
<td>24</td>
<td>31</td>
<td>50</td>
<td>70</td>
</tr>
</tbody>
</table>

**Applications**

- Reed-9/16" & 3/4" bore low wattage
- Reed-24 VDC 3-wires w/LED
- Reed-24 VDC or 120 VAC, 2-wires bi-polar, low current, good for PLC
- Reed-24 VDC or 120 VAC, 2-wires No LED, quick connect
- Trac Reed-AC only, up to 230 VAC, Inductive Inrush OK, 100mA min.
- Reed-24 VDC or 200 VAC, 2-wires No LED, quick connect

* (Normally Open)  
1 (1-1/16" to 2-1/2")  
2 (9/16" to 3/4")
**Electrical Circuit Diagrams**

**MRS-.027**
MRS-.087
MRS-.087-B

**MRS-.087-BL**

**MRS-.087**
MRS-.087-BL
MRS-.087-PBL
MRS-.087-PBLQ
MRS-.1.5-B

**MRS-.087-BQ**
MRS-.087-PBLQ

8mm Male Connector

See page 134 for Pin and Wire Assignments for Quick Connect

**Dimensions**

(inches shown, mm in parentheses)

To order longer leads, specify D-12660-A-lead length in inches. Consult BIMBA distributor or factory for prices.

To order longer leads, specify D-7000-A-lead length in inches. Consult BIMBA distributor or factory for prices.

To order longer leads, specify D-16312-A-lead length in inches. Consult BIMBA distributor or factory for prices.
Mounting

Band-style

The switch can be mounted anywhere along the length and circumference of the actuator body. Mounting hardware includes the switch, a band, a U-shaped bracket and a screw (included). 2-3 in.- lbs. of torque recommended for mounting.

Track-style

For Original Line MRS Cylinders With -Z Option

Actuator models ordered for position sensing include a special switch track. The switch slides into the track and is tightened with a screw (included). For track-mounted switches on MRS cylinders with -Z option, the following dimensions apply:

<table>
<thead>
<tr>
<th>Bore Designator</th>
<th>Bore</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>02</td>
<td>9/16&quot;</td>
<td>1.00</td>
</tr>
<tr>
<td>04</td>
<td>3/4&quot;</td>
<td>1.38</td>
</tr>
<tr>
<td>09</td>
<td>1-1/16&quot;</td>
<td>1.50</td>
</tr>
<tr>
<td>12</td>
<td>1-1/4&quot;</td>
<td>1.68</td>
</tr>
<tr>
<td>17</td>
<td>1-1/2&quot;</td>
<td>1.91</td>
</tr>
<tr>
<td>24</td>
<td>1-3/4&quot;</td>
<td>2.20</td>
</tr>
<tr>
<td>31</td>
<td>2&quot;</td>
<td>2.43</td>
</tr>
<tr>
<td>50</td>
<td>2-1/2&quot;</td>
<td>2.98</td>
</tr>
</tbody>
</table>

Miniature Position Sensing track lengths can now be purchases separately for field mounting of custom track locations. Simply Specify the length of track desired after the part number.

Mounting recommendations:
- Clean body with acetone. Remove all oil from body surface.
- Avoid mounting track over rolled construction. Locate edge of track 0.175" from rolled construction.
- Use a solid continuous bead of glue for the entire length of track used. Bead should fill center channel of track.
- Adhere to recommended cure times as specified by the glue manufacturer.

For all Original Line Cylinders with M option, including MRS cylinders

<table>
<thead>
<tr>
<th>Bores</th>
<th>Part Number</th>
<th>List Price</th>
<th>Adder per Inch</th>
</tr>
</thead>
<tbody>
<tr>
<td>007 - 04 D-74168-A-length</td>
<td>$2.50</td>
<td>$0.90</td>
<td></td>
</tr>
<tr>
<td>06 - 31 D-78527-A-length</td>
<td>$2.50</td>
<td>$1.00</td>
<td></td>
</tr>
<tr>
<td>50 - 70 D-78528-A-length</td>
<td>$2.50</td>
<td>$1.10</td>
<td></td>
</tr>
</tbody>
</table>

Loctite U-05FL or similar adhesive is recommended (not included).
**Hysteresis and Operating Windows**

**Hysteresis**
Bimba Magnetic Reed switches are subject to hysteresis. Hysteresis is the difference in magnetic field strength needed to initiate switch operation versus the field strength needed to sustain switch operation. The effect is that the switch break point will be different from the switch make point in the piston travel.

**Operating Window**
The operating window is the distance the piston travels while the switch is in the “ON” state, and includes the hysteresis action. For the Magnetic Reed Switch, hysteresis is equal on both sides of the operating window.

For high speed equipment, the time duration of the switch signal may be critical. The time duration is a function of the operating window length and the speed of operation of the actuator. It is calculated by dividing the minimum travel in the operating window by the piston speed, taking into account the hysteresis effect. The illustrations and charts below show the operating windows for the Magnetic Reed Switches.

---

**All band mount, MRS-.087 and MRS-1.5 for Original Line**

<table>
<thead>
<tr>
<th>Type</th>
<th>Bore Designator</th>
<th>Bore</th>
<th>Operating Window</th>
<th>Hysteresis Maximum</th>
<th>Repeatability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original Line</td>
<td>02, 04, 09</td>
<td>9/16&quot;, 3/4&quot;, 1-1/16&quot;</td>
<td>0.350</td>
<td>0.040</td>
<td>± .015&quot;</td>
</tr>
<tr>
<td></td>
<td>12, 17, 24, 31, 50</td>
<td>1-1/4&quot;, 1-1/2&quot;, 1-3/4&quot;, 2&quot;, 2-1/2&quot;</td>
<td>0.440</td>
<td>0.040</td>
<td>± .015&quot;</td>
</tr>
</tbody>
</table>

**MRS-.027 and MRS-1.5-S for Original Line**

<table>
<thead>
<tr>
<th>Type</th>
<th>Bore Designator</th>
<th>Bore</th>
<th>Operating Window</th>
<th>Hysteresis Maximum</th>
<th>Repeatability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original Line</td>
<td>02, 04</td>
<td>9/16&quot;, 3/4&quot;</td>
<td>0.345</td>
<td>0.015</td>
<td>± 0.015&quot;</td>
</tr>
</tbody>
</table>
Bimba Low Profile Switch

Bimba’s new low profile switches offer the latest giant magnetoresistive technology, and offers more features and functionality in the smallest package of any actuator position sensing switch. The switch fits in a track located on the cylinder’s body and leaves it flush with the cylinder body. It has fast response, symmetrical hysteresis, and infinite life.

Bimba offers 4 different low profile switches:
- Magnetic Reed Switch
- GMR Auto-configure
- GMR source (PNP) output
- GMR Sink (NPN) output

Features/Advantages
- Extremely small – the Bimba GMR Switches are the lowest profile switch currently available.
- The Auto-Configure GMR Switch automatically determines whether the switch has been connected to a current sinking or sourcing load.
- Solid state reliability – no moving parts means longer life, no contact bounce.
- Fast response rate – 1 microsecond maximum.

- Low, symmetrical hysteresis eases set-up and provides more accurate sensing.
- Built-in fault protection including reverse polarity, overvoltage and transient protection.
- LED verifies switching and eases set-up.
- Several switches can be mounted on one actuator.
- Pigtail leads in two lengths, with Quick Connect option for easy set-up.
- For use with Bimba EF1, Twin Bore, and Original Line cylinders, and PneuMoment® actuators.

How it Works
The Bimba GMR Switch is based on giant magnetoresistive (GMR) technology, which was first developed in 1988. It includes 4 GMR resistors (2 active, 2 shielded), each of which has many thin layers of magnetoresistive material. In each layer, the electrons are oriented opposite the adjacent layer, providing a great deal of resistance to electrical flow. The presence of a magnetic field overcomes the magnetic coupling between the adjacent layers, causing parallel alignment of magnetic moments between layers, and resistance drops significantly. By connecting the 4 resistors in a classic Wheatstone bridge configuration, the voltage across a single resistor is doubled, providing a linear output. This voltage is then amplified, and sent to a comparator that switches the sensor output when it detects that a minimum magnetic field strength is present. High voltage transistors provide TTL-compatible output rated at 25 milliamps. The switch includes reverse polarity, overvoltage and transient protection.

Switch Application Selection Guide

<table>
<thead>
<tr>
<th>Switch Application Guideline</th>
<th>Switch Application Selection Guide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch</td>
<td>Programmable Controllers</td>
</tr>
<tr>
<td>Magnetic Reed</td>
<td>Yes</td>
</tr>
<tr>
<td>GMR Auto-configure Switch</td>
<td>Yes</td>
</tr>
<tr>
<td>GMR Source or Sink Output</td>
<td>Yes</td>
</tr>
</tbody>
</table>

*Use resistor-capacitor protection
**How to Order**

The Model Number for all extruded track mount switches consists of three alphanumeric clusters. These designate switch type and lead length. Please refer to the chart below for an example of Model Number MSCQCX. This is a Solid State switch with PNP output including a Quick Connect cable attachment and a 5meter mating cable.

**MSC X QCX**

<table>
<thead>
<tr>
<th>Switch Type</th>
<th>Optional</th>
<th>Optional</th>
</tr>
</thead>
<tbody>
<tr>
<td>MR- Magnetic Reed Switch</td>
<td>X- Include if 144&quot; (3.6m) pigtail lead needed (not applicable with Quick Connect)</td>
<td>Q- 8mm Quick Connect without cable</td>
</tr>
<tr>
<td>MSC- GMR Source (PNP) output</td>
<td></td>
<td>QC- 2 meter mating cable accompanies switch</td>
</tr>
<tr>
<td>MSK- GMR Sink (NPN) output</td>
<td></td>
<td>QCX- 5 meter mating cable accompanies switch</td>
</tr>
<tr>
<td>MS- GMR auto-configure</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**List Prices**

<table>
<thead>
<tr>
<th>Base Model</th>
<th>Base Model with Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>MR (Magnetic Reed)</td>
<td>MRX (3.6m leads)</td>
</tr>
<tr>
<td>$17.50</td>
<td>$28.50</td>
</tr>
<tr>
<td>MSC (GMR Source output)</td>
<td>MSCX (3.6 leads)</td>
</tr>
<tr>
<td>$28.80</td>
<td>$39.80</td>
</tr>
<tr>
<td>MSK (GMR Sink output)</td>
<td>MSKX (3.6m leads)</td>
</tr>
<tr>
<td>$28.80</td>
<td>$39.80</td>
</tr>
<tr>
<td>MS (Auto-configure)</td>
<td>MSX (3.6m leads)</td>
</tr>
<tr>
<td>$35.75</td>
<td>$45.00</td>
</tr>
</tbody>
</table>

**To Order Cable Connectors Separately**

<table>
<thead>
<tr>
<th>Base Model</th>
<th>Description</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>C4</td>
<td>2 meter – straight</td>
<td>$20.00</td>
</tr>
<tr>
<td>C4X</td>
<td>5 meter – straight</td>
<td>30.00</td>
</tr>
</tbody>
</table>

**Mounting**

Slide the switch into the cylinder’s switch track. Extend and retract the cylinder while positioning the switch until the switch’s operating window is correct. Secure the switch in the cylinder track by turning the set screw with a hex driver. Cycle the cylinder (both extending and retracting) a number of times to confirm correct operation and adjust as required.

**Note:** Maximum torque on set screw is .170 N-m (1.5 in.-lbs.). Do not overtighten.

All prices are F.O.B. Monee, Illinois and are subject to change without notice.
## Electrical Specifications

**Reed Switch (Models: MR, MRX, MRQ)**

- Circuit: 2 Wire, Normally Open, Sinking (NPN) or Sourcing (PNP)
- Input Voltage: 3 to 120 VAC / 3 to 24 VDC
- Current Rating: 25mA max.
- Contact Rating: 3 Watts
- Voltage Drop: 2.3 V
- Shock: 10-200 Hz, 10g
- Vibration: 11ms, 1/2 Sine Wave, 150g
- Turn ON/OFF Time: 1.0 millisecond
- Operating Temperature: -25° to 85°C (-13° to 185°F)
- Enclosure: IEC IP 67
- Flammability: 94VO
- LED Indicator: Red

**GMR Switch (Models: MSC, MSCX, MSCQ)**

- Circuit: 3 Wire, Normally Open, Sourcing (PNP)
- Input Voltage: 5 to 24 VDC
- Current Rating: 50mA max.
- Voltage Drop: 1.5 V
- Off State Leakage: 10µA max.
- Quiescent Current: 5mA max.
- Turn ON/OFF Time: 0.10 millisecond
- Operating Temperature: -20° to 85°C (-4° to 185°F)
- Enclosure: IEC IP 67
- Flammability: 94VO
- LED Indicator: Yellow
- Over Voltage, Reverse Polarity and Transient Protected

**GMR Switch (Models: MS, MSC, MSQ)**

- Circuit: 3 Wire, Normally Open, Sinking (NPN) or Sourcing (PNP)
- Input Voltage: 5 to 24 VDC
- Input Current: 25mA max.
- "ON" Voltage Drop: Sinking 0.4 Volts max.
- Sourcing 1.5 Volts max.
- Output Current: 25µA max.
- Power Dissipation: 300 mW max.
- Turn ON/OFF Time: 0.10 millisecond
- Operating Temperature: -20° to 85°C (-20° to 185°F)
- Off State Leakage: 10 microamp max.
- Signal: ± 0.4mm (.015")
- Repeatability: ± 0.4mm (.015")
- LED Indicator: Red
- Reverse Polarity Protection: 500 Watts of Peak Power Protection
- Over Voltage Protection: 27 VDC max. 16A max.

**GMR Switch (Models: MSK, MSKX, MSKQ)**

- Circuit: 3 Wire, Normally Open, Sinking (NPN)
- Input Voltage: 5 to 24 VDC
- Current Rating: 25mA max.
- Voltage Drop: 0.5 V
- Off State Leakage: 10µA max.
- Quiescent Current: 5mA max.
- Turn ON/OFF Time: 0.10 millisecond
- Operating Temperature: -20° to 85°C (-4° to 185°F)
- Enclosure: IEC IP 67
- Flammability: 94VO
- LED Indicator: Red
- Over Voltage, Reverse Polarity and Transient Protected

## Dimensions

### MR, MRX, MRQ, MS, MSX, MSQ, MSC, MSCX, MSCQ, MSK, MSKX, MSKQ mm (in.)

![Diagram of dimensions]
### Electrical Circuit Diagrams

**MR, MRX, MRQ (Reed Switch)**

![Diagram](image)

**MSK, MSKX, MSKQ (Sinking, Solid State)**

![Diagram](image)

**MSC, MSCX, MSCQ (Sourcing, Solid State)**

![Diagram](image)

**Note:** On Quick Connect reed switch models, connect only the Blue and Brown wires on the mating cable and cut back the Black wire. Do Not connect switch to a mating cable that has been previously wired for a 3 wire solid state switch, as it will short the MRQ switch.

**Color Codes**

<table>
<thead>
<tr>
<th>Color</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown</td>
<td>(+) Positive</td>
</tr>
<tr>
<td>Black</td>
<td>Output</td>
</tr>
<tr>
<td>Blue</td>
<td>(-) Negative</td>
</tr>
</tbody>
</table>

### Hysteresis and Operating Window

**Original Line Cylinder Window Switch Comparisons for Mini GMR and Mini Reed Switches**

<table>
<thead>
<tr>
<th>Bore</th>
<th>Window</th>
<th>Maximum Hysteresis</th>
<th>Repeatability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mini GMR</td>
<td>Mini Reed</td>
<td></td>
</tr>
<tr>
<td>007</td>
<td>.250”</td>
<td>.350”</td>
<td>.040”</td>
</tr>
<tr>
<td>01</td>
<td>.275”</td>
<td>.375”</td>
<td>.040”</td>
</tr>
<tr>
<td>02</td>
<td>.350”</td>
<td>.450”</td>
<td>.040”</td>
</tr>
<tr>
<td>04</td>
<td>.375”</td>
<td>.475”</td>
<td>.045”</td>
</tr>
<tr>
<td>06</td>
<td>.375”</td>
<td>.500”</td>
<td>.045”</td>
</tr>
<tr>
<td>09</td>
<td>.425”</td>
<td>.550”</td>
<td>.045”</td>
</tr>
<tr>
<td>12</td>
<td>.450”</td>
<td>.575”</td>
<td>.050”</td>
</tr>
<tr>
<td>17</td>
<td>.450”</td>
<td>.575”</td>
<td>.050”</td>
</tr>
<tr>
<td>24</td>
<td>.450”</td>
<td>.575”</td>
<td>.050”</td>
</tr>
<tr>
<td>31</td>
<td>.450”</td>
<td>.575”</td>
<td>.050”</td>
</tr>
<tr>
<td>50</td>
<td>.450”</td>
<td>.575”</td>
<td>.050”</td>
</tr>
<tr>
<td>70</td>
<td>.500”</td>
<td>.650”</td>
<td>.050”</td>
</tr>
</tbody>
</table>